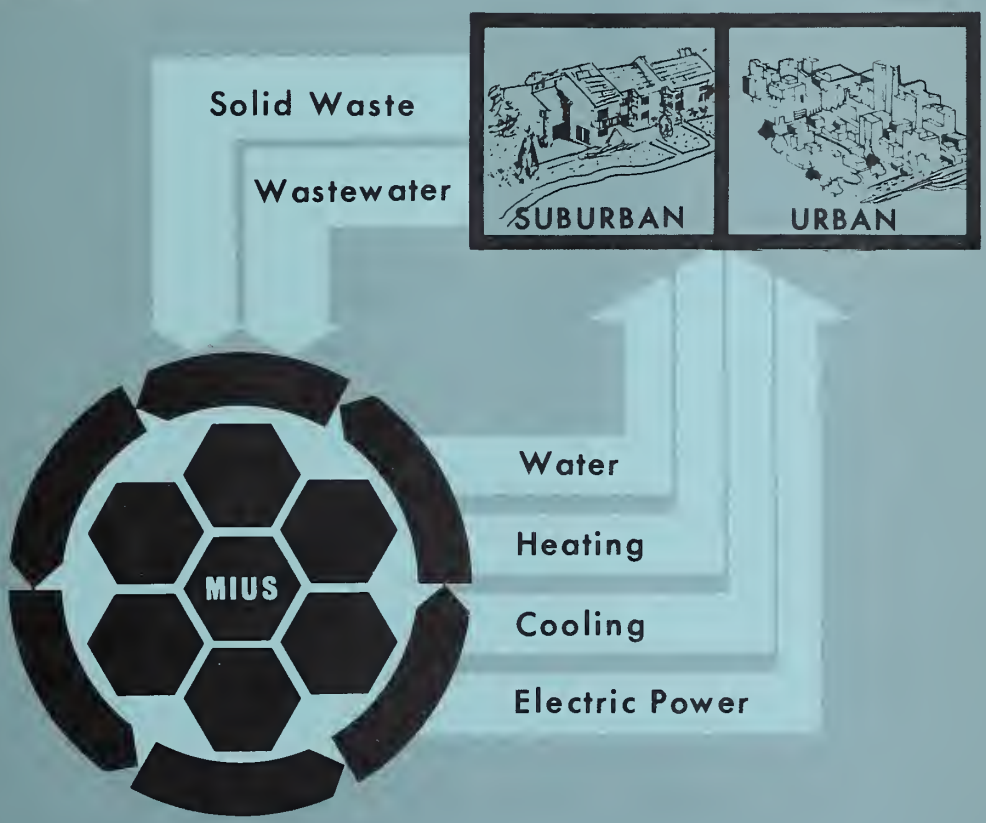
International Project Catalog of Modular Integrated Utility Systems

NBS SPECIAL PUBLICATION 515

U.S. DEPARTMENT OF COMMERCE/National Bureau of Standards for
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

hudmius

MODULAR INTEGRATED UTILITY SYSTEMS
improving community utility services by supplying electricity, heating, cooling, and water/ processing liquid and solid wastes/ conserving energy and natural resources/ minimizing environmental impact



NATO OTAN | CDSM CCMS

COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY

NATO/CCMS 73

NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards[1] was established by an act of Congress March 3, 1901. The Bureau's overall goal is to strengthen and advance the Nation's science and technology and facilitate their effective application for public benefit. To this end, the Bureau conducts research and provides: (1) a basis for the Nation's physical measurement system, (2) scientific and technological services for industry and government, (3) a technical basis for equity in trade, and (4) technical services to promote public safety. The Bureau's technical work is performed by the National Measurement Laboratory, the National Engineering Laboratory, and the Institute for Computer Sciences and Technology.

THE NATIONAL MEASUREMENT LABORATORY provides the national system of physical and chemical and materials measurement; coordinates the system with measurement systems of other nations and furnishes essential services leading to accurate and uniform physical and chemical measurement throughout the Nation's scientific community, industry, and commerce; conducts materials research leading to improved methods of measurement, standards, and data on the properties of materials needed by industry, commerce, educational institutions, and Government; provides advisory and research services to other Government Agencies; develops, produces, and distributes Standard Reference Materials; and provides calibration services. The Laboratory consists of the following centers:

Absolute Physical Quantities[2] — Radiation Research — Thermodynamics and Molecular Science — Analytical Chemistry — Materials Science.

THE NATIONAL ENGINEERING LABORATORY provides technology and technical services to users in the public and private sectors to address national needs and to solve national problems in the public interest; conducts research in engineering and applied science in support of objectives in these efforts; builds and maintains competence in the necessary disciplines required to carry out this research and technical service; develops engineering data and measurement capabilities; provides engineering measurement traceability services; develops test methods and proposes engineering standards and code changes; develops and proposes new engineering practices; and develops and improves mechanisms to transfer results of its research to the utlimate user. The Laboratory consists of the following centers:

Applied Mathematics — Electronics and Electrical Engineering[2] — Mechanical Engineering and Process Technology[2] — Building Technology — Fire Research — Consumer Product Technology — Field Methods.

THE INSTITUTE FOR COMPUTER SCIENCES AND TECHNOLOGY conducts research and provides scientific and technical services to aid Federal Agencies in the selection, acquisition, application, and use of computer technology to improve effectiveness and economy in Government operations in accordance with Public Law 89-306 (40 U.S.C. 759), relevant Executive Orders, and other directives; carries out this mission by managing the Federal Information Processing Standards Program, developing Federal ADP standards guidelines, and managing Federal participation in ADP voluntary standardization activities; provides scientific and technological advisory services and assistance to Federal Agencies; and provides the technical foundation for computer-related policies of the Federal Government. The Institute consists of the following divisions:

Systems and Software — Computer Systems Engineering — Information Technology.

[1]Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington,D.C. 20234.
[2]Some divisions within the center are located at Boulder, Colorado, 80303.

The National Bureau of Standards was reorganized, effective April 9, 1978.

International Project Catalog of Modular Integrated Utility Systems

A Report of the
Committee on the Challenges of Modern Society
Rational Use of Energy Pilot Study
Modular Integrated Utility Systems Project

M. H. Nimmo
C. W. Phillips

Center for Building Technology
National Engineering Laboratory
National Bureau of Standards
Washington, D. C. 20234

Prepared for:

Division of Energy, Building Technology and Standards
Office of Policy Development and Research
U. S. Department of Housing and Urban Development
Washington, DC 20410

U.S. DEPARTMENT OF COMMERCE, Juanita M. Kreps, Secretary
Dr. Sidney Harman, Under Secretary
Jordan J. Baruch, Assistant Secretary for Science and Technology
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, Director

Issued July 1978

Library of Congress Catalog Card Number: 78-600056

National Bureau of Standards Special Publication 515

Nat. Bur. Stand. (U.S.), Spec. Publ. 515, 455 pages (July 1978)
CODEN: XNBSAV

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON: 1978

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
Stock No. 003-003-01953-4 Price $6.50

(Add 25 percent additional for other than U.S. mailing).

FOREWORD

This International Project Catalog was prepared for the Committee on the Challenges of Modern Society - Rational Use of Energy Pilot Study - Modular Integrated Utility System (CCMS-MIUS Project), to identify modular integrated utility system type of projects among participating countries. This product of the committee's work is an outgrowth of strong international concern for improving utility services to communities, reducing energy consumption and improving the environment.

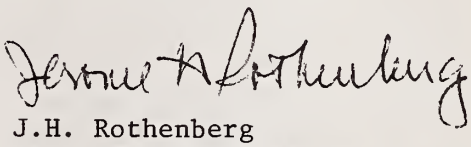
The CCMS-MIUS Project has been piloted by the U.S. under the leadership and sponsorship of the U.S. Department of Housing and Urban Development (HUD) Division of Energy, Building Technology and Standards, Office of Policy Development and Research.

The International Project Catalog is significant in that it provides experts with a means to seek further technical information and data on a particular project in which they are interested. For each project the catalog includes a description of the project, its status, the approach, expected results, some technical data, the principal investigator, and an indication whether or not data is/or will be available.

Another product being prepared by the CCMS-MIUS Project separate from the catalog is a standard methodology for measuring the performance of Modular Integrated Utility Systems (MIUS) type of projects and the reporting and taking of data. This product will aid principal investigators in preparing a final report and other experts where reports are available in evaluating and comparing the performance of systems.

The International Project Catalog has been designed to facilitate the location of projects by country and type of project (e.g., total energy, district heating) and to aid the inclusion of future revisions.

C.W. Phillips
Chairman, CCMS-MIUS Project Committee
and NBS/HUD-MIUS Program Manager



J.H. Rothenberg
Head, U.S. Delegation to
CCMS-MIUS Project Committee and
HUD-MIUS Program Director

CONTRIBUTING STAFF

This Catalog was prepared by the Secretariat of the CCMS-MIUS Project under the direction of the Project's Data Format Committee.

The U.S. was the lead country and the Department of Housing and Urban Development (HUD) served as the lead agency of the CCMS-MIUS Project. HUD sponsored and directed the U.S. participation and effort under the leadership of J.H.Rothenberg, HUD-MIUS Program Director. The National Bureau of Standards in providing technical support to HUD on the HUD-MIUS Program performed the duties of Secretariat and chaired the semi-annual committee meetings. The individuals who contributed to the preparation of this Catalog are hereby acknowledged:

J.H.Rothenberg (HUD) - Head of U.S. Delegation as lead country

Secretariat

Clinton W. Phillips (NBS)-CCMS-MIUS Project Committee Chairman
Morris H. Nimmo (NBS) - Editor
Walter Shipp (NBS) - Contributing Editor
Sandra L. Kelley (NBS) - Administrative Aide
Ulesia B. Gray (NBS) - Clerical and Typing
Norma A. Wood (NBS) - Clerical and Typing

Data Format Committee

Canada (K.R.Solvason)
Italy (Dr. Marzio Mangialajo)
Netherlands (J.W.H. Van den Bergh)
United Kingdom (P.J.O'Neill)
United States (C.W.Phillips, Chairman)

Contributing Countries and Their Coordinators

Belgium - J.A.Michel
Canada - K.R. Solvason
Denmark - Prof. E. Bjorn Qvale
Federal Republic of Germany - Dr. Helmut Klein
France - Dr. Tovy Grjebine
Italy - Dr. Marzio Mangialajo
Japan - Kunio Shimizu
Netherlands - J.W.H.Van den Bergh
Sweden - Ulf Renghold
United Kingdom - P. J. O'Neill
United States - C.W.Phillips

Others Who Contributed to the Catalog through their Committee Participation are:

Austria - P.V.Gilli
Federal Republic of Germany - Dr. Ulrich Plantikow
France - Michel Simon
Netherlands - J.A.Knobbout
U.S.CCMS Coordinator - F.A.Harris

TABLE OF CONTENTS

List of Tables

International Project Catalog of Modular Integrated Utility Systems

M.H. Nimmo
C.W. Phillips

The International Project Catalog prepared for the Committee on the Challenges of Modern Society-Rational Use of Energy Pilot Study - Modular Integrated Utility Systems (CCMS-MIUS Project) is a compilation of project descriptions on more than 200 Modular Integrated Utility Systems (MIUS) type of projects being conducted in the participating countries. Each project description includes a description of each project, its status, the approach, expected results, some technical data, the principal investigator, an indication whether or not data is/or will be available and other miscellaneous project information. The catalog is useful to the experts in identifying the various projects being conducted and seeking further technical information on those particular projects in which they are interested.

The catalog is the first of a three level reporting system to report on MIUS type of projects. The second and third level reporting systems, which are expected to be improved and completed in future activities under another international organization, will provide information and guidelines for reporting progress and supplying data. The catalog consists of three parts: an Introduction, list of Projects by Country, and Project Descriptions, one for each project reported.

Keywords: Catalog, CCMS-MIUS Project Catalog, International Project Catalog, Project Catalog, Project Summary Forms, Reporting System.

1.1 PURPOSE

This International Project Catalog has been designed to provide summary descriptions of Modular Integrated Utility System (MIUS) type of projects* being conducted by countries participating in the Committee on the Challenges of Modern Society (CCMS), Rational Use of Energy Pilot Study, Modular Integrated Utility System (MIUS) Project hereafter referred to as the CCMS-MIUS Project.

The International Project Catalog has been prepared by the CCMS-MIUS Project under the direction of its Data Format Committee to assist users in identifying MIUS type of projects and assessing the objectives, progress and significance of each project. The catalog also provides at a glance a sampling of the state of the art in MIUS type of projects and integrated utility system technology and research and thus provides a base for the exchange of information and data resulting from research.

The catalog is a collection of Project Summary Forms assembled on the projects reported. Each form covers one project and provides a description of the project, its status, the approach, expected results, some technical data and other miscellaneous project information. It further indicates whether analytical data and more comprehensive information is or will be available and from whom it may be obtained.

There are many energy saving and energy efficient MIUS type of projects either planned, in progress or in operation. Some are operating successfully and efficiently while others are marginal or disappointing. Thus an organized and standard method of measuring performance in order that MIUS type of projects can be compared with each other is essential if the danger of someone replicating a less than desirable project is to be reduced and shortcomings identified and corrected. Since information and analyses of MIUS type of projects are to be shared among participating countries, the need for a standard method for measuring the performance of a project is even greater. The CCMS-MIUS Project recognizing this need also worked toward the preparation of a standard methodology for measuring performance. It is included in the project's report to the Fall CCMS Plenary, October 18-19, 1977.

1.2 SCOPE

The International Project Catalog includes MIUS type of projects submitted by all participating NATO and Non-NATO countries. Every effort was made to be as comprehensive as possible in view of the information available at the time.

---

* Refer to paragraph 1.4.3 for a definition of "MIUS type of projects."

Each Project Summary Form submitted as a candidate for the Catalog was considered on the basis of whether the project is a MIUS type of project, its significance to MIUS technology, and the expected availability of information and data resulting from the project. Project Summary Forms were accepted on projects that are planned, in progress or completed. Although there was no time limit on projects submitted, those projects that were completed for more than two years were examined more carefully and included primarily on the basis of their significance. Paragraph 1.4.3 Definition of "MIUS Type of Project" is the criteria that was used for selecting Project Summary Forms for inclusion in the catalog. Future selections for any subsequent update of the catalog will also follow the same criteria.

Twenty-six countries (15 NATO and 11 Non-NATO) were invited to participate in the CCMS-MIUS Projects and provide inputs to the catalog. Fifteen countries participated in the CCMS-MIUS Project by having attended and participated in the semi-annual meetings and/or by having provided Project Summary Forms.

1.3 HISTORY AND DESCRIPTION OF CCMS

The Committee on the Challenges of Modern Society (CCMS) is a committee of the North Atlantic Treaty Organization (NATO) created by the member countries on the occasion of the twentieth anniversary of the Alliance in 1969.

CCMS was established and directed to examine how to improve, in every practical way, the exchange of views and experience among the NATO countries in the task of creating a better environment for their societies ... and to consider specific problems of the human environment with the deliberate objective of stimulating action by member governments.

The basis of CCMS and its work program is to promote an effective and continuing exchange of information, technology and experience in order to pool the world's expertise and expand the base of knowledge, and to create the best possible environment for all nations. Participation is open to Non-NATO countries.

The CCMS is flexible and action oriented and differs from most international organizations in that it operates by a "pilot study" method where countries with the most expertise and interest agree to take the lead role (pilot), finance the project and see that action ensues.

1.4 CCMS-MIUS PROJECT

1.4.1 Origin and Objectives

The CCMS-MIUS Project is one among several projects that comprise the pilot study program, Rational Use of Energy. The project was organized as a result of strong mutual international concern over the need to improve methods for providing improved utility services to communities.

The MIUS concept of integrating the services into a single plant is the major thrust and distinguishing characteristic of the project. This project was approved at the NATO CCMS Ministers Level Meeting in Turin, Italy, May 1974 with the establishment of the pilot study, Rational Use of Energy. This pilot study began from an ad hoc committee established to investigate the feasibility of establishing such a pilot study and the Chairman's report on the U.S. proposal for a pilot study on "Energy Conservation and Meetings of Experts on Energy Conservation in Buildings and Industry". The object of this pilot study was to identify and transfer energy conservation technology among the participating countries.

The pilot study, Rational Use of Energy and its sub-project, the CCMS-MIUS Project, are both piloted by the United States. The U.S. Department of Housing and Urban Development (HUD) was assigned the lead agency role responsibility for the CCMS-MIUS Project due to its pursuance of the MIUS concept through its HUD-MIUS Program and its experience with the Total Energy Demonstration at Jersey City, N.J.

The CCMS-MIUS Project had its first meeting in Brussels at NATO headquarters, April 10-11, 1975. It was an organization meeting in which the various needs in the transfer of Modular Integrated Utility Systems information were identified and tasks to help satisfy these needs begun.

At present the CCMS has eleven pilot studies underway. They are as follows:

	STUDY	PILOT
1.	Advanced Wastewater Treatment	U.K.
2.	Disposal of Hazardous Wastes	FRG
3.	Solar Energy	U.S.
4.	Geothermal Energy	U.S.
5.	Rational Use of Energy	
	° Climatic Conditions and Test Reference Year	Denmark
	° Electric Utility Load Management	U.S.
	° International Industrial Data Base	U.S. & Italy
	° Modular Integrated Utility Systems	U.S.
6.	Air Pollution Assessment Methodology and Modeling	FRG
7.	Automotive Propulsion/Low Pollution Power Systems (APS/LPPSD)	U.S.
8.	Nutrition and Health	Canada
9.	Remote Sensing in the Control of Marine Pollution	France
10.	Flue Gas Desulfurization	U.S.
11.	Drinking Water	U.S.

The following pilot studies have been completed.

1. Environment and Regional Planning
2. Disaster Assistance
3. Road Safety
4. Air Pollution
5. Inland Water Pollution
6. Coastal Water Pollution
7. Advanced Health Care
8. Urban Transportation

1.4.2 Description of the MIUS Concept

The Modular Integrated Utility System Concept brings together subsystems that together provide improved means for furnishing essential services for residential communities.

The MIUS "recycles energy" by providing an option to package into one processing plant all of the six utility services necessary for community development.

- electricity
- space heating and water heating
- air conditioning
- solid waste processing
- wastewater treatment
- residential water purification

Conventional methods of generating electricity convert about 35% of the energy input to electrical output. The remaining 65% is vented to the atmosphere or flowing water in a manner that optimizes the electrical conversion process. MIUS theoretically can recover better than half of this rejected energy and use it for space heating, air conditioning, water heating and to improve wastewater treatment efficiency. An additional 5-10% fuel savings can be made by recycling solid waste for its energy content.

In addition to saving energy, MIUS minimizes the environmental impact of utility systems.

The overall objectives of the MIUS concept are to:

- Provide utility services in an improved manner with advantages in total cost, decreased environmental impact and increased efficiency in the utilization of natural resources;

- Provide utility service capacity at a pace equal to the rate of growth of the new development;

- Make land available for development in areas that are not being serviced by conventional utility.

1.4.3 Definition of "MIUS Type of Project"

The following criteria was used to select projects for the catalog. It will be used also for any further revisions.

Although the MIUS concept generally connotes or is thought of as the integration of six utility services, it is accepted as two or more integrated utility services. However, for classification purposes in this catalog, a MIUS will be thought of as having five or six utility services.

A "MIUS type of project", a term used throughout this catalog, means a broad range of utility/energy systems which are related to, similar to, part of a MIUS, or may include a MIUS. A "MIUS type of project" is one that involves a utility system/subsystem that is, or has the potential to be, integrated with one or more utility system(s)/subsystem(s) to produce those utility services more efficiently and economically than would be possible with independent (non-integrated) systems.

"Integrated" refers to use of a combined plant to furnish more than one utility service with a total system approach, whereby some resource requirements of one utility would be met by utilizing the effluent of another.

Project

What constitutes a project? A project acceptable for inclusion in the International Project Catalog should be hardware oriented. A project may even be a study, such as a feasibility study, if it has major national significance, or if it is one that could lead to the construction of an actual system or a study which shows that an application is not feasible.

An acceptable hardware system may be a research-oriented laboratory or pilot plant investigation, or it may be a demonstration or commercial facility which is serving actual community utility loads. A laboratory investigation would most likely be one for equipment or subsystem development, a pilot plant would be one for experimentation with future plants or system development in mind, a demonstration facility would be one constructed specifically to prove feasibility of an actual real-life plant by acquisition and evaluation of data. A commercial facility serving an actual community or industry is highly desirable as a CCMS-MIUS project if basic operating data is available for evaluating performance.

Modular

What do we mean by Modular? Modular can have several meanings when applied to an integrated utility system. Some ideas that were helpful in determining a CCMS-MIUS type of project are as follows:

1. Modular may connote a small community size plant serving a small community or part of a community. Thus, the modular system is part of the overall infrastructure. It could be a small facility serving a shopping center, a school, a hospital, an apartment complex or a combination of these.

2. Modular may connote a small community size plant with the potential to grow in increments as the community grows. Thus the added increment could be considered a module.

3. Modular may represent the structure of the integrated utility system itself, since an integrated utility system would consist of subsystems. Thus a subsystem could be considered a module.

MIUS Type of Projects

The following definitions and guidelines of MIUS type of projects were used in considering projects for the Catalog.

1. MIUS - An integrated utility system where all utility subsystems are integrated to provide utility services better, more economically and with less fuel consumption than conventional systems. A MIUS provides power, space heating/cooling, domestic hot water, solid waste processing, wastewater treatment and provisions for potable water. A MIUS recovers rejected heat from power generation and refuse incineration, and reduces undesirable discharges to the environment. It is recognized that a MIUS, no matter how well designed and operated, can not achieve maximum overall efficiency all of the time. All rejected heat that is reclaimable is unlikely to be needed 100 percent of the time, e.g. very little, if any, space heating/cooling may be needed during mild temperatures.

2. Total Energy System (TE) - An integrated utility system that provides power, space heating/cooling and domestic hot water. It recovers rejected heat from power generation.

3. Integrated Utility System (IUS) (other than a complete MIUS or Total Energy) - Two or more utility subsystems which are integrated. Examples are: use of renovated wastewater for use in power plant cooling towers, solid waste processing with incineration and wastewater treatment, and wastewater treatment with water renovation or reuse. A MIUS and a Total Energy System are special cases of an Integrated Utility System.

4. District Heating (DH)-A system by which heat is supplied to buildings in an urban area through insulated pipelines from one or more heat

sources situated external to the buildings. Any district heating system that has the potential or is to be integrated with another utility subsystem (refuse incineration or power generation, to provide better services at less cost) should be included.

5. Utility System - A system that furnishes a single utility service. A utility subsystem that is being improved or developed for integration with another utility system or one that is being improved to exhance the integration process should be considered. This would include, for example an improved method of recovering heat during power generation.

6. Component/Equipment - A component or piece of equipment that is being improved or developed specifically for the purpose of improving the integrated utility system/subsystem, or the integration process. For example: Thermal Storage Systems, boilers, heat pumps, heat exchangers, etc. Note: A project to improve a component or piece of equipment such as a boiler or heat pump, with no specific objective related to integrated systems should not be considered a project for the catalog.

Scale

Although modular in "MIUS" has sometimes been interpreted as being limited to small scale plants, this is not correct. For the purpose of identifying projects all size plants which followed the type of projects listed above were considered.

Status

The status of a project was not a critical factor in the acceptance of a project for the catalog. Projects that were in the planning stage, on-going, or completed were accepted. A project was not considered complete until the final report had been published or released and data evaluated.

Availability of Data

A pilot plant, demonstration facility or commercial system should be one in which good quality data that will be useful in analyzing plant performance is being acquired and is readily accessible. The more data available the better, however, operational data such as that produced by a commercial system was adequate in choosing candidates for the project catalog.

1.5 PARTICIPATING COUNTRIES

NATO and Non-NATO countries are participating in the CCMS-MIUS Project.

Those NATO and Non-NATO countries that have participated in the CCMS-MIUS Project by either sending Project Summary Forms for inclusion in the International Project Catalog or by participating in the CCMS-MIUS Project meeting are as follows: Austria, Belgium, Canada, Denmark, Finland, France, Federal Republic of Germany, Italy, Japan, the Netherlands, New Zealand, Spain, Sweden, the United Kingdom and the United States.

All countries that have particular interest in MIUS type of projects by virtue of their work, are encouraged to participate in any future activities. Any future work will be under the auspices of another International Organization when one has been acquired, as the CCMS-MIUS Project concluded its activities at its last meeting July 12-14, 1977, after a two year period.

1.6 ORGANIZATION OF CATALOG AND HOW TO USE THE CATALOG

1.6.1 Contents

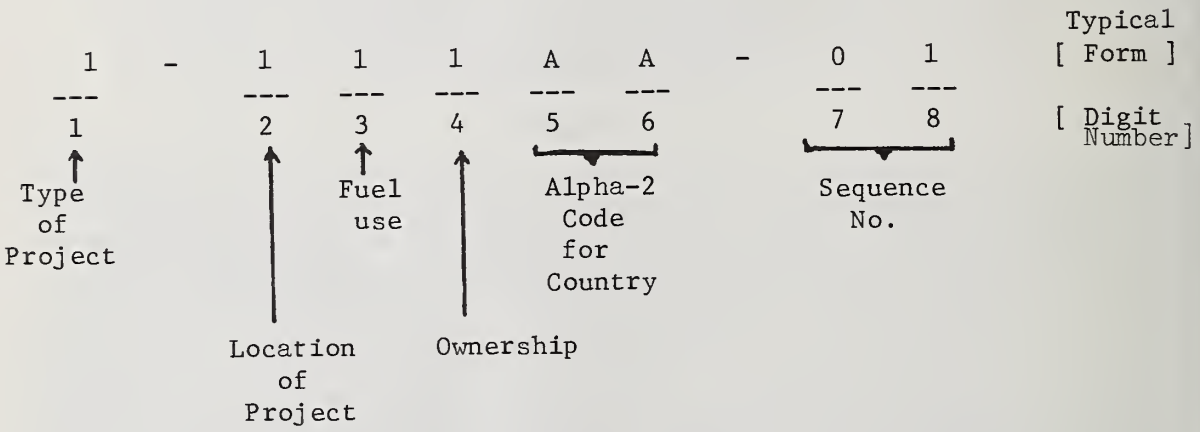
The catalog is divided into three parts, Introduction, List of Projects by Country, and Project Descriptions. Part I, Introduction, includes the purpose of the catalog and its intended use; the scope of the catalog's coverage; the history and description of the CCMS-MIUS Project, the MIUS concept and a definition of a MIUS type of project; the countries participating in the CCMS-MIUS Project, the Catalog's organization and how to use the catalog; a discussion of the three level reporting system; a description of the Project Summary Form, and how one may obtain additional copies of the catalog. Part II, List of Projects by Country, includes a table for each country reporting MIUS type of projects. Each table lists each MIUS type of project indentified or reported for that particular country. There may be projects listed which do not have a completed Project Summary Form. If a completed Project Summary Form is provided in Part III, the Identification Number will be given. Part III, the Project Description is a compilation of Project Summary Forms, one for each project reported, and is divided into 6 sections, one for each type of project. They are MIUS, Total Energy Systems, Integrated Utility Systems (IUS - for purpose of the catalog an IUS is defined as two or more integrated utility systems other than MIUS and Total Energy), District Heating, Utility Systems (a single system), and Component/Equipment.

Each project is assigned an identification number which can be useful in locating a project. It can assist in quickly identifying the type of project, the project's location, the fuel used, ownership, and the country in which the project is located. Refer to paragraph 1.6.3., How to Use the Catalog.

1.6.2 Description of Identification Number and Code

Part III, Project Descriptions, of the Catalog has been organized according to the identification number, an eight digit code, as shown in Table 1-1. This listing is by no means inclusive. As more projects are included, in any future revision, categories will be added, as necessary. In some cases the combination of some areas may be necessary.

Table 1-1 Identification Number Code



In the case of fuel use there are systems that are multi-fueled. If more than one fuel category is needed to identify the fuels used, indicate more than one category by using a period (.) to represent "and". For example: categories 1 "and"2 may be represented by "1.2". Thus the identification number might be 1-21.21AA-09. If three categories are needed use "1.2.3". The identification number would then be 1-21.2.31AA-09.

Table 1-1 Identification Number Code (cont.)

The First digit--Type of Project

1. MIUS
2. Total Energy System
3. Integrated Utility System (IUS)
4. District Heating
5. Utility System (a single system)
6. Component/Equipment

The Second digit -- Location of Project

1. Community (Residential/Commercial)
2. Shopping Center
3. School
4. Hospital
5. Industrial/Commercial
6. Utility
7. Military Base
8. Small Utility
9. Hotel/Motel
0. Other

The Third digit -- Fuel Used

1. Fuel Oil (distillate, residual or crude)
2. Natural Gas
3. Refuse Derived Fuel (RDF)
4. Synthetic Gas
5. Coal
6. Coal + RDF
7. Fuel Oil + Natural Gas
8. Solar Assist
9. Nuclear
0. Other

The Fourth digit -- Ownership

1. Public
2. Private
3. Cooperative
4. Public and Private

The fifth and six digit -- The country where the Project is located, using the Alpha-2 Code, of ISO Standard 3166-1974 and American National Standard Z39.27-1976.

Those countries which reported MIUS type of projects and their Alpha-2 codes are as follows:

Belgium	- BE	Italy	- IE
Canada	- CA	Japan	- JP
Denmark	- DK	Netherlands	- NL
Finland	- FI	Sweden	- SE
France	- FR	United Kingdom	- GB
Germany	- DE	United States	- US

The seventh and eighth digits form the Sequence Number.

As an example, 1-222US-12 would be a MIUS located in the U.S. in a shopping center using natural gas and privately owned. The last two digits indicate that it is the 12th entry in the MIUS category of projects.

1.6.3 How to Use the Catalog

The catalog has been designed in order that a particular project can be easily located on the basis of country, type of project by country, type of project, project descriptions (e.g. location, fuel used, ownership, etc.). The first step in using this Catalog is to become familar with its organization (e.g. Parts, Sections, etc.) and the various aids such as Table of Contents, Tables 2-1 through Table 2-12, and the Identification Number. Study the identification number and learn the code for each digit. Refer to Paragraph 1.6.2.

The Table of Contents identifies the type of projects (e.g. total energy, district heating) by their Section Number in Part III; Tables 2-1 through 2-12 in Part II identify all projects in a particular country; by using the first digit of the identification, a further breakdown by the type of project for a particular country can be located; and by using the identification number alone a project may be identified easily and in many cases located on the basis of country, type of project, location (e.g. community, utility) fuel used and type of ownership (e.g. public, private).

Examples:

Question: Locate all Total Energy Projects in the U.S.

Procedure: Go to Table 2-12, locate all projects whose identification number begins with a 2 (corresponds to total energy systems), observe sequence numbers. They are numbers 2--07, --18, --19, --21, --25, --27, --38, --39, --40. (Note the 2nd through the 5th digit in this case are not used. Only the first digit which identifies the type of project and the last two digits which identify the sequence within the type of project category are used.)

Question: Locate all oil fired total energy systems.

Procedure: Go to Section 2 for all total energy systems; check each identification number and note that the third digit is a 1. They are numbers 2--04, --05, --06, --07, --16, --17, --18, --21, --27, --28, --38.

Question: Locate all privately owned total energy systems in the Netherlands.

Procedure: Go to Table 2-9 and identify all total energy projects. They are 2-01, 08, 09, 10-12, 14, 15, 17, 22-24, 30-37, 41. Go to Section 2, check the projects identified above, and observe those projects that have PRIVATE checked in box 11, Type of Project. They are 2-11, 12, 14, 15, 17, 30-34, 37 and 41.

1.7 THREE LEVEL REPORTING SYSTEM

The International Project Catalog was designed as the first of a three level reporting system, Phase I, to report data on MIUS type of projects. The catalog is comprised of Project Summary Forms assembled together with appropriate tables of contents. This first phase is designed to be all inclusive without identifying successful or marginal beneficial systems, but to make certain that all possible systems are covered. The information contained on these forms is a broad overview of what the system is supposed to accomplish rather than a detailed analysis. The Project Summary Form developed by the CCMS-MIUS Project Data Format Committee will in general, tell where a project is located and who is responsible for its development and what generally is to be expected. Enough general information is included to allow a quick assessment of its merits and whether or not more information would be desirable. If in fact more information is necessary in order to determine whether this system would serve a given set of needs as perceived by the decision maker than he would request Phase II.

The second level reporting system, Phase II, is the "Project Progress/Evaluation Report". It was designed and partially developed by the CCMS-MIUS Project Data Format Committee and is intended to serve as an executive summary, i.e. it provides much more detail than Phase I. Obviously not all systems reported in Phase I are appropriate for the second level reporting system, Phase II.

If an expert desires more information than is provided in the Project Summary Form, he may contact the principal investigator or sponsoring organization to obtain the Project Progress/Evaluation Report if one is available. The report may not follow the same outline provided in the report form, but generally it will provide the information requested as appropriate for the particular project. The availability or future availability of a Project Progress/Evaluation Report may be indicated by whether the "Exchange of data" box (12) on the Project Summary Form has been checked "Yes or No". Not all projects, of course, will have a Project Progress/Evaluation Report if the "Exchange of data" box is checked "Yes".

From the Project Progress/Evaluation Report one will be able to make valid comparisons of similar projects to determine which one is best suited for a given set of conditions. The format is also such that problems and how they were overcome can be assessed and comparisons made. Many times similar projects in different locations have varying degrees of success, and it becomes quite difficult to determine what the critical factors are. Phase II should eliminate this variance or at least reduce its magnitude.

Although the Project Progress/Evaluation Report was designed and partially developed by the CCMS-MIUS Project its future development and use, if any, will be done under the auspices of another International Organization when one has been acquired as the CCMS-MIUS Project has concluded its activities.

The third level reporting system, Phase III, and final Phase is the "Standard Methodology for Measuring the performance of MIUS Type of Projects". It was developed by the CCMS-MIUS Project Measurement Technology Committee. This methodology is a standard methodology which is a guide for documenting the measurement of performance and taking of and reporting of data resulting from testing and demonstration of MIUS type of projects. It is the complete analysis of the system in such fashion that every conceivable constraint is considered and all critical points are identified. With this report a project can be successfully duplicated in another location. The standard methodology is included in the CCMS-MIUS Project report to the CCMS Plenary.

These forms have one common goal in mind and that is to carry the project manager from an ideal to a successful project in a logical sequential fashion using the inverted pyramid approach, eventually narrowing down to the one concept that fits all the needs of a particular area.

1.8 PROJECT SUMMARY FORM

1.8.1 Description

The Project Summary Form is two pages (front and back) and serves as a vehicle for providing summary descriptions of MIUS type of projects. The Project Summary Form is intended to assist experts in determining if a project is of interest to him and in accessing the objectives, progress and significance of each project.

Each CCMS-MIUS Project participant was asked to prepare a Project Summary Form for all MIUS type of projects with which he is associated or knowledgeable whether or not project data will be available for sharing with other experts.

The completed Project Summary Forms then were forwarded to the Secretariat who processed, printed, and bound the forms to compose this International Project Catalog. The catalog will be disseminated to CCMS-MIUS Project participants. It will also be made available to others on a single copy basis upon request.

1.8.2 Instruction for Completing the Form

The following instructions were used to guide the CCMS-MIUS Project participants in the completion of Project Summary Forms, and are included as follows to help the catalog user better understand the content of each Project Summary Form by knowing the criteria under which the Project Summary Forms were prepared.

When completing a form, one should endeavor to provide all of the information requested, in order to give as complete a description of the project as possible. Information also should be limited to the space provided where possible, to minimize the task of the Secretariat in collecting and cataloging the material. If there is insufficient room on the front page to include the "Purpose of Project" and "Status and Results" use the continuation boxes on the reverse side.

Detail instruction for completing each box are provided below to guide those preparing the form. Abbreviated instructions are included in each box, as appropriate, adjacent to the headings.

1. TITLE OF PROJECT. Enter official title of CCMS-MIUS type of project A CCMS-MIUS type of project is one that can be or has the potential to be integrated into a utility system that will increase plant efficiency or as a minimum provide an economical and beneficial utility service better than that which separate non-integrated utility systems can provide. (Also refer to paragraph 1.4.3 for the definition of a MIUS type of project.) If this project has subordinate projects, prepare Project Summary Forms for those that are appropriate for the catalog. Include those projects which are planned, ongoing, or have been completed.

3. PERFORMING ORGANIZATION. Enter name and complete mailing address of organization performing research. For example:

Center for Building Technology
National Bureau of Standards
U.S. Department of Commerce
Washington, D. C. 20234

4. PRINCIPAL INVESTIGATOR. Enter name, title of principal investigator (person directly responsible for project); also provide complete mailing address if different from the performing organization.

5. SUPPORTING ORGANIZATION. Enter name and address of organization providing financial support for this project if different from the performing organization. Also provide name and title of person to contact who has responsibility for the project. Also enter name of the owner of the utility or facility, if appropriate.

6. DURATION OF INVESTIGATION. Enter month and year investigation began or is expected to begin, and the expected completion date, month and year. If investigation has been completed, include data investigation was completed.

7. ESTIMATED FUNDING AND MANPOWER. In order to describe the size of the project, please provide monies allocated per period of time, and estimated number of man years for same period of time. Use dollars ($) for English version, and Francs for French version. For example:

   $1,000,000 for three years, 27 man years

8. PURPOSE OF PROJECT. Describe purpose of investigation using a brief narrative. Include objectives, motivations, approach, plans, and expected results. Also include any appropriate milestones with expected completion dates. Use the reverse side if necessary.

9. STATUS AND RESULTS. Describe briefly status of project and results of the investigation (findings to date). Also indicate whether the project is planned, in-progress or completed by checking (✓) the applicable box. Use the reverse side if more space is needed for the narrative.

10. UTILITY SERVICES. Denote which utility services are being investigated by checking the appropriate boxes.

11. TYPE OF PROJECT. Denote whether this project is government-sponsored, private or cooperative (government and private) by checking the appropriate box.

12. EXCHANGE OF DATA. Denote whether this project will result in data that can be shared with other CCMS-MIUS Project participants by checking (✓) the appropriate box.

13. TECHNICAL DATA. Provide the requested technical data as appropriate. This data, depending upon the status of the project, may be design data as well as measured or calculated values as a result of testing or operation. The type of data requested in this box is appropriate for a demonstration facility, an operating plant, or a system that may ultimately become part of an integrated system. If your project can more appropriately be represented by other types of technical data or if there are other technical data which you consider important, please include. Use the unused space in this box or one of the continuation boxes below. Identify this additional data by using the box number and title.

    Project location - This is the location of the plant or system being demonstrated or operated. Also include the expected site of a plant or system to be constructed.

13. TECHNICAL DATA (Continued). Degree-days - Include both the heating degree-days during the winter and the cooling degree-days or hours during the summer. Also define the base for both heating and cooling degree-days or cooling hours. For example, in the U.S. heating degree-days are equal to the mean daily dry-bulb temperature below 65°F for each calendar day on which such deficiency or excess occurs and are accumulated for each day. The amount of cooling required is frequently determined in the U.S. by using the number of cooling hours the dry-bulb temperature is above 80°F (26.7°C) for the year (normally during the 3-4 months summer period). However, the amount of cooling required is also determined by using the number of cooling degree-days. This is equal to the mean daily dry-bulb temperature above 65°F for each calendar day on which such excess temperature occurs and are accumulated for each day.

Plant Load Capacity - Include the maximum load that the plant can produce or is designed to produce on a continuous basis for each utility service as indicated.

Heat to Power Ratio (average) - Provide the average heat to power ratio. Indicate whether it is the expected ratio or that calculated from measured values. Use consistent units of measure such as megawatts.

Energy Source - Indicate the primary energy source, such as coal, gas, or oil, etc. Also list any secondary source such as solid waste (RDF) or solar energy.

Expected Payback Period - Denote the expected payback period of the plant in utilities services as compared with a conventional system. Consider overcost of operation and maintenance if any, capital investment, interest and depreciation. Consider any other influencing factors, such as taxes, environmental penalties, etc.

Type and Size of User - Characterize the users by describing the size of the community being served. Use number of units and floor area for residential and commercial users as indicated in the box and thermal load and power load for industry.

14. OTHER RELATED PROJECTS. Enter title of other projects being conducted in your country or organization which are related to this project. If this project is a large effort with subordinate projects which have been or will be included in the catalog also, enter the title of the subordinate projects. If this project is part of a larger effort enter title of the larger (total) effort as well as the other subordinate projects for which Project Summary Forms have or will be prepared.

14. OTHER RELATED PROJECTS (Continued). Identify the larger effort by preceding title with "(LP");identify the subordinate projects by preceding title with "(SF)". Use the reverse side if necessary.

1.9 HOW TO OBTAIN ADDITIONAL COPIES

Additional paper copies are available from the U.S. Government Printing Office, Superintendent of Documents, Washington, D. C. 20402, etc. Microfiche may be purchased from the National Technical Information Service, Springfield, Virginia, 22151.

TABLE 2-1 Projects Reported from BELGIUM

No.	Project Title	Identification No.	Page No.
1	TOTAL ENERGY PLANT FOR HOTEL CREST	2-922BE-42	137
2	TREATMENT OF MUNICIPAL SLUDGE BY USE OF RESIDUAL HEAT	3-832BE-69	277
3	HEATING OF DWELLINGS BY HEAT PUMP USING DIRECTLY COLLECTED - OR STORED SOLAR ENERGY	5-182BE-11	343
4	RATIONAL USE OF ENERGY CASE-STUDY ON GREENHOUSES, DEVELOPMENT OF COMPUTER CODE AND DESIGN OF REGULATION DEVICE	5-582BE-18	357
5	MISCELLANEOUS SCK/CEN ACTIVITIES RELATED TO MIUS	5-832BE-46	413
6	H_2 - PRODUCTION BY WATER ELECTROLYSIS	6-802BE-23	461
7	ELECTRODES FOR FUEL CELLS	6-802BE-24	463
8	STUDY AND DEVELOPMENT OF NEW ALLOYS SHOWING THE SHAPE MEMORY EFFECT, AND THEIR APPLICATIONS, i.a. IN A "METAL ENGINE" OR "SOLID STATE ENGINE"	6-802BE-25	465

TABLE 2-2 Projects Reported from CANADA

No.	Project Title	Identification No.	Page No.
1	IMPROVEMENT OF ENERGY UTILIZATION IN CANADA -- URBAN USE SECTOR	3-601CA-22	183
2	CANWEL (CANADIAN WATER ENERGY LOOP)	3-831CA-64	267
3	OTTAWA MASTER PLAN STUDY	3-831CA-65	269
4	DISTRICT ENERGY SYSTEM ANALYSIS (DESA)	4-601CA-13	309

TABLE 2-3 Projects Reported from DENMARK

No.	Project Title	Identification No.	Page No.
1.	POWER AND HEAT PRODUCTION FORM A COMBINED DIESEL RANKINE POWER PLANT	2-111DK-04	61
2.	TOTAL ENERGY SYSTEM FOR A GREENHOUSE	2-511DK-26	105

TABLE 2-4 Projects Reported from FINLAND

No.	Project Title	Identification No.	Page No.
1.	MERTANIEMI POWER PLANT (FINLAND)	3-611FI-27	193

TABLE 2-5 Projects Reported from FRANCE

No.	Project Title	Identification No.	Page No.
1.	DISTRICT FROM NUCLEAR POWER PLANTS - STUDY	3-691FR- 56	251
2.	ENERGY SAVINGS	5-102FR-03	327
3.	SOLAR HEATING INSTALLATION FOR TECHNIP BUILDINGS IN SAINT-NAZAIRE (FRANCE)	5-102FR-04	329
4.	THERMAL STORAGE OF ENERGY	6-601FR-14	443

TABLE 2-6 Projects Reported from GERMANY

No.	Project Title	Identification No.	Page No.
1.	BLOCK HEAT-POWER STATION	2-123DE-13	79
2.	MODEL COMMUNITY WITH NOVEL ENERGY AND HEATING SYSTEMS (ET/5109)	3-101DE-03	145
3.	USES OF LONG-DISTANCE HEAT IN POWER STATIONS	3-601DE-23	185
4.	OVERALL STUDY ON THE POSSIBILITIES OF LONG-DISTANCE HEAT SUPPLY FROM HEATING POWER STATIONS IN THE FRG. (ET 5072)	3-691DE-50	239
5.	PROJECT STUDY ON LONG-DISTANCE HEAT SUPPLY FROM HEATING POWER STATIONS IN THE MANNHEIM-LUDWIGSHAFEN-HEIDELBERG AREA (ET 5073)	3-691DE-51	241
6.	PLANNING AND DESIGN WORK FOR DEMONSTRATING INTERCONNECTION NETWORKS FOR LONG-DISTANCE HEAT SUPPLY IN THE OBERHAUSEN AREA (ET 5074)	3-691DE-52	243
7.	STUDY OF THE LONG-DISTANCE HEAT-SUPPLY SYSTEM IN THE KOBLENZ-BONN-BAD GODESBERG-KOLN AREA (ET 5075)	3-691DE-53	245
8.	PROJECT STUDY FOR THE CONURBATION OF BERLIN TO ASCERTAIN THE POSSIBILITIES OF SAVING ENERGY AND SUBSTITUTING NUCLEAR ENERGY FOR FOSSIL FUELS (ET 5076)	3-691DE-54	247

TABLE 2-6 Projects Reported from GERMANY

No.	Project Title	Identification No.	Page No.
9.	AGROTHERM	3-691DE-55	249
10.	DISTRICT HEAT SUPPLY SYSTEM INGOLDSTADT (ET 5147A)	4-651DE-16	315
11.	INSTALLATION OF A HEAT-PUMP PLANT FOR THE PRODUCTION OF HEAT AND WARM WATER FOR RESIDENTIAL BUILDINGS (ET 5804)	5-101DE-01	323
12.	SYSTEM STUDY "ELECTRIC BULK POWER TRANSMISSION	5-103DE-07	335
13.	PROGRAM STUDY "HEAT DISPERSION" (ET 5004)	5-601DE-19	359
14.	FUEL CONSERVATION IN (CONVENTIONAL) HOT WATER HEATING SYSTEMS BY GAS-OPERATED HEAT PUMPS (ET 5164A THRU ET 5167A)	5-821DE-40	401
15.	GASIFICATION OF MUNICIPAL AND INDUSTRIAL WASTE (ET 1040)	5-82.41DE-41	403
16.	STUDY CONCERNING SEASONAL THERMAL STORAGE DEVICES FOR LOW TEMPERATURES (ET 4048)	6-601DE-10	435
17.	"LONG DISTANCE HEAT TRANSPORT LINE SAAR" LONG DISTANCE HEAT SUPPLY OF THE CITY VOLKLINGEN (ET 4137A)	6-601DE-11	437
18.	LONG-DISTANCE HEAT RAIL RUHR: MIDDLE SECTION (ET 4145)	6-601DE-12	439
19.	STUDY OF ENERGY STORAGES IN SYSTEMS OF HEAT-POWER COUPLING (ET 4197A)	6-601DE-13	441
20.	LARGE HEAT STORAGE UNIT WITH A HEAT CAPACITY OF 1500 GCAL, IN THE KFA, JUELICH (ET 4139A)	6-601DE-22	459

TABLE 2-7 Projects Reported from ITALY

No.	Project Title	Identification No.	Page No.
1.	SAN POLO RESIDENTIAL DISTRICT	2-101IE-03	59
2.	CENTRALE TERMOELETTRICA QUARTIERE COMASINA	2-111IE-05	63
3.	TOTAL ENERGY HOSPITAL (BRESCIA)	2-401IE-20	93
4.	TOTAL ENERGY DIESEL POWERED HEAT PUMP FOR AIR CONDITIONING OF BUILDINGS	2-512IE-28	109
5.	TOTAL ENERGY MODULE (TOTEM)	2-522IE-29	111
6.	SYSTEM FOR SUPPLYING UTILITY SERVICES TO A MULTI-FAMILY LOW RISE BUILDING	3-122IE-06	151
7.	CENTRALE THERMOELECTTRICA DI VAREDO	3-572IE-20	179

TABLE 2-7 Projects Reported from ITALY

No.	Project Title	Identification No.	Page No.
8.	MILANO OLGETTINA - ELECTRICITY AND HEAT COMBINED PRODUCTION BY SOLID WASTE INCINERATION	3-631IE-30	199
9.	MILANO ZAMA - ELECTRICITY AND HEAT COMBINED PRODUCTION BY SOLID WASTE INCINERATION	3-631IE-31	201
10.	MONCALIERI POWER PLANT (HEAT RECOVERY)	3-671IE-49	237
11.	DISTRICT HEATING IN BRESCIA (TELERISCALDAMENTO DELLA CITTA DI BRESCIA)	4-111IE-03	289
12.	BIOGAS PLANT FOR PIG SLURRY TREATMENT - REGGIO EMILIA	5-543IE-17	355

TABLE 2-8 Projects Reported from JAPAN

No.	Project Title	Identification No.	Page No.
1.	OHTEMACHI OFFICE AREA D.H.C. PLANT	3-123JP-11	161
2.	KATAYAMAZU SPA DISTRICT DH PLANT	4-113JP-06	295
3.	BANNAGURO HOUSING ESTATE DH PLANT	4-113JP-07	297
4.	SENBOKU NEW TOWN TOGA AREA CENTER (DHC PLANT)	4-122JP-09	301
5.	TOMAKOMAI CITY BUSINESS AREA DH PLANT	4-122JP-10	303
6.	2ND MORINOMIYA HOUSING ESTATE OF JAPAN HOUSING CORPORATION DHC PLANT	4-122JP-11	305
7.	CHIBA KAIHIN NEW TOWN (KEMIGAWA AREA) PLANT	4-123JP-12	307

TABLE 2-9 Projects Reported from NETHERLANDS

No.	Project Title	Identification No.	Page No.
1.	TOTAL ENERGY/HEAT PUMP SYSTEMS	2-021NL-01	55
2.	TOTAL-ENERGY PLANT "SWIMMING POOL" 'T KEERPUNT AMSTELVEEN	2-121NL-08	69
3.	TOTAL-ENERGY PLANT FOR SWIMMING POOL	2-121NL-09	71
4.	TOTAL-ENERGY-PLANT FOR SWIMMING POOL	2-121NL-10	73
5.	TOTAL-ENERGY PLANT (LP) CENTRAAL BEHEER, INSURANCE COMPANY	2-122NL-11	75

TABLE 2- 9 Projects Reported from NETHERLANDS

No.	Project Title	Identification No.	Page No.
6.	TOTAL ENERGY PLANT VICTORIA VESTA	2-122NL-12	77
7.	TOTAL ENERGY PLANT FOR DEPARTMENT STORE V & D	2-222NL-14	81
8.	TOTAL ENERGY PROJECT IN HOUSE FOR MENTAL DEFECTIVES	2-22.42NL-15	83
9.	TOTAL ENERGY PLANT VRIJE UNIVERSITEIT	2-312NL-17	87
10.	TOTAL ENERGY PLANT HET NIEUWE SPITTAAL HOSPITAL	2-420NL-22	97
11.	TOTAL ENERGY PLANT FOR LUKAS HOSPITAL	2-421NL-23	99
12.	TOTAL ENERGY PLANT ST. ANNA HOSPITAL	2-422NL-24	101
13.	TOTAL ENERGY PLANT FOR CHICKEN SLAUGHTER-HOUSE "FRIKI", OOSTERWOLDE	2-522NL-30	113
14.	TOTAL ENERGY PROJECT FOR ALUMINUM FACTORY	2-522NL-31	115
15.	TOTAL ENERGY PLANT FOR GREENHOUSE BOOTS	2-522NL-32	117
16.	TOTAL ENERGY FOR NURSEY GARDENS	2-522NL-33	119
17.	TOTAL ENERGY PLANT LILY CULTIVATING COMPANY	2-522NL-34	121
18.	TOTAL ENERGY PLANT FOR GREENHOUSE	2-522NL-35	123
19.	TOTAL ENERGY PLANT "FACTORY NEW HOLLAND"	2-523NL-36	125
20.	TOTAL ENERGY PLANT FOR INDUSTRIAL APPLICATION EMINENT	2-572NL-37	127
21.	IMPROVEMENT OF ENERGY GENERATION PLANTS BY USING TOTAL ENERGY SYSTEMS	2-822NL-41	135
22.	UTILIZATION OF HEAT, GENERATED BY COMBUSTION OF WASTE	3-031NL-02	143
23.	LOCAL HEATING FOR TOWNS TO BE BUILT (IN PLANNING)	3-101NL-04	147
24.	IMPROVING THE EFFICIENCY OF THE COMBINED STEAM/POWER GENERATING SYSTEM	3-502NL-15	169
25.	TECHNOLOGICAL AND ECONOMICAL OPTIMIZATION OF ELECTRIC POWER STATIONS AND HEAT/POWER GENERATING PLANTS	3-600NL-21	181
26.	COMBINED HEAT AND POWER PRODUCTION FOR DISTRICT HEATING	3-601NL-26	191
27.	TOTAL ENERGY PLANT FOR SEWAGE TREATMENT 'SCRAVENZANDE	3-821NL-59	257
28.	TOTAL ENERGY PLANT FOR SEWAGE TREATMENT HILVERSUM	3-821NL-60	259
29.	TOTAL ENERGY PLANT FOR SEWAGE TREATMENT RWZI-NEIUGRAAF	3-821NL-61	261
30.	TOTAL ENERGY PLANT FOR SEWAGE TREATMENT - NIJMEGEN	3-821NL-62	263
31.	TOTAL ENERGY - PLANT FOR SEWAGE TREATMENT - RAALTE	3-821NL-63	265

TABLE 2-9 Projects Reported from NETHERLANDS

No.	Project Title	Identification No.	Page No.
32.	SEVERAL PROJECTS CONCERNING UTILIZATION OF HEAT RAISED BY INCINERATION OF WASTE	3-831NL-68	275
33.	DISTRICT HEATING ROTTERDAM	4-651NL-17	317
34.	DISTRICT HEATING OF THE CITY OF UTRECHT (HOLLAND)	4-672NL-18	319
35.	SUBORDINATE PROJECT, HEAT PUMP SYSTEM CENTRAAL BEHEER U.A. INSURANCE COMPANY	5-122NL-09	339
36.	WASTE TREATMENT	5-502NL-13	347
37.	COMBINED CYCLE POWER	5-602NL-21	363
38.	SEVERAL PROJECTS CONCERNING THERMAL DISPOSAL METHODS OF MUNICIPAL WASTE AND SEWAGE SLUDGE	5-631NL-22	365
39.	SEVERAL PROJECTS CONCERNING RECYCLING AND REUSE	5-831NL-45	411
40.	SOLAR ENERGY AND UTILITY BUILDINGS	6-582NL-09	433
41.	GAS/GAS REGENERATOR	6-602NL-15	445
42.	HEAT PUMPS	6-602NL-16	447
43.	RANKINE-SYSTEMS	6-602NL-17	449
44.	DEVELOPMENT OF A MULTI-STAGE FLASH/FLUIDIZED BED EVAPORATOR (MSF/FBE)	6-603NL-18	451
45.	DIESEL ENGINE TM620 - AN UNCOMMONLY LARGE MEDIUM SPEED DIESEL ENGINE FOR POWER GENERATION	6-612NL-19	453
46.	TECHNICAL AND ECONOMICAL EVALUATION OF GAS-FIRED HEAT-PUMP SYSTEMS FOR SPACE-HEATING PURPOSES	6-612NL-20	455

Note 1. Where indicated the efficiencies are specified on the basis of calculated values by nominal load as follows:

$$n = \frac{\text{energy delivered by plant}}{\text{primary energy consumed}} \times 100\%$$

Note 2. In the Netherlands degree days are specified as follows:

$$GD = \sum_{n=1}^{365} (18 - t_u) \text{ : for } t_u \leq 15.5°C$$

wherein t_u = outside temperature

TABLE 2-10 Projects Reported from SWEDEN

No.	Project Title	Identification No.	Page No.
1.	TOTAL ENERGY DIESEL PLANT	2-111SE-06	65
2.	MINI-NUCLEAR PLANTS FOR DOMESTIC HEATING AND HOT WATER SUPPLY	3-191SE-13	165
3.	LOCAL ENERGY PLANTS FOR DOMESTIC FUELS	3-601SE-24	187
4.	DISTRICT HEATING SYSTEM ENKOPING	4-101SE-01	285
5.	VASTERAS DISTRICT HEATING POWER STATION (80MW ELEC.)	4-111SE-04	291
6.	THE VARTA POWER STATION	4-111SE-05	293
7.	VASTERAS DISTRICT HEATING POWER STATION (400 & 500MW ELEC.)	4-114SE-08	299
8.	WASTE HEAT UTILIZATION IN FORSETRY	5-501SE-12	345

TABLE 2-11 Projects Reported from UNITED KINGDOM

No.	Project Title	Identification No.	Page No.
1.	TOTAL ENERGY USAGE IN HOUSES IN THE BRETTON DISTRICT (887)	2-101GB-02	57
2.	MEDICAL AREA TOTAL ENERGY PLANT, INC	2-311GB-16	85
3.	LEEDS GENERAL INFIRMARY GENERATOR STATION COMPLEX	3-471GB-14	167
4.	ATHENS PAPER MILL-ATHENS	3-512GB-16	171
5.	WASTE HEAT RECOVERY SCHEME FROM SITE GENERATING PLANT	3-512GB-17	173
6.	PROCESS STEAM SUPPLIES TO BRITISH CELANESE CO., LTD.	3-51.53GB-19	177
7.	WASTEWATER TREATMENT	3-61.41GB-28	195
8.	DISTRICT HEATING FEASIBILITY STUDY (939)	4-102GB-02	287
9.	PERFORMANCE OF DISTRICT HEATING SCHEMES (907)	4-602GB-15	313
10.	INCREASING LUNER CAPACITY BY MEANS OF DRAG REDUCING POLYMER (955)	5-102GB-05	331
11.	ALTERNATIVE SOURCES OF ENERGY FOR BUILDINGS (922)	5-102GB-06	333
12.	EFFECT OF LOAD AND FLOW VARIABILITY ON SEWAGE WORKS PERFORMANCE (975)	5-802GB-38	397
13.	ENERGY CONSERVATION VIA THE CN HEAT GENERATOR (891)	6-002GB-01	417

TABLE 2-11 Projects Reported from UNITED KINGDOM

No.	Project Title	Identification No.	Page No.
14.	TOTAL HEAT SYSTEMS - STIRLING ENGINE AND OTHER PRIME MOVERS FOR USE AS HEAT PUMPS AND CIRCULATORS (925)	6-002GB-02	419
15.	UTILIZATION OF LOW GRADE HEAT ENERGY (936)	6-002GB-03	421
16.	HEAT PUMPS (885)	6-101GB-04	423
17.	APPLICATIONS OF HEAT PUMPS, HEAT PIPES AND SIMILAR DEVICES FOR HEAT RECOVERY AND ENERGY CONSERVATION (908)	6-102GB-06	427

TABLE 2-12 Projects Reported from UNITED STATES

No.	Project Title	Identification No.	Page No.
1.	MIST (MODULAR INTEGRATED UTILITY SYSTEM - INTEGRATION AND SUBSYSTEM TEST) FACILITY	1-011US-01	43
2.	GRID-CONNECTED INTEGRATED COMMUNITY ENERGY SYSTEM (ICES)	1-101US-02	45
3.	MIUS DEMONSTRATION	1-111US-03	47
4.	MIUS DEMONSTRATION EVALUATION	1-111US-04	49
5.	INTEGRATED UTILITY SYSTEMS	1-363US-05	51
6.	MODULAR INTEGRATED UTILITIES SYSTEM - TOTAL ENERGY DATA MEASUREMENT SYSTEM	2-111US-07	67
7.	TOTAL ENERGY PLANT	2-312US-18	89
8.	WILKES-BARRE AREA VOCATIONAL-TECHNICAL SCHOOL TOTAL ENERGY PLANT	2-321US-19	91
9.	WILFORD HALL USAF MEDICAL CENTER	2-411US-21	95
10.	SIOUX VALLEY HOSPITAL TOTAL ENERGY PLANT	2-422US-25	103
11.	CENTRAL ENERGY PLANT - WALT DISNEY WORLD	2-512US-27	107
12.	LINDEN GENERATING STATION	2-612US-38	129
13.	CONSTRUCT TOTAL ENERGY POWER PLANT (COMPLETED APRIL 1970)	2-721US-39	131
14.	NAVAL TRAINING CENTER GENERATING PLANT	2-772US-40	133
15.	ENVIRONMENTAL, ECONOMIC, AND CONSERVATION ASPECTS OF INTEGRATED ENERGY USE APPLICATIONS	3-001US-01	141
16.	INTEGRATED COMMUNITY ENERGY SYSTEMS (ICES) SYSTEMS ENGINEERING	3-101US-05	149
17.	DEVELOPMENT OF TESTING OF A VAPOR COMPRESSION SYSTEM	3-103US-07	153

TABLE 2-12 Projects Reported from UNITED STATES

No.	Project Title	Identification No.	Page No.
18.	ALASKA VILLAGE DEMONSTRATION PROJECT, WAINWRIGHT, ALASKA	3-111US-08	155
19.	ALASKA VILLAGE DEMONSTRATION PROJECT, EMMONAK FACILITY	3-111US-09	157
20.	ALASKA VILLAGE DEMONSTRATION PROJECT, A THIRD FACILITY FOR SMALL INTERIOR VILLAGE	3-111US-10	159
21.	CODISPOSAL & COORDINATED MATERIALS RECOVERY	3-133US-13	165
22.	CAT JOLIET PLANT "F"	3-512US-19	177
23.	DEMONSTRATION OF COMBINED DISPOSAL OF SEWAGE SLUDGE AND SOLID WASTE IN PUROX OXYGEN REFUSE CONVERTER	3-601US-25	189
24.	ONONDAGA COUNTY RESOURCE RECOVERY PROJECT	3-631US-29	197
25.	N.W.5 8 STREET RESOURCE RECOVERY FACILITY	3-631US-32	203
26.	CITY OF BALTIMORE - SOLID WASTE DISPOSAL AND RESOURCE RECOVERY PLANT (PYROLYSIS PLANT)	3-631US-33	205
27.	HARRISBURG REFUSE INCINERATOR	3-631US-34	207
28.	HARRISBURG INCINERATOR	3-631US-35	209
29.	MILWAUKEE RESOURCE RECOVERY FACILITY	3-632US-36	211
30.	NASHVILLE THERMAL TRANSFER CORPORATION, A MASS SOLID WASTE FIRED CENTRAL HEATING AND COOLING FACILITY	3-632US-37	213
31.	TOWN OF HEMPSTEAD SOLID WASTE MANAGEMENT & RESOURCE RECOVERY FACILITY	3-633US-38	215
32.	MEMPHIS LIGHT, GAS & WATER DIVISION; ENERGY RECOVERY SYSTEM	3-633US-39	217
33.	RESOURCE RECOVERY SYSTEM	3-633US-40	219
34.	GREATER BRIDGEPORT RESOURCES RECOVERY STEAM	3-633US-41	221
35.	MSD RESOURCE RECOVERY PROGRAM	3-633US-42	223
36.	CO-INCINERATION OF SEWAGE FLUDGE WITH REFUSE AND/OR COAL	3-661US-43	225
37.	ENVIRONMENTAL EFFECT OF UTILIZING SOLID WASTE AS A SUPPLEMENTARY POWER-PLANT FUEL	3-661US-44	227
38.	ST. LOUIS WASTE CO-FIRING WITH COAL PROJECT: EQUIPMENT, FACILITIES AND ENVIRONMENTAL EVALUATION OF MERAMAC POWER PLANT	3-661US-45	229
39.	HMDC RESOURCE RECOVERY FACILITY	3-661US-46	231
40.	EVALUATION OF AMES SOLID WASTE RESOURCES	3-661US-47	233

TABLE 2-12 Projects Reported from UNITED STATES

No.	Project Title	Identification No.	Page No.
41.	CHICAGO SOUTHWEST SUPPLEMENTARY FUEL PROCESSING FACILITIES AND COMMONWEALTH EDISON CRAWFORD POWER PLANT	3-663US-48	235
42.	PRODUCTION OF POTABLE WATER FROM WASTEWATER	3-801US-57	253
43.	EVALUATION OF FULL SCALE WASTEWATER REFUSE SYSTEM FOR DOMESTIC GROUNDWATER REPLEN ISHMENT	3-803US-58	255
44.	WASTE-AS-FUELS PROGRAM	3-831US-66	271
45.	PLANT-SCALE STUDY OF COMBINED INCINERATION OF SEWAGE SLUDGE WITH COAL & SOLID WASTE	3-831US-67	273
46.	ROTARY KILN GASIFICATION OF SEWAGE SLUDGE SOLID WASTE MIXTURE	3-832US-70	279
47.	FEASIBILITY OF COMBINED INCINERATION OF SEWAGE SLUDGE WITH SOLID WASTES	3-832US-71	281
48.	STUDY ON DISTRICT HEATING FOR RETROFIT OF POWER PLANTS	4-601US-14	311
49.	EXTRACTION OF HEAT FROM RIVER BY HEAT PUMP - ESSLINGEN	5-101US-02	325
50.	A SNOW MELTER FOR A DOMESTIC WATER SUPPLY	5-112US-08	337
51.	TECHNICAL ASSESSMENT OF AIR POLLUTION CONTROL FOR SO_x, NO_x, AND OTHER AIR EMISSIONS AT THE BALTIMORE DEMONSTRATION GAS PYROLYSIS FACILITY	5-131US-10	341
52.	STEAM EXPORT SYSTEM AT THE CHICAGO NORTHWEST SOLID WASTE DISPOSAL	5-531US-14	349
53.	FIRING DENSIFIED REFUSE DERIVED FUEL IN A STOKER BOILER	5-533US-15	351
54.	PREPARATION OF DENSIFIED REFUSE DERIVED FUEL FOR STOKER BOILERS	5-533US-16	353
55.	HARRISBURG ADVANCED WASTEWATER TREATMENT FACILITY	5-601US-20	361
56.	RECYCLE ENERGY SYSTEM	5-631US-23	367
57.	TECHNICAL AND ECONOMIC EVALUATION OF THE EPA RESOURCE RECOVERY DEMONSTRATION FACILITY IN SAN DIEGO, CALIFORNIA	5-631US-24 -	369
58.	ENVIRONMENTAL ASSESSMENT OF WASTE-TO-ENERGY	5-631US-25	371
59.	AIR POLLUTION CONTROL TECHNOLOGY DEVELOPMENT FOR WASTE-AS-FUEL PROCESSES	5-631US-26	373
60.	CONVERSION OF SOLID WASTE TO POLYMER GASOLINE	5-631US-27	375
61.	PILOT SCALE PYROLYTIC CONVERSION OF MIXED WASTE TO FUEL	5-631US-28	377

TABLE 2-12 Projects Reported from UNITED STATES

No.	Project Title	Identification No.	Page No.
62.	PUROX SYSTEM	5-633US-29	379
63.	CITY OF FRANKLIN SOLID WASTE DISPOSAL AND RESOURCE RECOVERY FACILITY	5-633US-30	381
64.	PALMER SOLID WASTE RESOURCE RECOVERY PROJECT	5-661US-31	383
65.	EVALUATION OF AMES' WASTE PROCESS - AN ENERGY RECOVERY SYSTEM	5-661US-32	385
66.	PREPARATION, USE AND COST OF d-RDF AS A SUPPLEMENTARY FUEL IN STOKER FIRED BOILERS	5-661US-33	387
67.	EFFECTS OF BURNING DENSIFIED FORMS OF MUNICIPAL SOLID WASTES DERIVED FUELS IN INDUSTRIAL, UTILITY AND INSTITUTIONAL STOKER-FIRED BOILERS	5-661US-34	389
68.	WOOD WASTE AS A POWER PLANT FUEL IN THE OZARKS	5-661US-35	391
69.	SALVAGE FUEL BOILER PLANT	5-731US-36	393
70.	INSTRUMENTATION OF SEWAGE SLUDGE PROCESSING OPERATIONS INCLUDING ANAEROBIC DIGESTION & VACUUM FILTRATION	5-801US-37	395
71.	INVESTIGATE HEAT TREATMENT OF SLUDGE & PROCESSING OF SUPERNATANT TO REDUCE BOD & COD	5-802US-39	399
72.	CONCEPTUAL DESIGN & COST ESTIMATION FOR HEATING AN ANAEROBIC DIGESTER BY SOLAR ENERGY	5-831US-42	405
73.	EVALUATE COST OF HEAT TREATMENT OF SLUDGE INCLUDING COST OF TREATING SIDE STREAMS	5-831US-43	407
74.	EVALUATION OF WASTE-TO-ENERGY PROCESSES	5-831US-44	409
75.	SOLAR HEAT SYSTEM FOR INDOOR SWIMMING FACILITY	6-101US-05	425
76.	COAL FUELED, FLUIDIZED-BED GAS TURBINE UNIT FOR MIUS APPLICATIONS	6-151US-07	429
77.	RESOURCE RECOVERY - MONTGOMERY COUNTY, OHIO	6-532US-08	431
78.	HARRISBURG STEAM MAIN	6-631US-21	457
79.	STUDY OF MODIFICATIONS REQUIRED TO CONVERT A MULTIPLE HEARTH INCINERATOR TO PYROLYTIC OPERATION	6-833US-26	467
80.	OPTIMIZATION OF ACTIVATION OF SOLID WASTES	6-833US-27	469

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No (Secretariat Use Only): 1-011US-01

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
MIST (Modular Integrated Utility System) (Integration and Subsystem Test) Facility

2 Date *(Form Completed)*
11/10/76

3. Performing Organization *(Complete Mailing Address)*
National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, Texas 77058 U.S.A.
ATTN: Code EZ

4 Principal Investigator *(Name and Complete Mailing Address)*
Willie S. Beckhman
National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, Texas 77058 U.S.A.
ATTN: Code EZ

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
J.H.Rothenberg, Program Manager
HUD/MIUS Program
Dept. of Housing and urban Development
Office of Policy Development and Research
451 7th St. S.W., Rm. 8158
Washington, D.C. 20410 U.S.A.

6. Duration of Investigation *(Beginning and ending)*
5/74 to present

7. Estimated Funding and Manpower *(Monies and Manyears)*
$1,150,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To provide a test facility which will be capable of:

a. Evaluation of various MIUS subsystems and system design issues.
b. Providing data for verification of software used in analysis and design.
c. Providing a test bed for development and evaluation of future subsystem concepts.

Use Box No 15 if additional space is needed

9. Status and Results

1. ASME Publication 74-ENAS-44 - The MIST Laboratory: A Testbed for the MIUS Program.
2. Results reported in JSC NASA TMX 58187 (published December 1976).

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☒ potable water

11 Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 1-011US-01

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — .23
b. heating (MW) — 500,000 BTU/Hr
c. cooling (MW) — 50 tons
d. wastewater treatment-liters/day 7000 gal/day
e. solid waste processing-kilograms/day — 400 #/day
f. potable water-liters/day — — — — — — —
heat to power ratio (average expected)

— [energy source
NA [expected payback period

Type and size of user
a residential (dwelling units)
b. residential (square area-m²)
c. commercial (square area-m²)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

HUD/MIUS Demonstration Project
(1-111US-03)

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)*

PROJECT SUMMARY FORM

1-101US-02

1. Title of Project *(Official Title)*

Grid-Connected Integrated Community Energy Systems (GC-ICES)

2. Date *(Form Completed)*

November, 1977

3. Performing Organization *(Complete Mailing Address)*

Engineering Division
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, Illinois 60439
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

J. Pascual
Engineering Division
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, Illinois 60439
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

John Rodousakis
Community Systems Branch
U.S. Department of Energy
Washington, D.C. 20545
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

Jan.-May, 1976 Phase I
May 1976-May 1981 Other Phases

7. Estimated Funding and Manpower *(Monies and Manyears)*

Approx. $5 million

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objectives: to design, construct, and operate a G-C ICES in a manner that is: (a) conserving of energy and scarce fuels, (b) economically viable, and (c) feasible from an institutional prospective.

Motivations: to enhance the rate of commercialization

Approach: to develop a system, based on available technologies, which operates continuously at the highest possible energy efficiency by relying on the local grid to act as an electrical "fly wheel", and to build a demonstration project and monitor the results.

Plans: to enter various phases of the demonstration project, detailed feasibility analysis, preliminary design, construction and operation with reasonable assurance of attaining an economically viable, energy conserving system.

Expected Results: Utilization of the optimum of the energy produced by an ICES system based on community demand.

Use Box No. 15 if additional space is needed

9. Status and Results

Phase I completed.

Phase II contracts awarded and in progress

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No.
1-101US-02

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Grid-Connected Integrated Community Energy Systems (ICES) Systems Engineering (3-101US-05)

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only)

PROJECT SUMMARY FORM

1-111US-03

1 Title of Project *(Official Title)*

MIUS Demonstration

2 Date *(Form Completed)*

May 5, 1977

3 Performing Organization *(Complete Mailing Address)*

Interstate Land Development Corporation
336 Post Office Road
St. Charles, Maryland 20601
U.S.A.

4 Principal Investigator *(Name and Complete Mailing Address)*

Maurice G. Gamze
G-K-C
Chicago, Ill. 60606
U.S.A.

Clinton W. Phillips
Nat'l Bureau of Stds.
Washington, D.C. 20234 U.S.A.

Bill Reeves
Interstate Land Development, Inc.
St. Charles, Md. 20601 U.S.A.

5 Supporting Organization *(Complete Mailing Address and Name of Contact)*

Jerome H. Rothenberg, Director, HUD-MIUS Prog.
Division of Energy Bldg. Technology and Standards
Office of Policy Development and Research
451 7th St., S.W., Room 8158
Washington, D.C. 20410 U.S.A.

6 Duration of Investigation *(Beginning and ending)*

March 1974 - September 1982

7 Estimated Funding and Manpower *(Monies and Manyears)*

$ 6-7M Government Overcost

8 Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The purpose of the MIUS Demonstration, Phase II of the HUD-MIUS Program is to actualize the MIUS concept by constructing, instrumenting and evaluating a MIUS in a residential community. The demonstration will serve as a means to evaluate the actual technical performance of an integrated system serving a line load. The evaluation will result in the collection of data that will assist investors, developers, utilities, etc. in appraising the concept. In addition to evaluating the technical performance and economics of the MIUS concept, the demonstration will also provide a means to evaluate its environmental impact and assess the institutional factors that may become barriers to future MIUS's.

The MIUS is a system that brings together several subsystems into a master system that serves the utility needs of a community and performs the combined functions as well as or better than a conventional system with the potential for lower cost to the consumer.

The MIUS recovers more than half of the waste heat from power generation and recycles it to help provide space heating/cooling, water heating, and wastewater treatment. Another 5-10 percent fuel savings is possible by recycling solid waste for its energy content.

Use Box No. 15 if additional space is needed

9 Status and Results

A grant for the MIUS design was awarded in April 1976 to Interstate Land Development Inc. (ILD). The MIUS demonstration will be constructed in a New Community near Washington, D.C. starting in 1977. It will provide utilities for 700 dwelling units 18,580 square meters for commercial shopping space and other space as well as a 8360 square meter school. Gamze, Korobkin and Caloger will design the MIUS. NBS will evaluate the design, instrument the system, collect data, evaluate system performance, and identify and evaluate institutional barriers.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10 Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11 Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12 Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 1-111US-03

project location Waldorf, Md.
degree-days (heating) 4300 (65°F)
degree-days (cooling) 1150 (65°F)

plant load capacity
a. power (MW) 2.5
b. heating (MW) 7.9
c. cooling (MW) 6.2
d. wastewater treatment-liters/day 680K
e. solid waste processing-kilograms/day 9090
f. potable water-liters/day N/A
heat to power ratio (average expected) Not determined

energy source Fuel oil
expected payback period

Type and size of user
a. residential (dwelling units) 700
b. residential (square area-m²) 73,500
c. commercial (square area-m²) 18,600
d. industrial (thermal + elec.-MW) N/A

14. Other Related Projects *(Titles)*

MIUS - Total Energy System (2-111US-07)

MIUS - Demonstration Evaluation (1-111US-04)

15. Additional space for Purpose of Project

The MIUS concept addresses the problems of increased cost of community utilities, and the reduced construction rate that has resulted in part from the lack of wastewater treatment capacity in many municipalities.

The HUD approach is to select a developer of a new community and provide financial assistance for him to design,construct, and operate a MIUS in the framework of the local institutional constraints. The MIUS will be constructed in phase with new construction as the site design can be coordinated with the MIUS plant to produce optimum performance and minimize or eliminate retrofit. This will be the most cost effective approach. HUD will evaluate the design to assure a viable and replicable MIUS.

The system will be instrumented, data will be acquired for the technical & financial evaluation of its performance, its environmental impact on the community will be examined, and the institutional factors and constraints will be identified, evaluated and ameliorated as appropriate.

16. Additional space for Status and Results

The demonstration is in the preliminary design phase with various system configurations now under investigation for economic viability. The design concept under consideration is a grid connected site where power production is independent of site electrical demand, but exceeds internal plant demand and the demand of the commercial space. Excess power is sold to the local electric utility at wholesale rates which must be comparable to alternative utility options. Energy purchased by the MIUS from the local electric utility would be billed by the local electric utility at cost plus 0.1¢/KWH.

Note: Sufficient funds are not available at the date of this publication to initiate construction of the MIUS. Preparation of a final report on the design has been completed by the developer.

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 1-111US-04

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

MIUS Demonstration Evaluation

2 Date *(Form Completed)*

September 30, 1977

3. Performing Organization *(Complete Mailing Address)*

Office of Housing and Building Technology
Center for Building Technology
National Bureau of Standards
Department of Commerce
Washington, D.C. 20234
U.S.A.

4 Principal Investigator *(Name and Complete Mailing Address)*

John R. Schaefgen, Project Leader
National Bureau of Standards
Bldg. 225, Rm. A146
Center for Building Technology
Washington, D.C. 20234
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)* Dept. of Housing and Urban Development
Division of Energy Building Technology and Standards
Office of Policy Development and Research
451 7th St. S.W., Room 8158
Washington, D.C. 20410 U.S.A.
Jerome H. Rothenberg, Director, HUD-MIUS Program

6. Duration of Investigation *(Beginning and ending)*

March 1974 - September 1982

7. Estimated Funding and Manpower *(Monies and Manyears)*

Not Known

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

This demonstration is intended to actualize the Modular Integrated Utility System (MIUS) concept and to obtain sufficient data to permit investors to appraise the cost effectiveness and risks of the concept. The key objectives are: 1) collection and analysis of data on the financial performance of the MIUS; 2) a chronicle and evaluation of institutional impediments to implementation of the MIUS; 3) collection and analysis of data on the technical performance of the MIUS compared to available alternatives; 4) analysis of site utility demand characteristics; and 5) an analysis of the environmental effects of MIUS discharges.

The MIUS concept addresses the increased cost of community utilities. The increased cost and unavailability of utilities are in part responsible for halving the percentage of middle-income families who own their own homes. The MIUS concept of integrating the facilities for providing electricity, space heating, space cooling, domestic water heating, solid waste processing, and wastewater treatment has a potential to reduce the life-cycle of these utilities while reducing fuel energy consumption by up to 50%. For this latter reason, MIUS has a potential for inclusion in the national energy conservation program.

Use Box No. 15 if additional space is needed

9. Status and Results

NBS worked with HUD to define the nature of the demonstration, its objectives, and the statement of work under which the site developer would operate. NBS prepared a specification defining the performance levels expected of the MIUS. Review of the developer's design concept was initiated following award of the HUD contract in April 1976. NBS has monitored the developer's interaction with regulatory authorities and has prepared a format for the collection of cost data. The MIUS design concept has been prepared and the initial buildings to be served have been identified. Preliminary design definition of equipment has been completed and reviewed by NBS. A financial

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No: 1-111US-04

project location: Waldorf, Md.
degree-days (heating): 4300 (65°F)
degree-days (cooling): 1150 (65°F)

energy source:
expected payback period:

plant load capacity
- a. power (MW): 2.5
- b. heating (MW): 7.9
- c. cooling (MW): 6.2
- d. wastewater treatment-liters/day: 680K
- e. solid waste processing-kilograms/day: 9090
- f. potable water-liters/day: N/A

heat to power ratio (average expected): Not determined

Type and size of user
- a. residential (dwelling units): 700
- b. residential (square area-m²): 73,500
- c. commercial (square area-m²): 18,600
- d. industrial (thermal + elec.-MW): N/A

14. Other Related Projects *(Titles)*

MIST Facility (1-011US-01)

MIUS - Demonstration Evaluation (1-111US-04)

MIUS - Total Energy System (2-111US-07)

15. Additional space for Purpose of Project

Since a MIUS is most cost effective when installed in phase with new construction and has a significant potential as a near-term (pre-breeder) technology to reduce energy consumption, rapid demonstration and deployment of the technology is important.

This part of a multi-agency effort, will produce the technical and financial data base desired by potential implementors of the technology. Present installations using elements of the MIUS technology have kept very minimal records and collect little data on system performance. This project will undertake complex measurement and analysis tasks to provide much data and a thorough analysis of MIUS performance.

The project will provide the definitive test of a concept which has a large potential to increase housing production and save energy. The results of the project will flow directly to trade associations (e.g. EEI, APPA, IDHA) and will be made available through reports, articles and talks to A&E's planners, investment and commercial bankers, local government officials, utilities and developers.

Direct contacts with trade associations and major utilities and developers will ensure productive transfer of the research results.

EEI - Edison Electric Institute
APPA - American Public Power Association
IDHA - International District Heating Association

16. Additional space for Status and Results

feasibility analysis has been prepared. Preliminary discussions have been held with most regulatory authorities. Many buildings on the site are completed and are entering the construction phase. Financing and/or tenants are being sought for the remaining buildings. Sufficient funds are not presently available to initiate construction of the MIUS. Preparation of a final report by the developer is now in progress.

Two papers which discuss the MIUS Demonstration have been published:

Rothenberg, Jerome H., The Modular Integrated Utility Systems (MIUS) Program, Proceedings of the XI IECEC Conference, September 1976.

Schaefgen, John R., Integrating Community Utilities for Resource Conservation, Proceedings of the Third National Conference on Complete Water Reuse, June 1976.

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 1-363US-05

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Integrated Utility Systems (College Campus Studies)

2. Date *(Form Completed)*: 11/12/76

3. Performing Organization *(Complete Mailing Address)*

Reynolds, Smith and Hills
Architects Engineers Planners
4019 Boulevard Center Drive
Jacksonville, Florida 32201
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. Edwin F. Cox
Reynolds, Smith and Hills
Architects Engineers Planners
4019 Boulevard Center Drive
Jacksonville, Florida 32201
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Robert Blake PE
Director, Office of Planning and Development
OFEPM/OS/DHEW
330 Independence Avenue, S.W.
Washington, D.C. 20201 U.S.A.

6. Duration of Investigation *(Beginning and ending)*: 6/75 to 11/76

7. Estimated Funding and Manpower *(Monies and Manyears)*: $160,000 (2 man years)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

HEW Integrated Utility System (IUS) Application Project

This project addresses utilities energy conservation exterior to the building and within a defineable community boundary - specifically a university campus facilities complex of education and/or health facilities. The project resulted from a collaboration between HEW and the National Bureau of Standards (NBS) Experimental Technology Incentives Program (ETIP).

Two college campus have been selected as being representative of a community system. The objective of the project is to prepare feasibility studies and conceptual design for the two campuses showing how five utility systems within a community (electricity generation, heating and cooling, solid waste incineration, sewage treatment, and potable water management) may be integrated to conserve energy and water, reduce energy cost,/control pollution, and therefore to induce the two universities to install an IUS with their own funds. The goal of the project is to bring about technology transfer and induce other campuses and medical complexes to develop integrated utility systems.

(cont.)

Use Box No. 15 if additional space is needed

9. Status and Results

Four products to be completed in Nov. 1976.
Feasibility Study U of Fla.
Feasibility Study Central Michigan University
Marketing Guide for the IUS
Technology Assessment for the IUS

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☒ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No
1-363US-05

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source - coal,oil,wood chips,solid waste
expected payback period 5 years

plant load capacity
a. power (MW) — — — — — SITE SPECIFIC
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)
e. University-Health Complex Campus Type Environment

heat to power ratio (average expected) 8 to 10,000 Btu/KWH

14. Other Related Projects *(Titles)*

HUD-MIUS - Jerome H. Rothenberg
ERDA-ICES - Steve Cavros
HEW-Campus Community IUS - Max Novinsky

15. Additional space for Purpose of Project

Phase one of the project was completed in 1976. Reports entitled "Integrated Utility System (IUS) - Feasibility and Conceptual Design" have been delivered to the University of Florida at Gainesville and Central Michigan University and Mount Pleasant. The reports recommended (1) installation of on site electric power generating capacity - (2) utilization of the accessory heat for heating, air conditioning, and hot water service, (3) incineration of university and town solid waste, and (4), use of liquid effluent for plant process water and irrigation. The economic indicators, in the case of the University of Flordia are 44% annual energy cost savings as compared to the present costs projected to 1981, the year of IUS start up. The IUS investment cost is estimated at $19.5 million. The interest rate of return on the investment is 23% per year, the discounted total savings to investment ratio is 3.4, and the payback time is less than 5 years.

Phase two of the project is the design and installation of the two IUS plants. Both Universities have accepted the report recommendations and plan to secure investment capital and initiate design in 1977 and complete construction in 1981.

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)*

PROJECT SUMMARY FORM

2-021NL-01

1. Title of Project *(Official Title)*

Total Energy/Heat Pump Systems

2. Date *(Form Completed)*

3-15-77

3. Performing Organization *(Complete Mailing Address)*

Central Org. Adv. Appl. Res.
Inst. for Mechanical Constr.
P.O. Box 29
Delft, Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

P.J. Collet
Central Org. Adv. Appl. Res.
Inst. for Mechanical Constr.
P.O. Box 29
Delft, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Netherlands
Central Org. Adv. Applied Res.

6. Duration of Investigation *(Beginning and ending)*

7/74 to 6/75

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Evaluation of energy systems based on the combination of total energy (TE) installations and heat pumps for space-heating applications. The combined system improves the applicability of each of the energy-saving component systems. The heat pump creates an electricity demand which improves the energy-utilization efficiency of the TE-installation. The TE-installation produces cheap electricity which improves the heat pump economics. A preliminary study is aimed at evaluating the applicability of various system configurations with special reference to the comparison between centralized and decentralized TE-installations.

Continuation of the project features the development of a system-optimalization procedure and to initiation of experimental work as indicated by the results of the previous evaluation.

Present work is carried out in cooperation with CTI-TNO. Future cooperation is envisaged with national gas and electricity companies, technical universities and mechanical industry.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No ☒ Unknown

13. Technical Data

Identification No.
2-021NL-01

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 2-101GB-02

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy Usage in Houses in the Bretton District (887)

2. Date *(Form Completed)*: 3/15/77

3. Performing Organization *(Complete Mailing Address)*

Building Research Establishment
Bucknells Lane
Garston, Watford Herts WD2 7JR
England

4. Principal Investigator *(Name and Complete Mailing Address)*

R.S.J. Leach
R.G. Courtney
E.W. Spink

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Department of the Environment
2 Marsham St.
London SW1P 3EB
England

6. Duration of Investigation *(Beginning and ending)*: 9/74 to 9/77

7. Estimated Funding and Manpower *(Monies and Manyears)*: 22,576

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The following will be measured by a meter: Cold water service inlet; inlet to hot water storage tank; district heating return line from radiator systems; and between flow and return service of district heating system, cooling and other electrical loads will be distinguished. To provide information for a field study into total energy consumption.

Use Box No 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No

13. Technical Data

Identification No. 2-101GB-02

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)* 2-101IE-03

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

San Polo Residential District

2. Date *(Form Completed)*

1/22/77

3. Performing Organization *(Complete Mailing Address)*

CISE
C.P. 3986
20100 Milano
(Italy)

4. Principal Investigator *(Name and Complete Mailing Address)*

Ing. Giuseppe Morandi
Unita Tecnologie
CISE
C.P. 3986
20100 Milano (Italy)

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

A joint venture association between 10 public and private organizations Refer to CISE

6. Duration of Investigation *(Beginning and ending)*

1 year

7. Estimated Funding and Manpower *(Monies and Manyears)*

100.000.000 lire
5 to 6 man/year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

San Polo is a residential complex for 18,000 inhabitants, to be built in Brescia outskirts (Northern Italy). Municipal utility (ASM-Brescia) will be charged of supplying water, electricity, natural gas and heat to the complex. (Brescia is the only town in Italy where district heating now exists. It will provide a test of whether the total energy concept can be applied to a new residential development in Italy.

The project must be considered as a feasibility study for a preliminary assessment.

The project will also study a possible link with the Brescia total energy hospital.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

☒ public ☒ private ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? to be defined ☐ Yes ☒ No

13. Technical Data

Identification No.
2-101IE-03

project location Brescia
degree-days (heating) —
degree-days (cooling) — —

plant load capacity TO BE DETERMINED
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Total energy hospital of Brescia.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-111DK-04

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Power and Heat Production form a Combined Diesel Rankine Power Plant

2. Date *(Form Completed)*

11/24/76

3. Performing Organization *(Complete Mailing Address)*

Laboratory for Energetics
Technical University of Denmark
Bldg. 403
DK-2800 Lyngby Denmark

4. Principal Investigator *(Name and Complete Mailing Address)*

Qvale, E.B., Professor
Laboratory for Energetics
Technical University of Denmark
Bldg. 403
DK-2800 Lyngby Denmark

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

The Council of Technology

6. Duration of Investigation *(Beginning and ending)*

4/75 to 2/76

7. Estimated Funding and Manpower *(Monies and Manyears)*

160,000 Dkr (app. $27,500)
for half a year, 1.2 Manyears

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The purpose of this investigation has been to evaluate the problems concerning the construction and operation of a plant for the combined production of electricity and district heating using diesel engines and steam turbines. The goal has been to develop a preliminary design for a competitive 82 MW (electric) plant for a medium-size Danish town based on up-to-date technical information and to establish the basis for comparison between this type of power plant and the conventional steam power plant. The work has consisted of collection and evaluation of the most recent information concerning technical, economic, and environmental aspects of these plants.

Use Box No. 15 if additional space is needed

9. Status and Results

A first design of a combined Diesel-Rankine Power and Heat Plant for the city of Herning in Denmark has been completed. The plant consists of 6 medium-speed diesel engines with separate generators and one steam turbine. Steam for the steam cycle is produced in a common exhaust gas boiler. Total power output 82.6 MW. The heat production is 69.7 MW, of which 37.3 MW comes from the steam condenser and 32.4 MW from the diesel engines (water coolers, oil coolers, and coolers for air from turbochargers). If the same power and heat were going to be generated in a conventional

(continued)

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☐ potable hot water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 2-111DK-04

project location Herning, Demark

degree-days (heating) —

degree-days (cooling) — —

energy source Heavy fuel oil

expected payback period

plant load capacity

a. power (MW) 82.6 MW

b. heating (MW) 69.7 MW

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected) 0.84

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

power plant (efficiency 0.40) and district heating plant (efficiency 0.85) the consumption of primary energy would be 57.5 percent higher. The political, economic and technical aspects of the combined generation in a Diesel-Rankine Power and Heat Plant, and the problems of integrating this type into the present district-heating and electric networks have been studied. Information collected for users of diesel engines and from the manufacturers indicate that there should be no irrevocable operational problems and that the reliability of the diesel engines is very high. The present value of the accumulated surplus for this plant during the period in question (20 years) will amount to 1.3 times the intial cost of the plant. Further information see paper F69296, 11 Intersociety Energy Conversion Engineering Conference.

USCOMM_NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-111IE-05

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

CENTRALE TERMOELETTRICA
QUARTIERE COMASINA

2. Date *(Form Completed)*

10/14/76

3. Performing Organization *(Complete Mailing Address)*

Azienda Elettrica Municipale
Corso di Porta Vittoria, 4
20100 Milano - Italy

4. Principal Investigator *(Name and Complete Mailing Address)*

Istituto Autonomo delle Case
Popolari
Viale Romagna, 26
20100 Milano - Italy

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N/A

6. Duration of Investigation *(Beginning and ending)*

1956 to 1968

7. Estimated Funding and Manpower *(Monies and Manyears)*

N.A.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Joint production of electrical power and heating. Municipal grid absorbed the electrical power and the heat was used for district heating of Quartiere Comasina (2500 dwelling unit 12,000 inhabitants in high-rise complexes).

Plant was basically constitued by 3 boilers and an 18.5 MW turbine which were usually functioning from November 1 to March 31.

Use Box No. 15 if additional space is needed

9. Status and Results

Building started in 1956 and power production in 1958. The plant was dismantled in 1968 for economical reasons.

This project is: ☐ planned ☐ in-progress ☒ completed ☒ dismantled

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☒ No no more data available

13. Technical Data

Identification No: 2-111IE-05

project location: Milan

degree-days (heating): 2,500°C day

degree-days (cooling):

plant load capacity

a. power (MW): 18.5

b. heating (MW): NA

c. cooling (MW): 7

d. wastewater treatment-liters/day:

e. solid waste processing-kilograms/day:

f. potable water-liters/day:

heat to power ratio (average expected): NA

energy source

expected payback period

Type and size of user

a. residential (dwelling units): 2.541

b. residential (square area-m²): 153.454

c. commercial (square area-m²): 25,000

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)*

PROJECT SUMMARY FORM

2-111SE-06

1. Title of Project *(Official Title)*

Total Energy Diesel Plant

2. Date *(Form Completed)*

12/1/76

3. Performing Organization *(Complete Mailing Address)*

Municipality of Vasteras
Sweden

4 Principal Investigator *(Name and Complete Mailing Address)*

Mr. Gunnar Kers
Tekniska Verken i Vasteras
Box 14
721 03 VASTERAS, Sweden

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Swedish Council for Building Research
S:t Goransgatan 66
112 30 Stockholm, Sweden

6. Duration of Investigation *(Beginning and ending)*

1976 - 1978

7. Estimated Funding and Manpower *(Monies and Manyears)*

Unknown

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Skultuna is located 20 km north of Vasteras and 120 km west of Stockholm. For a number of years district heating has been practiced. Today the connected capacity is 30 MW of which half is domestic and half industrial heating. Three hot water boilers were previously installed. A total energy diesel plant, the first in Sweden, was commissioned at the end of 1975 for combined production of power and heat. The prime mover consists of a standard marine diesel engine of medium speed type. The engine shaft is directly connected to the generator shaft. Hot water is produced by a boiler in the exhaust gas system and by heat exchangers in the engine jacket, the combustion air compressor and the lub oil cooling systems. With combination of power and heat production a high proportion of the oil energy is being utilized.

Use Box No. 15 if additional space is needed

9. Status and Results

Project start: January 1976
Now in progress

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11 Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No.
2-111SE-06

project location — — — — Skultuna
degree-days (heating) —
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
a. power (MW) — — 12 — —
b. heating (MW) — 13 — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units) 4000 inh
b. residential (square area-m^2) 6 MW heat
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

[redacted]

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-111US-07

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Modular Integrated Utility System - Total Energy

2. Date *(Form Completed)*

May 5, 1977

3. Performing Organization *(Complete Mailing Address)*

Gamze, Korobkin and Caloger
205 W. Wacker Drive
Chicago, Illinois 60606
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Maurice G. Gamze
Gamze, Korobkin and Caloger
Chicago, Ill. 60606 U.S.A.

Clinton W. Phillips
National Bureau of Standards
Washington, D. C. 20234, U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)* Jerome H.Rothenberg, Dir.HUD-MIUS Program
Department of Housing & Urban Development
Division of Energy Building Technology & Standards
Office of Policy Development & Research
451 7th St. SW Room 8158
Washington, D. C. 20410, U.S.A.

6. Duration of Investigation *(Beginning and ending)*

Total Program 1970-1978

7. Estimated Funding and Manpower *(Monies and Manyears)*

$5,000,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)* The purpose of the Total Energy Demonstration at Jersey City, N.J. is for the first time in the United States to evaluate the economy,efficiency, & reliability of total energy systems as compared to conventional utility plants. Although total energy plants have been around for some time in the U.S. most have been constructed for industry and commercial application. Accurate data on the performance and reliability of the existing plants have not been collected and made available particularly in a residential community. The information gathered in this evaluation also will provide valuable spin-off knowledge for the MIUS concept. HUD's involvement stems from its reponsibility for improving the cost of housing in the Nation's communities.

The distinguishing characteristic of a total energy system is its generation of electricity locally with the recovery and reuse of waste heat for space heating,water heating and space cooling. It was predicted that a total energy system would reduce the fuel normally required to supply all of the sites energy requirement by one-third & the annual cost of operation & maintenance by 25 % as compared with a conventional system. Additionally a total energy system can be expanded as needed to serve a growing development.

Use Box No. 15 if additional space is needed

9. Status and Results The plant was designed & is being operated by the engineering firm of Gamze-Korobkin-Caloger, Inc.,Chicago, Ill. The plant was put into operation January, 1974. The plant has 5 V-12 Caterpillar D398TA diesels driving 600 kw generators each. No more than 3 engines are required to maintain full load. There are two 3,9MW boilers capable of supplying all of the thermal energy required for the site without using heat recovery. Two 1.9 MW absorption chillers supply the cooling needs.

The instrumentation was designed & installed by NBS. The collection of data from the TE Data Acquisition System has been underway since May,1975.

The first performance report, the most important near-term milestone, was released

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☒ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 2-111US-07

project location Jersey City, N.J. USA
degree-days (heating) 4811
degree-days (cooling) 400

energy source Fuel Oil No. 2
expected payback period To be determined

plant load capacity
a. power (MW) 2.4
b. heating (MW) 7.6
c. cooling (MW) 3.8
d. wastewater treatment-liters/day NA
e. solid waste processing-kilograms/day NA
f. potable water-liters/day NA

Type and size of user
a. residential (dwelling units) 485
b. residential (square area-m²) 67,600
c. commercial (square area-m²) 6,500
d. industrial (thermal + elec.-MW) NA

heat to power ratio (average expected) Annual BLR output + Eng. Recov/Gross KW = 24

14. Other Related Projects *(Titles)*

MIUS Demonstration (1-111US-03)
MIUS Demonstration Evaluation (1-111US-04)

15. Additional space for Purpose of Project

The total energy plant which serves the Summit Plaza Apartments provides power, space heating/cooling, and hot water for 485 apartments, a school, 6,500 sq. meters of commercial space and a swimming pool.

The objective was to design and construct a plant, utilizing existing technology, at an innovative housing project being constructed by HUD under the Operation BREAKTHROUGH Program. After construction the objective was to install, operate and maintain an instrumentation and acquisition system and to collect, reduce and analyze data, prepare evaluations of component and system performance and monitor plant operations/retrofit/maintenance activities as related to plant performance.

16. Additional space for Status and Results

In May, 1977 analyzing the plants performance from November,1975 to October, 1976. Data will be collected through December 1977 and a final report will be released in mid-1978.

In addition to performance reports a report on the design of the plant and the design and operation of the instrumentation and Data Acquisition System will be published.

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 2-121NL-08

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy-Plant "Swimmingpool" 't Keerpunt AMSTELVEEN

2. Date *(Form Completed)*: 3/14/77

3. Performing Organization *(Complete Mailing Address)*

Geveke Engine Division
Kabelweg 25
AMSTERDAM, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. E.D. Broekman
Geveke Engine Division
Kabelweg 25
AMSTERDAM, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Gemeente Werken
AMSTELVEEN
The Netherlands

6. Duration of Investigation *(Beginning and ending)*: start-up 1969

7. Estimated Funding and Manpower *(Monies and Manyears)*: ± Dfl. 225,000.--

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity, space heating and swimming water heating for a swimming pool (25 m)

Motivation: To take technical and economical advantage of the overall increased efficiency in transforming natural gas into heat and electricity by local integration of utility energy systems.

Approach:
- Recovery waste heat
  - ° engine jacket cooling water
  - ° exhaust gas
- Gas fired boilers
- 2 gas engines (Caterpillar Ë 342 NA) driven electric generators

Use Box No. 15 if additional space is needed

9. Status and Results

Plant put in operation summer 1969
Electricity production 1 x 10^6 kWh per year
- efficiency TE-plant 70%
- efficiency electr. supply 28%
- efficiency heat supply jacket cooling 30%
- efficiency heat supply exhaust gas 12%

Refer to Note 2, Table 2-9.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Contact 4

13. Technical Data

Identification No. 2-121NL-08

project location — — — — AMSTELVEEN
degree-days (heating) — 300*
degree-days (cooling) — —

energy source natural gas
expected payback period 4-5 years

plant load capacity
a. power (MW) — 2 x 0.125 (Caterpillar)
b. heating (MW) — 0.375 (TE)
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

heat to power ratio (average expected) *Refer to Note 2, Table 2-9

14. Other Related Projects *(Titles)*

Swimming Pool: Bussum, Leidschendam, Rotterdam, Nijmegen
The Netherlands

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-121NL-09

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy Plant for Swimming Pool

2. Date *(Form Completed)*

3/14/77

3. Performing Organization *(Complete Mailing Address)*

N/A

4. Principal Investigator *(Name and Complete Mailing Address)*

Gemeentelijke Dienst voor Sport en Recreatie
Afd. Zuembaden
M.A. Versloot
Weena 760
ROTTERDAM , The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Item 4

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

ƒ 350,000.--

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity, space heating and swimming water heating
Motivation: To take technical and economical advantage of the overall increased efficiency in transforming natural gas into heat and electricity by local integration of utility energy systems.
Approach:
- Installation of 3 Caterpillar type G 353 NA gas driven engine electric generators
- Recovery of waste heat by series connection of
  - ° heat exchanger with separate engine jacket cooling water loops
  - ° exhaust gas heat exchanger
- Gas fired boiler for temporarily limited additional supply of heat or as space during component breakdown
- No grid connection

The plant operates basically as an independent energy supply unit

Use Box No. 15 if additional space is needed

9. Status and Results

The plant is in operation.
Results of 1975 indicate that the net cost of electricity produced corrected for pool heating is 10.8 ct/kWh compared to 10 ct/kWh from the municipal grid.

eff. elec. 26%
overall eff. 63% } Refer to Note 1, Table 2-9

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- [x] pool water heating

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Contact 4

13. Technical Data

Identification No: 2-121NL-09

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity 140 kW/unit
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS-DC

NBS-1075 (2-77) — U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. (Secretariat Use Only): 2-121NL-10

1. Title of Project *(Official Title)*

Total Energy - Plant for Swimming Pool

2. Date *(Form Completed)*: 3/7/77

3. Performing Organization *(Complete Mailing Address)*

N/A

4. Principal Investigator *(Name and Complete Mailing Address)*

Sportfondsenbad Bussum, N.V
Strukheiweg
Mr. M.A.V.Maarschol Berweerd
BUSSEM
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Item 4

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity, space heating and swimming water heat
Motivation: To take technical and economical advantage of the overall increased efficiency in transforming natural gas into heat and electricity by local integration of utility energy systems.
Approach:
- Installation of 2 Caterpillar G342 Na gas engine driven electric generators
- Recovery of waste heat by series connection of
  - ° heat exchanger with separate jacket cooling water loop
  - ° exhaust gas heat exchanger
- Gas fired boiler for temporarily limited additional supply or for supply when components have failed.
- No grid connection

The plant operates basically as an independent energy supply unit.

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in operation since 1969
Operating results from 1969, up to and including 1973 indicate that the net cost of electricity produced corrected for pool heating has been 9.37 ct/kWh compared to the cost of electricity from the municipal grid of 6-9 ct/kWh

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- [x] pool water heating

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Contact 4

13 Technical Data

Identification No.
2-121NL-10

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
a. power (MW) — 130 kW/unit
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

The net cost is based on the total cost for production minus cost of gas supply which would be required for separate heating

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-122NL-11

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy-Plant (LP)
Centraal Beheer, Insurance Company

2. Date *(Form Completed)*

1/20/77

3. Performing Organization *(Complete Mailing Address)*

Ir. A.Verhoef
DYNAF B.V.
Kwakelkade 29, P.O.Box 54
ALKMAAR, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. P.H.H.Leijendekkers
Raadgevend Technics Adviesbureau
Van Heugten B.V.
St. Annastraat 143-147
NIJMEGEN

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. L.B.Bosdijk
c/o Centraal Beheer U.A.
P.O.Box 700
APELDOORN
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

August 1971 till November 1972

7. Estimated Funding and Manpower *(Monies and Manyears)*

$6,000,000 for one and a half year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity and space-heat and cooling etc. for office building and computer centre.

Motivation: To take technical and economical advantage of the increase of overall efficiency in transforming natural gas into heat, electricity, etc. by local integration of systems.

Approach: Installation of 3 gas (Waukesha F-3521-GSI, 1000 rpm) driven electric generators (A.V.Kaick), 450 kVA each of which one is spare

- recovery of waste heat - engine jacket cooling water) ebullient cooling
  - exhaust gas)
- installation of 3 gas fired boilers (15 psi, 1200 kgf/hr steam)
- installation of 1 absorption cooling engine
- grid connection for additional electricity supply, and the possibility to take over the complete supply in case of emergency

Use Box No 15 if additional space is needed

9. Status and Results

The plant has been in operation since 1972
Results 1976 are

- efficiency TE-plant 68.14]
- efficiency electr. suppl. 26.1%] Refer to Note 1, Table 2-9
- efficiency heat suppl. 42.04%]

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11 Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 2-122NL-11

project location — — — — Apeldoorn
degree-days (heating) — 125.6 *
degree-days (cooling) — — 25,5

plant load capacity
a. power (MW) 800+1800 grid kW
b. heating (MW) 1090 + 4187 kW
c. cooling (MW) — 744 + 1511 kW
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source natural gas
expected payback period 15 years

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

*Refer to Note 2, Table 2-9

14. Other Related Projects *(Titles)*

SP - Heat Pump System

See 5-122NL-09

15. Additional space for ~~Purpose of Project~~ Technical Data

- days, heating, temp. under 15°C
- days, cooling, temp. above 23°C

Plant load capacity:

a: Usually the power supply is 800 kW from total-energy plant and 250 kW from grid in case of breakdown of TE-plant grid supply up to 1800 kW is possible.

b. Steam capacity TE-plant 1090 kW, additional capacity gas fired boilers is 4187 kW (sufficient for complete take-over in case of breakdown). waste heat is normally used for heating and cooling (absorption system).

c. Absorption cooling engine 744 kW, additional centr. compr. engine 1511 kW, (also sufficient for complete take over by breakdown TE-plant, electr. supply via grid)

Type and size of user:
Office building for 1050 people, square area 23.323 m^2, including a computer centre.

16. Additional space for Status and Results

Reports of economical and technical results are available in Dutch language
Contact: "Beheer en Onderhoud"
Misset
P.O. Box 4
DOETINCHEM

Remark: Efficiencies based on lower heating value

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-122NL-12

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy Plant
Victoria Vesta

2. Date *(Form Completed)*

3/7/77

3. Performing Organization *(Complete Mailing Address)*

See 4

4. Principal Investigator *(Name and Complete Mailing Address)*

Installatie Techniek Bredero
Jaarbeursplein 22
UTRECHT
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. A.de Haan
Victoria Vesta N.V.
EDE
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

± Dfl. 1,500,000 --

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity and space heating and cooling for office building
Motivation: To take technical and economical advantage of the overall increased efficiency in transforming natural gas into heat and electricity by local integration of utility energy systems.
Approach: 3 gas engine driven (Caterpillar G3gg TA) electric generators (V.Kaick) of which one is spare.
- recovery of waste heat from
  - ° engine jacket cooling water
  - ° engine exhaust gas
- 1 absorption cooler
- 2 gas fired boilers for additional heat supply
- no grid connection

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in operation since 1973
Data from 1975:

- Total efficiency of TE-plant	69.02%	]
- Efficiency electr. supply	25.47%	]Refer to Note 1, Table 2-9. Efficiencies
- Efficiency heat supply	33.55%	] are based on total energy delivered and consumed over a full year.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No See 9

13. Technical Data

Identification No. 2-122NL-12

project location — — — — EDE
degree-days (heating) —
degree-days (cooling) — —

energy source natural gas
expected payback period

plant load capacity
a. power (MW) — — — — 540 kW/unit
b. heating (MW) — 750,000 kcal/h unit
c. cooling (MW) — 1,500,000 kcal/h
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for ~~Purpose of Project~~ Technical Data

e. Bruto volume buildings: 79000 m^3
f. Wall Surface : 6000 m^2
g. Window surface : 18000 m^2
h. Number of levels : 5

16. Additional space for Status and Results

- Overall efficiency TE-plant + gas fired boilers 71.91%
- Load factor 0.373
- Average load 41.13 (of max. power of one engine)

Remark: Efficiencies based on lower heating values

Technical and economical information is published in
Beheer en onderhoud
MISSET
Postbus 4, Yselkade 32
DOETINCHEM

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-123DE-13

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Block Heat-Power Station

2. Date *(Form Completed)*

12/21/76

3. Performing Organization *(Complete Mailing Address)*

Heidenheimer Heizkraftwerks GmbH
Postfach 1860
7920 Heidenheim/Benz
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*

1. Stadtwerke Heidenheim AG*)
2. Energietechnik GmbH*)
3. Forschungsstelle fur Energiewirtschaft*)
*) S. Beiblatt

* See box 15, reverse side, for complete addresses

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Bundeministerium fur Forschung
und Technologie
Stresemannstrasse 10
5300 Bonn-Bad Godesberg
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*

1975 to 1978

7. Estimated Funding and Manpower *(Monies and Manyears)*

1,87 Million DM

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Establishment of an experimental station to demonstrate the feasibility of coupling power and heat production in block heating power stations and to relate numerical values to primary energy conservation

Energy balances for daily and yearly full load and part load operation will be plotted.

Power & heat consumption and cost values will be determined, and the idle time and operational safety of all aggregate parts will be investigated. The cost of maintenance and the possibilities for automating the system will be investigated. The standardization of new communities (300-400 units) as it effects a block heating power station will be examined.

Use Box No. 15 if additional space is needed

9. Status and Results

The testing phase has been completed and the evaluation phase has begun.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 2-123DE-13

project location 7920 Heidenheim/Br. Iglauerstr. 66

degree-days (heating) —

degree-days (cooling) — —

energy source Erdgas

expected payback period

plant load capacity

a. power (MW) — 0,8 MVA

b. heating (MW) — 1.5 MW

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units) 283

b. residential (square area-m²) 16760

c. commercial (square area-m²)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

Stadtwerke Heidenheim AG
Postfach 1869
7920 Heidenheim/Brenz
Federal Republic of Germany
Energietechnik GmbH
Postfach 5424
4307 Kettwig
Federal Republic of Germany
Forschungsstelle fur Energiewirtschaft
Am Blutenanger 71
8000 Munchen 50
Federal Republic of Germany

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-222NL-14

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy Plant for Department Store V & D

2. Date *(Form Completed)*

3/14/77

3. Performing Organization *(Complete Mailing Address)*

Geveke, Engine Division
Kabelweg 25
AMSTERDAM, The Netherlands

4 Principal Investigator *(Name and Complete Mailing Address)*

Ir.E.D.Broekman
Geveke, Engine Division
Kabelweg 25
AMSTERDAM, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. Sanders
Department Store
Vroom and Dreesmann
ZAANDAM
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

start-up 1970

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity and space heating for the total department store
Motivation: To take technical and economical advantage of the increase of overall efficiency in transforming natural gas into heat, electricity, etc. by local integration of systems.
Approach: 3 roof mounted gas engine driven electric generators (2 Caterpillar A398 ND, and 1 C342 NA)
- recovery waste heat - engine jacket cooling water
- gas fired boilers

Use Box No. 15 if additional space is needed

9. Status and Results

Plant has been in operation since November 1970
kWh production: 1,5 x 10^6 kWh per year
Efficiency TE-plant: 58%]
Efficiency electr. supply: 28%] Refer to note 1, Table 2-9
Efficiency heat supply: 30%]

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 3 or 4

13 Technical Data

Identification No. 2-222NL-14

project location — — — — Zaandam
degree-days (heating) — 250 *
degree-days (cooling) — —

plant load capacity
a. power (MW) — 2x0.275 +1x0, 125 Caterpillar
b. heating (MW) ~~0,112~~ 5 (TE)
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source Natural gas
expected payback period 5-8 years

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

*Refer to Note 2, Table 2-9

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Remark: Efficiencies based on lower heating value

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-22.42NL-15

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy Project in house for mental defectives

2. Date *(Form Completed)*

3/14/77

3. Performing Organization *(Complete Mailing Address)*

Landre' Ruhaak Motoren B.V.
Industrieweg 30, P.O.B 63
Vianen
The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

B.V.Ontwerp - en Adviesbureau
R. Veenhuizen
Jan van Nassaulaan 104
The Hague
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Ver. Johannes Stichting
Hooge Burch, Spoorlaan 19
Zwammerdam
The Netherlands
Attn: Mr. Ir. P. Haanappel (pr. Supervisor)

6. Duration of Investigation *(Beginning and ending)*

12/71 to 10/74

7. Estimated Funding and Manpower *(Monies and Manyears)*

Dfl. 750,000. = 10 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objectives: To transfer natural gas into electricity and fuel
Motivation: Electricity supply in peak hours and night time, to supply heat for central heating of buildings. Also used as standby units.
Approach: Two gen. set units of 300 KVA each, supply electricity for peak-shaving purpose. The recovered heat will be transferred ty a heat exchanger to by a central heating system at 90°C. The shortage of heat will be supplied by a conventional boiler. The standby use will be obtained by autom. supplying LPG gas in case of failure of public services.
Plans: To reduce extra cost of peak hour supply of electricity and to generate cheap heat for heating purposes.
Exp. results: Lower costs of electricity and heating. Price details not available.

Use Box No. 15 if additional space is needed

9. Status and Results

Installation is now in continuous service
Results not yet available

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 2-22.42NL-15

project location Netherlands

degree-days (heating) —

degree-days (cooling) — —

plant load capacity

a. power (MW) 0.48 — —

b. heating (MW) 0.48 — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected) 1:1

energy source

expected payback period

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

1 MW + 0.7 MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)* 2-311GB-16

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Medical Area Total Energy Plant, Inc.

2. Date *(Form Completed)*

March 11, 1977

3. Performing Organization *(Complete Mailing Address)*

Harvard University
Boston, Massachusetts
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

United Engineers & Constructors, Inc.
100 Summer Street
Boston, Massachusetts
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Harvard University
Boston
Massachusetts
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Total Energy Plant to supply electrical and heating services to the Harvard University Hospital complex.

Use Box No. 15 if additional space is needed

9. Status and Results

Project is in final planning stages with construction commenced and a considerable amount of equipment already purchased.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] unknown

13. Technical Data

Identification No.
2-311UK-15

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source fuel oil
expected payback period

plant load capacity
a. power (MW) — — 40 —
b. heating (MW) — — 40 — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Information supplied by:
Mioleri Blackstone, Ltd. (Diesel Engine Manufacturer)
Hazel Grove
Stockport, Chesline SK75AH
United Kingdom

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-312NL-17

PROJECT SUMMARY FORM

1. Title of Project (Official Title)
Total Energy Plant
Vrije Universiteit

2. Date (Form Completed)
3/7/77

3. Performing Organization (Complete Mailing Address)
Mr. Van Tuyl
Croon Company
Schiemond 22
ROTTERDAM
The Netherlands

4. Principal Investigator (Name and Complete Mailing Address)
Ir. W. Jongendijk
N.V.Nederlandse Gasunie
Planning and Research Department
GRONINGEN, The Netherlands

5. Supporting Organization (Complete Mailing Address and Name of Contact)
Ir. L. van der Meer
Vrije Universiteit
De Boelelaan 1105
AMSTERDAM, The Netherlands

6. Duration of Investigation (Beginning and ending)
N/A

7. Estimated Funding and Manpower (Monies and Manyears)
N/A

8. Purpose of Project (Objectives, Motivations, Approach, Plans and Expected Results)

Objective: To provide electricity and space heating for the university complex.
Motivation: The increased overall efficiency and economical advantages in transforming natural fuel into heat and electricity by local integrated systems.
Approach: installation of 6 (Ruston Paxman) dual-fuel engine driven (Smit) electric generators. Normally natural gas with 80% diesel oil is used. The engines are provided with turbo boosters (CO, CO_2, O_2, CH_4 NO_x content)
- recovery of waste heat from exhaust gas. Engine cooling jacket water and generator cooling water is released to the atmosphere presently.
- grid connection for additional electricity supply.

Use Box No. 15 if additional space is needed

9. Status and Results
The plant is in operation for some years.
Presently extensive test are done to determine accurately the energy balance as well as the quality of combustion gases being released to the atmosphere.
The tests indicate that:
- The TE-plant efficiency is 53% } Refer to Note 1, Table 2-9. The efficiency was measured during a certain period at different loads & did not appear to change. By improving the exhaust gas heat exchanger & using the heat from the lub oil & jacket cooling water the efficiency could be improved by 14%

This project is: ☐ planned ☐ in-progress ☒ completed Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No Contact 4

13. Technical Data

Identification No. 2-312NL-17

project location — — — — Amsterdam
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) ~~1300/1040~~ kW, cos ϕ=0.8 per engine
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m²)
c. commercial (square area-m²)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

The TE-plant efficiency could be increased to 71% by
- increasing the exhaust gas cooler ± 4%
- recovery of waste heat engine jacket cooling water presently released to the atmosphere 14%

Remark: The efficiencies are based on the lower heating value

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 2-312US-18

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy Plant

2. Date *(Form Completed)*

Feb. 15, 1977

3. Performing Organization *(Complete Mailing Address)*

Bergan High School
5105 N. Sheridan Rd.
Peoria, Ill. 61614
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

James Stewart
1106 E. Republic
Peoria, Ill. 61603
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Catholic High School Board
503 Bryan
Peoria, Ill. 61603
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

Sept. 1964 until Jan. 1977 and plan to run twenty more years.

7. Estimated Funding and Manpower *(Monies and Manyears)*

???

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To provide a home for the Christian Brothers teaching at Bergan. Also to provide a high school of 129,000 sq. ft. floor space, that is well insulated with air-conditioning in the summer and in the winter heat the building using hot water and forced air. Fresh air from roof ducts via air handling units. All windows to the outside can not be opened.

Caterpillar engine 1400 R.P.M. 450 hpl 6 cy. diesel electric generator set at 400-480-3p. With transformer operating. The electric set for best resulted is out put 300am. Ps 440-480-3p. This will heat the building and give electricity. We use 1 engine for 20 degrees and above and 2 engines for 20 degrees and below to 25 below zero like we have had this winter.

Use Box No. 15 if additional space is needed

9. Status and Results

The school has operated for over fourteen year with minimal problems.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☒ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 2-312US- 18

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 2-321US-19

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Wilkes-Barre Area Vocational-Technical School
Total Energy Plant

2. Date *(Form Completed)*
2-3-77

3. Performing Organization *(Complete Mailing Address)*

Robert F. Jones, Director, Voc. Ed.
Wilkes-Barre Area Voc.-Tech School
P.O. Box 1699, North End Station
Wilkes-Barre, Pennsylvania 18705
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Robert F. Jones, Director, Voc. Ed.
Wilkes-Barre Area Voc.-Tech School
P.O. Box 1699, North End Station
Wilkes-Barre, Pennsylvania 18705
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Joint Operating Committee
Wilkes-Barre Area Voc-Tech School
P.O. Box 1699, North End Station
Wilkes-Barre, Pennsylvania 18705
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
Unknown

7. Estimated Funding and Manpower *(Monies and Manyears)*
$8,350,000 for 25 years
$ 800,000 for 6 years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To provide all of the electricity (except for emergency corridor lighting) and all heat for a Vocational High School. The system also air-conditions all of the classrooms, the administrative officies, the cafeteria and kitchen and most of the shopts.

Five engines fueled by propane (LPG) or natural gas from a pipeline turn generators that make electricity. Hot water passed through the engine jackets is further heated by the engine exhaust in a heat recovery unit. Steam from the separator unit is used to heat water for cooking, sinks, and showers; to heat water to a higher temperature for building heat, and during warm weather, to provide energy for chilling water for air conditioning.

A computer monitors the overall operation of the entire T.E. System. It also monitors operational functions at 252 points in the power room and throughout the school building.

Use Box No. 15 if additional space is needed

9. Status and Results

Initial structure completed in September 1972
Expansion completed in September 1975

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

☒ public ☐ private ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☒ No

13. Technical Data

Identification No.
2-321US-19

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-401IE-20

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy Hospital (Brescia)

2. Date *(Form Completed)*

1/22/77

3. Performing Organization *(Complete Mailing Address)*

CISE
C.P. 3986
20100 Milano
(Italy)

4. Principal Investigator *(Name and Complete Mailing Address)*

Ing. Giuseppe Morandi
Unita Tecnologie
CISE, C.P. 3986
20100 Milano (Italy)

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Progetto finalizzato "Energetica" del Consiglio Nazionale delle Ricerche - Via Morgagni, 30/E, Roma
ing. Publio Fedi

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

10.000.000 lire
1 man year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The project, very interesting because of the induced energy and money savings, must be considered as a feasibility study for the application of the total energy concepts to a hospital.

The project will be referred to a medium size hospital (400 beds) under construction in Brescia, very close to the future residential district (San Polo) that will be the object of a similar feasibility study.

Use Box No. 15 if additional space is needed

9. Status and Results

Work has just started with input data collection

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 2-4011E-20

project location -- Brescia

degree-days (heating) —

degree-days (cooling) — —

plant load capacity TO BE DETERMINED

a. power (MW) — — — — —

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source

expected payback period

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

San Polo (Brescia) residential district

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)*

PROJECT SUMMARY FORM

2-411US-21

1. Title of Project *(Official Title)*

Wilford Hall USAF Medical Center

2. Date *(Form Completed)*

Nov. 29, 1976

3. Performing Organization *(Complete Mailing Address)*

HQ USAF/PREE
Bolling AFB
Washington, D.C. 20332
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Benham-Blair and Affilitates, Inc.
6323 North Grand Boulevard
Oklahoma City, Oklahome 73118
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

HQ USAF/PREE
Bolling AFB
Washington, D.C. 20332
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

2 years - Study and Design

7. Estimated Funding and Manpower *(Monies and Manyears)*

Estimated Construction Cost: $8,000,000.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To produce electric power for a large medical center and utilize waste heat from the diesel engines for heating and cooling the complex. Project has an estimated annual requirement of 72,655 x 10^6 Btu for heating, 38,696 x 10^6 Btu for cooling, 57,080 x 10^6 Btu for processes, and 24,883,530 KWH for electricity. Project has an estimated payout period of 5 years. Current plan is to install two 1495-ton electrically driven-chillers, two 905-ton absorption chillers and five 2000-KW Diesel-driven generators. The final design may modify the number and size of units.

Use Box No. 15 if additional space is needed

9. Status and Results

Study is complete. Project is under design. Construction contract award scheduled for summer of 1977.

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

☒ public ☐ private ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☒ No Not at this time.

13 Technical Data

Identification No. 2-411US-21

project location Lackland AFB, Texas

degree-days (heating) 1546

degree-days (cooling) — —

energy source Diesel Oil

expected payback period 5 years

plant load capacity

a. power (MW) See Section 8.

b. heating (MW) " — " — — "

c. cooling (MW) " — " — — "

d. wastewater treatment-liters/day — 0 — — —

e. solid waste processing-kilograms/day 0 — —

f potable water-liters/day — — — 0 — — — — —

Type and size of user

a residential (dwelling units)

b residential (square area-m^2)

c commercial (square area-m^2) 112,000

d industrial (thermal + elec.-MW)

heat to power ratio (average expected) Thermal Efficiency = $\frac{\text{Energy Produced}}{\text{Fuel Consumed}}$ = 77.3

14 Other Related Projects *(Titles)*

15 Additional space for Purpose of Project

16 Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No (Secretariat Use Only): 2-420NL-22

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy-Plant
Het Nieuwe Spittaal Hospital

2. Date *(Form Completed)*: 3/14/77

3. Performing Organization *(Complete Mailing Address)*

Ir. A.Verhoef
DYNAF B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. P.H.H. Leijendekkers
Raadgevend Technisch Advies Bureau
Van Heugten B.V.
St. Annastraat 143-147
NIJMEGEN
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. Coorens
Het Nieuwe Spittaal Hospital
ZUTPHEN
The Netherlands

6. Duration of Investigation *(Beginning and ending)*: January 1972 - September 1973

7. Estimated Funding and Manpower *(Monies and Manyears)*: Dfl. 1,900,000. --

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity and space heating for a hospital.
Motivation: Obtaining technical and economical advantage by transforming natural gas at higher efficiency into heat and electricity by local integration of utility systems.
Approach:
- Installation of 3 gas engine (Waukesha-L 5108) driven electric generators (V.Kaick) 1200 rpm, 735 kVA, of which one is spare
- Recovery of waste heat
  - ° engine jacket cooling water) ebullient
  - ° exhaust gas) 15 psi, 1500 kg/hr steam/unit
- Gas fired boilers
- Absorption cooler
- Grid Connection

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in operation since August 1974. Results extrapolated from data obtained for the period January-October 1975.

- efficiency TE-plant	70.3%]	
- efficiency electr. supply	21.8%]	Refer to Note 1, Table 2-9
- efficiency heat supply	48.5%]	

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 3 and 4

13. Technical Data

Identification No. 2-420NL- 22

project location — — — — ZUTPHEN
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) 2 980 kW + 100 kW grid
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source natural gas
expected payback period 9.17 years

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)
e. hospital: 450 beds

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Total cost of investment TE-plant (including connection cost etc. project financing, and design cost) Dfl. 1,894,997. --

Remark: Efficiencies based on lower heating values

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-421NL-23

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Total Energy Plant for LUKAS Hospital

2. Date *(Form Completed)*
3/14/77

3. Performing Organization *(Complete Mailing Address)*
Ir. B.Verhoef
DYNAF
Kwakelkade 29, P.O.Box 54
ALKMAAR, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
Ir. P.H.H.Leijendekkers, Mr.Liebeek
Raadgevend Technics Advies Bureau
Van Heugten B.V.
St. Annastraat 143-147
NIJMEGEN, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Mr. Schaafsma
LUKAS Hospital
Albert Schweitzerlaan 31
APELDOORN, The Netherlands

6. Duration of Investigation *(Beginning and ending)*
January 1972 - September 1973

7. Estimated Funding and Manpower *(Monies and Manyears)*
Dfl. 2,200,000 --

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity, space heating and cooling for a hospital.
Motivation: To take technical and economical advantage of the increase of overall efficiency in transforming natural gas into heat, electricity, etc. by local integration of systems.
Approach:
- Installation of 3 gas engine driven electric generators
- Recovery of waste heat
  - ° engine jacket cooling water
  - ° exhaust gas
- Gas fired boilers
- Grid connection for additional electricity supply
- Absorption coolers

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in operation since 1974
Results (1975)
- efficiency TE-plant 74.4%]
- efficiency electr. supply 28.8%]Refer to Note 1, Table 2-9
- efficiency heat supply 45.6%]

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? XX ☐ Yes ☐ No Request 4

13. Technical Data

Identification No. 2-421NL-23

project location — — — — Apeldoorn
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) 1400 kW + 100 Grid
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source natural gas
expected payback period 7.5 years

Type and size of user
a residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)
e. hospital - 500 beds

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Cost of investment (connection, instrumentation, tools, project financing design cost) Dfl. 2,202,400. --

Payback period on basis of net savings 7.42 years.

Remark: Efficiencies based on lower heating values.

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-422NL-24

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Total Energy Plant
St. Anna Hospital

2. Date *(Form Completed)*
3/14/77

3. Performing Organization *(Complete Mailing Address)*
Ir. A. Verhoef
DYNAF B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR
The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
Ir. P.H.H.Leijendekkers
Raadgevend Technish
Van Heugten B.V.
St. Annastraat 143-147
NIJMEGEN
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
C.Th. M. Dalessi
St. Anna Hospital
GELDROP
The Netherlands

6. Duration of Investigation *(Beginning and ending)*
August 1969 - July 1971

7. Estimated Funding and Manpower *(Monies and Manyears)*
approx. Dfl. 1,300,000 --

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity and space heating for a hospital

Motivation: To take technical and economical advantage of the increase of overall efficiency in transforming natural gas into heat, electricity, etc. by local integration of systems.

Approach:
- Installation of 3 gas engine driven electric generators of which one is spare
- Recovery from waste heat
  - ° engine jacket cooling water
  - ° exhaust gas
- Gas fired boilers
- Grid Connection for additional electricity supply

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in successful operation since 1972
Data from 1975

- efficiency TE-plant	71.98%	]
- efficiency electr. supply	27.18%	]Refer to Note 1, Table 2-9.
- efficiency heat supply	44.80%	]Efficiencies are based on total energy delivered and consumed over a full year.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No.
2-422NL-24

project location — — — — Geldrop
degree-days (heating) —
degree-days (cooling) — —

energy source natural gas
expected payback period

plant load capacity
a. power (MW) 1080 kW
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

- Total efficiency TE-plant + gas fired boilers 78.64%
- Load factor 0.566
- Average load 47% (of power of one engine)

Reports of technical and economical data are available in Dutch language
Contact: "Beheer en Onderhoud"
MISSET
P.O.Box 4
DOETINCHEM

Remark: Efficiencies based on lower heating value-

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. *(Secretariat Use Only)*: 2-422US-25

1. Title of Project *(Official Title)*

Sioux Valley Hospital Total Energy Plant

2. Date *(Form Completed)*

2-2-77

3. Performing Organization *(Complete Mailing Address)*

Sioux Valley Hospital
1100 S. Euclid
Sioux Falls, SD 57105
U.S.A.

4 Principal Investigator *(Name and Complete Mailing Address)*

Gary Rothenbuehler
Total Energy Plant Foreman
1100 S. Euclid
Sioux Falls, SD 57105
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Sioux Valley Hospital
1100 S. Euclid
Sioux Falls, SD 57105 U.S.A.
Gary Rothenbuehler

6. Duration of Investigation *(Beginning and ending)*

October 1969 - October 1970

7. Estimated Funding and Manpower *(Monies and Manyears)*

$1,700,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To provide the most economical, reliable and pollution free source of power, heating and air conditioning for our hospital.

Commenced operation in April 1971 and all of our objectives have been fulfilled.

Original thought of Total Energy was conceived after we realized that we would have to have had two generators for emergency power anyway, so we installed three with the intention of the plant paying itself off in ten years.

Use Box No. 15 if additional space is needed

9. Status and Results

We are currently in full operation but due to critical shortage of natural gas and the rising prices we find it is not economically feasible to continue in our current status. By 1980 we will be back into a steam and refrigeration plant with back up electrical systems for outages. We will again be purchasing our electricity.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☒ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No.
2--422US-25

project location — — — —
degree-days (heating) — 200
degree-days (cooling) — — 100

plant load capacity
a. power (MW) — 1950 KW
b. heating (MW) — 5880 KW
c. cooling (MW) — 800 KW
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — 36,988/Days —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user 100,000 Pop. 350 Bed Hospital
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2) 460,000 sq. ft.
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)*

PROJECT SUMMARY FORM

2-511DK-26

1. Title of Project *(Official Title)*

Total Energy System for a Greenhouse

2. Date *(Form Completed)*

3-15-77

3. Performing Organization *(Complete Mailing Address)*

Technical University of Denmark
Copenhagen, Denmark

4. Principal Investigator *(Name and Complete Mailing Address)*

Technical University of Denmark
Copenhagen, Denmark

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Denmark

6. Duration of Investigation *(Beginning and ending)*

10/76 to 9/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

A number of greenhouse crops can be raised advantageously entirely or partially with the use of a artifical lighting, which means that they will be able to be grown in a highly insulated greenhouse. The electric energy for the lighting fixtures is produced by local diesel generators, heat loss from the fixtures and the diesel motors in utilized for the heating of the entire greenhouse.

The purpose of the project is to work out an up-to-date outline of the project. If it is shown that the project is economic with respect to energy and/or money, a detailed project will be worked out that will then try to be realized.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No

13 Technical Data

Identification No. 2-511DK-26

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-512US-27

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Central Energy Plant - Walt Disney World

2. Date *(Form Completed)*

February 7, 1977

3. Performing Organization *(Complete Mailing Address)*

Reedy Creek Utilities Co., Inc.
P.O. Box 40
Lake Buena Vista, Florida 32830
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Earl Shaw
Manger, Energy Systems
Reedy Creek Utilities Co., Inc.
P.O. Box 40
Lake Buena Vista, Florida 32830, U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N/A

6. Duration of Investigation *(Beginning and ending)*

Continuing operational data for on-line facility

7. Estimated Funding and Manpower *(Monies and Manyears)*

None other than operational requirement.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Plant was constructed as a fully functional, advanced energy plant employing two jet engines to generate power and recovering waste heat in high temperature hot water (HTHW) boilers.

HTHW is partially used in absorption chillers to generate chilled water (CW) for air conditioning.

An integrated underground distribution network distributes from the Central Energy Plant, electrical power at 12KV, HTHW at 400°, and CW at 42° throughout the 1200 acre developed area. HTHW is also pumped throughout the complex to supply all heating needs such as spece heating, domestic hot water at hotels, cooking, reheat for air conditioning etc. Chilled water is produced at the plant and pump throughout the area to provide all cooling and air conditioning requirements.

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been on line and operational for five and one-half years, and has been a success. The versatility of using turbines, generators, boilers, absoprtion and an advanced total energy system.

In times of national or regional fuel and power shortages, the complex has eased the burden locally by utilizing our own fuel storage and generating capacity to its maximum extent. Direct cut backs have been exercised to reduce utility loads during emergencies by having complete control at one central energy palnt.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No
2-512US-27

project location
degree-days (heating)
degree-days (cooling)

energy source
expected payback period

plant load capacity
a. power (MW) 11MW
b. heating (MW) 59MW
c. cooling (MW) 53MW
d. wastewater treatment-liters/day 0
e solid waste processing-kilograms/day 0
f. potable water-liters/day 0
heat to power ratio (average expected)

Type and size of user
a residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Central Energy Plant Solar Office Addition - a solar energy prototype office building with 3800 square feet of horizontal parabolic collectors serving as the roof. This is part of Walt Disney Production's Experimental Prototype Community of Tomorrow program.

15 Additional space for Purpose of Project

16 Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 2-512IE-28

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy Diesel powered heat pump for air conditioning of buildings

2. Date *(Form Completed)*: 11/15/76

3. Performing Organization *(Complete Mailing Address)*

FIAT - C.R.F.
Strada del Drosso, 145
10135 Torino
Italy

4. Principal Investigator *(Name and Complete Mailing Address)*

Ing. Armando Campanile
FIAT - C.R.F.
Strada del Drosso, 145
10135 Torino
Italy

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Consiglio Nazionale delle Ricerche - CNR
Progetto Finalizzato Energia - Cap. IX
Piazzale delle Scienze, 7 - Roma Italy
Prof. M. Silvestri

6. Duration of Investigation *(Beginning and ending)*: March 1976 - Dec. 1980

7. Estimated Funding and Manpower *(Monies and Manyears)*

Italian Liras 445 millions
6 man-years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Construction and comparative operation of a pilot plant powered by a Diesel engine with an output of about 50 HP, for a peak heat requirement of about 140,000 kcal/h for winter heating (outdoor temperature of -10 °C) and of about half the above figure for summer cooling (this on account of the smaller heat differential required).
The novelty, with respect to the conventional heat pumps (electrically driven) is represented by the fact that the power is supplied by a thermal engine which allows the possibility of recovering the exhaust gas and coolant heat which would otherwise be lost.

The program develops through the following main phases : preliminary studies, study and design of the system, construction tests.
The final product is a running system for evaluating:

Use Box No. 15 if additional space is needed

9. Status and Results

- Study and project of the system: completed
- Construction: is underway

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? Subject to authorization of CNR ☐ Yes ☐ No

13. Technical Data

Identification No. 2-512IE-28

project location — Torino, CRF, Strada del Drosso, 145

degree-days (heating) — 2342°C days

degree-days (cooling) — —

energy source Diesel Oil

expected payback period

plant load capacity

a. power (MW) — 0.037 MW
b. heating (MW) — 0.16 — —
c. cooling (MW) — 0.08 — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec -MW)
e. factory canteen - 900 m^2

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

8. Purpose of Project (cont.)

- Operation of the system for a full season with critical processing of the experimental results obtained and comparison with the conventional system.

- The defrosting problem.

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-522IE-29

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

TOTAL ENERGY MODULE (TOTEM)

2. Date *(Form Completed)*

11/15/76

3. Performing Organization *(Complete Mailing Address)*

FIAT - Centro Ricerche
U.R. Apparati Propulsivi
Strada del Drosso, 145 - Torino
Italy

4. Principal Investigator *(Name and Complete Mailing Address)*

Ing. A. Campanile
C.R.F.
Strada del Drosso, 145 - Torino
Italy

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

FIAT - Gruppo Auto
C. so G. Agnelli, 200 - Torino (Italy)
Dr. Dal Bo

6. Duration of Investigation *(Beginning and ending)*

Jan. 1976 - May 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*

700.000 $ 5 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

OBJECTIVE: To demonstrate technical and economic advantages of providing heat and electricity in small integrated groups

MOTIVATION: To increase efficiency in transforming natural gas in to heat and electricity

APPROACH : The "Total Energy" Group provides electricity by mean of an I.C. otto motor coupled with an a syncronous electric generator of 15 kw power, at a constant speed of 3000 R/M. 3 heat exchangers utilized heat of the cooling system and of the exhaust gases to heat water.

PLANS : Design and construct some prototypes of "Total Energy" groups.

Use Box No. 15 if additional space is needed

9. Status and Results

First prototype under preliminary tests other prototypes are under construction.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☒ No AT PRESENT

13 Technical Data

Identification No
2-522IE-29

project location TORINO, OTHERS

degree-days (heating) —

degree-days (cooling) — —

energy source NATURAL GAS

expected payback period

plant load capacity

a power (MW) — 15.10-3

b. heating (MW) — 38.10-3

c. cooling (MW) — — — — —

d wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a residential (dwelling units)

b residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Also see Project Summary Forms 3-122IE-06.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) — U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. (Secretariat Use Only): 2-522NL-30

1. Title of Project *(Official Title)*

TE-Plant for Chicken Slaughter-House "Friki", OOSTERWOLDE

2. Date *(Form Completed)*: 3/14/77

3. Performing Organization *(Complete Mailing Address)*

Ir. Van der Drift
CEBECO
Blaak 31
ROTTERDAM, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. E.D.Broekman
Geveke Engine Division
Kabelweg 25
AMSTERDAM, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N/A

6. Duration of Investigation *(Beginning and ending)*

Start-up 1971

7. Estimated Funding and Manpower *(Monies and Manyears)*

± Dfl. 400,000 --

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide cooling and space heating

Motivation: To obtain technical and economical advantage of the increase of overall efficiency in transforming natural gas into energy by local integration of utility systems.

Approach:

- installation of 2, 500-HP Caterpillar Gas Engines for driving the cooling compressors which provide the total cooling capacity
- recovery of waste heat from
  - ° engine jacket cooling water
  - ° engine exhaust gas

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in operation since 1971

- equivalent kWh production 5 x 10^6 kWh per year
- efficiency TE-plant 74%] Refer to Note 1,
  efficiency electr. supply 32%] Table 2-9
  efficiency heat supply from jacket cooling water 30%]
  efficiency heat supply from exhaust gas 12%]

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☒ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 3 or 4

13. Technical Data

Identification No: 2-522NL-30

project location — — — — Oosterwolde

degree-days (heating) —

degree-days (cooling) — —

energy source natural gas

expected payback period 2 years

plant load capacity

a. power (MW) — 2 x 500 HP

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Remark: Efficiencies are based on lower heating value

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-522NL-31

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy Project for Aluminium Factory

2. Date *(Form Completed)*

3/11/77

3. Performing Organization *(Complete Mailing Address)*

Landre Ruhaak Motoren B.V.
Industrieweg 30, P.O.B. 63
Vianen
The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Mr. G.S.Bongers
Landre Ruhaak Motoren B.V.
Industrieweg
Vianen
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Boal B.V.
Kijckerweg 107
De Lier
The Netherlands
attn. Mr. J.J. Zitman

6. Duration of Investigation *(Beginning and ending)*

2/76 to 11/76

7. Estimated Funding and Manpower *(Monies and Manyears)*

Dfl. 500,000. -.3 man year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objectives: to transfer natural gas into electricity and heat
Motivation: electr. supply, heating factory, pre-heating bars in furnace
Approach: One natural gas engine direct coupled with alternator 800 kVA to generate electricity, cooling water heat at 80°C is transferred to factory by a heat-exchanger and radiators. Exhaust gases of 625°C are conducted in the furnace
Plans: To generate cheaper power at lower costs of energy.
Exp. results: Heating savings approx. Dfl. 35.000. = per year
Electric cost savings Dfl. 125.000. = per year

Use Box No. 15 if additional space is needed

9. Status and Results

Installation is continuous in service for 144 hours per week.
The factory can be heated in wintertime at an average temp. of 18°C
The bars are preheated up to 320°C
In summer the cooling water heat will be rejected.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 2-522NL-31

project location — — — — Netherlands
degree-days (heating) — 250*
degree-days (cooling) — —

plant load capacity
a. power (MW) — — 0.48
b. heating (MW) — — 0.9 — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected) 1:2

energy source natural gas
expected payback period 2.5 years

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW) ($1.5MW_{th}$ + 1 MW_e)

*Refer to Note 2, Table 2-9

14. Other Related Projects *(Titles)*

None

15. Additional space for Purpose of Project

Expected results based on:

Price natural gas 1976	: Dfl. 0,14 per m3.
Price electricity 1976	: Dfl. 0,12 per kWh
Running hours	: 6000 per year
Maintenance costs	: Dfl. 0,01 per kWh
Cont. rating	: 600 KVA
Interm rating	: 850 KVA
Units	: one

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only)

PROJECT SUMMARY FORM

2-522NL-32

1. Title of Project *(Official Title)*

Total Energy Plant for Greenhouse Boots

2. Date *(Form Completed)*

3/14/77

3. Performing Organization *(Complete Mailing Address)*

DYNAF B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. A. Verhoef
DYNAF B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. Boots
Fa. Boots-Greenhouse
Rustenburgerweg
HEER HUGOWAARD, The Netherlands

6. Duration of Investigation *(Beginning and ending)*

7. Estimated Funding and Manpower *(Monies and Manyears)*

Dfl. 92,700. --

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity for crop illumination and greenhouse heating
Motivation: To obtain economic advantage from the increased efficiency in transforming natural gas into electricity and heat by local integration of systems
Approach:
- 1 gas engine (Waukesha F 817 GA) driven electric generator 155 pk (HP), 110 kVA
- Recovery of heat from
  - ° engine jacket cooling water
  - ° exhaust gas
- Additional boilers
- Operating of the plant as energy island
- Feeding the recovered heat into the existing central heating system

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in operation since November 1976

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No
2-522NL-32

project location — — — — HEER HUGOWAARD
degree-days (heating) —
degree-days (cooling) — —

energy source natural gas
expected payback period

plant load capacity
a. power (MW) — - ·
b. heating (MW) — - —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-522NL-33

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy for Nursery Gardens

2. Date *(Form Completed)*

3/14/77

3. Performing Organization *(Complete Mailing Address)*

Techn. Handelsonderneming
J. de Ruiter
Vinkenweg 72
Rijnsburg
The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Landré Ruhaak Motoren, B.V.
Industrieweg 30, P.O.B. 63
Vianen
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

P.A. van Paridon
Rijnsburgerweg
Voorhout
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

6/75 to 10/75

7. Estimated Funding and Manpower *(Monies and Manyears)*

Dfl. 100,000. = . 2 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To transfer natural gas into electricity and heat
Motivation: Electricity for lighting flowers and heating greenhouses.
Approach: One generator set of 100 KVA provides electricity for the bulbs and the motor provides by means of a heat exchanger heat of 90°C to reduce costs of heating by a conventional boiler.
Plans: To reduce lighting and heating costs and to extend the periods of producing flowers per year.
Exp. results: Heating savings approx. Dfl. 4,870. = per year
Electr. savings approx. Dfl.16.500. = per year

Use Box No. 15 if additional space is needed

9. Status and Results

Installation is continuous in service during 3 months per year in winter time. Till 0°C ambient temp. the installation provides enough heat for the greenhouse without the use of the stand-by boiler.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No.
2-522NL-33

project location — — — — Netherlands
degree-days (heating) —
degree-days (cooling) — —

energy source natural gas
expected payback period 5 years

plant load capacity
a. power (MW) — — 80 kW
b. heating (MW) — ~~80 kW~~
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Total energy for two other nursery gardens already completed.
There is a potential of approximately 150 gardens.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-522NL-34

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
TE-Plant
Lily Cultivating Company

2. Date *(Form Completed)*
3/14/77

3. Performing Organization *(Complete Mailing Address)*
Geveke Engine Division
Kabelweg 25
AMSTERDAM, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
Ir. E.D.Broekman
Geveke Engine Division
Kabelweg 25
AMSTERDAM, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Mr. Dekker
Company Dekker
HENSBROEK, The Netherlands

6. Duration of Investigation *(Beginning and ending)*
Start-up 1975

7. Estimated Funding and Manpower *(Monies and Manyears)*
+ Dfl. 200,000.--
-

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity and space heating for a greenhouse during approx. 6 months a year.

Motivation: To obtain economic advantage from the increased efficiency in transforming natural gas into electricity and heat by local integration of systems.

Approach: 1 gas engine (Caterpillar G 398 TM) driven electric generator.
- Recovery of waste heat from
  - ° engine jacket cooling water
  - ° exhaust gas
  - ° lub. oil cooling
  - ° radiation losses

Use Box No 15 if additional space is needed

9. Status and Results

The plant has been in operation since 1975
- equivalent kWh production 2.6 x 10^6 kWh per year]
- efficiency TE-plant 85%]Refer to Note 1,
- efficiency heat supply from jacket cooling water + lub. oil cooler 30%] Table 2-9
- efficiency heat supply from exhaust gas 15%]
- efficiency heat supply from radiation losses 10%]

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11 Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 4

13. Technical Data

Identification No. 2-522NL-34

project location — — — — HENSBROEK
degree-days (heating) — 180 days *
degree-days (cooling) — —

plant load capacity 0.420
a. power (MW) — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source natural gas
expected payback period 2-4 years

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

* Refer to Note 2, Table 2-9

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
2-522NL-35

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy Plant for Greenhouse

2. Date *(Form Completed)*
3/14/77

3. Performing Organization *(Complete Mailing Address)*

Ir. A.Verhoef
DYNAF B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR, The Netherlands

4 Principal Investigator *(Name and Complete Mailing Address)*

Mr. Van Tuyl
Croon and Comp. + DYNAF
Schiemond 22,
ROTTERDAM, THE Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. Smit
Openbare Nuts Bedrijven
Boomgaardlaan 12
SCHIPLUIDEN, The Netherlands

6. Duration of Investigation *(Beginning and ending)*
N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*
Dfl. 136,400. --

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity for crop illumination and greenhouse heating
Motivation: By local production of electricity and supply of electricity to the local grid, increase of main grid capacity could be prevented while waste heat could be used efficiently for greenhouse heating
Approach:
- 1 gas engine (Waukesha F 1197 C4, 240 pk (HP) driven electric generator
- Recovery of waste heat, which is fed into the heating system of the greenhouse
  - ° from engine jacket cooling water
  - ° from exhaust gases
  - ° from lub. oil cooler
- Parallel operation to the local public grid without power feedback to the main grid

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in operation since January 1977
Measurements are made to determine in service efficiencies.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 5

13. Technical Data

Identification No. 2-522NL-35

project location — — — — CHIPLUIDEN

degree-days (heating) —

degree-days (cooling) — —

energy source natural gas

expected payback period

plant load capacity

a. power (MW) — — 0.2

b. heating (MW) — — 0.28 —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) — U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. (Secretariat Use Only): 2-523NL-36

1. Title of Project *(Official Title)*
Total Energy Plant
"Factory New Holland"

2. Date *(Form Completed)*: 3/14/77

3. Performing Organization *(Complete Mailing Address)*
Geveke Engine Division
Kabelweg 25
AMSTERDAM, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
Ir. E.D.Broekman
Geveke Engine Division
Kabelweg 25
AMSTERDAM, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Nederlandse Melkunie
WOERDEN
The Netherlands

6. Duration of Investigation *(Beginning and ending)*
Start-up 1968

7. Estimated Funding and Manpower *(Monies and Manyears)*
N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity and dishwater heating for the factory
Motivation: To take technical and economical advantage of the overall increased efficiency in transforming natural gas into heat and electricity by local integration of utility energy systems.
Approach: 2 gas driven engines (Caterpillar) coupled to one electric generator
- recovery waste heat
  engine jacket cooling water
- grid connection

Use Box No. 15 if additional space is needed

9. Status and Results

Plant has been in operation since Mid-summer 1968

Equivalent kWh production: 1.2×10^6 kWh per year
- Efficiency TE-plant : 58%]
- Efficiency electr. supply : 28%] Refer to Note 1, Table 2- 9
- Efficiency heat supply : 30%]

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 3

13. Technical Data

Identification No
2-523NL-36

project location — — — — Woerden
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — 0.3 — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source natural gas
expected payback period 3-5 years

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Ir. Van Houten (Dir.), Mr. De Groot
Potato-Mill Factory "Twee Provincien"
STADSKANAAL
The Netherlands

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Remark: Efficiencies based on lower heating value

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-572NL-37

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy plant for Industrial Application
EMINENT

2. Date *(Form Completed)*

3/14/77

3. Performing Organization *(Complete Mailing Address)*

DYNAF, B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. A.Verhoef
DYNAF B.V.
Kwakelkade 29, P.O.Box 54
ALKMAAR, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. K.L.Vreeken
B.V. Eminent
Dronenhceck 1, P.O. Box 25
BODEGRAVEN
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity and space heating for factory and office building.
Motivation: The increased overall efficiency and economical advantages in transforming natural fuel into heat and electricity by local integrated systems.
Approach: 2 gas engines(F1197 GU, 140 kW) and 1 diesel engine (Cummens type NT-855 C 180 kW) driven electric generators.
- recovery of waste heat from
  - ° engine jacket cooling water) hot water
  - ° exhaust gas)

Use Box No. 15 if additional space is needed

9. Status and Results

Order for erection of the plant has been given. According to design calculations the efficiencies are:
- efficiency TE-plant 75%] Refer to Note 1, Table 2-9
- efficiency electricity gen. 26%]
- efficiency heat generation 49%]

Remark: Efficiencies are based on lower heating values

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 4

13. Technical Data

Identification No. 2-572NL-37

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source natural gas
expected payback period

plant load capacity
a. power (MW) 140 kW/unit
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-612US-38

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Linden Generating Station

2. Date *(Form Completed)*

11/76

3. Performing Organization *(Complete Mailing Address)*

Public Service Electric & Gas Company
80 Park Place
Newark, N.J. 07101
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Chief Engineer, PSE&G
80 Park Place
Newark, N.J. 07101
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

NOT APPLICABLE

6. Duration of Investigation *(Beginning and ending)*

Commercial Plant - began operation in 1956

7. Estimated Funding and Manpower *(Monies and Manyears)*

NOT APPLICABLE

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Construct and operate a commercial steam-electric power plant adjacent to the Bayway Refinery of the EXXON Oil Company in Linden, New Jersey for the purposes of providing the refinery with its entire steam requirements in exchange for residual fuel and surface run-off wastewater. Electric power is provided to the PSE&G system.

The motivation is to achieve a high fuel efficiency of 54% at design conditions as opposed to the 39% expected efficiency of similar single-purpose steam-electric power plants in order to achieve improved overall economics.

Use Box No. 15 if additional space is needed

9. Status and Results

The power plant and refinery have operated essentially continuously since 1956.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- [x] process heat

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

*published data on the plant design is available in the open literature (limited)

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 2-612US-38

project location Linden, N.J.

degree-days (heating) —

degree-days (cooling) — —

energy source Heavy Oil

expected payback period

plant load capacity

a. power (MW) — (maximum) 511

b. heating (MW) — (maximum) 580

c. cooling (MW) — — — — — 0

d. wastewater treatment-liters/day — 20.4 x 10^6

e. solid waste processing-kilograms/day — 0 — —

f. potable water-liters/day — — — — — — 0 — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Article: Large Scale Exchange of Extraction Steam for Residual Fuel at the Linden Generating Station, Proceedings of the American Power Conference, Volume XVIII - 1956, Illinois Institute of Technology, 3300 S Federal, Chicago Illinois 60616.

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. *(Secretariat Use Only)*: 2-721US-39

1. Title of Project *(Official Title)*
Construct Total Energy Power Plant
(Completed April 1970)

2. Date *(Form Completed)*
February 15, 1977

3. Performing Organization *(Complete Mailing Address)*
Department of the Air Force
6594 Air Base Squadron/DE
Sunnyvale Air Force Station, CA 94086
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
Mr. John E. Runaldue
Chief Operations and Maintenance
(Current Responsible Official)
(Address same as item #30

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Department of the Air Force
HQ Space & Missile Systems Organization
Directorate of Civil Engineering
P.O. Box 92960, Worldway Postal Center
Los Angeles, CA 90009
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
May 1964 - April 1970

7. Estimated Funding and Manpower *(Monies and Manyears)*
Total Cost: $4,838,000, 18 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Provide continuous stable power to the Satellite Test Center in Sunnyvale California which includes various computer monitoring and controlling all Department of Defense satellites. Provide continuous utility power to provide lighting, heating, air conditioning, etc to support administrative and technical facilities.

Project was conceived as a result of numerous power outages by the commercial power supplier. The computer systems, without backup power, were made inoperative and lost all memory data due to the unscheduled outages on many occasions. Being the only facility of its type in the United States, results were sometimes unacceptable because of the loss of memory data.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 2-721US-39

project location — — — California

degree-days (heating) 2,500

degree-days (cooling) not used-cooling used 100% daily to control humidity for computers.

energy source - natural gas; secondary JP-5

expected payback period - 20 years

plant load capacity

a. power (MW) — — 9 — —

b. heating ~~MWt~~ 36 tons/hr @870°F, 12 psi

c. cooling ~~MWt~~ 2500 tons/hr

d. wastewater treatment-liters/day — — — None — —

e. solid waste processing-kilograms/day None

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

type and size of user

a. residential (dwelling units)

b. residential (square area-m²)

c. commercial (square area-m²) 34,000M²

d. industrial (thermal + elec.-MW)

14 Other Related Projects *(Titles)*

None

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
2-772US-40

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Naval Training Center Generating Plant

2. Date *(Form Completed)*

11/76

3. Performing Organization *(Complete Mailing Address)*

Applied Energy, Inc.
P.O. Box 909
San Diego, California 92112
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Robert C. Eckely, General Manager
Applied Energy, Inc.
P.O. Box 909
San Diego, California 92112
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

NOT APPLICABLE

6. Duration of Investigation *(Beginning and ending)*

Commercial Plant - began operation in 1971

7. Estimated Funding and Manpower *(Monies and Manyears)*

NOT APPLICABLE

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Construct and operate a commercial gas turbine heat power plant at the Naval Training Center in San Diego, California to serve the Naval Training Center and Marine Corps Recruitment Depot. Steam is supplied to these facilities & electricity is supplied to the San Diego Gas & Electric Co. System (Applied Energy, Inc. is a wholly-owned subsidiary of SDG&E).

Use Box No. 15 if additional space is needed

9. Status and Results

The gas turbine heat recovery plant has been operated since 1971 on a basis of steam production economics. This depends on fuel (natural gas or distillate oil) cost & availability for the gas turbine and separate auxiliary boiler.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No limited

13. Technical Data

Identification No
2-772US-40

project location San Diego
degree-days (heating) —
degree-days (cooling) — —

energy source Natural Gas & Distillate Oil
expected payback period

plant load capacity
a. power (MW) — 1.80 —
b. heating (MW) — 50 approx.
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Other gas turbine heat recovery power plants operated by AEI and interconnected with the PSE&G system: 32nd Street Generating Station
North Island Generating Station

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
2-822NL-41

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Improvement of Energy Generation Plants by Using Total Energy Systems

2. Date *(Form Completed)*
3/15/77

3. Performing Organization *(Complete Mailing Address)*
RIJN Schelde Verolme N.V.
OOSTMAASLAAN 59 65
Rotterdam, Netherlands

4 Principal Investigator *(Name and Complete Mailing Address)*
P. Croockewit
OOSTMAASLAAN 59 65
Rotterdam, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Netherlands
RIJN Schelde Verolme N.W.
OOSTMAASLAAN 59 65
Rotterdam, Netherlands

6. Duration of Investigation *(Beginning and ending)*
7/74 to 6/75

7. Estimated Funding and Manpower *(Monies and Manyears)*
Unknown

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objectives: a) Combined cycle installation engineering
b) Total energy systems
c) Off gas energy recovery systems

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] unknown

13. Technical Data

Identification No.
2-822NL-41

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 2-922BE-42

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Total Energy Plant for Hotel CREST

2. Date *(Form Completed)*
3/14/77

3. Performing Organization *(Complete Mailing Address)*
J.Harker
Twengge Consultant Anstalt
La Ville Ave. Pape Meigneux
77520 DONNE MARIE, DONTILLY
PARIS, France

4. Principal Investigator *(Name and Complete Mailing Address)*
Ir. A.Verhoef
DYNAF B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
CREST Hotel
ANTWERP
Belgium

6. Duration of Investigation *(Beginning and ending)*
N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*
Dfl. 1,400,000.-- 2.5 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide electricity, space heating and cooling
Motivation: To take technical and economical advantage of the increase of overall efficiency in transforming natural gas into heat, electricity etc. by local integration of systems

Approach:
- 3 gas engine (Waukesha F 3521-G) driven electric alternator (UNELEC 450 kWA)
- Recovery of waste heat from
  - ° engine jacket cooling water
  - ° exhaust gases
- 1 absorption cooler

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in operation since August 1973
Start-up test showed good agreement with calculated values

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 5

13 Technical Data

Identification No
2-922BE-42

project location — — — — ANTWERP
degree-days (heating) —
degree-days (cooling) — —

energy source natural gas
expected payback period

plant load capacity
- a power (MW) — 750 kW
- b heating (MW) — — — — —
- c cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user
- a residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-001US-01

PROJECT SUMMARY FORM

1. Title of Project (Official Title)
Environmental, Economic, and Conservation Aspects of Integrated Energy use Applications

2. Date (Form Completed)
3/15/77

3. Performing Organization (Complete Mailing Address)
Georgia Institute of Technology
225 North Avenue NW
Atlanta, Georgia 30332
U.S.A.

4. Principal Investigator (Name and Complete Mailing Address)
Dr. Neil B. Hilsen
Georgia Institute of Technology
225 North Avenue NW
Atlanta, Georgia 30332
U.S.A.

5. Supporting Organization (Complete Mailing Address and Name of Contact)
Dr. C.C.Lee
U.S.EPA, PTCB, IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation (Beginning and ending)
4/76 to 1/78

7. Estimated Funding and Manpower (Monies and Manyears)
$120,000

8. Purpose of Project (Objectives, Motivations, Approach, Plans and Expected Results)

The purpose of this project is to provide up-to-date analyses of the environmental, economic and technical feasibility of alternatives for supplying total energy needs, to assess various integrated energy system concepts for supplying multipurpose energy for utility and industrial needs, to identify the technical feasibility of matching industrial processes to thermal outputs of power plants, to analyze extensively several final concepts selected for their potential for future environmentally sound developments, and to make recommendations about future environmental research and development activities based on the project results.

This research study will follow a phase-oriented program to achieve its objectives. Five phases have been identified and are listed below:

Phase 1: Project management;
Phase 2: Environmental, economic and technological overview and preliminary concept identification;
Phase 3: Methodology development and final concept selection;
Phase 4: Concept analysis and evaluation;
Phase 5: Conclusion and Recommendation.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-001US-01

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No *(Secretariat Use Only)*: 3-031NL-02

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Several projects concerning utilization of heat raised by incineration of waste.

2. Date *(Form Completed)*: 6/10/77

3. Performing Organization *(Complete Mailing Address)*

N/A

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. B.G. Kreiter
Institute for Waste Disposal
P.O. Box 184
Amersfoort
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Institute for Waste Disposal
P.O. Box 184
Amersfoort
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

Continuously

7. Estimated Funding and Manpower *(Monies and Manyears)*

Projects are of evaluating nature.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Generation of electric power is a well-known method of utilization of incineration-heat.

The low efficiency, however, is a reason to investigate alternatives.
Running projects are:
- district heating (in cooperation with a national committee)
- water evaporation
- firing of the light combustible waste fraction in power-station boilers.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 3-301NL-02

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. *(Secretariat Use Only)*: 3-101DE-03

1. Title of Project *(Official Title)*
Model Community with novel energy and heating systems (ET 5109)

2. Date *(Form Completed)*
Jan. 6, 1975

3. Performing Organization *(Complete Mailing Address)*

D.-Ing.Arne Strassberger
Beethovenstr. 33
53 Bonn-Beuel 1
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr.-Ing.Strassberger (BMFT)

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-517 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*
4,206-$ US (11077.--DM)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

- Energy saving buildings based on sensible planning,
- Saving energy through integrated energy supplies,
- Heating rooms with energy produced during the summer,
- Utilization of diverse heat sources.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No.
3-101DE-03

project location
degree-days (heating)
degree-days (cooling)

energy source
expected payback period

plant load capacity
- a power (MW)
- b heating (MW)
- c cooling (MW)
- d. wastewater treatment-liters/day
- e. solid waste processing-kilograms/day
- f. potable water-liters/day

heat to power ratio (average expected)

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14 Other Related Projects *(Titles)*

15 Additional space for Purpose of Project

16. Additional space for Status and Results

This study is available from BMFT (See box 5)

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 3-101NL-04

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Local Heating for Towns to be Built (In planning)

2. Date *(Form Completed)*
3/15/77

3. Performing Organization *(Complete Mailing Address)*
1. Delft Univ. of Technology
2. Technischi Hogeschoal
Delft, The Netherlands
3. Centrum voor Technische Milienkunde

4 Principal Investigator *(Name and Complete Mailing Address)*
G.S.Jonker
Delft Univ. of Technology
Center for Environmental Science Technology
Delft, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
1. Delft University of Technology
Delft, The Netherlands
2. Technischi Hogeschoal, Delft,
The Netherlands

6. Duration of Investigation *(Beginning and ending)*
NA

7. Estimated Funding and Manpower *(Monies and Manyears)*
NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Methods for (local) heating will be studied concerning towns to be built (Almere, North quarter of Breda and the quarter Holy of the town Vlaardingen) as well as environmental aspects. Also will be regarded: a) incineration of refuse; b) efficient utilization of power stations and their capacity (MW); c) utilization of solar energy for space heating; d) use of water heat, tec.

The utilization of partly solar energy and partly waste heat is of substantial importance for the physical planning of the town concerned. What is acceptable from the point of view of civil engineering will be studied.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: [X] planned [ ] in-progress [ ] completed

Use Box No. 16 if additional space is needed

10. Utility Services
- [ ] electrical power
- [x] space heating
- [ ] space cooling
- [x] potable hot water
- [ ] wastewater treatment
- [x] solid waste processing
- [ ] potable water

11 Type of Project
- [ ] public
- [ ] private
- [ ] cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? [ ] Yes [ ] No [x] unknown

13. Technical Data

Identification No. 3-101NL-04

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only)

PROJECT SUMMARY FORM

3-101US-05

1. Title of Project *(Official Title)*

Integrated Community Energy Systems (ICES) Systems Engineering

2. Date *(Form Completed)*

Nov. 1977

3. Performing Organization *(Complete Mailing Address)*

Energy & Environmental Systems Division
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, Illinois 60439
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

John Roberts
EES Division
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, Illinois 60439
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

John Rodousakis
Community Systems Branch
U.S. Department of Energy
20 Massachusetts Avenue, N.W.
Washington, D.C. 20545
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

Started January 1976 - Ongoing

7. Estimated Funding and Manpower *(Monies and Manyears)*

Approx. $1 million/yr.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objectives: (1) to develop basic data and methods for evaluation and design of ICES.
(2) to identify and conduct preliminary engineering and economic evaluations and intercomparisons of numerous ICES concepts, leading to an ICES Systems Guide.
(3) to conduct detailed engineering evaluations of advanced ICES concepts.
(4) to perform tests of components and subsystems for integration into ICES.
(5) to provide engineering support to ICES demonstrations, especially in the feasibility, design, and evaluation phases.

Motivations: to conserve energy and scarce fuels through new methods of satisfying the energy needs of American communities.

Plans: (1) to develop a sound data base for the performance and cost of components and subsystems.
(2) to develop and validate methods for design of central plants, distribution systems and end-use equipment.
(3) to evaluate and catalog the more promising ICES concepts for ready access by consulting engineers and planners.

Use Box No. 15 if additional space is needed

9. Status and Results

Periodic reports on technology evaluation of subsystems. Computerized programs, simulation and optimization under development.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☒ potable water

11. Type of Project

☒ public ☐ private ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No.
3-101US-05

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Grid-connected Integrated Community Energy System (ICES) (1-101US-02)

15. Additional space for Purpose of Project

Approach: to take ICES Systems Engineering from conceptual design to future commercialization through: (1) Technology Evaluations which provide performance and cost data for conceptual designs; (2) Design & Method Manuals which provide user-oriented computer codes to simulate and optimize the various program elements; (3) Systems Development which integrates the various Systems Engineering technical areas into a systems synthesis and development effort; (4) Evaluation of Advanced ICES which assesses the potential and economic viability of ICES programs and demonstrations and analyze successes and failures; and (5) ICES Test Facility which provides laboratory-tested engineering data for implementing successful DOE demonstration programs that will lead to future commercialization.

Estimated Results: to realize the goal of successful conservation in the provision of energy to a community.

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-122IE-06

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

System for supplying utility services to a multi-family low rise building

2. Date *(Form Completed)*

3-7-77

3. Performing Organization *(Complete Mailing Address)*

FIAT - Centro Ricerche
U.R. - Apparati Propulsivi
Strada del Drosso, 145 - Torino
Italy

4. Principal Investigator *(Name and Complete Mailing Address)*

Ing. A. Campanile
C.R.F.
Strada del Drosso, 145 - Torino
Italy

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

FIAT - Gruppo Auto
C. so G. Agnelli, 200 - Torino - Italy
Dr. Dal Bo

6. Duration of Investigation *(Beginning and ending)*

1/76 to 5/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$200,000 2 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objective is "in situ" testing of performances of a small group generating heat and electricity for housing services. The group named TOTEM has been developed by FIAT and is described under a different Project Summary Form. The research is motivated by the need of increasing the efficiency in the utilization of fuel resources.

The experiment here described consists of 3 TOTEM groups which operate in parallel among them and with an integrating boiler. The system provides heat and electricity to a four-stored 16 apartments building located in TORINO - via Spotorno 40. The base thermal load is supposed to be supplied by the three TOTEM Groups.

Use Box No. 15 if additional space is needed

9. Status and Results

Installation of the plant completed

Operation being started

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-122IE-06

project location TORINO - ITALY
degree-days (heating) — 2342 °C Day
degree-days (cooling) — —

plant load capacity
a. power (MW) — 45.10^{-3}
b. heating (MW) — .114 (T.E.) +0,2 (boiler)
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — —
heat to power ratio (average expected)

energy source Natural Gas
expected payback period

Type and size of user
a. residential (dwelling units) 16
b. residential (square area-m^2) 925
c. commercial (square area-m^2) 191
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Also see Project Summary Form 2-522IE-29.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No (Secretariat Use Only): 3-103US-07

1. Title of Project (Official Title)

Development of Testing of a Vapor Compression System

2. Date (Form Completed): 11/23/76

3. Performing Organization (Complete Mailing Address)

Chemtric Inc.
Rosemont, Ill. 60018
U.S.A.

4. Principal Investigator (Name and Complete Mailing Address)

Victor J. Guarino
Robert A. Bambenek
Chemtric Inc.
Rosemont, Ill. 60018
U.S.A.

5. Supporting Organization (Complete Mailing Address and Name of Contact)

H. Bostian
U.S. EPA, ORD, IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation (Beginning and ending): 3/74 to 1/77

7. Estimated Funding and Manpower (Monies and Manyears): NA

8. Purpose of Project (Objectives, Motivations, Approach, Plans and Expected Results)

Evaluation of the use of flash evaporation-vapor compression distillation to recover hot water from contaminated wastewater. The system was tested on laundry wastewater and synthetic brine water. The laundry water was successfully treated, but escape of voltatiles and ammonia in to the distillate of the brine water produced and unacceptable effluent.

Use Box No. 15 if additional space is needed

9. Status and Results

Economic analysis indicates the system is cost effective for areas where water must be brought in by vehicle but not for general metropolitan or semi-rural use.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-103US-07

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-111US-08

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Alaska Village Demonstration Project, Wainwright, Alaska

2. Date *(Form Completed)*

11/23/76

3. Performing Organization *(Complete Mailing Address)*

Arctic Environmental Research Station
College, Alaska 99701
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Bertold Puchtler
Arctic Environmental Research Station
College, Alaska 99701
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

U.S. Environmental Protection Agency
Arctic Environmental Research Station
College, Alaska 99701 U.S.A.
ATTN: Bert Puchtler
Also See Box 15

6. Duration of Investigation *(Beginning and ending)*

10/70 to 12/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

12 man years $2,000,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

PURPOSE: To demonstrate methods for providing safe water supply, waste disposal and improving enviornmental health conditions in Alaskan villages.

APPROACH: Provide a central facility to serve each village involved. Such facility to include potable water treatment, waster water treatment, showers, saunas and laundry facilities. Also incorporating vehicular pickup and delivery system for wastewater and potable water. Employ an energy conservative approach to minimize operating costs with future use of waste heat from power generation.

Use Box No. 15 if additional space is needed

9. Status and Results

Interim report is available

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☒ potable water

11. Type of Project

☒ public ☐ private

☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-111US-08

project location 70° 38.2N 160° 01.8'W

degree-days (heating) 19,000 below 65°F

degree-days (cooling) — —

energy source Diesel Oil

expected payback period ?

plant load capacity

a. power (MW) — 0.01 —

b. heating (MW) — 4×10^{-3}

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — $\frac{20 \times 10^3}{250}$

e. solid waste processing-kilograms/day — 20×10^3

f. potable water-liters/day — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units) 80

b. residential (square area-m^2) 4 km^2

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

(SP) Alaska Village Demonstration Project, Emmonak, Alaska
(LP) Village Safe Water Program - State of Alaska, Department of Environmental Conservation
Wainwright Secondary School Complex - North Slope Borough, Alaska

15. Additional space for Purpose of Project

Department of Housing and Urban Development
Division of Energy, Building Technology and Standards
Office of Policy Development Research
Washington, D.C. 20410 U.S.A.
Jerome H. Rothenberg, Director, HUD/MIUS Program Manager

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-111US-09

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Alaska Village Demonstration Project, Emmonak Facility

2. Date *(Form Completed)*: 11/24/76

3. Performing Organization *(Complete Mailing Address)*

U.S. Environmental Protection Agency
Arctic Environmental Research Station
College, Alaska
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Bert Puchtler, Head
Alaska Village Demonstration Project
Arctic Environmental Research Station
College, Alaska 99701
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

U.S. Environmental Protection Agency
Arctic Environmental Research Station
College, Alaska
U.S.A.

6. Duration of Investigation *(Beginning and ending)*: 1971 - 1978

7. Estimated Funding and Manpower *(Monies and Manyears)*: $1,000,000 30 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Primary central village utility facility for water, waste, bathing & laundry purposes. However, since costs in remote Alaska are high and processes are energy intensive, the several processes were interfaced, and heat needs were exchanged with waste heat sources as a supplement to primary heat source. Results were only partially successful due to lack of simple system of controling the interfaces.

Use Box No. 15 if additional space is needed

9. Status and Results

The project has been in operation while facility has been under completion. Considerable process modification has been done to reduce operating costs and improve reliability of the several processes.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☒ potable water

Public laundry Public bathing facilities

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data Emmonak, Alaska (Bearing Sea Coast)

Identification No. 3-111US-09

project location — —
degree-days (heating) 14,000
degree-days (cooling) — —

plant load capacity
a. power (MW) 0.5 mu (not part of project)
b. heating (MW) 1,000,000 Btu/hr.
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day 500
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units) 80
b. residential (square area-m²) 500
c. commercial (square area-m²)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-111US-10

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Alaska Village Demonstration Project, A Third Facility for Small Interior Village

2. Date *(Form Completed)*

11/24/76

3. Performing Organization *(Complete Mailing Address)*

U.S. Environmental Protection Agency
Arctic Environmental Research Station
College, Alaska 99701
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

M.A.Mitchell, Head
Alaska Village Demonstration Projects
Arctic Environmental Research Station
College, Alaska 99701
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

U.S. Environmental Protection Agency
Arctic Environmental Research Station
College, Alaska 99701
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

1972 - 1973

7. Estimated Funding and Manpower *(Monies and Manyears)*

$500,000 20 man years unfunded

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

This third facility was to be a refinement of the first two facility designs under the AVDP. It was to provide potable water, waste disposal, bathing, laundry, central power & heat source for a small 100-200 population village in interior Alaska. It would have been a totally integrated system with advantages of increased efficiency, fuel savings, improved health, fire safety.

Use Box No. 15 if additional space is needed

9. Status and Results

The facility design was 90% complete when funding was withdrawn. The design A&E still holds the work and could proceed with adequate program resources.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☒ potable water
- [x] community & bath laundry

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No If carried out!

13. Technical Data

Identification No. 3-111US-10

project location Planned for Interior Alaska

degree-days (heating) 18,000

degree-days (cooling) — —

plant load capacity

a. power (MW) 0.3MW

b. heating (MW) 750K BTU/hr.

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day 4000

e. solid waste processing-kilograms/day 100

f. potable water-liters/day — — — — 4000 — —

heat to power ratio (average expected)

energy source

expected payback period

Type and size of user

a. residential (dwelling units) 20-30

b. residential (square area-m²) 20,000

c. commercial (square area-m²)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 3-123JP-11

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Ohtemachi Office Area D.H.C. Plant

2. Date *(Form Completed)*

March 1977

3. Performing Organization *(Complete Mailing Address)*

Marunouchi District Heating & Cooling Co., LTD
Mitsubishi-Shoji Building Annex 2
No. 3, 2-Chome, Marunouchi, Chiyoda-Ku.
Tokyo, Japan

4. Principal Investigator *(Name and Complete Mailing Address)*

Mitsubishi Real Estate Co., LTD
No. 4, 2-Chome, Marunouchi, Chiyoda-Ku
Tokyo, Japan

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mitsubishi Real Estate Co., LTD
No. 4, 2-Chome, Marunouchi, Chiyoda-Ku.
Tokyo , Japan

6. Duration of Investigation *(Beginning and ending)*

Begun at 1972, Ended at 1974

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

1) Effective usage of energy.
2) Prevention of public nuisances

Use Box No. 15 if additional space is needed

9. Status and Results

Services started partially from April 1976. Present capacity of the plant is 65 Gca/H. The plant will finally have capacity of 94.3 Gcal/H.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No
3-123JP-11

project location — Tokyo, Japan
degree-days (heating) — 1,956
degree-days (cooling) — —

energy source City Gas
expected payback period not known

plant load capacity
a. power (MW) — 15 (present)
b. heating (MW) — 34 (40 Gcal/H) (present)
c. cooling (MW) — 56 (65 Gcal/H) (present)
d. wastewater treatment-~~liters~~ m3/day — 5,000 —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2) 1,650,00
d. industrial (thermal + elec.-MW) (final)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075
(2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No.
(Secretariat Use Only)
3-133US-12

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Codisposal & Coordinated Materials Recovery

2. Date *(Form Completed)*

11/23/76

3. Performing Organization *(Complete Mailing Address)*

Brown and Caldwell Consulting Engrs
1501 N. Broadway
Walnut Creek, CA 94596
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. Richard Stone
Brown and Caldwell Consulting Engr.
1501 N. Broadway
Walnut Creek, CA 94596
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

F.L. Evans
U.S. EPA, OR&D, MERL, WRD
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

1/77 to 6/78

7. Estimated Funding and Manpower *(Monies and Manyears)*

$90,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Identification of situations where co-disposal or coordinated materials recovery or recycling of waste residuals is economically and technically justified.

Use Box No. 15 if additional space is needed

9. Status and Results

Not yet started

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☒ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No.
3-133US-12

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d industrial (thermal + elec.-MW)

14 Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-191SE-13

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Mini-Nuclear Plants for Domestic Heating and Hot Water Supply

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

1. ASEA-ATOM
2. AB Atomenergic, Sweden
3. Finnatum (Finish Company)
4. Finnish State Technological Research Center

4. Principal Investigator *(Name and Complete Mailing Address)*

Unknown

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Sweden
(Government Grant)

6. Duration of Investigation *(Beginning and ending)*

1976 - 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*

9 million Skr.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

This project is a nuclear heating plant to be placed in a rock Chamber to generate heat for Urban Area with a popluation between 50,000 and 100,000 inhabitants. The project is based on an idea by Erik Svenke, Managing Director of the Swedish Nuclear Fuel Supply Company (SKBF).

Based on experiences to date, a nuclear power plant for production of heat appears to be competitive compared with oil-fired home heaters or district heating plants even if such a plant is not as profitable as a combined power and district heating plant.

The plant now being studied by ASEA-ATOM has a thermal capacity of 100-300 MW, which is about one-fifth of a modern Swedish nuclear power plant. The water in the reactor vessel is heated to just over 100°C, thus there is no problem of over-pressure. The project is considered safe and suitable for urban siting. The main purpose is to reduce Sweden's dependence on oil, of which 40% is used for domestic heating.

Use Box No. 15 if additional space is needed

9. Status and Results

A complete report is expected in the fall of 1977.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 3-191SE-13

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
3-471GB-14

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Leeds General Infirmary Generator Station Complex

2. Date *(Form Completed)*
March 19, 1977

3. Performing Organization *(Complete Mailing Address)*
Leeds Area Health Authority (Teaching)
Western District
Generator Station Complex
Leeds General Infirmary, Leeds 1
U.K.

4. Principal Investigator *(Name and Complete Mailing Address)*
P.M.Chilton
Station Superintendent
Generator Station Complex
Leeds General Infirmary, Leeds 1
U.K.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
As Above

6. Duration of Investigation *(Beginning and ending)*
Station Commissioned January 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*
N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
To provide service supplies of electricity, steam, hot water, chilled water compressed air for 1600 bed general hospital.

Use Box No. 15 if additional space is needed

9. Status and Results
Commissioned and now in initial operation phase.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-471GB-14

project location — Leeds

degree-days (heating) —

degree-days (cooling) —

energy source gas, oil & natural gas

expected payback period

plant load capacity

a. power (MW) — 10.4

b. heating (MW) — 47 including steam

c. cooling (MW) — 2.1

d. wastewater treatment-liters/day —

e. solid waste processing-kilograms/day — 10,800

f. potable water-liters/day —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

e. hospital 1600 beds

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-502NL-15

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Improving the Efficiency of the Combined Steam/Power Generating System

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

AKZON. V.
Arnhem, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

G.K. Dorling
AKZON. V.
Arnhem, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

AKZON. V.
Arnhem, The Netherlands

6. Duration of Investigation *(Beginning and ending)*

NA

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

AKZO, as an important consumer of energy, has acquired detailed information about combined steam/power generating systems.

The project is to be regarded as a continuous study to improve the energy conversion efficiency within an industrial economic framework.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project

☐ public ☐ private ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] unknown

13 Technical Data

Identification No. 3-502NL-15

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14 Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-OC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-512 GB-16

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Athens Paper Mill - Athens

2. Date *(Form Completed)*

March 11, 1977

3. Performing Organization *(Complete Mailing Address)*

The Athens Paper Mill S.A.
P.O. Box 367
K. Kefala Street
Athens, Greece

4. Principal Investigator *(Name and Complete Mailing Address)*

N/A

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N/A

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To supply electrical power for operation of paper mill and augment main steam raising system from exhaust gas driven boilers. Two plants are involved, one at Athens and the other at Drama

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- [x] process stream

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] unknown

13. Technical Data

Identification No: 3-512GB-16

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — 34.5 & 41.5
b. heating (MW) — — — — — 17 & 20.5
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source fuel oil
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Information supplied by diesel engine supplier. Contract:

Mioleir Blackstone Ltd.
Hazel Grove
Stockport, Chesline SK75AH
United Kingdom

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-512GB-17

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Waste Heat Recovery Scheme from Site Generating Plant

2. Date *(Form Completed)*

March 2, 1977

3. Performing Organization *(Complete Mailing Address)*

Petbow Ltd.,
Sandwich,
Kent.
U.K.

4. Principal Investigator *(Name and Complete Mailing Address)*

D.E.Barber, Technical Director
Petbow, Ltd.,
Sandwich, Kent.
U.K.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N/A

6. Duration of Investigation *(Beginning and ending)*

January 1975 to June 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*

£130,000 capital cost + 2 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To set up a practical installation comprising electrical generation and space heating by waste heat recovery to supply a new factory on the Petbow site. To analyse the practical difficulties, determine good engineering solutions and check economic viability simultaneously to have available a working system for demonstration to potential customers of Petbow products. To power and heat the new factory at lower annual cost than otherwise possible.

Use Box No. 15 if additional space is needed

9. Status and Results

The installation of 3 x 400 kW Diesel Sets is now complete and provides electrical power and space heating for 7 months of the year to a 70,000 sq. ft. factory building. Results so far indicate a possible annual cost saving of $23,000 per annum which will pay the equipment cost in about 5 years. Final assessment mid 1977.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No 3-512GB-17

project location Sandwich, Kent.

degree-days (heating) 150

degree-days (cooling) — —

energy source

expected payback period

plant load capacity

a. power (MW) 1.2 max.

b. heating (MW) ~~1.2 max.~~

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected) 1.2

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. *(Secretariat Use Only)*: 3-512GB-18

1. Title of Project *(Official Title)*

Cat Joliet Plant "F"

2 Date *(Form Completed)*

3. Performing Organization *(Complete Mailing Address)*

N/A

4. Principal Investigator *(Name and Complete Mailing Address)*

John O. Henderson
Caterpillar Tr. Co. Inc.
Peoria, Illinois 60601
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N/A

6. Duration of Investigation *(Beginning and ending)*

Continuing

7. Estimated Funding and Manpower *(Monies and Manyears)*

-0-

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Economical - Reliable Production of required utilities for production of Hydraulic Components under closely controlled environmental conditions using numerically tape controlled machinery.

Use Box No. 15 if additional space is needed

9. Status and Results

- Excellent -

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-512 GB-18

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
3-51.53GB-19

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Process Steam Supplies to British Celanese Co., Ltd.

2. Date *(Form Completed)*
March 16, 1977

3. Performing Organization *(Complete Mailing Address)*
Midlands Region Headquarters
Central Electricity Generating Board
Haslucks Green Road
Shirley, Solihull.
U.K.

4. Principal Investigator *(Name and Complete Mailing Address)*
Director of Resource Planning
Midlands Region Headquarters
Central Electricity Generating Board
Haslucks Green Road
Shirley, Solihull
U.K.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Director of Resource Planning
Midlands Region Headquarters
Central Electricity Generation Board
Haslucks Green Road
Shirley, Solihull
U.K.

6. Duration of Investigation *(Beginning and ending)*
April 1974, still in progress

7. Estimated Funding and Manpower *(Monies and Manyears)*
$10M - $17M over 3 or 4 years respectively depending on method of firing adopted

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To provide an additional supply of steam for process use by British Celanese increasing by approx. 60% the existing supply which has been in operation since 1960. This additional supply is via a back-pressure turbine the electrical output from which is supplied directly to the National Grid system.

Use Box No. 15 if additional space is needed

9. Status and Results

Negotiations as to type of fuel, quantity of steam supply and price of steam supplied are not concluded.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- x process steam

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-51.53 GB-19

project location Spondon, Derby

degree-days (heating) — N/A

degree-days (cooling) — — N/A

energy source coal or oil

expected payback period 20 yrs.

plant load capacity

a. power (MW) — — — — —

b. heating (MW) 69 (Process Steam)

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected) 7.5 to 1

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

none

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-572IE-20

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Centrale Thermoelecttrica di Varedo

2. Date *(Form Completed)*

1/7/77

3. Performing Organization *(Complete Mailing Address)*

SNIA-VISCOSA
Via Montebello, 18
20121 Milano (Italy)

4. Principal Investigator *(Name and Complete Mailing Address)*

N/A

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N/A

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Since 1971 SNIA VISCOSA has a combined power plant producing electric power and heat for its industrial plants of Varedo.
Maximum electric power: 44MW
Condensation electric power: 30 MW
Steam pressure: 181 kg/cm^2
Steam temperature: 535°C

Use Box No. 15 if additional space is needed

9. Status and Results

	1971	1972
Annual utilization	8000 h	8300 h
Fuel	Oil 80% - NG 20%	Oil 20% - NG 80%
Max. Steam flow rate	152 tons/h	138 tons/h
Process heat max. steam flow rate	78 tons/h	76 tons/h
Max. elect. power output	33.2 MW	29 MW

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- X Industrial heat

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-572IE-20

project location Varedo

degree-days (heating) ~~NA~~

degree-days (cooling) ~~NA~~

plant load capacity

a. power (MW) — 44 — —

b. heating (MW) — 78 tons/h

c. cooling (MW) — — ~~NA~~ — —

d. wastewater treatment-liters/day — NA — — —

e. solid waste processing-kilograms/day — ~~NA~~ —

f. potable water-liters/day — — — NA — — —

heat to power ratio (average expected) NA

energy source oil and natural gas

expected payback period NA

Type and size of user

a residential (dwelling units)

b. residential (square area-m²)

c. commercial (square area-m²) NA

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 3-600NL-21

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Technological and Economical Optimalization of Electric Power Stations and Heat/Power Generating Plants

2. Date *(Form Completed)*: 3-15-77

3. Performing Organization *(Complete Mailing Address)*

Delft Univ. of Technology
Lab. for Thermal Power Engin.
Kleuyverweg 1
Delft, Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

JA Miedema
CA Vanpaassen
Delft Univ. of Technology
Lab. for Thermal Power Engin.
Kleuyverweg 1
Delft, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Netherlands
Delft University of Technology

6. Duration of Investigation *(Beginning and ending)*: 7/75 to 6/76

7. Estimated Funding and Manpower *(Monies and Manyears)*: $12,693 FY76

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objectives are: a) Thermodynamical and economical optimalization of energy conversion systems in electric power stations and heat/power generating plants. b) Studying interdisciplinary problems regarding the design and management and control of these types of power stations. c) Performing desk studies on thermodynamics regarding heat and power generation. (Research on new methods to produce heat and electric power.) d) Follow up studies concerning category c.)

Co-operation: a) Exchange with KEMA (Dutch Electricity Generating Board) of computer programs for the design of power stations. b) The Delft Hydraulics Laboratory coaches students concerning the research on water-hammer subjects.

Modern power stations are complicated systems. The adjustment and harmonization of the many sub-processes (by means of calculation and process analysis) is necessary to realize an optimal operation of the power generating units.

Addena: Supporting agency and performing organization: Technische Hogeschool Delft.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

☐ public ☐ private ☐ cooperative Unknown

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No Unknown

13. Technical Data

Identification No. 3-600NL-21

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)* 3-601CA-22

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Improvement of Energy Utilization in Canada -- Urban use Sector

2. Date *(Form Completed)*

3-15-77

3. Performing Organization *(Complete Mailing Address)*

Carleton University
Colonel by Dr., KIS 5B6
Ottawa, Ontario, Canada

4. Principal Investigator *(Name and Complete Mailing Address)*

Prof. JT Rogers
D. Moizer
DA Millar
G. Paquet
TB Hedley
M.C.Swinton
Carleton Unversity
Energy Research Group

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Canada
Dept. of Energy Mines & Resource

6. Duration of Investigation *(Beginning and ending)*

4/76 to 3/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$18,850 FY76

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The work to date has covered the following topics: Application of CANDU reactors to dual-purpose use. Utilization of low-grade heat in Canadian industry. Survey of present district heating systems throughout the world. Survey of utilization of energy for residential and commercial purposes in Canada. Development of methods of optimization of dual-purpose power plants and other energy devices. Study of thermal energy storage systems for dual-purpose power plants. Development of notes on electrical energy conversion.

Use Box No. 15 if additional space is needed

9. Status and Results

Results have been reported in ERG Reports 74-3, 75-4 and in internal technical memos.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 3-601CA-22

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-601DE-23

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Uses of long-distance heat in power stations

2. Date *(Form Completed)*

Sept. 30, 1975

3. Performing Organization *(Complete Mailing Address)*

Dipl.-Ing.R.Schwedler
Beratender Ingenieur VDI
Furstenrieder STr. 35
8000 Munchen 21
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*

Rolf Schwedler
address see 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

PLE/KFA-Juelich
Postfach 1913
Dr. Plantikow
D-517 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*

June 1, 1975 - Sept. 30, 1975

7. Estimated Funding and Manpower *(Monies and Manyears)*

15,966.- $US

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

It is the aim of this project, proceeding from the state of the art technology and existing experiences, to test the possibilities of utilizing waste heat from thermal electric stations, and to compile forthcoming sollutions. Through this project, it should become evident which of these possibilities for utilization would be worthy of an introduction, and therfore profit by an intensified further development.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-601DE-23

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 3-601SE-24

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Local Energy Plants for Domestic Fuels

2. Date *(Form Completed)*
3/14/77

3. Performing Organization *(Complete Mailing Address)*
Chem. Technology, Royal Inst. of Tech.
S-10044 Stockholm 70, Sweden

4. Principal Investigator *(Name and Complete Mailing Address)*
Prof. Olle Lindstrom
Chem. Technology, Royal Inst. of Tech.
S-10044 Stockholm 70, SWEDEN

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
National Swedish Board for Energy Source Development
Chem. Technology, Royal Inst. of Tech.
S-10044 Stockholm 70, SWEDEN

6. Duration of Investigation *(Beginning and ending)*
1973 up to 1985 (?)

7. Estimated Funding and Manpower *(Monies and Manyears)*
20 Million $ approx., 500 manyears(?)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

This project is kind of frame for a number of smaller, independently financed and directed project activities being coordinated towards the overall project goal which represents the R & D policy of our group.

Objectives: Develop an optimized energy system for Sweden based on domestic and renewable energy sources, primarily biomass but including peat and solid wastes.

Motivations: An independent university group has the freedom and responsibility to carry projects of this character or at least to initiate activities of this long-range type.

Approach: Using available resources and funds not losing overall objective out of sight. Recently a breakthrough for public interest in this afterchange of Swedish energy policy.

Plan: No firm plan for overall project. Firm plans for pyrolysis and fuel cell projects.

Expected results: Convincing demonstration of technical, economic, environmental and social advantages of decentralized total energy systems.

Use Box No. 15 if additional space is needed

9. Status and Results

Systems studies reported. Plans made up for long range development of biomass and local energy fuel cell power plants. Experimental work on pyrolysis, hydrogen production for fuel cells, carbon dioxide removal from fuel cell gases and fuel cell electrode materials and fuel cell concepts. Favorable picture.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11 Type of Project

- ☒ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-601SE-24

project location — — — —
degree-days (heating) —
degree-days (cooling) — — 365

energy source
expected payback period

plant load capacity
a. power (MW) — — — — — 5
b. heating (MW) — — — — — 10
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — — 10,000
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec -MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
3-601US-25

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Demonstration of Combined Disposal of Sewage Sludge and Solid Waste in Purox Oxygen Refuse Converter

2. Date *(Form Completed)*

11/23/76

3. Performing Organization *(Complete Mailing Address)*

The Sanitary Board of the City of South Charleston, West Virginia
City Hall, 4th Avenue & D Street
South Charleston, W.Va. 25303
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Mr. William J. Plank, P.E.
Project Manager, Union Cabride (Linde Div.)
P.O. Box 44
Tonawanda, N.Y. 14150
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Union Carbide Corp.
Mr. W.J.Plan
P.O. Box 44
Tonawanda, N.Y.
14150 U.S.A.

Ultimate Disposal Sec
WRD, MERL
Cincinnati, OH
45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

7/75 to 9/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$443,150 (total
$332,000 (EPA) 9 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objectives of this grant are to confirm and demonstrate the technical and economic feasibility of disposing of sewage sludge in combination with municipal refuse in the Union Carbide Purox System, and to establish the environmental effects of this means of disposal. The project will be carried out a Union Carbide Corporations full scale test facility in South Charleston, West Virginia. An intermediate quality level gas is a product of the system and is suitable for power generation

Use Box No. 15 if additional space is needed

9. Status and Results

Project grant just beginning - supplemental funding for grant approved 9/30/76

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☒ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No.
3-601US-25

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-601NL-26

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Combined Heat and Power Production for District Heating purposes

2. Date *(Form Completed)*
6/8/77

3. Performing Organization *(Complete Mailing Address)*
Lab. for Thermal Power Engineering
Delft Univ. of Technology
Rotterdamseweg 139A
Delft
Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
Ir. J.A. Miedema
Lab. for Thermal Power Engineering
Delft Univ. of Technology
Rotterdamseweg 139A
Delft
Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Delft Univ. of Technology
Netherlands

6. Duration of Investigation *(Beginning and ending)*
7/75 to 7/79

7. Estimated Funding and Manpower *(Monies and Manyears)*
$130,000 not included personal costs
7 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objectives are: a) Thermodynamical and economical optimalization of energy conversion systems in combined heat and power generating plants. b) Studies with respect to the integration of heat storage possibilities in district heating systems where combined heat and power production is applied. Special attention will be given to heat storage possibilities in heat distribution networks. c) Investigation to the impact of a heat/power station to be built for a district-heating scheme on existing power stations, in especially with respect to fuel conservation aspects.

Motivations

1. Modern/heat power stations are complicated systems. The adjustment and harmonization of the many sub-processes (by means of calculations and process analysis is to realize an optimal operation of the power generating units.

2. In the near future special attention will be given to the introduction of district heating in the Netherlands. Especially the studies b)

Use Box No. 15 if additional space is needed

9. Status and Results

Two computer programs have been developed in order to be able to study the points 8a and 8c. Some corrections will be still necessary and parameter analysis will be performed in the near future.

A limited study has been performed with respect to point 8b. Special attention will be given to heat storage possibilities in heat distribution networks.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-601NL- 26

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

and c) have been set up for this purposes.

Approach

All studies will be restricted to desk studies and the development of some computer programs.

Co-operation

1. Exchange with KEMA (Dutch Electricity Generating Board) of computer programs for the optimalization of heat/power stations.
2. Exchange with TPD-TNO (Technical, Physical Research Institute) of know-how with respect to heat storage and heat storage systems.

Expected Results

An insight in the possibilities for district heating in the Netherlands and its contribution to fuel conservation.

Addena

Supporting agency and performing organization:
Technical University of Delft.

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-611FI-27

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

MERTANIEMI POWER PLANT (FINLAND)

2. Date *(Form Completed)*: 7/12/77

3. Performing Organization *(Complete Mailing Address)*

Lappeenrannan Lampovoima Oy Lappeenranta-Finland
-FIAT Termomeccanica-nucleare e Turbogas S.p.A(FIAT TTG SpA)via Cuneo,20 Torino Italy
-AHLSTROM-Finland
-TRANSELEKTRO/GANZ -Hungary

4. Principal Investigator *(Name and Complete Mailing Address)*

N.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N.A.

6. Duration of Investigation *(Beginning and ending)*

N.A.

7. Estimated Funding and Manpower *(Monies and Manyears)*

N.A.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

ELECTRIC ENERGY PRODUCTION AND DISTRICT HEATING

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

TO BE REQUESTED TO LAPPEENRANNAN LAMP. OY FINLAND

Will data be available from this project that will be shared with others? ☐ Yes ☐ No

13 Technical Data

Identification No.
3-611FI-27

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — 170 about
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14 Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-OC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANOARDS

Identification No. *(Secretariat Use Only)*
3-61.41GB-28

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Wastewater Treatment

2. Date *(Form Completed)*
March 1977

3. Performing Organization *(Complete Mailing Address)*
Metropolitan Public Health Division
Thames Water Authority
Broadway Buildings
50-64 Broadway SW1H ODB
U.K.

4. Principal Investigator *(Name and Complete Mailing Address)*
Mr. L.H.Thompson, CEng FICE FIPHE FInst. WPC
Divisional Manager
Metropolitan Public Health Division
Thames Water Authority, Broadway Buildings
50-64 Broadway SW1H ODB, U.K.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Mr. E.C.Reed DFC, Director of Operations
New River Head
Rosebery Avenue
EC1R 4 TP.
U.K.

6. Duration of Investigation *(Beginning and ending)*
On going operational activity

7. Estimated Funding and Manpower *(Monies and Manyears)*
On going inbuilt works operation

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Sewage gas is burnt in dual fuel engines for power on a works. Heat is received from the engine jackets and exhaust gas to heat sludge to obtain sewage gas.

The amount of gas, power requirements and heat load do not always correlate Sometimes bought in energy is required; other types heat must be dumped.

Use Box No. 15 if additional space is needed

9. Status and Results

To reduce the amount of bought-in energy by utilizing natural resources.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-61.41 GB-28

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

All major cities with advanced plant are behaving similarly.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No (Secretariat Use Only)
3-631US-29

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Onondaga County Resource Recovery Project

2. Date *(Form Completed)*

February 3, 1977

3. Performing Organization *(Complete Mailing Address)*

County of Onondaga
14th Floor Civic Center
421 Montgomery Street
Syracuse, New York 13201
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Carrier Corporation
Energy Systems Division
Carrier Tower
Syracuse, New York 13201
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N/A

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Use solid waste produced in county as fuel for heating and cooling hospitals, housing developments, university buildings and government buildings through existing distribution system.

Use Box No. 15 if additional space is needed

9. Status and Results

Project planning complete. Bids submitted on major equipment.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11 Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-631US-29

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-631IE-30

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
MILANO OLGETTINA - Electricity and heat combined production by solid waste incineration

2. Date *(Form Completed)*
7/12/77

3. Performing Organization *(Complete Mailing Address)*
AZIENDA ELETTRICA MUNICIPALE
C.so di Porta Vittoria, 4
20100 -- MILANO (Italy)

4. Principal Investigator *(Name and Complete Mailing Address)*
N/A

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
N/A

6. Duration of Investigation *(Beginning and ending)*
Investigation started in February 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*
$2,000,000 for 25 years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The purpose of the project is the heat recovery for space heating, from a thermoelectric plant using solid waste as primary fuel. The steam is bleeded, according to the users request before the low pressure stage of a turbine and used to produce heat.

Use Box No. 15 if additional space is needed

9. Status and Results

The preliminary consideration of feasibility and convenience started in February 1977.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-631IE- 30

project location MILANO (Italy)

degree-days (heating) — 2390*

degree-days (cooling) — —

plant load capacity 11.6

a. power (MW) — ~~18.6~~

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — —

heat to power ratio (average expected) 1.6

energy source solid waste

expected payback period

Type and size of user

a. residential (dwelling units) 1,000,000 m^3

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

* It has been considered a heating period of 180 days; the external reference temperature has been s at 18°C.

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC-

NBS-1075 (2-77) | U.S DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-631IE-31

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

MILANO ZAMA - Electricity and heat combined production by solid waste incineration

2. Date *(Form Completed)* 1/12/77

3. Performing Organization *(Complete Mailing Address)*

Azienda Elettrica Municipale
C. so di Porta Vittoria, 4
20100 - MILANO (Italy)

4. Principal Investigator *(Name and Complete Mailing Address)*

N/A

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N/A

6. Duration of Investigation *(Beginning and ending)*

Investigation started in June 1975 and will finish in December 1977.

7. Estimated Funding and Manpower *(Monies and Manyears)*

$2,000,000 for 25 years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The purpose of the project is the heat recovery for space heating, from a thermoelectric plant using solid waste as primary fuel. The steam, of a conventional cycle, after its expansion in a back-pressure turbine, is condensed, for heat production, in a warm condenser.

Use Box No. 15 if additional space is needed

9. Status and Results

The operation of the solid waste incineration plant started in the early month of 1968. The condenser for the turbine was built to allow the "warm" operation for heat production. From June 1975 to December 1977 a preliminary consideration of feasibility and convenience was made with success. The plan has been carrying out since January 1977.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-6311E-31

project location MILANO (Italy)
degree-days (heating) — 2390*
degree-days (cooling) — —

plant load capacity
a. power (MW) — 7.35 — —
b. heating (MW) — 12.4 — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected) 1.7

energy source solid waste
expected payback period 20 years

Type and size of user
a. residential (dwelling units) 936,500 m^3
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

* It has been considered a heating period of 180 days; the external reference temperature has been set at 18°C.

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No (Secretariat Use Only) 3-631US- 32

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

N.W.5 8 Street Resource Recovery Facility

2. Date *(Form Completed)*

2/3/77

3. Performing Organization *(Complete Mailing Address)*

Dade County Public Works Dept.
909 S.E. 1 Ave.
Miami, Fla. 33156
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

P.Thomas, Public Works Dept.
909 S.E. 1 Ave.
Miami, Fla. 33156
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Dade County Public Works Dept.
W.M. Powell, Director of Pub. Works
909 S.E. 1 Ave.
Miami, Fla. 33156
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

1973 to present

7. Estimated Funding and Manpower *(Monies and Manyears)*

Cost of Facility: $120,000,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective - Solid Waste Disposal in a code conforming manner.
Motivations - Dissatisfication with landfills and incineration and desire to preserve resources and reduce tipping fees
Approach - Request for proposals from the private sector
Plans - Implementation of the Black Clawson system developed in Franklin, Ohio

Use Box No. 15 if additional space is needed

9. Status and Results

Resources Recovery (Dade County) Inc. is now under contract to build a 3,000 ton per day facility and to manage it for a period of 20 years. County presently negotiating with Fla. Power & Light to buy the steam and run their turbogenerator. County has purchased land and is in process of site improvements.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-631US-32

project location N.W. 97 Ave., Miami, Fla.

degree-days (heating) —

degree-days (cooling) — —

energy source

expected payback period

plant load capacity

a. power (MW) — — — — —

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

[illegible]

13. Technical Data (cont.)

For further Info contact Mr. Dean Kolhepp
Resources Recovery (Dade County) Inc.
Douglas Entrance
Coral Gables, Fla.

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
3-631US- 33

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
City of Baltimore - Solid Waste Disposal and Resource Recovery Plant (Pyrolysis Plant)

2. Date *(Form Completed)*
1/31/77

3. Performing Organization *(Complete Mailing Address)*
City of Baltimore
Dept. of Public Works
Municipal Bldg.
Baltimore, Md.
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
Carl S. Weinberger,
Plant Manager
1801 Annapolis Road
Baltimore, Maryland 21230
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Environmental Protection Agency
Solid Waste Management
Washington, D.C.
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
January 1976 (Start)

7. Estimated Funding and Manpower *(Monies and Manyears)*
$21,000,000 Capital Invest.
$2,000,000 Operating Exp. per year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The purpose of this project was to use Pyrolysis as a means of converting 1000 tons/day of Municipal Solid Waste into recoverable energy, metal, and glass. The purpose was also to investigate a new means of waste disposal for municipal refuse.

(Cont.)

Use Box No. 15 if additional space is needed

9. Status and Results

Plant start up was Jan. 1975. To date, process and mechnical problems have limited operations severly. No final determination has been made as to whether the system is an acceptable method for the City of Baltimore as a means of disposal.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-631US-33

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — 200,000 #Steam/Hr
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — 1000 ton/day
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m²)
c. commercial (square area-m²)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

LP - Baltimore Municipal Solid Waste Program

SP - Pyrolysis Plant

15. Additional space for Purpose of Project

8. Purpose of Project (Cont.)

For complete information, contact:

Mr. David Sussman
Resource Recovery Office
Solid Waste Management
Environmental Protection Agency
Washington, D.C.
U.S.A.
Phone No. 202-755-9140

16. Additional space for Status and Results

9. Status and Results (Cont.)

Project status is currently operational, however, evaluation and economic study of plant operation is not complete so as to determine wehther project will be a success. Determination should be completed within the next 6 months to 1 year.

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-631US-34

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Harrisburg Refuse Incinerator

2. Date *(Form Completed)*

January 21, 1977

3. Performing Organization *(Complete Mailing Address)*

Engineer
Gannett Fleming, Corddry and Carpenter, Inc.
P.O. Box 1963
Harrisburg, Pennsylvania 17105
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Project Engineer
Paul W. Bricker

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. Louis Einhorn
Public Works Director
City of Harrisburg
423 Walnut Street
Harrisburg, Pennsylvania 17101
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

December 1969 to April 1973

7. Estimated Funding and Manpower *(Monies and Manyears)*

$8,271,155 (construction cost)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The Harrisburg Refuse Incinerator was constructed in order to dispose of most of the solid waste from the metropolitan area. The incinerator is of waterwall construction and produces steam as a secondary function of the process. A portion of the steam produced is used for auxiliary in-plant uses. Present plans call for another portion of the steam to be used for the dewatering of sludge from the City's wastewater treatment facility, while the remainder of the excess steam will be supplied to a local utility for supplementary use in the City's district heating system.

Use Box No. 15 if additional space is needed

9. Status and Results

The construction was completed in 1973 and is currently operating on an around the clock basis.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data See below

Identification No. 3-631US-34

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

(SP) Harrisburg Advanced Wastewater Treatment Facility
(SP) Harrisburg Steam Main

15. Additional space for Purpose of Project

~~16. Additional space for Status and Results~~

13. Technical Data

Solid Waste Processing	- maximum - 720 tons/day	
	average - 360 tons/day	
Steam Produced	- maximum - 180,000 pounds/hour	
	average - 90,000 pounds/hour	
Steam Use (average)	- In-house - 35,000	
	Sludge processing - 20,000	
	District heating - 35,000	

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
3-631US-35

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Harrisburg Incinerator

2. Date *(Form Completed)*

November 29, 1976

3. Performing Organization *(Complete Mailing Address)*

UOP, Inc.
10 UOP, Inc.
Des Plaines, Ill. 60016
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Georg Stabenow
Registered Professional Engineer
Consultant to UOP, Inc.
603 Ann Street, P.O. Box 508
Stroudsburg, Pa. 18360
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

City of Harrisburg
Walnut & Aberdeen Streets
Harrisburg, Pa. 17104
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

2 yrs for design and construction

7. Estimated Funding and Manpower *(Monies and Manyears)*

$3,600,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To utilize steam generated at existing Harrisburg, Pa. incinerator, (presently all steam generated is being condensed) for City of Harrisburg District Heating System Located approximately 2 miles (3.22 Km) from incinerator plant and requires complete pipeline installation.

Use Box No. 15 if additional space is needed

9. Status and Results

Planning stage, but requires acceleration to reduce fuel oil consumption at existing district heating plant located in downtown Harrisburg.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-631US- 35

project location Harrisburg, Pa.

degree-days (heating) —

degree-days (cooling) — —

energy source

expected payback period

plant load capacity

a. power (MW) — — — — —

X b. heating (MW) — 15 — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day X — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

655,000 Kg/d = 720 sh. tpd

7.0 Kg steam per Kw

14. Other Related Projects *(Titles)*

Resource Recovery from Residue
Ferrous Metal
Non-Ferrous Metal, Glass etc.

15. Additional space for Purpose of Project

To maximize energy recovery from existing solid waste incineration plant for utilization in heat consuming plants and to minimize fuel oil consumption for same.

16. Additional space for Status and Results

The Harrisburg Incinerator Plant is presently in full operation, but the energy quantity recovered at a rate of 220,000 Lbs/H steam at 275 psig and 460°F = 100,000 Kg/H at 1892 kPa and 238°C is presently wasted in an air colled condensing system.

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-632US- 36

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Milwaukee Resource Recovery Facility

2. Date *(Form Completed)*

February 11, 1977

3. Performing Organization *(Complete Mailing Address)*

Americology Division
American Can Company
American Lane
Greenwich, CT 06830
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Mr. L.C. Bielicki
Vice President & General Manager
(Same as 3)

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Contract with City of Milwaukee
Contact: Mr. H.A. Goetsch
Commissioner of Public Works
Municipal Bldg. - m. 516
Milwaukee, Wis. 53202
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

1973 - present (17 yr. service contract

7. Estimated Funding and Manpower *(Monies and Manyears)*

$18 million - capital budget
approx. 185 manyears

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective - To provide disposal service for the City of Milwaukee's entrie municipal refuse collection and recover and recycle approximately 80% of the refuse processed.

Motivation - To establish a profitable community service business.

Approach - Refuse extraction "dry" process based on size reduction (milling, air classification (separation by size and mass), magnetic and electro magnetic separation and screening and water elutriation. (see attachment)

Results - Processing of over 250,000 tons per year of Milwaukee's garbage with recovery of a shredded fuel, ferrous, non-ferrous (aluminum paper, and glass aggregate products.

Use Box No. 15 if additional space is needed

9. Status and Results

Plant construction has been completed in both the resource recovery facility and the fuel receiving and storage facility at Wisconsin Electric's Oak Creek power generating plant. Both facilities are currently in start-up operations processing municipal refuse. A one-year refuse derived fuel firing demonstration program will begin this spring at Oak Creek power plant. Full commercial operation of the Milwaukee facilities is anticipated by April-May of this year (See Attached press release)

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Through publication/presentation

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-632US-36

project location Milwaukee, Wis.

degree-days (heating) unheated or air cond.

degree-days (cooling) processing facility

energy source electrical, oil

expected payback period

plant load capacity

a. power (MW) connected h.p. 7800 (80% Usage)

b. heating (MW) unheated or air

c. cooling (MW) condition except

d. wastewater treatment-liters/day for control room &

e. solid waste processing-kilograms/day admn none required

f. potable water-liters/day 1200 tons/day

heat to power ratio (average expected) minimal use - drinking purposes only

not applicable

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2) *

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

* Processing facility - 5076m^2 scale house, truck driver's building and office building - 495m^2

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-632US-37

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Nashville Thermal Transfer Corporation, A mass solid waste fired central heating and cooling facility.

2. Date *(Form Completed)*
December 9, 1976

3. Performing Organization *(Complete Mailing Address)*
Nashville Thermal Transfer Corp.
110 First Avenue South
Nashville, Tennessee 37201
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
B. A. McDermott
110 First Avenue, South
Nashville, Tennessee 37201
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)* Nashville Thermal Transfer is a private non profit Tenn. corporation financed by the sale of Revenue Bonds. Title to the physical assets of the corp. is held in escrow to be transferred to the city of Nashville in the year 2002.

6. Duration of Investigation *(Beginning and ending)*
Construction began June 1972. This project is a continuing effort in the domestic technological development of heat recovery from solid waste incineration.

7. Estimated Funding and Manpower *(Monies and Manyears)*
Initial capitalization was $16.5 Million. Additional requirement is $8.0 Million in 1976 for some completion. Man years do not apply to this facility.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

1. Provide low cost district heating and cooling for center city buildings.
2. Recover energy in all combustible solid waste not recycled for other purposes.
3. Partially eliminate the need for sanitary landfill.
4. Substantially reduce the cost of solid waste disposal.
5. Improve water and air quality in urban Nashville by meeting solid waste disposal, water pollution, and air emission standards with a central plant that incorporates effective environmental control equipment.
6. Provide for major ferrous metal recycling from incinerator residue.
7. Create and operate a solid waste fueled central heating and cooling plant project that has a favorable economic and environmental impact on the community.

* Privately financed. This project functions as a quasi-public corporation. The eleven member Board of Directors is made up of city and state officals, with two members from the business community, it therefore cooperates quite closely with those governmental bodies.

Use Box No. 15 if additional space is needed

9. Status and Results The results and status as related to the objectives listed in item B are:

1. Reliable district heating and cooling are being provided using solid waste as the primary fuel, presently at the rate of about 75%. However present delivered prices for steam and chilled water are in some cases higher than the equivalent prices for steam and chilled water are in some cases higher than the equivalent energy charge from local utilities. Comparing the cost of purchased energy services from thermal to the total annual owning and operating cost of in building provided service brings the comparison more in line.

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-332US-37

project location 110 First Ave South, Nashville, Tennessee
degree-days (heating) — 3696 Annual
degree-days (cooling) — 1694 Annual
energy source Solid Waste with oil and gas standby
expected payback period Revenue bonds mature in June 2002. The project should be self supporting in 5-10 years.

plant load capacity
- a. power (MW) — NA
- b. heating (MW) — See below
- c. cooling (MW) — See below
- d. wastewater treatment-liters/day — NA
- e. solid waste processing-kilograms/day — 654,545
- f. potable water-liters/day — NA

heat to power ratio (average expected) See below

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m²)
- c. commercial (square area-m²)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)* Following are similar projects which are technologically related but separate efforts:
- Harrisburg, Pennsylvania Municipal Incinerator
- Chicago, Illinois Northwest Incinerator
- Saugus, Massachusetts (Wheelabor-Frye)

15. Additional space for Purpose of Project Examples:

13. Degree Day Base - 65° - Daily max. Temp = 55° Daily Max. Temp = 92°
Daily Min. Temp = 31° Daily Max. Temp = 66°
Average Temp = 43° Average Temp = 79°
Base 56°-43° = 22 Heating degree days
Base 65°-79° = 14 cooling degree days.

13b. Heating capacity = 218,000 pounds per hour (two incinerator boilers)
c. Cooling capacity = 14,000 tons (two centrifugal chillers)

Heat to power ratio expressed in pounds of steam equals .7. From one pound of solid waste we produce 3.5 pounds of steam. Boilers are 70% efficient.

Type & Size of Users

Thermal serves thirty downtown Nashville buildings with a total connected load of 171,300 pounds per hour steam and 8,625 tons of cooling. This represents approximately 3 million square feet of buildings space, of which roughly 90% is Commercial Office and 10% is Hotel.

16. Additional space for Status and Results

2. Energy is being recovered from solid waste in an efficient manner.
3. Refuse is being reduced 90% in volume and 75% in weight, eliminating a portion of the landfill operation.
4. Metropolitan Government's cost of solid waste disposal has been reduced.
5. The Plant is now meeting Federal, State, and Local Air, Water and Solid Waste Disposal Quality Standards. Total emissions from Thermal are less than if Thermal's Customers were privately and individually heated and cooled.
6. This objective has not been achieved or attempted.
7. This objective has been partially attained in improvement to the enivornmental and in economic benefit to the City. The stablization of service rates as compared to the escalation if comparable utility costs will provide similar economic benefits to service users over the life of the project.

USCOMM-NBS OC

NBS-1075
(2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No.
(Secretariat Use Only)
3-633US-38

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Town of Hempstead Solid Waste Management & Resource Recovery Facility

2. Date *(Form Completed)*

December 2, 1976

3. Performing Organization *(Complete Mailing Address)*

Town of Hempstead
Department of Sanitation
1600 Merrick Road
Merrick, N.Y. 11566
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

William J. Landman
Commissioner of Sanitation
Town of Hempstead
(Address as in #3)

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

6. Duration of Investigation *(Beginning and ending)*

1974 through 1978

7. Estimated Funding and Manpower *(Monies and Manyears)*

$73,000,000.00
Manyears Unavailable

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To provide for the residents of the Town of Hempstead, New York (population 850,000) a Solid Waste Management & Resource Recovery Facility having a capacity of no less than 2,000 tons per day. The facility will be capable of recovering from the solid waste stream, allmetals, ferrous and non-ferrous, glass, and other saleable product, and to utilize the paper and cellulosic material as a fuel for the on-site generation of electrical power (up to 40 mw/h) to be purchased by public utility. The project is an interface with public energy (the Department of Sanitation and private enterprise, Black Clawson Inc.), with the entire project funded by private industry without tax base support of local government, for a contractual period of 20 years. The Department Sanitation, the only customer permitted to utilize the facility, will pay a prescribed tipping fee for services to be rendered over the life term of the contract, and share as a credit up to 40% of the gross sales of recovered resources and electrical energy produced for sale to the public utility.

Use Box No. 15 if additional space is needed

9. Status and Results

Project currently (December 1976) under construction; 20% completed and on schedule. Estimated operational on line June 1978.

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No 3-633US-38

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-633US- 39

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Memphis Light, Gas & Water Division; Energy Recovery System

2. Date *(Form Completed)*

February 18, 1977

3. Performing Organization *(Complete Mailing Address)*

Memphis Light, Gas & Water Division
P.O. Box 430
Memphis, Tennessee 38101
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Same as 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Same as 3

6. Duration of Investigation *(Beginning and ending)*

Nov. 1973 to Sept. 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The project's purpose is to effectively utilize the energy in the community's solid waste to heat and cool some of the community's hospitals and commercial office buildings and supply process steam to industrial manufacturing facilities. The primary motivation for the project is to be able to offset the effect on the community resulting from its loss of natural gas for boiler fuel. The project involves the installation of a large central energy conversion plant and a distribution system to connect the new central plant to all of the buildings to be served.

Use Box No. 15 if additional space is needed

9. Status and Results

The preliminary economic and technical feasibility study has been completed. Building owners to be served from the plant have committed themselves to financially support the project. It has received political support from the City Council and Majyor which authorized the current activity - Preliminary engineering and major equipment bidding.

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water
- [x] process steam

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13 Technical Data

Identification No 3-633US-39

project location — Memphis, Tenn.
degree-days (heating) — 3227
degree-days (cooling) — 2029

energy source Solid Waste
expected payback period 10 to 20 years

plant load capacity
a. power (MW) — NONE
b. heating (MW) — 40 Electric Input Equivalent
c. cooling (MW) — 15
d. wastewater treatment-liters/day — NONE
e. solid waste processing-kilograms/day — Fuel input 1500 ton/day with residue of 300 ton/day.
f. potable water-liters/day — Minimal
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m²)
c. commercial (square area-m²) 770,000
d. industrial (thermal + elec.-MW)

14 Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-633US-40

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Resource Recovery System

2. Date *(Form Completed)*
February 16, 1977

3. Performing Organization *(Complete Mailing Address)*
City of Detroit
Environmental Protection & Maint. Dept.
513 City - County Building
Detroit, Michigan 48226
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
Clyde Dowell
Principal Accountant

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

6. Duration of Investigation *(Beginning and ending)*
May 1975 to September 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*
Consultants $260,000 9/76 to 9/77
City Committee & Support - 15 persons

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The City of Detroit solicited proposals from private industry to provide the service of disposing of residential, commercial, (light) and other solid wastes; to provide steam for electric generation and/or district heating; and to recover recyclable materials. This is to be accomplished at a reasonable cost to the City, while preserving or improving the quality of the environment.

Use Box No. 15 if additional space is needed

9. Status and Results

The City of Detroit is currently in the process of selecting the system-contractor finalist (1 of 2), selecting energy customer (1 of 2) and designating system site (1 of 2).

Selection process should be completed on or about 4/11/77 and appropriate contracts negotiated and executed on or about 8/1/77.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data Not specified at this time; particulars will be developed and identified on or about 8/1/77

Identification No. 3-633US-40

project location

degree-days (heating) —

degree-days (cooling) — —

energy source municipal solid waste (only)

expected payback period

plant load capacity

a. power (MW) — — — — —

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — — 3,000 tons per day

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 3-633US-41

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Greater Bridgeport Resources Recovery Steam

2 Date *(Form Completed)*

February 7, 1977

3. Performing Organization *(Complete Mailing Address)*

Conn. Resources Recovery Authority
60 Washington Street - Suite 1305
Hartford, Connecticuit 06106
U.S.A.

4 Principal Investigator *(Name and Complete Mailing Address)*

Conn. Resources Recovery Authority
60 Washington Street - Suite 1305
Hartford, Connecticut 06106
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Conn. Resources Recovery Authority
60 Washington Street - Suite 1305
Hartford, Connecticut 06106
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Conversion of solid waste stream generated by nine municipalities to a refuse derived fuel to be burned in conjunction with fuel oil at United Illuminating Power Plant in Bridgeport, Connecticut

Use Box No 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11 Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-633US-41

project location Bridgeport, CT

degree-days (heating) —

degree-days (cooling) — —

plant load capacity

a. power (MW) — — — — —

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — n/a — —

e. solid waste processing-kilograms/day 1.6 mm

f. potable water-liters/day — n/a — — — — —

heat to power ratio (average expected)

energy source

expected payback period

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

(L.P.) Conn. Statewide Solid Waste Management Plan

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-633US-42

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

MSD Resource Recovery Program

2. Date *(Form Completed)*

2/2/77

3. Performing Organization *(Complete Mailing Address)*

Metropolitan Service Dist. (MSD)
1220 Sin Morrison
Room 300
Portland, Oregon 97229
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Charles C. Kemper
Same Address

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

State of Oregon
Department of Environmental
1234 SW Morrison Quality
Portland, Oregon 97225
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

Feb 1973 to date

7. Estimated Funding and Manpower *(Monies and Manyears)*

$750,000/30 M-Y (EST)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To reduce dependancy on landfilling solid waste in the Portland Oregon Metropolitan Area. To devevelop a viable alternative solid waste disposal method.
To re cover and reuse maximum of materials in solid waste stream.
To provide for an environmentally sound solid waste disposal system.

Use Box No. 15 if additional space is needed

9. Status and Results

Markets Developed - Preparing for Implementation

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water
- X Steam Generation

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-633US-42

project location Portland, Oregon
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — 2000 T/day
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
3-661US-43

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Co-incineration of Sewage Sludge with Refuse and/or Coal

2. Date *(Form Completed)*
5/12/77

3. Performing Organization *(Complete Mailing Address)*
Metropolitan Waste Control Commission
350 Metro Square Building
St. Paul, Minnesota 55101
U.S.A.

4 Principal Investigator *(Name and Complete Mailing Address)*
Dale C. Bergstedt, Wilber A. Blain, Gary J. Swanson, Robert L. Hughes
Metropolitan Waste Control Commission
350 Metro Square Building
St. Paul,Minnesota 55101
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Steve Hathaway
U.S.EPA
WRD, MERL
Cincinnati, Ohio 45268
U.S.A.

6 Duration of Investigation *(Beginning and ending)*
8/75 to 7/77

7. Estimated Funding and Manpower *(Monies and Manyears)*
1. $250,000 FY75
2. 123,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
Purpose of the project is to evaluate the operational worth and environmental aspects, if any, of adding combustible solid matter to wastewater plant sludges and filter cakes, as offsets to part or all of the fuels conventionally used in sludge incineration practice. Impending shortages of natural gas and fuel oil create the sense of urgency in this work. Low-sulfur coal and combustible solid wastes will be utilized as admix materials in various test sequences. Wastes to be tried include shredded combustibles from refuse, in pelletized and loose form, wood chips from urban tree-trimming, shredded tires, and industrial combustible wastes. A full-scale multiple hearth furnace in a modern wastewater treatment plant will be used. Applicability to other incinerators of the 200-plus total in United States' communities will be assessed. Assay of stack gases, after scrubbing, will include relevant chemical properties of public health significance. Scrubber drainage and ash will also be assayed.

Use Box No. 15 if additional space is needed

9. Status and Results

Many modifications to the existing, large-scale, multiple hearth sludge incinerator have been accomplishment; these will enable the test sequences to be carried out.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-661US-43

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-661US-44

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Environmental Effect of Utilizing Solid Waste as a Supplementary Power-Plant Fuel

2. Date *(Form Completed)*
5/12/77

3. Performing Organization *(Complete Mailing Address)*
Battelle Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
Dale A.Vaughan, Materials Science Dept. Corrosion Research Section
W.K.Boyd " " "
H.H.Krause, Atmospheric Sciences Section
R.B.Engdahl, Fuels and Combustion Systems Section

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
R.Olexsey
U.S.EPA
ORD, IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
6/74 to 6/77

7. Estimated Funding and Manpower *(Monies and Manyears)*
$120,000 FY74
190,000 FY75
193,000 FY76

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
The objective of this project is to investigate the benefits to the environment resulting from the utilization of solid waste as a supplementary fuel in existing coal-fired plants.
The approach is to evaluate the gaseous and particulate emission plus the corrosiveness of combustion products as a function of refuse-coal ratio and as a function of sulfur content of the coal. Experiments will be conducted in an operating power station through cooperation of the City of Columbus, Ohio.
Furnace and stack gas and particulate samples will be collected throughout the periods that corrosion probes are inserted at several locations in the heat recovery passes. These probes will be examined for corrosion attack and deposit composition for various gas and metal temperatures to provide guidance in future utilization of solid waste as a supplementary fuel.

Use Box No. 15 if additional space is needed

9. Status and Results
Short-duration (8 hour) corrosion tests have been completed, as have modifications to the boiler to enable longer duration corrosion testing.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-661US-44

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-661US-45

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

St. Louis Waste Co-firing with Coal Project: Equipment, Facilities and Environmental Evaluation of Meramce Power Plant

2. Date *(Form Completed)*

5/12/77

3. Performing Organization *(Complete Mailing Address)*

Midwest Research Institute
425 Volker Boulevard
Kansas City, Missouri 64110
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

P.G.Gorman, L.J.Shannon, M.P.Schrag, D. E. Fiscus
Midwest Research Institute
425 Volker Boulevard
Kansas City, Missouri 64110
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

C. Wiles
U.S.EPA
ORD, MERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

6/68 - 9/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$300,000 FY75
242,000 FY76

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

As part of an EPA demonstration grant, the City of St. Louis has been processing municipal solid waste and the Union Electric Utility has been firing it as an auxiliary fuel at the Meremac Power Plant. The feasibility of the concept has been demonstrated but more data of a substantive nature is being sought from the program. This procurement is to provide services to fully test and evaluate the refuse preparation and firing processes.

Specifically, this project provides for tests to determine the effects of firing refuse and coal on gases and particulates emitted from a 120 MW tangentially-fired utility boiler. Tests will be made to investigate the mechanisms which cause a loss in ESP performance. Water pollution tests will be conducted and the emission of potentially hazardous pollutants will be investigated. Testing and engineering analyses will be performed to technically and economically evaluate the refuse preparation and firing processes. Requirements for design of emission control devices will be established and process or equipment modifications necessary to reduce process cost and to increase energy or material recovery will be determined.

Use Box No. 15 if additional space is needed

9. Status and Results

Detailed emission characterization has essentially been completed, as have tests of a mobile baghouse for dust and particulate removal from the refuse preparation plant.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No

13. Technical Data

Identification No. 3-661US- 45

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
3-661US-46

PROJECT SUMMARY FORM

1 Title of Project *(Official Title)*

HMDC Resource Recovery Facility

2. Date *(Form Completed)*
2-2-77

3. Performing Organization *(Complete Mailing Address)*

Hackensack Meadowlands Development Commission
1099 Wall Street West
Lyndhurst, New Jersey 07071 U.S.A.
(Agency of the State of New Jersey)

4 Principal Investigator *(Name and Complete Mailing Address)*

George D. Cascino, P.E., P.P.
Chief Engineer

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Financial Support Provided by HMDC through Revenue Bonds

6. Duration of Investigation *(Beginning and ending)*

2/76 - 11/79

7. Estimated Funding and Manpower *(Monies and Manyears)*

$21,400,000 for two years, manpower unknown at this time.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

HMDC will be concstructing a 2500 ton (short)/day solid waste processing facility to service & process solid wastes from Bergen County, N.J. which has a population of 911,480 (1970 Census) and a surface area of 618. 36Km^2. This processing plant will shred, air classify & separate the incoming solid waste into four components: ferrous metals, aluminum, refuse-derived fuel (RDF) & an inert residue (glass, dirt, etc.).

Of these components, the largest fraction by weight, is the RDF which is approximately 1300 tons (short)/day, dry. This component which is composed of light organice materials less than 6.35 mm in size will be marketed to an electric generating station located in the City of Jersey City, Hudson County, New Jersey, by an existing railroad line between the HMDC Resource Recovery Facility and this electric generating station.

(Continued on second page)

Use Box No. 15 if additional space is needed

9. Status and Results

Preliminary design of the proposed facility was completed on February 18, 1976. The HMDC is currently in the process of obtaining various permits from regulatory agencies. On the advise of financial counsel, HMDC applied to the N.J. Board of Public Utilities for a Solid Waste Franchise on August 11, 1976. Upon receipt of this franchise, revenue bonds will be issued to finance the cost of construction. Resolution of this matter is expected in the second half of 1977.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-661US-46

project location Bergen, County, NJ
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — 78 (indirectly)
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source - Coal/RDF
expected payback period - 20 years

Type and size of user
a. residential (dwelling units)
b. residential (square area-m²) See #8
c. commercial (square area-m²)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

XXAdditional space for Purpose of Project X

8. Purpose of Project (Cont.)

This generating station which is known as Hudson #2 currently uses coal to provide the energy required to generate its average daily load of 434 MWe for its service area which includes all 12 municipalities of Hudson County. RDF from the HMDC facility would replace 4520 x 10^6 Kcal/Day of energy, provided by coal, approximately 18% of Hudson #2's total daily energy input. Based upon the draft contract between HMDC and the utility, this RDF has a current value of \$5.75/10^6 Kcal, approximately 28% less than the coal being used at Hudson #2. This would result in a net fuel savings to the utility of 3.6 million dollars per year.

16. Additional space for Status and Results

NBS-107
(2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No.
(Secretariat Use Only)
3-661US-47

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Evaluation of Ames Solid Waste Resources

2. Date *(Form Completed)*

December 9, 1976

3. Performing Organization *(Complete Mailing Address)*

Engineering Research Institute, Iowa
State Univ., Ames, Iowa 50010 and
Midwest Research Institute
425 Volker Blvd.
Kansas City, Missouri 64110
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Mr. Al Joensen
Engineering Department
Iowa, State University
Ames, Iowa 50010
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Solid & Hazardous Waste Research
Municipal Environmental Research Lab.
EPA
26 W. St. Claire St.
Cincinnati, Ohio 45268, U.S.A.

6. Duration of Investigation *(Beginning and ending)*

February 5, 1976 to February 4, 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*

$464,841

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

This is the first year of a three-year program to conduct an in-depth evaluation of the environmental, economic and technical aspects of a full-scale on-line solid waste recovery system. This system is producing refused derived fuel to supplement firing in a coal-fired steam generator and is providing for valuable metal recovery. The program has the following principal objectives: (1) technical, economic and environmental evaluation of facilities and equipment, individually and as a system, including both the processing plant and associated power plant operations; (2) characterize the refuse fuel and by-product materials produced by the system; (3) determine the environmental impact of firing MSW as a supplemental fuel in the utility boiler including air, water and solids effects. Laboratory analysis and measurement instrumentation is being conducting by E.R.D.A., Ames Laboratory, Iowa State University.

Use Box No. 15 if additional space is needed

9. Status and Results

Project in progress and results will be published in 1977

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-661US-47

project location Ames, Iowa
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — 125 MG/day
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec -MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1073 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
3-663US-48

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Chicago Southwest Supplementary Fuel Processing Facility and Commonwealth Edison Crawford Power Plant

2. Date *(Form Completed)*
5/14/77

3. Performing Organization *(Complete Mailing Address)*
1. City of Chicago
Dept. of Public Works
Commissioner's Office
City Hall, 121 N. La Salle St.
Chicago, Illinois 60602
U.S.A.

4 Principal Investigator *(Name and Complete Mailing Address)*
City of Chicago
Commissioner of Public Works
Commissioner's Office
City Hall, 121 N. La Salle St.
Chicago, Illinois 60602
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
2. Commonwealth Edison Company
Crawford Power Plant
35th and Pulaski
Chicago, Illinois

Same as 3

6. Duration of Investigation *(Beginning and ending)*
4 years design and construction

7 Estimated Funding and Manpower *(Monies and Manyears)*
$22,500,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The city operated supplementary fuel processing facility located at W. 34th St. and St. Harlen Avenue is capable of receiving and processing 1000 tons of residential refuse a day. Processed waste is transported to the Commonwealth Edision Crawford Power Plant where the waste is used in combination with coal to feed the plants' furnances. Commonwealth Edison's officials have estimated that use of the processed waste will replace about 100,000 tons of coal a year.

Use Box No. 15 if additional space is needed

9. Status and Results
Plant is in shake down phase.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
☒ electrical power
☐ space heating
☐ space cooling
☐ potable hot water
☐ wastewater treatment
☐ solid waste processing
☐ potable water

11 Type of Project
☐ public ☐ private
☒ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13 Technical Data

project location 35th and Pulaski, Chicago, Illinois 60623

degree-days (heating) —

degree-days (cooling) — —

plant load capacity

a. power (MW) — — — — —

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day 100 tons/day*

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Identification No. 3-663US-48

energy source

expected payback period

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

*500 tons/day processed waste is used as fuel in combination with fuel.

14. Other Related Projects *(Titles)*

Resource Recovery of Ferrous Metals by Magnetic Separation.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) — U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. *(Secretariat Use Only)*: 3-671IE-49

1. Title of Project *(Official Title)*
Moncalieri Power Plant. (heat recovery)

2. Date *(Form Completed)*
10-18-77

3. Performing Organization *(Complete Mailing Address)*
Azienda Elettrica Municipale
via Bertola 48
10122 Torino - ITALY

4. Principal Investigator *(Name and Complete Mailing Address)*
Ing. Guido Bonicelli
Direttore Generale AEM - Torino
Italy

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Azienda Elettrica Municipale (AEM)
Torino, Italy

6. Duration of Investigation *(Beginning and ending)*
Three years

7. Estimated Funding and Manpower *(Monies and Manyears)*
not applicable

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

A 35 MW gas turbine with discharge heat recovery is used to improve the output of a 135 MW existing steam unit and to reduce specific fuel consumption.

The AEM electric system needs a peak load unit with a good versatility and with the lowest fuel consumption possible per unit of output. This is obtained with the 35 MW gas turbine whose exhaust gas preheats the feed water of the existing 135 MW steam unit.

Use Box No. 15 if additional space is needed

9. Status and Results

The 35 MW unit will be in regular operation in November 1977.
Preliminary tests in co-generation have already been conducted.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- x steam

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-671 IE-49

project location Moncalieri (Torino) - Italy

degree-days (heating) —

degree-days (cooling) — —

plant load capacity

a. power (MW) — 35+(135+10) MW

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source

expected payback period

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. *(Secretariat Use Only)*: 3-691DE- 50

1. Title of Project *(Official Title)*
Overall study on the possibilities of long-distance heat supply from heating power stations in the FRG (ET 5072)

2. Date *(Form Completed)*
Aug. 31, 1976

3. Performing Organization *(Complete Mailing Address)*
Arbeitsgemeinschaft Fernwarme
e.V. (AGFW)
Kennedyallee 89
D-6000 Frankfurt/Main 70
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*
Dipl.-Ing.F.' Neuffer
Arbeitsgemeinschaft Fernwarme
e.V. (AGFW)
Kennedyallee 89
D-6000 Frankfurt/Main 70
Federal Republic of Germany

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-517 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
Sept. 1, 1974 - Aug. 31, 1976

7. Estimated Funding and Manpower *(Monies and Manyears)*
1,062,146.-$ US

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Estimate of the saving in fossil fuels which can be achieved on a short-term and medium-term basis in the Federal Republic by means of long-distance heating from heating power stations, in particular of the nuclear type, and statement of the ecological and politico-economic advantages obtained thereby, as well as the necessary measures and investments.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-691DE-50

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

The overall study uses the results obtained in the four planning studies ET 5073, ET 5074, ET 5075, ET 5076 and extrapolates them to the whole Federal Republic.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

The study is available from AGFW (See Box 4).

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-691DE- 51

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Project study on long-distance heat supply from heating power stations in the Mannheim-Ludwigshafen Heidelberg area (ET 5073)

2. Date *(Form Completed)*
Feb. 28, 1976

3. Performing Organization *(Complete Mailing Address)*
KA-Planung GmbH
Im Breitspiel 7
D-6900 Heidelberg
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*
Dipl.-Ing.Blattner
KA-Planung GmbH
Im Breitspiel 7
D-6900 Heidelberg
Federal Republic of Germany

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-517 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
Sept. 1, 1974 - Feb. 28, 1976

7. Estimated Funding and Manpower *(Monies and Manyears)*
742,307.-$ U.S.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
The study of the Mannheim-Ludwigshafen-Heidelberg area is one out of four regional studies which serve as model investigations of long-distance heating systems in regions with different structures. The choice of this area, besides being highly industrialized, is also based on its particular structure consisting of different clusters. Several nuclear power stations, either under construction of being planned are situated in the periphery surrounding this region. The aim of this study is to find out to which extent it is possible to fulfill the long-distance heating demand of the industry by the nuclear power stations. To this purpose, an economically optimum design of a long-distance heating network is to be developed based on an accurately determined heat requirement. The existing long-distance heating network will form an integral part of the projected planning.

Use Box No. 15 if additional space is needed

9. Status and Results
The chief task was to find out and analyse the heat requirements of different groups of consumers and to forecast the economic development up to 1990. The result shows that in the Mannheim-Ludwigshafen-Heidelberg area a connected load of approx. 2800 MJ/s for room heating purposes and about 980 MJ/s for industrial requirements (i.e. 37% and 60% resp. of the total heat demand) can be supplied by a nuclear district heating power station. 40% of the industrial heat requirements can be met by hot water and 60% in form of steam. A comprehensive concept of a regional district heating system has been established. Moreover all necessary installations for the genera-

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-691DE-51

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

This study is to be viewed as being interested with four other studies, ET 5074, ET 5075, ET 5076, and with general study ET 5072 on long-distance heating.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

tion and distribution systems into account. All calculations for predetermining the investment costs were based on this design. Profitability studies and evaluation covering the ecological effects were made in 1976. From an estimated total investment of 1000 million DM for heat generation, transport and distribution, it became obvious that the costs for supplying heating water to individual consumers lie within reasonable limits, whereas the costs for supplying steam to industrial enterprises approach to margin of profitability which is mainly due to the already existing private energy generation facilities in industry.

The study is available from AGFW (See Box 4).

NBS-1075 (2-77) | U.S DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-691DE-52

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Planning and design work for demonstrating interconnection networks for long-distance heat supply in the Oberhausen area (ET 5074)

2. Date *(Form Completed)*

Feb. 28, 1976

3. Performing Organization *(Complete Mailing Address)*

Energieversorgung Oberhausen (EVO)
Postfach 400420/40 und 60
D-42 Oberhausen
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*

Dipl.-Ing.G.Deuster
address see 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-517 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*

Sept. 1, 1974 - Feb. 28, 1976

7. Estimated Funding and Manpower *(Monies and Manyears)*

1,115,623.-$ U.S.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objective of this design study is to investigate the demand and the supply of long-distance heating for the area of the western Ruhf district. This area, which incorporates the cities of Oberhausen, Muhlheim, and Dinslaken is densely populated and industrialized. This study is to be considered in conjunction with four further studies which will yield information on the long-distance heating demand in model areas of different structure. A subject of this study, in particular, will also be the tie-in of a high temperature reactor at a later date. The existing network will be included in the design. The four regional studies will then provide the basis for the 5th study which will cover the demand for long-distance heating in the Federal Republic.

Use Box No. 15 if additional space is needed

9. Status and Results

The results of the study for the design of an integrated energy supply system within the area of Oberhausen/Western Ruhr district have shown that the potential for a large district heating system exists in the area investigated. When existing district heat networks expand independently in the next ten years, then high connection costs can be expected. This makes the incorporation of heat from a large, nearby, power station significant. However, the study has shown that the utilization of waste heat form large power stations has its price; with the desired decrease in thermal emission

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11 Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-691DE-52

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

This study is associated with three further design studies, ET5073, ET5075 and ET5076 for long-distance heating, and with the main study, ET5072, for long distance heating in the Federal Republic.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

there also occurs a reduction in electrical power.

Expansion of district heat according to the design provided by this study within the area of the Oberhausen/Western Ruhr district could substitute about 40% of todays consumption of coal and 47% of fuel oil consumption in single and collective consideration of these ecological aspects in conjunction with the saving of primary energy makes the expansion of district heat plants recommendable.

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No *(Secretariat Use Only)*: 3-691DE-53

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Study of the long-distance heat-supply system in the Koblenz-Bonn-Bad Godesberg-Koln area (ET5075)

2. Date *(Form Completed)*
Feb. 28, 1976

3. Performing Organization *(Complete Mailing Address)*
Wibera AG
Achenbachstr. 43
Postfach 86 40
D-4000 Dusseldorf 1
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*
Dipl.-Ing.E.Orth
Wibera AG
Achenbachstr . 43
Postfach 86 40
D-4000 Dusseldorf 1
Federal Republic of Germany

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-5170 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
Sept. 1, 1974 - Feb. 28, 1976

7. Estimated Funding and Manpower *(Monies and Manyears)*
787,815.-$ U.S.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
In the study, the demand for long-distance heating of the Koln/Bonn/Bad Godesberg/ Koblenz region is to be investigated on the assumption that the nuclear power station now under construction in Muhlheim-Karlich near Koblenz may also be used for the long-distance heating supply. The essential question is whether it is economical to transport thermal energy over a large distance and through a region with low heat requirements in order to utilize it later on for heat supply in congested areas. This study is one of four regional studies in which certain selected regions of different structure are investigated as to their demand for district heating. These four studies are the basis for the investigations of the heat requirements in the German Federal Republic.

Use Box No 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-691DE-53

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

The study is available from WIBERA (See box 4)

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)* 3-691DE-54

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Project study for the conurbation of Berlin to ascertain the possibilities of saving energy and substituting nuclear energy for fossil fuels. (ET 5076)

2. Date *(Form Completed)*
March 31, 1976

3. Performing Organization *(Complete Mailing Address)*
Energieanlagen Berlin GMBH
Lutzowplatz 11-13
D-1000 Berlin 30
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*
Ing.grad.P.Schade
Energieanlagen Berlin GmbH
Lutzowplatz 11-13
D-1000 Berlin 30
Federal Republic of Germany

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-5170 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
Oct. 1, 1974 - March 31, 1976

7. Estimated Funding and Manpower *(Monies and Manyears)*
1,117,684.-$ U.S.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
The project study Berlin forms part of an overall study prepared by the Arbeitsgemeinschaft Fernwarme e.V. (district heat association). This study is conducted to ascertain the existing heat requirement potential to be covered by district heat. The section concerning Berlin deals with the particular situation (insularity) of this town. Investigations are to refer to possibilities of extending the Berlin town heating system by an optimal utilization of waste heat emitted from a nuclear power plant, in conjunction with a description of the economic aspects involved. For this purpose, an exact specification of the heat density and heat requirement must be established. The study will also comprise the aspects of energy conservation and improve air quality in densely populated areas in connection with the use of district heat.

Use Box No. 15 if additional space is needed

9. Status and Results
The project was completed on 5/31/76

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No.
3-691DE-54

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

The project study must be seen in connection with three other project studies, ET5073, ET5074, ET5075, and the results will be used in the district heating study, ET5072 for the Federal Republic of Germany.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

The study has been completed and is available from EAB Berlin (See box 4).

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-691DE-55

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
AGROTHERM

2. Date *(Form Completed)*
Dec. 31, 1976

3. Performing Organization *(Complete Mailing Address)*
August Thyssen-Hutte AG
Kaiser Wilhelm Str. 100
D-41 Duisburg-Hamborn
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*
Dir. Herbert Luckow
address see 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-517 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
Jan. 15, 1975 - Dec. 31, 1978

7. Estimated Funding and Manpower *(Monies and Manyears)*
4.7 Million $ U.S.

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

In an ecologically beneficial way Agrotherm is meant to dissipate the waste heat from power plants by means of a pipeline system buried in the ground. The result thereof will be:

- greater independance for the selection of the location of power plants.
- improved efficiency of power plants as compared with necessarily required dry cooling towers
- increased productivity in agriculture and possible cultivation of plants previously not cultivated here.

Use Box No. 15 if additional space is needed

9. Status and Results
The pilot installation in Neurath was set in operation on May 3, 1976 those at Auweiler and Riswick on June 25/26, 1976, and the one in Gundremmingen not until November 10, 1976 because of a close-down of the power plant.

The experience gathered so far in the building for this installation confirms that with today's state of technology:

(Continued)

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- [x] heat for agriculture

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-691DE-55

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m²)
c. commercial (square area-m²)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

- it is feasible,
- to set up a large-scale soil heating system and as far as can be seen today,
- to supply it uniformly with heat.

After the Neurath pilot installation was set in operation, achieved more rapidly than expected. After only 14 days, almost constant temperatures were observed in the ground. In the main root zone, the temperature increase in the soil is approx. 8°C when compared with a non-heated reference area. In spite of the hot summer the soil did not appear to dry up any more than that of the non-heated area.

Although use could not be made of the entire vegetation period because of the date start, the results of the harvest were favorable. As examples, spring potatoes showed a 69% extra yield, and sugar beets also produced about a 70% extra yield. Another particular feature was the early harvest and the substantially higher percentage of marketable sizes of potatoes.

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No (Secretariat Use Only) 3-691DE-56

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

District from Nuclear Power Plants - Study

2. Date *(Form Completed)*

1/20/77

3. Performing Organization *(Complete Mailing Address)*

TECHNIP
232, Avenue Napoleon Bonaparte
92500 - Rueil-Malmaison
France

4. Principal Investigator *(Name and Complete Mailing Address)*

J.M. Bourguet, Manager
TECHNIP Power Division
TECHNIP
232, Avenue Napoleon Bonaparte
92500 - Rueil-Malmaison France

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

French environment Quality of Life Ministry

6. Duration of Investigation *(Beginning and ending)*

7 months

7. Estimated Funding and Manpower *(Monies and Manyears)*

7000 hours

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Simultaneous production of heat and electrical power from nuclear plants, in 1985, for 3 typical sites:
- Lyon (1.087.384 people)
- Nantes/Saint-Nazaire (634.153 people)
- Colmar/Mulhouse (302.160 people)

Statistical study about heat consumption at temperatures lower than 100°C.

Economical study about production, transport and distribution

Pollution reduction.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-691DE-56

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 3-801US-57

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Production of Potable Water from Wastewater

2. Date *(Form Completed)*

11/23/76

3. Performing Organization *(Complete Mailing Address)*

U.S. EPA - OR&D, MERL, WRD
Cincinnati, Ohio 45268
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Howard P. Warner
U.S. EPA-DC Pilot Plant
Washington, D.C. 20032, U.S.A.
Mailing Address (see box 5)

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Dr. Irwin J. Kugelman
U.S. EPA
OR&D, MERL, WRD
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

10/74 to 6/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$500,000 10 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Raw domestic wastewater is being treated by 6 processes in series in a 200 m^3/d pilot plant to determine if potable quality water can be consistently achieved. Analyse for all drinking water quality standards are being conducted as well as for trace organics, haloforms, and specific pathogens.

Use Box No. 15 if additional space is needed

9. Status and Results

Experimental work complete 10/76 - Final report 6/77
Preliminary data evaluation - finished H_2O meets all drinking water quality standards.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☒ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-801US-57

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
3-803US-58

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Evaluation of Full Scale Wastewater Reuse System for Domestic Groundwater Replenishment

2. Date *(Form Completed)*
11/23/76

3. Performing Organization *(Complete Mailing Address)*
Orange County Water District
P.O. Box 8300
Fountain Valley, California 92708
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
David Argo
Orange County Water District
P.O. Box 8300
Fountain Valley, California 92708
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
John English
U.S. EPA, MERL, WRD
Cincinnati, Ohil 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
1/76 to 6/79

7. Estimated Funding and Manpower *(Monies and Manyears)*
$486,000 EPA share $95,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objectives of this study are to evaluate on a full plant-scale basis:

(1) the reliability and effluent variability of a 15 mgd advanced wastewater treatment (AWT) system producing a water approaching potable quality for use in groundwater replenishment and prevention of seawater intrusion, and

(2) the quality of the effluent with regard to the identification, measurement, and monitoring of trace materials (chemical, physical and biological) and residues. Particular emphasis will be placed on the characterization chromatographic/mass spectrophotometric procedures.

Use Box No. 15 if additional space is needed

9. Status and Results

Treatment plant operation generally successful. Injection of wastewater started 10/76. Analytical work just beginning.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☒ potable water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-803US -58

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-OC

NBS-1075 (2-77) — U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No (Secretariat Use Only): 3-821NL-59

1. Title of Project (Official Title)
Total Energy Plant for Sewage Treatment
'sGRAVENZANDE

2. Date (Form Completed)
3/14/77

3. Performing Organization (Complete Mailing Address)
Raadgevend Technics Adviesbureau
Van Heugten B.V.
St. Annastraat 143-147
NIJMEGEN, The Netherlands

4. Principal Investigator (Name and Complete Mailing Address)
Ir. P.H.H.Leijendekkers
Raadgevend Technics Adviesbureau
Van Heugten B.V.
St. Annastraat 143-147
NIJMEGEN, The Netherlands

5. Supporting Organization (Complete Mailing Address and Name of Contact)
Mr. Van Heiningen
Rioolwaterzuiveringsbedrijf
Nieuwe Waterweg
'sGRAVENDZANDE, The Netherlands

6. Duration of Investigation (Beginning and ending)
N/A

7. Estimated Funding and Manpower (Monies and Manyears)
± Dfl. 1,200,000

8. Purpose of Project (Objectives, Motivations, Approach, Plans and Expected Results)

Objective: To provide an effective way on sewage treatment before release

Motivation: To use the gas released by sludge fermentation on a most efficient way for sewage treatment.

Approach:
- 3 gas engine driven electric generators of which one is spare
- Heat recovery from jacket cooling water primarily for sludge heating (ebulient cooling)
- Compressors and pumps electrically driven
- Grid connection (max. capacity 8 kW)
- Plant can be switched over automatically from sewage gas to natural gas

Use Box No. 15 if additional space is needed

9. Status and Results

The plant is not yet in operation

The sewage gas delivers approx. 60% of the primary energy consumption of the engines.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- x sludge heating

11. Type of Project
- ☐ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 4

13. Technical Data

Identification No. 3-821NL-59

project location — — — — s'GRAVENZANDE

degree-days (heating) —

degree-days (cooling) — —

energy source sewage gas + natural gas

expected payback period

plant load capacity

a power (MW) 450 kW — —

b. heating (MW) — 1,2 — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a residential (dwelling units)

b residential (square area-m^2)

c. commercial (square area-m^2)

d industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-821NL-60

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy-plant for Sewage Treatment
HILVERSUM

2. Date *(Form Completed)*

3/14/77

3. Performing Organization *(Complete Mailing Address)*

DYNAF.B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Mr. Zuurbier
DYNAF B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. Hageman
Waterschap "Amstel en Gooiland"
HILVERSUM
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

For the TE-plant ± Dfl. 1,900,000.--
2 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide an effective way of sewage treatment before release

Motivation: To use the gas released by sludge fermentation on a most efficient way for sewage treatment.

Approach:

- 3 gas engine (Waukesha VRG-310) driven electric generators (UNELEC, 450 kVA)
- Electric driven pumps and compressors
- Recovery of heat from engine jacket, primarily for sludge heating
- The plant is switched over automatically from sewage gas to natural gas in case of shortage.

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in operation since November 1974 with good experience
The plant operates conforming design calculations energy basis
60% of the fuel required for plant operation is delivered by sludge fermentation.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- x sludge heating

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 5

13. Technical Data

Identification No. 3-821NL-60

project location — — — — HILVERSUM

degree-days (heating) —

degree-days (cooling) — —

energy source natural gas + sewage gas

expected payback period 5 years

plant load capacity

a. power (MW) — 0.7 — —

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — — 100.000 IE

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Remark: IE Inhabilant equivalent

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-821NL-61

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Total Energy Plant for Sewage Treatment
RWZI - NIEUWGRAAF

2. Date *(Form Completed)*
3/14/77

3. Performing Organization *(Complete Mailing Address)*
Ingenieursbureau
Dwars Heedrik Verhey
Laan 1914
AMERSFOORT, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
Mr. Zuurbier
DYNAF B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Ir. Van Koppel
Z.O.G.
DOETINCHEM
The Netherlands

6. Duration of Investigation *(Beginning and ending)*
N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*
Dfl. 700,000.--, 2 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
Objective: To provide an effective way of sewage treatment before release
Motivation: To use the gas released by sludge fermentation on a most efficient way for sewage treatment
Approach:
- 2 gas engine (F 2895 G) driven electric generators (UNELEC 320 kVA)
- Electric driven pumps and compressors
- Recovery of waste heat from engine jacket primarily for sludge heating

Use Box No. 15 if additional space is needed

9. Status and Results
The plant has been in operation since August 1976
About 60% of the gas required for plant operation is delivered by sludge fermentation

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
☒ electrical power
☒ space heating
☐ space cooling
☐ potable hot water
☐ wastewater treatment
☐ solid waste processing
☐ potable water
x sludge heating

11 Type of Project
☒ public ☐ private
☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 5

13. Technical Data

Identification No. 3-821NL-61

project location — — — — NIEUWGRAAF
degree-days (heating) —
degree-days (cooling) — —

energy source natural gas + sewage gas
expected payback period

plant load capacity
a. power (MW) — 0.6 — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m²)
c. commercial (square area-m²)
d. industrial (thermal + elec.-MW)

300, 000 IE

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Remark: IE = Inhabilant Equivalent

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 3-821NL-62

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

TE-Plant for Sewage Treatment - NIJMEGEN

2. Date *(Form Completed)*

3/14/77

3. Performing Organization *(Complete Mailing Address)*

Raadgevend Technisch Advies Bureau
Van Heugten B.V.
St. Annastraat 143-147
NIJMEGEN
The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. P.H.H. Leijendekkers
Raadgevend Technisch Advies Bureau
Van Heugten B.V.
St. Annastraat 143-147
NIJMEGEN
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Ir. Kempees
Zuiveringsschap "Rivierenland"
TIEL, The Netherlands

6. Duration of Investigation *(Beginning and ending)*

Ending Mid 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*

Dfl. 2,400,000. --

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide an effective way of sewage treatment before release
Motivation: To use the gas which is released by sludge fermentation on a most efficient way for sewage treatment
Approach:
- 3 gas engine driven electric generators of which one is spare
- Recovery of waste heat from engine jacket, primarily for sludge heating
- Grid connection 2200 kW, with small number of full load hours (heavy rain)

Use Box No. 15 if additional space is needed

9. Status and Results

The plant is presently in design
TE-plant delivering 6.8 x 10^6 kWh/a
TE-plant consuming sewage gas energy consumption is approx. 60% of total
Grid connection delivering 2.5 x 10^6 kWh/a

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- x sludge heating

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 5

13. Technical Data

Identification No. 3-821NL-62

project location — — — — NIJMEGEN
degree-days (heating) —
degree-days (cooling) — —

energy source sewage + natural gas
expected payback period

plant load capacity
a. power (MW) — 1.150 —
b. heating (MW) — 4 — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — — 20,000 m^3/hr
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-821NL-63

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Energy - Plant for Sewage Treatment - RAALTE

2. Date *(Form Completed)* 3/14/77

3. Performing Organization *(Complete Mailing Address)*

Mr.Van Holst Pelikaan
Ingenieurs Bureau
Dwars Hedrik Verhey
Laan 1914
AMERSFOORT, The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Mr. Zuurbier
DYNAF B.V.
Kwakelkade 29, P.O. Box 54
ALKMAAR, The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. Horning
Z.W.O
ZWOLLE
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

For TE-Plant ± Dfl. 400,000.--

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide an effective way of sewage treatment before release
Motivation: To use the gas released by sludge fermentation on a most efficient way for sewage treatment
Approach:
- 3 gas engine (Waukesha VRG-310) driven air compressors (Aerzener GMB 15.10)
- Heat recovery from engine jacket primarily for sludge heating
- Grid connection for electricity supply for driving pumps
- The plant is switched over automatically from sewage gas to natural gas in case of shortage

Use Box No. 15 if additional space is needed

9. Status and Results

The plant will be taken into operation March 1977
About 60% of the primary engine fuel is delivered by sewage gas

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ Mechanical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- x sludge heating

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No Request 5

13. Technical Data

Identification No. 3-821NL-63

project location — — — — RAALTE

degree-days (heating) —

degree-days (cooling) — —

energy source sewage gas + natural gas

expected payback period

plant load capacity

a. power (MW) — 75 BHP/unit

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-831CA- 64

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
CANWEL (Canadian Water Energy Loop)

2. Date *(Form Completed)*
August 12, 1977

3. Performing Organization *(Complete Mailing Address)*
Central Mortgage and Housing Corporation
Ottawa, Ontario
Canada

4. Principal Investigator *(Name and Complete Mailing Address)*
David Yuille
Project Coordinator
CMHC National Office
Ottawa, Ontario
K1A OP7
Canada

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Ontario Research Foundation
Mississauga, Ontario
Canada

6. Duration of Investigation *(Beginning and ending)*
1972 - 1979

7. Estimated Funding and Manpower *(Monies and Manyears)*
To date $5 million + to completion
$1 million (M/Y - ?)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

1. To develop simple, reliable, high performance sewage treatment system producing effluent equating municipal raw water quality.

2. To purify effluent from 1. above, to drinking water quality.

3. To develop efficient automatic system for incineration of solid waste with high-rate energy recovery.

4. To integrate these developments into a partially closed loop system.

Use Box No. 15 if additional space is needed

9. Status and Results

1. Prototype plants serving 500 people now in operation or under construction. Results, so far, are conforming to expectations.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ wastewater treatment
- ☐ space heating
- ☒ solid waste processing
- ☐ space cooling
- ☒ potable water
- ☒ potable hot water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-831CA-64

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — 250,000
e. solid waste processing-kilograms/day — 2,000
f. potable water-liters/day — — — — — — variable
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m²) variable
c. commercial (square area-m²)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

The purpose of the project is to develop new waste management technology that places no burden on the environment and conserves water and energy. The renovation of waste water to a re-usable condition and the recovery of energy from solid waste will be a necessary activity in the urbanized society of the 21st century. The need for those facilities exists today wherever water is in limited supply or where the environment is overloaded with contaminants. There is a universal need to conserve energy and to shift the demand from non-renewable oil and gas to alternative energy sources. These developments are directed initially at serving small and intermediate size projects.

16. Additional space for Status and Results

The project has moved successfully through several stages: - concept development, pilot plants, optimization and integration studies, experimental demonstration, and prototype plants. At all stages, performance has been successfully held in line with required criteria. The prospects for success are excellent. Project does not appear to have serious competition. Patents are being applied for in 8 countries.

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-831CA-65

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Ottawa Master Plan Study

2. Date *(Form Completed)*

September 6, 1977

3. Performing Organization *(Complete Mailing Address)*

Department of Public Works
Sir Charles Tupper Building
Confederation Heights
Ottawa, Ontario, Canada
K1A OM2

4. Principal Investigator *(Name and Complete Mailing Address)*

A.E.Toole
Head
Central Utilities
Department of Public Works

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N/A

6. Duration of Investigation *(Beginning and ending)*

June 1975 - Continuing

7. Estimated Funding and Manpower *(Monies and Manyears)*

$75,000,000.00 Canadian

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To integrate electrical power generation with the production of heat for government buildings using municipal refuse as the base fuel supply to be supplemented by any of gas, oil, coal. The power so generated will not be distributed directly to the federal buildings but sold to the Ontario Hydro and purchased as needed from the local utility to avoid duplication of cabling and improve reliability of power supply.

Use Box No. 15 if additional space is needed

9. Status and Results

The economics of such a system seem to be favorable and the project is marking time until the actual site is approved by the town planners, environmentalists.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-831CA-65

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — 20-30
b. heating (MW) — 300 —
c. cooling (MW) — 150 —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — 1,000,000
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected) not determined

energy source
expected payback period

Type and size of user
a. residential (dwelling units) poss. 100,000
b. residential (square area-m^2) 2,000,000
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075
(2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No
(Secretariat Use Only)
3-831US-66

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Waste-as-Fuels Program

2. Date *(Form Completed)*

11/24/76

3. Performing Organization *(Complete Mailing Address)*

N/A

4. Principal Investigator *(Name and Complete Mailing Address)*

N/A

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

U.S.Environmental Protection Agency
Office of Research and Development
Office of Energy, Mining & Industry
Washington, D-C. 20460
ATTN: David Berg

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Research and development activities supporting the technical, environmental, and economic investigations of the use of wastes as fuels including: preparation of fuels and feedstocks; co-incineration of sewage sludge using municipal refuse as and production of solid, liquid, and gaseous fuels by pyrolysis. For project details refer to:

1. EPA Wastes As Fuels Research, Development, and Demonstration Program Plan
April 1975

Use Box No. 15 if additional space is needed

9. Status and Results

N/A

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data N/A

Identification No. 3-831US-66

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

N/A

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-831US-67

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Plant-Scale study of Combined Incineration of Sewage Sludge with Coal & Solid Waste

2. Date *(Form Completed)*: 5/12/77

3. Performing Organization *(Complete Mailing Address)*

Metropolitan Waste Control Commission
Twin Cities Area
350 Metro Square Bldg.
7th & Robert St.
St. Paul, MN 35101

4. Principal Investigator *(Name and Complete Mailing Address)*

Dale C. Bergstedt
Metropolitan Waste Control Commission
Twin Cities Area
350 Metro Square Bldg.
7th & Robert St.
St. Paul, MN 35101

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Steven W. Hathaway
U.S. EPA, MERL, WRD
Cincinnati, OH 45268

6. Duration of Investigation *(Beginning and ending)*: 8/1/76 to 7/31/77

7. Estimated Funding and Manpower *(Monies and Manyears)*: $371,021

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objective of this project is to evaluate the operational feasibility and environmental aspects of adding combustible solid matter to wastewater treatment plant sludges and filter cakes, as off-sets to part or all the auxiliary fuels used in conventional sludge incineration practice. Low sulfur coal and combustible solid wastes will be utilized as ad mix materials. The tests will take place at the Commission's Seneca 6 TPD.

Use Box No. 15 if additional space is needed

9. Status and Results

Project has successfully demonstrated the use of coal as a supplemental fuel. Further work plans to automate system and to evaluate solids wastes as well as coal.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ wastewater treatment
- ☐ space heating
- ☒ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☐ potable hot water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-831US-67

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075
(2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No.
(Secretariat Use Only)
3-831NL-68

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Several projects concerning utilization of heat raised by incineration of waste

2. Date *(Form Completed)*
7/13/77

3. Performing Organization *(Complete Mailing Address)*
N/A

4. Principal Investigator *(Name and Complete Mailing Address)*
Ir. B.G. Kreiter
Institute for Waste Disposal
P.O. Box 184
Amersfoort
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Institute for Waste Disposal
P.O. Box 184
Amersfoort
The Netherlands

6. Duration of Investigation *(Beginning and ending)*
Continuously

7. Estimated Funding and Manpower *(Monies and Manyears)*
Projects are of evaluating nature

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Generation of electric power is a well-known method of utilization of incineration-heat.
The low efficiency, however, is a reason to investigate alternatives.
Running projects are: - district heating (in cooperation with a national committee)
- water evaporation
- firing of the light combustible waste fraction in power-station boilers.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11 Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-831NL-68

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
3-832BE- 69

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Treatment of municipal sludge by use of residual heat from refuse incineration

2. Date *(Form Completed)*
7/28/77

3. Performing Organization *(Complete Mailing Address)*
SCK/CEN
Boeretang 200
B-2400 MOL
Belgium

4. Principal Investigator *(Name and Complete Mailing Address)*
F. DECAMPS
SCK/CEN
Avenue E. Plaskylaan 144
B-1040 Brussel/Bruxelles
Belgium

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
EEC (proposal submitted)
Wetstraat/rue de la Loi 200
B-1040 Brussel/Bruxelles
Belgium

6. Duration of Investigation *(Beginning and ending)*
1/1/78 - 7/1/79

7. Estimated Funding and Manpower *(Monies and Manyears)*
$700,000
2.5 man/year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

- Construction and experimental runs of prototype sludge dryer (size: 10,000 sq. in h)
- Use of heat of existing small incinerators (3-6 ton h^{-1})
- Since experimental data on indirect drying are available at SCK/CEN, a prototype will be built without further laboratory work.

Use Box No. 15 if additional space is needed

9. Status and Results
Program proposal submitted to EEC

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☒ wastewater treatment
- ☐ space heating
- ☒ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☐ potable hot water

11. Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data
if EEC agrees with it

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No.
3-832BE- 69

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — 50,000
- e. solid waste processing-kilograms/day — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Nuclear sludge treatment at SCK/CEN

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 3-832US- 70

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Rotary Kiln Gasification of Sewage Sludge Solid Waste Mixture

2. Date *(Form Completed)*

5/12/77

3. Performing Organization *(Complete Mailing Address)*

Wright-Malta Corp.
Malta Test Station
Ballston Spa, N.Y. 12020
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

John Coffman
Wright-Malta Corp.
Malta Test Station
Ballston Spa, N.Y. 12020
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Steven W. Hathaway
U.S. EPA, MERL, WRD
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

10/24/75 to 11/24/76

7. Estimated Funding and Manpower *(Monies and Manyears)*

$53,820

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

This research will test the thesis that a mixture of raw solid waste and liquid sewage sludge can be converted clearly into fuel gas, primarily by steam, at temperatures below 1000°F, in a pressurized, externally heated rotary kiln.

Experimental will determine the influence of these parameters: proportions of liquid to solid waste, types of waste and sludge, size speed of rotation, and fullness of minikiln. The effluent gases will be analyzed and mass balances obtained.

Use Box No. 15 if additional space is needed

9. Status and Results

Near completion. Statistically designed experiment expected to give reliable results. Numerous mechanical problems. Results show detailed chemical reactions and influence of parameters. Project has successfully confirmed chemistry continuous operation of a pressurized rotary kiln has not been attempted, is the critical operating parameter and is very difficult to achieve.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-832US-70

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 3-832US-71

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Feasibility of Combined Incineration of Sewage Sludge with Solid Wastes

2. Date *(Form Completed)*: 11/23/76

3. Performing Organization *(Complete Mailing Address)*

Roy F. Weston Inc.
Weston Way
Westchester, Pa 19380
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Walter R. Niessen
Roy F. Weston Inc.
Weston Way
Westchester, Pa 19380
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

J.B. Farrell
U.S. EPA, OR&D, MERL, WRD
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*: 6/4/74 to 9/30/75

7. Estimated Funding and Manpower *(Monies and Manyears)*: $72,280

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objective of this contract is to survey the available technology for incineration of sewage sludge with solid waste and assess the feasibility of each alternative approach. A literature survey, site visits, and contacts with practicing facilities will serve as the basis for determining the technology and economic merit of each technique. Engineering design and economic analysis of 4 selected techniques will be performed for 1, 10, and 100 mgd sewage treatment plants.

Use Box No. 15 if additional space is needed

9. Status and Results

Project complete
Final report in preparation

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ wastewater treatment
- ☐ space heating
- ☒ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☐ potable hot water

11 Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 3-832US-71

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 4-101SE-01

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
District Heating System Enkoping

2. Date *(Form Completed)*
5/23/77

3. Performing Organization *(Complete Mailing Address)*
N/A

4. Principal Investigator *(Name and Complete Mailing Address)*
H. Osterberg Man. Dir.
Enkoping District Heating CO.
Enkoping
Sweden

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
N/A

6. Duration of Investigation *(Beginning and ending)*
N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*
N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The purpose of the project is to provide electricity, space heating and to demonstrate the possibility of applying fluidized bed burners utilizing direct combustion of solid, liquid and gaseous fuels in series with existing boilers. This technique will reduce air pollution in a most economical way. The sewage of Enkoping will also be treated and sewage gas will be feed to the burner.

A standard hot water district heating boiler (190/140°C) is modified for recirculating water in series with the fluidized combustor. Combustion products generated in the fluidized combustor is introduced to the gas-tight membrane wall water tube boiler designed for outlet gas temperature 160°C.

Particles carried over from the fluidized combustor and rejected during the gas path through the boiler are collected in hoppers and transported to silos.

Use Box No. 15 if additional space is needed

9. Status and Results

The first commercial multi-fuel fluidized combustion hot water district heating boiler will be operating late 1977 for demonstration 1978-1980 using a wide range of fuels. Selected fuels for demonstration in 1978 are coal, peat, wood and high sulfur residual fuel oil. Within ten years more than 50 multi-fuel fluidized combustion hot water district heating boilers are expected to be operating in Sweden.

This project is: ☐ planned ☒ in-progress ☒ completed

Use Box No 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13 Technical Data

Identification No.
4-101SE-01

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source multifuel;solid,liquid & gaseous
expected payback period

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — —~~25 MW~~
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 4-102GB-02

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

District Heating Feasibility Study (939)

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

Warrington New Town Development Corporation
Warrington, Cheshire
England

4. Principal Investigator *(Name and Complete Mailing Address)*

D.S. Gulliner
Warrington New Town Development Corporation
Warrington, Cheshire
England

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Warrington New Town Development Corporation
Warrington, Cheshire
England

6. Duration of Investigation *(Beginning and ending)*

1975 - Present (1976)

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

An investigator into the possibility of adopting a district heating scheme in a new out-of-town multiple use centre.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 4-102GB-02

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 4-111IE-03

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

DISTRICT HEATING IN BRESCIA
(Teleriscaldamento della citta di Brescia)

2. Date *(Form Completed)*: 11/17/76

3. Performing Organization *(Complete Mailing Address)*

Azienda Servizi Municipalizzati
Sezione Energetica
Via Lamarmora, 230
25100 Brescia (Italy)

4. Principal Investigator *(Name and Complete Mailing Address)*

Dip. Eng. Renzo Capra
c/o ASM
Via Lamarmora, 230
25100 Brescia (Italy)

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

INSTITUTO MOBILIARE ITALIANO

6. Duration of Investigation *(Beginning and ending)*

Investigation started in Dec. 71 and ended in Jan. 73 - Revised in 1975

7. Estimated Funding and Manpower *(Monies and Manyears)*

41,483,000 for 28 years
1,161 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The purpose of the project is to face the energy demands in consideration of the continuous increase of the fuel costs. The project forsees the electricity and heat combined production with an exploitation rate of the fuel energy contents, about twice the rate achievable in a single thermoelectric plant. In a combined production plant, the steam, after its expansion in a back-pressure turbine, is bleeded and condensed for the heat production for the district heating network. The district heating network operates, as they say, as "warm condenser". The advantages of the combined production are: considerable saving of fuel, better efficiency of the fuel combustion employing large boilers always under control, considerable pollution reduction as it is possible to use flue-gas depuration systems. Great advantages for the users: no fuel problems, cleanliness, no upkeep, security of the system and continuous heat and hot water service.

Use Box No. 15 if additional space is needed

9. Status and Results

After the feasibility study carried out by the "Energi-consult" of Stockholm in 1972, on the 22nd of Jan. 1973 the preliminary project for the first stage of the plant and of the district heating network was approved and worked out by the Board of Management of the Azienda. Up to now a network section of about 16.5 km has been laid and 3 boilers (total capacity 85 Gcal/h) installed. A combined plant (energy-heat) of 30 MW and 77 Gcal/h is under construction, and it will be put into service on July 1978. The project development forcast are as stated in point 8.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 4-111IE-03

project location Brescia (Italy)
degree-days (heating) — 2,448 (+)
degree-days (cooling) — — N.A.

energy source natural gas and heavy oil
expected payback period 28 years

plant load capacity
a. power (MW) — 30 MW —
b. heating (MW) — 358 MW —
c. cooling (MW) — N.A. — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — — —

Type and size of user
a. residential (dwelling units)
b residential (square area-m^2)
c. commercial (square area-m^2) $5.16.10^6$ m^2
d. industrial (thermal + elec.-MW)

heat to power ratio (average expected) 12 (2.57 for turbogenerator only)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

Schedule time:
1975 - 2 boilers x 15Gcal/h and 10,000 m network laid
1976 - plus 1 boiler x 55 Gcal/h and 16,600 m network laid
1978 - plus first turbogenerator unit of 30 MW and 77 Gcal/h and 31,000 m network laid
1981 - plus a 70 Gcal/h boiler and 41,000 m network laid
1986 - plus second turbogenerator unit of 30 MW and 75 Gcal/h and 51,000 m network laid
1998 - plus 55 Gcal/h boiler and 66,000 m network laid

16. Additional space for Status and Results

(+) It has been considered that the heating period starts as the external daily average temperature reaches 13°C and ends when such temperature gets over 13°C for at least 3 days in succession. Such period, according to the data taken from 1955 till 1974 results for Brescia as 180 days, the average internal room temperature has been set at 19°C, while the external average temperature during the period in which the heating is functioning is for the city of Brescia of 5.4°C. According to these data the degree-days are 2,448.

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 4-111SE-04

PROJECT SUMMARY FORM

1. Title of Project (Official Title)
Vasteras District Heating Power Station (80MW electric)

2. Date (Form Completed)
5/23/77

3. Performing Organization (Complete Mailing Address)
Vasteras Study Kraftuaeme
Werk Aktiebolag
Vasteras
Sweden

4. Principal Investigator (Name and Complete Mailing Address)
L. Metzler Man. Director
Public Works Department
Vasteras City Council
Sweden

5. Supporting Organization (Complete Mailing Address and Name of Contact)
Krangede Aktiebolag 29%
Stora Kopparbergs Bergslags Aktiebolag 27.5%
Vasteras Stads Kraftvarmeverk Aktiebolag 17.5%
Gullspangs Kraftaktiebolag 15%
Aktiebolaget Bergslagens Gemensamma Kraftforvaltning 11%

6. Duration of Investigation (Beginning and ending)
N/A

7. Estimated Funding and Manpower (Monies and Manyears)
N/A

8. Purpose of Project (Objectives, Motivations, Approach, Plans and Expected Results)

The purpose of the project originally was to sell heat as well as electricity. It also helps to reduce energy consumption.

Use Box No. 15 if additional space is needed

9. Status and Results
The plant has been successfully in operation for many years.

(See blocks 15 and 16 on reverse side for technical data.)

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- [x] road heating

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others?
Contact 4
☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 4-111SE-04

project location Vasteras
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) 80 MWe
b. heating (MW) 200 MW (back-pressure)
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

The following technical data is applicable to the Vasteras District Heating Power Station.

Blocks 1 and 2 each 80 MW electrical + 200 MW heat (back-pressure) Vasteras Stads

Service	Overload	Boilers	Dome
electrical output	40 MW	Fuel	Heavy fuel oil bunker C
heat output	100 MW	Steam quantity normal	190 t/h
hot water in	60°C		
hot water out	90°C	Steam quantity max. cont.	220 t/h
efficiency	86%		
		Steam quantity peak load	240 t/h
Steam Date before Turbine			
steam quantity	220 t/hr	Pressure before economics	125 ata
steam pressure	105 ata		
steam temp.	530°C	Temp. before economics	250°C
year commissioned	1963		

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 4-111SE-05

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
The Varta Power Station

2. Date *(Form Completed)*
5/23/77

3. Performing Organization *(Complete Mailing Address)*
Sweden

4. Principal Investigator *(Name and Complete Mailing Address)*
N/A

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
N/A

6. Duration of Investigation *(Beginning and ending)*
N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*
N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The Varta power station is situated about 3 km from the centre of Stockholm in the Hjorthagen district on the Baltic. The plant dates from 1903, when two generators driven by reciprocating steam engines supplied a total of 3 MW mainly for lighting purposes in Stockholm. The plant has been gradually extended by generators driven by steam turbines, and all that is left of the older part of the works are three condensing steam turbines of a total rating of 60 MW and six steam boilers.
Construction of a district heating system in the Ostermalm and Gardet districts of Stockholm was started at the beginning of the sixties. Heat was temporarily generated by means of heat exchangers from the steam boilers, but in 1969 two hot water boilers were installed for district heating purposes. Two steam boilers, which will also be capable of supplying steam to the condensing turbines and replacing the old steam boilers, will be delivered by the autumn of 1973 to serve the district heating system being constructed in central Stockholm.
A gas turbine rated at 54 MW electric power was installed in 1969 to cater for peak loads and to serve as standby plant.

Use Box No. 15 if additional space is needed

9. Status and Results

Condensing Plant: 6 steam boilers, steam pressure 22 at.g., steam temperature 390°C, total steam supplied 235 tons/hr.
Fuel: low-sulphur Eo 4. Heat exchanger for district heating.
Feed water pumps: 3 No, one of which is driven by steam turbine, 1 by electric motor and 1 by electricity and steam.
Condensing steam turbines: G 12, De Laval, 25 MW, G 13 STAL LAVAL, 25 MW and G 14, De Laval 10 MW.
GAS TURBINE: G3, supplier STAL LAVAL Type GT 120, 54 MW industrial model, open system

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- [x] electrical power
- [x] space heating
- [ ] space cooling
- [ ] potable hot water
- [ ] wastewater treatment
- [ ] solid waste processing
- [ ] potable water

11. Type of Project

- [ ] public
- [ ] private
- [ ] cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 4-111SE-05

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

A back pressure plant with a rated electric power of 210/250 MW and district heating power of 330 MW will be delivered by 1976/77.

16. Additional space for Status and Results

with intercooling. Fuel :Eo 1.

Heating Plant I: Boilers Nos 11 and 12, hot water boilers 2 x 125 MW heat, supplier Gotaverken, pressure 10 at.g., water temperature 150°C, directly connected to the district heating system. The boilers are forced draught fired and have no flue gas fans. Precipitators of multicyclone type. Fuel: low-sulphur Eo4-5.

Heating Plant II: Boilers Nos 13 and 14, steam boilers 2 x 160 MW heat, supplier Svenska Maskinverken. Pressure 42 at.g., steam temperature 400°C, steam supplied 220 tons/h. Heat exchanger for district heating production and steam pipe line to condensing steam turbines G12-G14. Precipitators of multicyclone type and steam turbine driven fans, feed pumps and heating system circulation pumps. Fuel: low-sulphur Eo 4-5.

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 4-113JP-06

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Katayamazu Spa District DH Plant

2 Date *(Form Completed)*

March 1977

3. Performing Organization *(Complete Mailing Address)*

Katayamazu Heat Energy Co., LTD
No. 71, Katayamazu, Kaga-City
Ishikawa Prefecture, Japan

4 Principal Investigator *(Name and Complete Mailing Address)*

Katayamazu Heat Energy Co., LTD.
No. 71, Katayamazu, Kaga-City
Ishikawa Prefecture, Japan

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

NA

6. Duration of Investigation *(Beginning and ending)*

1972 to 1974

7. Estimated Funding and Manpower *(Monies and Manyears)*

not cleared

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

(1) Effective use of energy
(2) Prevention of public-nuisance especially for air pollution

Use Box No. 15 if additional space is needed

9. Status and Results

Services started from Nov. 1975.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No 4-113JP-06

project location Katayama zu

degree-days (heating) — 1980

degree-days (cooling) — —

energy source Heavy Oil

expected payback period not known

plant load capacity

a. power (MW) — —

b. heating (MW) — 28.5 (33 Gcal/H)

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m²) 400,000

c. commercial (square area-m²)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 4-113JP-07

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Bannaguro Housing Estate DH Plant

2. Date *(Form Completed)*

March 1977

3. Performing Organization *(Complete Mailing Address)*

Ishikari Service Co., LTD.
Sapporo Building, No. 1., Nish 3-Chome
Kita-Zjoh, Chuo-Ku, Sapporo, Hokkaido,
Japan

4. Principal Investigator *(Name and Complete Mailing Address)*

NA

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

°Hitachi-Ship Construction Co., LTD
°Tokyo Thermal Engineering Co., LTD
°Mitsui & Co., LTD.

6. Duration of Investigation *(Beginning and ending)*

1972 to 1974

7. Estimated Funding and Manpower *(Monies and Manyears)*

Not Cleared

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

(1) Effective usage of energy
(2) Prevention of air pollution

Use Box No. 15 if additional space is needed

9. Status and Results

Service started from Dec. 1976.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 4-113JP-07

project location Hokkaido
degree-days (heating) 4197
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) 23.3 (27 Gcal/H)
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source Heavy Oil
expected payback period not known

Type and size of user
a. residential (dwelling units) 3450
b. residential (square area-m²)
c. commercial (square area-m²)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 4-114SE-08

PROJECT SUMMARY FORM

1. Title of Project (Official Title)
Vasteras District Heating Power Station
(440 & 500 MW elec.)

2. Date (Form Completed)
5/23/77

3. Performing Organization (Complete Mailing Address)
Oktieholage Aroskraft
Vasteras
Sweden

4. Principal Investigator (Name and Complete Mailing Address)
L. Mitzler Man. Director
Public Works Department
Vasteras City Council
Sweden

5. Supporting Organization (Complete Mailing Address and Name of Contact)
N/A

6. Duration of Investigation (Beginning and ending)
N/A

7. Estimated Funding and Manpower (Monies and Manyears)
N/A

8. Purpose of Project (Objectives, Motivations, Approach, Plans and Expected Results)
To provide electricity and space heating for the city of Vasteras on a economical and energy saving way.

Use Box No. 15 if additional space is needed

9. Status and Results
The back pressure turbine was commissioned in 1969.

The condensing turbine was commissioned in 1973.

(See blocks 15 and 16 on reverse side for technical data.)

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- [x] road heating

11. Type of Project
- ☒ public
- ☒ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] unknown

Contact 4

13. Technical Data

Identification No. 4-114SE-08

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — 440 & 500 MW c back pr. and
b. heating (MW) — 730 — — — condensing back
c. cooling (MW) — — — — — pressure
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

The following technical data is applicable to the Vasteras District Heating Power Station.
Blocks 3 and 4 each, 440 MW electrical + 730 MW heat (back-pressure) or 500 MW electrical (condensing) Aktiebolaget Aroskraft

Service	Max. Cont.
electrical output	365 MW
heat output	585 MW
hot water in	60°C
hot water out	90°C
efficiency	89.5%
Steam data before turbine	
steam quantity	825 t/h
steam pressure	181 ata
steam temp.	535°C
year commissioned	1969 & 1973

Boilers	Monotube
Fuel	Heavy fuel oil bunker C
Steam quantity normal	750 t/h
Steam quantity max. cont.	820 t/h
Steam quantity peak load	890 t/h
Pressure before economiser	250 ata max. sliding pressure
Temp. before economiser	265°C

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No *(Secretariat Use Only)*
4-113JP-09

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Senboku New Town Toga Area Center (DHC Plant)

2. Date *(Form Completed)*

March 1977

3. Performing Organization *(Complete Mailing Address)*

Osaka Gas Co., LTD
No. 1, 5-Chome, Hirano-Cho, Azuma
Ku, Osaka-City, Osaka-Fu, Japan

4 Principal Investigator *(Name and Complete Mailing Address)*

Osaka Gas Co., LTD
No. 1, 5-Chome, Hirano-Cho, Azuma
Ku, Osaka-City, Osaka-Fu, Japan

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

NA

6. Duration of Investigation *(Beginning and ending)*

1971 to 1973

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

(1) Effective usage of energy

Use Box No. 15 if additional space is needed

9. Status and Results

Service started from Aug. 1976

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11 Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 4-113JP-09

project location Osaka
degree-days (heating) 1,737
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) 6.5 (7.6 Gcal/H)
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source Town Gas
expected payback period not known

Type and size of user
- a. residential (dwelling units) 13,000
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 4-122JP-10

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Tomakomai City Business Area DH Plant

2. Date *(Form Completed)*

March 1977

3. Performing Organization *(Complete Mailing Address)*

Tomakomai Energy Kosha Co., LTD
No. 16, 1-Chomo, Suehiro-Cho, Tomako Mai City, Hokkaido, Japan

4. Principal Investigator *(Name and Complete Mailing Address)*

Tomakomai Energy Kosha Co., LTD
No. 16, 1-Chomo, Suehiro-Cho, Tomako Mai City, Hokkaido, Japan.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

NA

6. Duration of Investigation *(Beginning and ending)*

1971 to 1972

7. Estimated Funding and Manpower *(Monies and Manyears)*

Not cleared

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

(1) Effective usage of energy

Use Box No. 15 if additional space is needed

9. Status and Results

Service started from Nov. 1974

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 4-122JP-10

project location — Hokkaido
degree-days (heating) — 3,933
degree-days (cooling) — —

energy source Town Gas
expected payback period not known

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — 25.7 (30 Gcal/H)
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 4-122JP-11

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
2nd Morinomiya Housing Estate of Japan Housing Corporation DHC Plant

2. Date *(Form Completed)*
March 1977

3. Performing Organization *(Complete Mailing Address)*
Osaka Gas Co., LTD
No. 1, 5-Chome, Hirano-Cho. Azuma-Ku
Ohasaka-City, Ohsaka-fu, Japan

4 Principal Investigator *(Name and Complete Mailing Address)*
Ohsaka Gas Co., LTD.
No. 1, 5-Chome, Hirano-Cho. Azuma-Ku
Ohasaka-City, Ohsaka-fu, Japan

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
NA

6. Duration of Investigation *(Beginning and ending)*
1972 to 1974

7. Estimated Funding and Manpower *(Monies and Manyears)*
NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

1) Effective usage of energy.

Use Box No. 15 if additional space is needed

9. Status and Results

Services started from May 1976.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 4-122JP-11

project location Ohaska
degree-days (heating) 1.737
degree-days (cooling) — —

energy source City Gas and Waste Heat
expected payback period not known

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — 9.3 (10.8 Gcal/H)
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user
- a residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 4-123JP-12

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Chiba Kaihin New Town (Kemigawa Area) Plant

2. Date *(Form Completed)*
March 1977

3. Performing Organization *(Complete Mailing Address)*
Keiyo Toshi Service Co., LTD.
No. 1, 4-Chome Masuna Chiba-City
Chiba Prefecture, Japan

4. Principal Investigator *(Name and Complete Mailing Address)*
Keiyo Toshi Service Co., LTD.
No. 1. 4-Chome Masuna Chiba-City.
Chiba Prefecture, Japan

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Mistui & Co., LTD.

6. Duration of Investigation *(Beginning and ending)*
1972 to 1973

7. Estimated Funding and Manpower *(Monies and Manyears)*
NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

1) Effective usage of energy

Use Box No. 15 if additional space is needed

9. Status and Results

Service started from April 1974.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 4-123JP-12

project location Chiba City
degree-days (heating) 1,971
degree-days (cooling) — —

plant load capacity
a. power (MW) —
b. heating (MW) 18.0 (21 Gcal/H)
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source City Gas
expected payback period not known

Type and size of user
a. residential (dwelling units) 3,000
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 4-601CA-1 3

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

District Energy System Analysis (DESA)

2. Date *(Form Completed)*

July 8, 1977

3. Performing Organization *(Complete Mailing Address)*

Dept. Public works
Technological Research and Development
Sir Charles Tupper Bldg., 7E
Ottawa, Ontario. K1A OM2
Canada

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. Edward Morofsky
Dept. Public Works, Sir Charles Tupper, Bldg 7E, Technological Research and Development
Ottawa, Ontario. K1A OM2 Canada
(613) 998-3993

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Department of Public Works
and
Dr. Don Stephenson
Division of Building Research
National Research Council
Ottawa, Ontario, Canada

6. Duration of Investigation *(Beginning and ending)*

June 1976 ------ March 1978

7. Estimated Funding and Manpower *(Monies and Manyears)*

1976-77 $32,000 2 man years
1977-78 $15,000 3/4 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Develop, test and document an automated financial and energy analysis of alternative district energy system designs.

Work Plan

a. Produce analytical, user's and programmer's manuals for DESA.
b. Analyze the proposed Halifax district energy system and present the results.
c. Code and test the DESA on a CAI mini computer.
d. Development of an integrated evaluation scheme for district energy systems incorporating financial, energy and environmental considerations.

Use Box No. 15 if additional space is needed

9. Status and Results

a. Preliminary versions of manuals.
b. Halifax analysis completed.
c. Coding of DESA scheduled for completion in Sept., 1977
d. Development of an integrated evaluation scheme commencing.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 4-601CA-13

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Halifax District Heating Study

Ottawa Master Plan Simulation Model

15. Additional space for Purpose of Project

Publications

a) Morofsky, E.L. (1976) A basis for a general distric energy system analysis (DESA) for Canadian cities, TR&D Report, Aug.
b) Morofsky, E.L. (1976) An ecological framework for evaluating the urban impact of district energy systems, TR&D Report, Oct.
c) Morofsky, E.L. (1977) Evaluating Distinct Energy Systems, 7th CIB Congress, Edinburgh, Scotland, Sept.
d) Morofsky, E.L. (1977) District Energy Options and Urban Impacts, Economic Commission of Europe, Seminar on the Impact of Energy Considerations on the Planning and Development of Human Settlements, Ottawa, Oct.
e) DESA Analytical Manual
DESA User's Manual preliminary drafts
DESA Programer's Manual Spring 1977
f) Financial and energy evaluation of the proposed Halifax District Heating System.

Publications a-d are available from the author - a limited number of e and f will be available in the autumn of 1977.

16. Additional space for Status and Results

Principal investigator would appreciate receiving technical and financial information on other urban related energy projects and is willing to supply details of his own projects.

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)*: 4-601US-14

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Study on District Heating for Retrofit of Power Plants

2. Date *(Form Completed)*: 3/15/77

3. Performing Organization *(Complete Mailing Address)*

1. Division of Buildings and Community Systems, DoE
2. Division of Nuclear Research and Application, DoE
3. Argonne National Laboratory, Agronne, Ill. 60439
4. Swedish Consulting Firm

4. Principal Investigator *(Name and Complete Mailing Address)*

John Rodousakis, Program Manager
Divison of Buildings and Community Systems
Office of Conservation
U.S.Department of Energy
20 Massachusetts Avenue, N.W.
Washington, D.C. 20545

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

John Rodousakis, Program Manager
Division of Buildings and Community Systems
Office of Conservation
U.S.Department of Energy
20 Massachusetts Avenue, N.W.
Washington, D.C. 20545, U.S.A

6. Duration of Investigation *(Beginning and ending)*: 3/77 to 3/78

7. Estimated Funding and Manpower *(Monies and Manyears)*: $200,000 (1 year)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

A study to investigate the institutional, technical, economic, and environmental feasibility of retrofitting power plants for district heating. The approach is to examine existing power plants in Minneapolis for utilizing their waste heat through district heating networks to provide heating and cooling to a metro area. The Minnesota State Energy Office and local power companies will participate and monitor this study. If this approach proves feasible, steps will be taken to implement this idea. Energy Conservation computer software developed in Sweden to analyse and optimize district heating systems will be utilized.

Use Box No. 15 if additional space is needed

9. Status and Results

Study is beginning.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 4-601US-14

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No *(Secretariat Use Only)*: 4-602GB-15

1. Title of Project *(Official Title)*

Performance of District Heating Schemes (907)

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

Heating and Ventilation Research Association
Old Bracknell Lane
Bracknell, Berks
England

4. Principal Investigator *(Name and Complete Mailing Address)*

P. Jackman
Heating and Ventilation Research Association
Old Bracknell Lane
Bracknell, Berks
England

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Building Research Establishment
Bucknells Lane
Garston
Watford WD27JR,
England

6. Duration of Investigation *(Beginning and ending)*

NA

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

A field study of selected district heating schemes with the aim of comparing the predicted and actual demand for heat.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☐ potable hot water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 4-602GB-15

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
4-651DE-16

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
District Heat Supply System Ingolstadt (ET 5147A)

2. Date *(Form Completed)*
Dec. 31, 1975

3. Performing Organization *(Complete Mailing Address)*
Stadtische Werke Ingolstadt
RinglerstraBe 28
D-8070 Ingolstadt
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*
Dir.Dipl.-Ing.Hans Meck
address see 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-5170 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
Apr. 15, 1975 - Dec. 31, 1975

7. Estimated Funding and Manpower *(Monies and Manyears)*
80,769,- $ US

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

- Establishment of a district heat supply system for the town of Ingolstadt in connection with the erection of a central hospital.

- Investigations into the possibilities of heat supply from the neighboring GroBmehring power station.

Use Box No. 15 if additional space is needed

9. Status and Results

The concept of the study was completed at the end of 1975, the study is available.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 4-651DE-16

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. (Secretariat Use Only)
4-651NL-17

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
District Heating Rotterdam

2. Date *(Form Completed)*
3/4/77

3. Performing Organization *(Complete Mailing Address)*
G.E.B.
Postbus 1313
Rotterdam
The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
Municipal Board
Stadhuis
Coolsingel
Rotterdam
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Municipal Board
Stadhuis
Coolsingel
Rotterdam
The Netherlands

6. Duration of Investigation *(Beginning and ending)*
The investigation started immediately after the bombing in 1940 & ended in 1949

7. Estimated Funding and Manpower *(Monies and Manyears)*
Until now there has been spent (computed to present value) 60 million florins

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
Because of the bombing of the Rotterdam city in 1940, there was a good opportunity after World War II for rebuilding a new center with an integrated hot water and space heating system provided by the municipal energy company (G.E.B.), a municipal government firm.

The motivations were:
space savings in office buildings, a decrease of smoke and soot, no more coal transports in the streets (an important point in those days) and energy savings.

Use Box No. 15 if additional space is needed

9. Status and Results
The heating system consists of one combined electricity and heat producing plant and two supporting stations for heat in case of excessive demand for electricity or extreme cold weather. The capacity of the two supporting stations together is 210 Gcal/h. This is enough to replace the main plant, if it would fail.

The capacity of the main plant is 110 Gcal/hr.
The heat is transported by 41.4 km of pipe. The distance between the main plant and

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 4-651NL-17

project location — — — — Schiehaven Rotterdam
degree-days (heating) — 2786*
degree-days (cooling) — —
energy source
expected payback period

plant load capacity
a. power (MW) — 189 (main plant only)
b. heating (MW) — 550 (all together)
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —

Type and size of user 161,040 GJ
a. residential (dwelling units) 2941
b. residential (square area-m²)
c. commercial (square area-m²)
d. industrial (thermal + elec.-MW) 1,349,0670 GJ

heat to power ratio (average expected) *Refer to note 2, table 2-9.

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

the consumers area is variating from 2.5 km to 5.5 km. The water temperature can change between 105°C to 140°C.

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 4-672NL-18

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

District heating of the city of Utrecht (Holland)

2. Date *(Form Completed)*: 3/15/77

3. Performing Organization *(Complete Mailing Address)*

N.V.PEGUS
Keulsekade 189
Utrecht
Holland

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. J.C.Resing
N.V.PEGUS
Keulsekade 189
Utrecht
Holland

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Ir. J.C.Resing
N.V.PEGUS
Keulsekade 189
Utrecht
Holland

6. Duration of Investigation *(Beginning and ending)*: January 1923 - unknown

7. Estimated Funding and Manpower *(Monies and Manyears)*: Not determined

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The district heating of the PEGUS at Utrecht originally started in the year of 1923 with a low-pressure steamnetwork (3 ata). All expansions after the year 1927 have been made in accordance with the low-pressure (maximum 6 ata) and low-temperature (maximum 100°C) water-system. The basic principle of the Pegus-district heating is the operation of conventional (fossil-fuelled) steam turbines for combined electricity and heat production and the primary energy saving by combined production of both electricity and heat by one production plant. The combined production of both electricity and heat takes place with back pressure turbines in the power station "Nicolaas Beets-straat", where the main purpose is heat production, and electricity production is a by-product and in the power stations "Merwedekanaal" and "Lage Weide" by means of condensing turbines with district heating extraction, where the main product is electricity and heat is a by-product. More over there are 4 auxiliary stations with simple warm water boilers installed in the centre or the outskirt of the two supply-areas for regulation of the production during the peakload of the heat-supply. As the peakload of the heat-supply only takes place during a few hours in the heating season, it will not be economical to install the whole heat production capacity.

Use Box No. 15 if additional space is needed

9. Status and Results

The status and the results for the heating season 1974/75 (September up to and including May) are as follows:

1.	Connected heat load	575 MW
2.	Maximum heat load	275 MW
3.	Heat production in	
	a. Power and heat supply stations	730,360 MWh
	b. Auxiliary heat supply stations	44,287 MWh

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 4-672NL-18

project location Utrecht

normal degree-days (heating) — 2993(15.5°C) *

degree-days (cooling) — —

energy source Natural gas and light fuel oil

expected payback period not determined

plant load capacity

a. power (MW) — 75 — — —

b. heating (MW) — 200 (excl. auxiliary

c. cooling (MW) — — — boiler units)

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected) Not determined

Type and size of user

a residential (dwelling units) 14,563

b. residential (square area-m²)

c. commercial (square area-m²)

d. industrial (thermal + elec.-MW)

*Refer to notes table 2-9.

14. Other Related Projects *(Titles)*

District heating of the city of Rotterdam.
District heating of the city of The Hague
Total Energy System of the "Vrije Universiteit" of Amsterdam.

15. Additional space for Purpose of Project

in combined production plants. By installing about 50 percentage of the maximum heat load in combined production plants (both electricity and heat production) and about 50 percentage in auxiliary station with only heat production it will be possible to deliver 85 till 90 percentage of total heat production by means of combined electricity and heat production and 10 till 15 percentage by the auxiliary stations. The reserved heat production capacity also is installed in the auxiliary stations.

In the power station "Merwedekanaal" a new combined cycle (one unit) will be installed. This project was planned in the years 1975 and 1976 and is in-progress during the years 1977 and 1978. It will be completed in October 1978. The combined cycle is designed for the combined production of electric power and heat-in the form of warm water - for the district heating. The new power and heat supply station is partly going to substitute old production plants - for the power and heat supply by means of back pressure turbines - in the power station "Nicolaas Beetsstraat". The plant load capacity is 100 MW power and 115 MW heating. The energy source is natural gas.

16. Additional space for Status and Results

4.	Quantity of heat supplied	774,647 MWh
5.	Heat intake by consumers	700,748 MWh
5a.	Of this for dwellings	41.2 %
6.	Heat losses in the pipe-lines	9.5 %
7.	Load utilization hours of maximum heat load	2818 hours
8.	Load utilization hours of connected heat load	1218 hours
9.	Number of degree-days in the heating season	2900 days
9a.	Stated internal temperature	18°C.
9b.	Heating limit external temperature	15.5°C
10.	Number of heating days	269 days
11.	Length of pipeline system	95.7 km
12.	Total number of connections on the pipeline system	2563

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-101DE-01

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Installation of a heat-pump plant for the production of heat and warm water for residential bldgs. (ET 5084)

2. Date *(Form Completed)*
Dec. 31, 1975

3. Performing Organization *(Complete Mailing Address)*
Vereinigte Esslinger
Wohnungsunternehmer GmbH
Postfach 822
4300 Esslingen
Federal Republic of Germany

4 Principal Investigator *(Name and Complete Mailing Address)*
E. Arnold (BMFT)

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-5170 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
Feb. 1, 1975 - Dec. 31, 1975

7. Estimated Funding and Manpower *(Monies and Manyears)*
782,384.- $US

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
Gaining of practical experience in heating of residential complexes with new heating systems and use of heat pumps.

The measurement and evaluation program of the Forschungsstelle fur Energiewirtschaft, Munich, will be extended. It is planned that the extra energy requirements (electricity, water, heat) for the residences and commercial premises in the area will be satisfied.

Use Box No. 15 if additional space is needed

9. Status and Results
With the exception of the setting up of the measuring equipment (extension to the original program), work on the heat-pump plant has been completed by the Energiewirtschaft, Munich. The heat-pump plant was set in operation in April, 1976, and the measuring program was begun in October 1976.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-101DE-01

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-101US-02

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Extraction of Heat from River by Heat Pump - Esslingen

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

Bundesministerium fur Forschung
und Technologie
Stresemannstrasse 10
5300 Bonn-Bad Godesberg
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*

NA

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

1. Bundesministerium fur Forschung und Technologie
2. U.S.Department of Energy
Washington, D.C. U.S.A.
Mr. Steve Cavros

6. Duration of Investigation *(Beginning and ending)*

9/76 to 9/77 approx.

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

This project is testing the extraction of heat from a river near Esslingen using water-to-water heat pumps to supply heating to 2 high rise buildings. Heat is obtained from upstream power plants. There are three types of heating system in the high-rise building being examined, a radiator system, a floor type of radiator system, and an air system.

Use Box No. 15 if additional space is needed

9. Status and Results

A report will be available 9/76.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-101US-02

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 5-102FR-03

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Energy Savings

2. Date *(Form Completed)*

1/20/77

3. Performing Organization *(Complete Mailing Address)*

TECHNIP
232, Avenue Napoleon Bonaparte
92500 - Rueil-Malmaison
France

4. Principal Investigator *(Name and Complete Mailing Address)*

J.M. Bourguet, Manager
TECHNIP Power Division
TECHNIP
232, Avenue Napoleon Bonaparte
92500 - Rueil-Malmaison
France

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

SODES (Ethanol plant in Lillebonne (France))

6. Duration of Investigation *(Beginning and ending)*

NA

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Recovery of lost heat in furnace flue stacks.
Setting up of a hot water system for heat recovery.

Use Box No. 15 if additional space is needed

9. Status and Results

Realized modification: hot water system and preheater of combustion air.
Pay-out of hot water system: 2 years
Pay-out of furnaces modification: 8 years

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☒ No

13. Technical Data

Identification No. 5-102FR-03

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 5-102FR-04

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Solar Heating Installation for TECHNIP Buildings in Saint-Nazaire (France).

2. Date *(Form Completed)*

1/20/77

3. Performing Organization *(Complete Mailing Address)*

TECHNIP
232, Avenue Napoleon Bonaparte
92500 - Rueil-Malmaison
France

4. Principal Investigator *(Name and Complete Mailing Address)*

J.M. Bourguet, Manager
TECHNIP Power Division
TECHNIP
232, Avenue Napoleon bonaparte
92500 - Rueil-Malmaison France

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

TECHNIP
232, Avenue Napoleon Bonaparte
92500 - Rueil-Malmaison
France

6. Duration of Investigation *(Beginning and ending)*

Operating in June 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Heating system for a surface of buildings of 800 m2, and sanitary hot water production for the whole buildings (11,200 m2).

Estimated surface of solar cells: 262 m2
Hot water storage: 20 m3
Yearly saving: 93280 kWh
Insolator: COULET type
General design: TECHNIP Power Division

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☒ No

13 Technical Data

Identification No. 5-102FR-04

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-102GB-05

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Increasing Luner Capacity by means of Drag Reducing Polymer (955)

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

Bristol City Council
Engineer's Dept.
Cabot House
Deanery Rd.
Bristol BS15TZ, Eng.

Bristol Univ.
Queen's Bldg.,
Univ. Walk
Bristol BS81TR
England

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. R.H.J. Sellin
Bristol University

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Wessex Water Authority
Bristol Avon Recovery Division

6. Duration of Investigation *(Beginning and ending)*

1975 to Present (1976)

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Following encouraging tests on a 4 Km long 200 mm sludge pumping main at Avonmouth, it is proposed to inject polymer into a sewer at Knowle Golf Course at times of peak flow. The sewer, which serves Stockwood, surcharges and causes foul water flooding of the golf course. Further development (200 houses) is imminent, and would normally necessitate a sewer duplication, which will be avoided, or at least deferred, if polymer dosing is successful.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ wastewater treatment
- ☐ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☐ potable hot water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 5-102GB-05

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No (Secretariat Use Only): 5-102GB-06

PROJECT SUMMARY FORM

1. Title of Project (Official Title)

Alternative Sources of Energy for Buildings (922)

2. Date (Form Completed)

3-15-77

3. Performing Organization (Complete Mailing Address)

Plymouth Polytechnic
Construction Studies Group
Drake Circus, Plymouth, Devon
England

4. Principal Investigator (Name and Complete Mailing Address)

H.S. Ward
P.G. Metherall
F. Rendel
Plymouth Polytechnic
Construction Studies Group
Drake Circus, Plymouth, Devon, England

5. Supporting Organization (Complete Mailing Address and Name of Contact)

Plymouth Polytechnic
Construction Studies Group
Drake Circus, Plymouth, Devon
England

6. Duration of Investigation (Beginning and ending)

10/75 to 10/78

7. Estimated Funding and Manpower (Monies and Manyears)

5,000

8. Purpose of Project (Objectives, Motivations, Approach, Plans and Expected Results)

To investigate the viability of alternative sources of energy for spaces and water heating. Projects are looking at the use of solar energy in a domestic, community and industrial situation. A study is also made of the hydro-electric potential of the streams on Dartmoor.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No 5-102GB-06

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
5-103DE-07

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
System study "Electric Bulk Power Transmission" (ET 4042A)

2. Date *(Form Completed)*
Dec. 31, 1975

3. Performing Organization *(Complete Mailing Address)*
Forschungsgemeinschaft fur Hochspannungs - und Hochstromtechnik e.V.
68 Mannheim-Rheinau
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*
Dipl.-Ing.E.Rumpf
address see 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-517 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
Aug. 26, 1973 - Dec. 31, 1975

7. Estimated Funding and Manpower *(Monies and Manyears)*
847,294. $ US

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Starting from the present state of technology, the possibilities of electric power supply in densely populated areas are to be investigated up to the year 2000 and means for a solution are to be worked out.

Use Box No. 15 if additional space is needed

9. Status and Results

Data available in July 1977

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-103DE-07

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-112US- 08

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

A Snow Melter for a Domestic Water Supply

2. Date *(Form Completed)*

11/24/76

3. Performing Organization *(Complete Mailing Address)*

H.J. Coutts
Mi. 348 Nenana Highway
Nenana, Alaska 99760
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

H.J. Coutts
Mi. 348 Nenana Highway
Nenana, Alaska 99760
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

H.J. Coutts
Mi. 348 Nenana Highway
Nenana, Alask 99760
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

1973 - Continuing

7. Estimated Funding and Manpower *(Monies and Manyears)*

$2,500 1/2 mean year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

OBJ: To supplement a surface water supply for a private residence.

MOT: Capturing surface water was more economical than drilling a well.

APP: Rain water is captured in summer. During winter snow is plowed into a melt tank heated with flue gas from a domestic oil fired furnace.

PLANS: Continued use.

RESULTS: EVALUATION OF ALTERNATES TO DRILLED WELLS IN COLD CLIMATES REGIONS.

Use Box No. 15 if additional space is needed

9. Status and Results

System in use for two years. Designer-operator experience has been reported. System functioned nearly as designed.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☒ potable water

11 Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-112US-08

project location Ester, Alaska USA

degree-days (heating) 15,000

degree-days (cooling) 0

plant load capacity

a. power (MW) — — — — —

b. heating (MW) 100,000 Btu/hr.

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — 60 — —

heat to power ratio (average expected)

energy source

expected payback period

Type and size of user

a. residential (dwelling units)

b. residential (square area-m²) 45

c. commercial (square area-m²)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

None

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS OC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-122NL-09

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Subordinate project, heat pump system
CENTRAAL BEHEER U.A. Insurance Company

2. Date *(Form Completed)*

1/20/77

3. Performing Organization *(Complete Mailing Address)*

Mr. L.B.Bosdijk
c/o CENTRAAL BEHEER U.A.
P.O. Box 700
APELDOORN, The Netherlands

4 Principal Investigator *(Name and Complete Mailing Address)*

Mr. H.G.M.Linthorst
Koningsstraat 36
APELDOORN
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. L.B.Bosdijk
c/o CENTRAAL BEHEER U.A.
P.O.Box 700
APELDOORN, The Netherlands

6. Duration of Investigation *(Beginning and ending)*

NA

7. Estimated Funding and Manpower *(Monies and Manyears)*

$20,000/0.8 manyears during 3 months

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To provide space heat during the period September till May for the office building by:
- recovering the waste heat from the cooling engine of the computer centre by using the exhaust cooling water for preheating of the inlet air for the office building.

Use Box No. 15 if additional space is needed

9. Status and Results

The plant has been in operation since September 1975
Result (1976) are:
- a saving from 400,000 m^3_o gas and 13,000 m^3 water

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-122NL-09

project location — — — — Apeldoorn
degree-days (heating) — 125.6 days*
degree-days (cooling) — —

energy source
expected payback period 2 years

plant load capacity
a. power (MW) — — — — — 65 kW
b. heating (MW) — — — — — 223,250 kcal/h
c. cooling (MW) — — — — — 235,000 kcal/h
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

heat to power ratio (average expected) *Refer to note 2, table 2-9.

14. Other Related Projects *(Titles)*

Note: This is a subordinate project of 2-122NL-11.

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 5-131US-10

PROJECT SUMMARY FORM

1. Title of Project (Official Title): Technical Assessment of Air Pollution Control for SO_x, NO_x, and other Air Emissions at the Baltimore Demonstration Gas Pyrolysis Facility

2. Date (Form Completed): 5/12/77

3. Performing Organization (Complete Mailing Address):
TRW Systems Group
TRW, Inc.
One Space Park
Redondo Beach, California 90278

4. Principal Investigator (Name and Complete Mailing Address):
Tony E. Eggleston
TRW, Inc.
One Space Park
Redondo Beach, California 90278

5. Supporting Organization (Complete Mailing Address and Name of Contact):
Walter W. Liberick, Jr.
U.S. EPA
ORD, IERL
Cincinnati, Ohio 45268

6. Duration of Investigation (Beginning and ending): 4/76 to 1/77

7. Estimated Funding and Manpower (Monies and Manyears): $27,474 FY76

8. Purpose of Project (Objectives, Motivations, Approach, Plans and Expected Results)

Objective: The overall objective of this task is to assess SO_x, NO_x, and other air emissions from Baltimore, Maryland, Demonstration Gas Pyrolysis Facility.

Approach: Contractor will develop the sample plan for all constitutents, collect required samples, perform required analysis, interpret the data and provide a written report of results.

Use Box No. 15 if additional space is needed

9. Status and Results

Contractor has collected samples from the Baltimore Plant, analyzed then, and provided EPA with a draft report of their findings.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-1310S-10

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. *(Secretariat Use Only)*: 5-182BE-11

1. Title of Project *(Official Title)*
Heating of dwellings by heat pump using directly collected-or stored solar energy

2. Date *(Form Completed)*
8/8/77

3. Performing Organization *(Complete Mailing Address)*
LABORELEC
B-1640 St-GENESIUS-RODE
Belgique
Section 8

4. Principal Investigator *(Name and Complete Mailing Address)*
GEERAERT
Chef de la Section 8
Belgique
C.O. cfr 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
C.C.E.
Direction Generale XII
Rue de la Loi 200
B-1049 Bruxelles
Belgique

6. Duration of Investigation *(Beginning and ending)*
2 years - 1/9/77 - 1/9/79

7. Estimated Funding and Manpower *(Monies and Manyears)*
5.7×10^6 BF: 2 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

- heating of individual dwellings with a garden
- combination of solar collectors and heat pump
- medium term storage (1-2 months) of solar energy using the ground as a storage medium
- primary energy savings (6.4% of actual total fuel consumption is the upper limit).

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10 Utility Services
- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11 Type of Project
- ☐ public
- ☒ private
- ☐ cooperative with EEC

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No if EEC agrees with it

13. Technical Data

Identification No. 5-182BE-11

project location — Brussels ≃ 3100 Kd(18.3/18.3)

degree-days (heating) — 2165 Kd (Base 15/15)

degree-days (cooling) — —

energy source

expected payback period

plant load capacity

a. power (MW) — 0.005

b. heating (MW) — 0.010 - 0.015

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units) some 10 m^2

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No (Secretariat Use Only): 5-501SE-12

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Waste Heat Utilization in Forestry

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

1. AB Atomenergic
   Studsvik Research Center
   Sweden
2. Royal College of Forestry
   Sweden

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. Peter Margen
Energy Technology Group
Studsvik Research Center
A.B. Atomenergi
Sweden

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

1. AB Atomenergic
   Studsvik Research Center
   Sweden
2. Royal College of Forestry
   Sweden

6. Duration of Investigation *(Beginning and ending)*

1976

7. Estimated Funding and Manpower *(Monies and Manyears)*

Unknown

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The waste heat (water) generated at the Studsvik Research Center is now being used to heat soil in which tree seedlings have been planted. The experiment is designed to study ways to grow deciduous trees rapidly and inexpensively as a source of commercial lumber and biomass for energy production. The warm water from the station flows in cross-linked plastic pipes a distance of about 2 kilometers. At the experimental plot, the water flows in plastic pipes about 300 mm below the soil's surface. The plastic tubing, tested at Studsvik since 1973, has an estimated life time of 50 years.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

☐ electrical power
☐ space heating
☐ space cooling
☐ potable hot water
☐ wastewater treatment
☐ solid waste processing
☐ potable water

11. Type of Project

☐ public ☐ private
☐ cooperative Unknown

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 5-501SE-12

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 5-502NL-13

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Waste Treatment

2. Date *(Form Completed)*

6/6/77

3. Performing Organization *(Complete Mailing Address)*

Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

F.J.H. van Woerkom
Oostmaaslaan 59-65
Rotterdam, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

6. Duration of Investigation *(Beginning and ending)*

6/76 - 12/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To develop systems for separating and recycling solid as well as liquid industrial waste.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11 Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others?

[x] Unknown
☐ Yes ☐ No

13. Technical Data

Identification No. 5-502NL-13

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No *(Secretariat Use Only)*: 5-531US-14

1. Title of Project *(Official Title)*
Steam Export System at the Chicago Northwest Solid Waste Disposal Plant

2. Date *(Form Completed)*
5/14/77

3. Performing Organization *(Complete Mailing Address)*
City of Chicago
Bureau of Engineering
Department of Public Works
320 N. Clark St., Rm. 300
Chicago, Illinois 60602
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
City of Chicago
Commissioner of Public Works
Commissioner's Office
City Hall, 121 N. LaSalle St.
Chicago, Illinois 60602
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
NA

6. Duration of Investigation *(Beginning and ending)*
2 years for design and construction

7. Estimated Funding and Manpower *(Monies and Manyears)*
$2,000,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
To utilize steam generated at existing Chicago Northwest Incinerator for process steam at an industrial facility adjacent to plant.

Use Box No. 15 if additional space is needed

9. Status and Results
Planning stage.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water
- [x] process steam

11 Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 5-531US-14

project location — 700 North Kilbourn Avenue, Chicago Illinois

degree-days (heating) —

degree-days (cooling) — —

energy source

expected payback period

plant load capacity

a. power (MW) — — — —

x b. heating (MW) — 30 — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — x — — —

e. solid waste processing-kilograms/day — 1,455,000 Kg/D=600 sh. tpd.

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

RESOURCE RECOVERY FERROUS METAL

15. Additional space for Purpose of Project

Energy recovery from existing solid waste incineration plant.

16. Additional space for Status and Results

The Chicago N.W. Incinerator Plant is presently in full operation. The energy at a rate of 440,000 Lbs/Hr steam at 250 psig saturated = 200,000 Kg/H at 1720 kPa saturated is presently condensed in an air cooled condensing system.

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 5-533US-15

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Firing Densified Refuse Derived Fuel In a Stoker Boiler

2. Date *(Form Completed)*: 11/24/76

3. Performing Organization *(Complete Mailing Address)*

Systems Technology Corporation
245 North Valley Road
Xenia, Ohio 45385
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. Greg Rigo
Systems Technology Corporation
245 North Valley Road
Xenia, Ohio 45385
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

U.S. Environmental Protection Agency
Office of Research and Development
26 West St. Clair Street
Cincinnati, Ohil 45268, U.S.A.
ATTN: Carlton C. Wiles

6. Duration of Investigation *(Beginning and ending)*: 6/76 to 6/77

7. Estimated Funding and Manpower *(Monies and Manyears)*: $294,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objective of this program is to demonstrate the use of densified Refuse Derived Fuel (d-RDF) as a coal supplement in stoker equipped boilers and to assess the environmental impact of wide spread implementation of the concept.

The approach will include burning pelletized, cubetted and bricquetted d-RDF and coal in spreader stoker equipped boilers. The coal/d-RDF ratio will be varied to establish the impact of substitution ratio on boiler performance and the environment. After initial testing is complete, a demonstration burn will occur to assess the impact of sustained firing. Each fuel-boiler combination will be approached in a three step sequence: (1) A field trail will establish the processability of the fuel by the boiler and the maximum substitution ratios usable without boiler problems; (2) A field test will quantify environmental, energy and boiler impacts of the fuel system over a range of boiler conditions; (3) A demonstration will be performed.

Use Box No. 15 if additional space is needed

9. Status and Results

Detailed burn tests of 1/2 in. pellets are scheduled to being December 6 at a boiler facility near Hagerstown, Maryland. Equipment installation, boiler modifications, and other arrangements have been completed. Cold and hot flow tests are scheduled for December 1, 2, and 3 to test the system prior to start of detailed tests.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-533US-15

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Preparation of Densified Refuse Derived Fuel for Stoker Boilers

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 5-533US- 16

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Preparation of Densified Refuse Derived Fuel for Stoker Boilers

2. Date *(Form Completed)*: 11/24/76

3. Performing Organization *(Complete Mailing Address)*

National Central for Resource Recovery
1211 Connecticut Avenue, N.W.
Washington, D.C. 20036
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. Harvey Alter
National Central for Resource Recovery
1211 Connecticut Avenue, N.W.
Washington, D.C. 20036
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

U.S. Environmental Protection Agency
Office of Research and Development
26 West St. Clair Street
Cincinnati, Ohio 45268, U.S.A.
ATTN: Carlton C. Wiles

6. Duration of Investigation *(Beginning and ending)*: 9/75 to 9/77

7. Estimated Funding and Manpower *(Monies and Manyears)*: $271,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

DESCRIPTION: This study is investigating the technical and economic aspects of preparing and using densified forms of municipal solid waste (d-RDF) as supplementary fuel in industrial and institutional coal fired stoker boilers. This project will produce the d-RDF for use in combustion studies to determine the environmental and technical aspects of combusting d-RDF (densified refuse derived fuel) with coal. Equipment operational requirements, power requirements, refuse processing, die wear, and similar factors will be determined for production of a specification d-RDF acceptable for storage, transportation and combustion.

Use Box No. 15 if additional space is needed

9. Status and Results

Installation of equipment has been completed. Two dies are available for producing 1/2 in. and 1 in. diameter pellets. Limited quantities of 1/2 in. diameter pellets have been produced during equipment shakedowns and operations are progressing for production runs to provide pellets for the combustion tests.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-533US- 16

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Firing Densified Refuse Derived Fuel in a Stoker Boiler

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-543IE-17

PROJECT SUMMARY FORM

1 Title of Project *(Official Title)*

Biogas plant for pig slurry treatment - Reggio Emilia

2. Date *(Form Completed)*

1/9/77

3. Performing Organization *(Complete Mailing Address)*

Centro Ricerche Produzioni Animali
via Crispi, 3 - 42100 - Reggio Emilia-
ITALIA

4 Principal Investigator *(Name and Complete Mailing Address)*

Dr. Walter Ganapini
Centro Ricerche Produzioni Animali
Via Crispi, 3
42100 Reggio Emilia
ITALIA

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Dr. L. Degen
Snamprogetti
c.p. 15
00015 Monterotondo (ROMA)
ITALIA

6. Duration of Investigation *(Beginning and ending)*

September 1977 - September 1978

7 Estimated Funding and Manpower *(Monies and Manyears)*

$80,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To provide an effective way of pig slurry exploitation before agronomical use.
Motivation: To improve the biogas production from pig slurry; to study its use on farms.
Approach: ---
Expected Results: The production from 4000 pigs, of 380,000 N m^3 CH_4/y.

Use Box No. 15 if additional space is needed

9. Status and Results

The plant will be placed in operation September 1977.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- x slurry heating

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-543IE-17

project location — Gavassa

degree-days (heating) —

degree-days (cooling) — —

energy source

expected payback period

plant load capacity

a. power (MW) — — — — —

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — 32,000 l/d

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec -MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 5-582BE-18

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Rational Use of Energy, Case-study on Greenhouses, development of computer code and design of regulation device

2. Date *(Form Completed)*
7/28/77

3. Performing Organization *(Complete Mailing Address)*
SCK/CEN
Boeretang 200
B-2400 MOL
Belgium

4. Principal Investigator *(Name and Complete Mailing Address)*
G. COCQUYT

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
EEC (proposal submitted)
Wetstraat/rue de la loi 200
B-1040 Brussel/Bruxelles
Belgium

6. Duration of Investigation *(Beginning and ending)*
1/1/78 - 7/1/79

7. Estimated Funding and Manpower *(Monies and Manyears)*
$300,000; 1.5 man/year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

- As a function of meteo data, construct a computer code and a regulation device for optimal energy housekeeping

- SCK/CEN study on greenhouses: extrapolation to other cases

- It is expected to include advanced systems such as solar collectors and heat pumps

Use Box No. 15 if additional space is needed

9. Status and Results
Program submitted to EEC

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data
If EEC agrees with it

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-582BE-18

project location — — — — Not applicable
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Data bank management for air pollution control

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-601DE- 19

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Program Study "Heat Dispersion" (ET 5004)

2. Date *(Form Completed)*

3-15-77

3. Performing Organization *(Complete Mailing Address)*

Battelle-Institut e.V.
Am Romerhof 35
6000 Frankfurt/Main 90
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*

Ing. (grad) F. Gruning
Battelle-Institut e.V.
Am Romerhof 35
6000 Frankfurt/Main 90
Federal Republic of Germany

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Bundesministerium fur Forschung und Technologie
Stresemannstrasse 10
5300 Bonn-Bad Godesberg
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*

8/1/75 to 7/31/76

7. Estimated Funding and Manpower *(Monies and Manyears)*

585500.--DM

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

1. Objective: It is planned to critically analyze existing long distance heat distribution systems in countries possessing highly technical standards. It is further planned to invest how similar problems are solved in other branches of industry, and which of these solutions can be utilized for long distance heat distribution systems.

2. Work Program: The investigation consists of six main points:
   a. Development of a multi-dimensional classification system scheme for the purposeful arrangement of the data to be gathered.
   b. Compilation of international experience of existing long-distance heat dispersion systems and those in the process of being built.
   c. Evaluation of published claims and actual values.
   d. Deduction of development trends for future long distance heat dispersion networks, especially taking into consideration the anticipated costs.
   e. Drafting of proposals for the technology of long distance heat distribution networks to be built and for improvements of those already existing. (cont.)

Use Box No. 15 if additional space is needed

9. Status and Results

The survey has been completed.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-601DE- 19

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Previous Publications

15. Additional space for Purpose of Project

f. Deduction of necessary research topics and programs, and proposals for current regulations.

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 5-601US-20

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Harrisburg Advanced Wastewater Treatment Facility

2. Date *(Form Completed)*

January 21, 1977

3. Performing Organization *(Complete Mailing Address)*

Engineer
Gannett Fleming Corddry and
Carpenter, Inc.
P.O. Box 1963
Harrisburg, Pennsylvania 17105
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Project Engineer
James C. Elliott
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Mr. Louis Einhorn
Public Works Director
City of Harrisburg
423 Walnut Street
Harrisburg, Pennsylvania 17101
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

October 1976 to July 1979

7. Estimated Funding and Manpower *(Monies and Manyears)*

$22,106,000 (construction cost)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Sludge from the City's wastewater treatment process will be dewatered using steam produced by the City's refuse incinerator. The dewatered sludge will then be charged into the incinerator, thereby producing steam and resulting in a practically self-sustaining sludge disposal operation.

Use Box No. 15 if additional space is needed

9. Status and Results

The project is currently under construction.
Expected completion date is July 1979.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ wastewater treatment
- ☐ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☐ potable hot water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data See below

Identification No.
5-601US-20

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

(LP) Harrisburg Refuse Incinerator
(SP) Harrisburg Steam Main

15. Additional space for Purpose of Project

16. Additional Space for Status and Results

13. Technical Data

Wastewater Treatment - 30.9 mgd (maximum)
Sludge to Incinerator - 4,070 pounds/hour
Steam required for dewatering - 20,450 pounds/hour
Steam produced by incinerating sludge - 13,550 pounds/hour

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 5-602NL-21

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Combined cycle power

2. Date *(Form Completed)*
6/6/77

3. Performing Organization *(Complete Mailing Address)*
Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
F.J.H. van Woerkom
Oostmaaslaan 59-65
Rotterdam, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

6. Duration of Investigation *(Beginning and ending)*
7/76 - 12/76

7. Estimated Funding and Manpower *(Monies and Manyears)*
N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To develop a combined cycle power generation system in order to improve overall efficiency.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-602NL-21

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only)

PROJECT SUMMARY FORM

5-631NL-22

1. Title of Project *(Official Title)*

Several projects concerning thermal disposal methods of municipal waste and sewage sludge.

2. Date *(Form Completed)*

6/10/77

3. Performing Organization *(Complete Mailing Address)*

CTI-TNO
Apeldoorn The Netherlands

Technical High Schools
Enschede-Eindhoven The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. B.G. Kreiter/Kr. F. van Veen
Institute for Waste Disposal
P.O. Box 184
Amersfoort
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Institute for Waste Disposal
P.O. Box 184
Amersfoort
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

Continuously

7. Estimated Funding and Manpower *(Monies and Manyears)*

Projects are of evaluating nature

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Evaluating possibilities of incineration, pyrolysis, gasification, fluid-bed incineration of municipal waste, chemical waste and sewage sludge. Research in cooperation with the Dutch Research Institute CTI-TNO, the Technical Highschools and the plants in operation.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-631NL-22

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075
(2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No.
(Secretariat Use Only)
5-631US-23

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Recycle Energy System

2. Date *(Form Completed)*
12/1/76

3. Performing Organization *(Complete Mailing Address)*
City of Akron
166 S. High Street
Akron, Ohio 44308
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
James Alkire, Director
Department of Planning & Urban
166 S. High Street # 401 Renewal
Akron, Ohio 44308
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Department of Planning & Urban
Renewal

6. Duration of Investigation *(Beginning and ending)*
1968 to present

7. Estimated Funding and Manpower *(Monies and Manyears)*
$46,000,000 to present

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
Provide long term solution for solid waste and to provide energy for the Central Business District

Use Box No. 15 if additional space is needed

9. Status and Results
Construction has just started

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data Akron, Ohio

Identification No. 5-631US-23

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — ~~Energy~~ 300,000 lbs/hr steam
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
XX a. residential (dwelling units)
b. residential (square area-m^2)
XX c. commercial (square area-m^2)
XX d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-631US-24

PROJECT SUMMARY FORM

1. Title of Project (Official Title)
Technical and Economic Evaluation of the EPA Resource Recovery Demonstration Facility in San Diego, California

2. Date (Form Completed)
5/12/77

3. Performing Organization (Complete Mailing Address)
Acres American Incorporated
Liberty Bank Building, Main at Court
Buffalo, New York 14202
U.S.A.

4. Principal Investigator (Name and Complete Mailing Address)
Gerald Nugent
Acres American Incorporated
Liberty Bank Building, Main at Court
Buffalo, New York 14202
U.S.A.

5. Supporting Organization (Complete Mailing Address and Name of Contact)
Yvonne Garbe, U.S. EPA Washington,D.C. and Walter W. Liberick Jr.
U.S.EPA
ORD/and IERL, R&D OSWMP
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation (Beginning and ending)
1976 to 1978

7. Estimated Funding and Manpower (Monies and Manyears)
$400,000 FY75

8. Purpose of Project (Objectives, Motivations, Approach, Plans and Expected Results)

1. Objectives - To produce a published report which describes and assesses comprehensively and in detail the environmental, technical, and economic feasibility of the San Diego County resource recovery plant which includes a 200-ton per day Occidental Research Corporation pyrolysis process, plus steel, aluminum and glass recovery systems.

2. Approach - The contractor shall conduct a 12-month sampling program at the San Diego County plant beginning in mid-1977 for the purpose of collecting process information to facilitate the subsequent technical, environmental, and economic assessment of the Occidental Research Corporation pyrolysis and material recovery processes. The contractor shall have full access to the San Diego County plant and to related Occidental Research Corporation proprietary information for the conduct of the assessments.

3. Current Plans - (a) Develop Evaluation Plan - 3 months
(b) Data collection on-site at San Diego County Facility - 12 months
(c) Analyses of Data including technical evaluation, economic evaluation and supplemental evaluation - 6 months

Use Box No. 15 if additional space is needed

9. Status and Results

Plan (a) above has been completed and the on-site data collection is about to begin.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-631US- 24

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-631US-25

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Environmental Assessment of Waste-to-Energy Processes

2. Date *(Form Completed)*

5/12/77

3. Performing Organization *(Complete Mailing Address)*

Midwest Research Institute
425 Volker Boulevard
Kansas City, Missouri 64110
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

M.P.Schrag
Midwest Research Institute
425 Volker Boulevard
Kansas City, Missouri 64110
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

H.M.Freeman
U.S.EPA
ORD, IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

8/76 to 7/79

7. Estimated Funding and Manpower *(Monies and Manyears)*

$400,000 FY75
717,000 FY76
330,000 FY77

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objective of this project is to characterize the liquid, gaseous, and solid emissions from various waste-to-energy systems. The characterization will be based on actual data obtained from on-site sampling operations. The first report from this project will be distributed in July 1977. This is a three year project.

Use Box No. 15 if additional space is needed

9. Status and Results

A Work Plan has been generated, as has a draft, preliminary Source Assessment Document. One site has been tested and negotiations are underway to environmentally test several other waste-as-fuel facilities.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-631US-25

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-631US- 26

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Air Pollution Control Technology Development for Waste-as Fuel Processes

2. Date *(Form Completed)*
5/12/77

3. Performing Organization *(Complete Mailing Address)*
Pedco Environmental, Inc.
11499 Chester Rd.
Cincinnati, Ohio 45246
U.S.A.

4 Principal Investigator *(Name and Complete Mailing Address)*
Timothy W. Devitt
Pedco Environmental, Inc.
11499 Chester Rd.
Cincinnati, Ohio 45246
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Robert A. Olexsey
U.S.EPA
ORD, IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
2/77 to 2/79

7. Estimated Funding and Manpower *(Monies and Manyears)*
$688,500 FY76

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
The objective of this project is to develop techniques for controlling air emissions from wastes-to-energy systems. Inputs to the effort will come from an ongoing project on pollutant characterization, literature, and testing from pilot and full scale waste-to-fuel facilities. For this project, the contractor will survey emissions from active facilities, will analyze potential control technologies and then will design and fabricate slipstream (3000 cfm) pilot plant air pollution control units. The pilot plant units will be installed at 2 to 4 existing waste-as-fuel facilities. Data obtained on the effectiveness of such devices as high energy scrubbers, electrostatic precipitators and bag filters will aid engineers in design of future facilities and in correcting problems at existing plants.

Use Box No. 15 if additional space is needed

9. Status and Results
A work plan has beey generated by the contractor and work on Phase 1 and 2 of the program has begun.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
☐ electrical power
☐ space heating
☐ space cooling
☐ potable hot water
☐ wastewater treatment
☒ solid waste processing
☐ potable water

11. Type of Project
☒ public ☐ private
☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. S-631US-26

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec -MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-631US-27

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Conversion of Solid Waste to Polymer Gasoline

2. Date *(Form Completed)*

5/12/77

3. Performing Organization *(Complete Mailing Address)*

Naval Weapon Center
China Lake, California 93555
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Charles B. Benhem, James P.Diebold
Naval Weapon Center
China Lake, California 93555
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Walter W. Liberick, Jr.
U.S.EPA
ORD, IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

6/75 to 6/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$100,000 FY75
135,000 FY76
110,500 FY77

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To determine the feasibility,both technical and economic, of pyrolyzing the organic fraction of municipal solid waste to sufficient quantity of hydrocarbon gases (ethylene, ethane, etc.) to produce chemical intermediates. Phase I of subsequent studies are directed towards the polymerization of hydrocarbon fraction to liquid fuel (polymer gasoline) suitable for internal combustion engine operation.

Approach: 1. An existing pyrolysis unit will be operated under various conditions to maximize the production of unsaturated hydrocarbons.

2. A polymerization unit will be designed, fabricated and added to the pyrolysis unit.

3. Data will be obtained over a wide variety of conditions using the combined pyrolysis and polymerization units. Compositional analysis of pyrolysis and polymarization products will be performed for each test condition.

4. Preliminary design of a scaled-up pilot plant will be developed.

Use Box No. 15 if additional space is needed

9. Status and Results

Studies have been conducted with the pyrolysis unit to optimize the unsaturated hydrocarbons in the off-gases. Separate studies have been made on a gas cleaning system and a thermal polymerization unit. Polymer gasoline has been produced from the polymerization unit using a combination of bottle gases simulating the gas mixture from the pyrolysis unit.

Future tests involve using gases from the pyrolysis unit in the gas cleaning system and the polymerization unit and again optimize operating parameters.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

☐ electrical power
☐ space heating
☐ space cooling
☐ potable hot water
☐ wastewater treatment
☒ solid waste processing
☐ potable water

11 Type of Project

☒ public ☐ private
☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No
5-631US-27

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-631US- 28

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Pilot Scale Pyrolytic Conversion of Mixed Waste to Fuel

2. Date *(Form Completed)*

5/12/77

3. Performing Organization *(Complete Mailing Address)*

Energy Resources Co. , Inc.
185 Alewife Brook Parkway
Cambridge, MA 02138
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. John Howard, Mr. Richard H.Stephens
Energy Resources Co., Inc.
185 Alewife Brook Parkway
Cambridge, MA 02138
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Walter W. Liberick, Jr.
U.S.EPA
ORD, IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

7/75 to 12/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$300,000 FY75
265,000 FY76
100,000 FY77

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objectives: To develop models relating fraction of fuel products (gas, liquid, solid) produced in pyrolysis of various types of solid wastes as function of pyrolyzed conditions. Solid wastes include mixed municipal, agricultural, and industrial wastes. An investigation of chemical conversions including steam gasification, partial oxidation, and catalytic effects of bed materials, as well as detailed analysis and characterization of pyrolysis products including char and oil will be conducted.

Approach: Experimental study using small batch pyrolyzer and pilot size (200 kg/hr) fluidized bed pyrolyzer to produce data for model development and verification. Statistical and semi-empirical models will be examined for the normal fluidized bed pyrolytic reaction as well as for steam gasification and partial oxidation. Several char and oil samples will be analyzed in detail to evaluate the acceptability of fuel products.

Use Box No. 15 if additional space is needed

9. Status and Results

Fabrication of the test units is completed. Test runs are under way to accumulate data for model verification.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-631US- 28

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
5-633US-29

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

PUROX System

2. Date *(Form Completed)*

2/4/77

3. Performing Organization *(Complete Mailing Address)*

Union Carbide Corporation
Linde Division
270 Park Avenue, 8th Floor
New York, NY 10017
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Mr. R.S. Paul
Union Carbide Corporation
Linde Division
270 Park Avenue, 8th Floor
New York, NY 10017
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

The entire project to date has been funded by the Union Carbide Corp. Forthcoming tests on municipal sludges will be funded in part by the USEPA.

6. Duration of Investigation *(Beginning and ending)*

1970 to present

7. Estimated Funding and Manpower *(Monies and Manyears)*

In excess of $10,000,000
In excess of 150 my

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The Union Carbide PUROX system is a process for the high temperature combustion and pyrolysis of all types of solid waste to produce a compact, inert residue and useful fuel within the constraints of national and local air and water emission standards. In addition it provides for the separation and recovery of valuable resources contained in refuse.

Use Box No. 15 if additional space is needed

9. Status and Results

The project has progressed to a 200 ton/day demonstration plant in South Charleston, W.Va. that has successfully processed municipal refuse from the city of Charleston, W.Va. and surrounding communities as well as assorted commercial solid waste.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-633US-29

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-OC

NBS-1075
(2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No.
(Secretariat Use Only)
5-633US-30

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

City of Franklin Solid Waste Disposal and Resource Recovery Facility

2. Date *(Form Completed)*

February 1, 1977

3. Performing Organization *(Complete Mailing Address)*

City of Franklin
City of Building
Franklin, Ohio 45005
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Bernard F. Eichholz, City Manager
City Building
Franklin, Ohio 45005
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Paul Marsh
Black Clawson Co.
605 Clark Street
Middletown, Ohio
U.S.A.

6 Duration of Investigation *(Beginning and ending)*

7. Estimated Funding and Manpower *(Monies and Manyears)*

$3,000,000 - 3 years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To inoffensively to the environment dispose of solid waste material, after reclaiming for refuse, glass, metals and paper fibers. Has been successfully operating since May 15, 1971.

Use Box No. 15 if additional space is needed

9. Status and Results

Much larger copies are being built in Hempstead, N.Y. and Dade County, Florida.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11 Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-633US- 30

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-633US- 31

PROJECT SUMMARY FORM

1 Title of Project *(Official Title)*
Palmer Solid Waste Resource Recovery Project

2. Date *(Form Completed)*
December 7, 1976

3. Performing Organization *(Complete Mailing Address)*
Pa. D.E.R.
Div. of Solid Waste Management
Fulton Building
Harrisburg, Pa. 17120
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
Mr. William Bucciarelli

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Board of Supervisors
H.Robert Daws, Chairman
Township of Palmer
3245 Freemansburg Ave.
P.O. Easton, Pa. 18042
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
2 years - following construction

7. Estimated Funding and Manpower *(Monies and Manyears)*
$4M, 15 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To demonstrate the economic and technical feasibility of an inter-municipal solid waste-resource recovery generation plant, and the use of 70 plus per cent of the waste as a supplemental fuel for use with coal in the manufacture of cement.

Use Box No. 15 if additional space is needed

9. Status and Results

Funding incomplete, construction phase pending.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-633US- 31

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-661US-32

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Evaluation of Ames' Waste Process - An Energy Recovery System

2. Date *(Form Completed)*
5/12/77

3. Performing Organization *(Complete Mailing Address)*
1. City of Ames, Iowa 50010
2. Midwest Research Institute] Subcontractors
3. Iowa State University]

4. Principal Investigator *(Name and Complete Mailing Address)*
A.O.Chantland, Project Mgr. Public Works Div. (Ames)
Dr. L.J.Shannon, Midwest Research Institute
Dr. A.W.Joensen, Iowa State University
Dr. E.R.Bauman, Director, ERI, Iowa State University

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
C. Wiles, R. Olexsey
U.S.EPA
ORD, MERL/IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

7. Estimated Funding and Manpower *(Monies and Manyears)*
$390,000 FY75
$ 74,000 FY76
$470,000 FY77

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
The study will assess the effects of using municipal solid waste (MSW) as a supplementary fuel. Co-firing of MSW with coal in stoker and tangentially-fired boilers will be conducted and since one boiler is the same type as at St. Louis, studies will permit confirmation, and comparison of selected St. Louis results. Assessments will be made of the technical and environmental aspects of these co-firing techniques. In addition, technical and economic tests and evaluations will be conducted on the second generation MSW processing facility associated with supplying the refuse derived fuel.

Use Box No. 15 if additional space is needed

9. Status and Results
A full year of operation, complete with detailed data taking has been accomplished. A draft annual report has been provided to EPA on the results of these experiments.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
☐ electrical power
☐ space heating
☐ space cooling
☐ potable hot water
☐ wastewater treatment
☒ solid waste processing
☐ potable water

11. Type of Project
☒ public ☐ private
☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-661US- 32

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No (Secretariat Use Only): 5-661US- 33

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Preparation, Use and Cost of d-RDF as a Supplementary Fuel in Stoker Fired Boilers

2. Date *(Form Completed)*

5/12/77

3. Performing Organization *(Complete Mailing Address)*

National Center for Resource Recovery, Inc
1211 Connecticut Avenue NW
Washington, D. C. 20036
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. Harvey Alter, Mr. Stu Natof
National Center for Resource Recovery, Inc.
1211 Connecticut Avenue NW
Washington, D. C.20036 , U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

C.Wiles
R.Olexsey
U.S.EPA
ORD, MERL/IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

9/75 to 8/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$270,464 FY75

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

This Research Grant involves the study of the technical and economic aspects of preparing and using densified forms of municipal solid waste as a supplementary fuel in industrial and institutional stoker coal-fired boilers. Investigations will be conducted to establish methodology for preparing densified refuse derived fuel (d-RDF). Process and product characterizations will be developed to enable establishment of specifications for d-RDF. Densification forms will include pellets, briquettes, and cubettes. Independent boiler burn tests and operations will be conducted in conjunction with this research to fully characterize the concept.

Use Box No. 15 if additional space is needed

9. Status and Results

Densified forms of solid waste have been produced in quantity. Combustion and environmental tests of the d-RDF have been accomplished by the Systems Technology Corporation at the Hagerstown Correctional Institute under contract to the EPA.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11 Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-661US-33

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 5-661US-34

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Effects of Burning Densified Forms of Municipal Solid Wastes Derived Fuels in Industrial, Utility and Institutional Stocker-Fired Boilers

2. Date *(Form Completed)*
5/12/77

3. Performing Organization *(Complete Mailing Address)*
Systems Technology Corporation
245 North Valley Road
Xenia, Ohio 45385
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
Melvin C. Eifert & H. Bregor Rigo
Systems Technology Corporation
245 N. Valley Rd.
Xemia, Ohio 45385
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
C.Wiles, R.Olexsey
U.S.EPA
ORD, MERL/IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
6/76 to 9/77

7. Estimated Funding and Manpower *(Monies and Manyears)*
$293,468 FY76
$119,000 FY77

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
The objective of this program is to demonstrate the use of densified Refuse Derived Fuel (d-RDF) as a coal supplement in stoker-equipped boilers and to assess the environmental impact of widespread implementation of the concept.
The questions are to be answered by burning pelletized, cubetted and briquetted d-RDF and coal in spreader stoker-equipped boilers. The coal d-RDF ratio will be varied to establish the impact of substitution ratio on boiler performance and the environment. After initial testing is complete, a demonstration burn will occur to assess the impact of sustained firing. Each fuel-boiler combination will be approached in a three step sequence: (1) a field trial will establish the processability of the fuel by the boiler and the maximum substitution ratios usable without boiler problems; (2) a field test will quantify environmental, energy and boiler impacts of the fuel system over a range of boiler conditions; (3) a demonstration will be performed. The program schedule calls for initiation of testing in September 1976 and completion in July 1977 with the draft report complete in October 1977.

Use Box No. 15 if additional space is needed

9. Status and Results
Several field tests have been accomplished utilizing a stoker boiler at the Hagerstown Correctional Institute; additional testing will be accomplished.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
☐ electrical power ☐ wastewater treatment
☐ space heating ☒ solid waste processing
☐ space cooling ☐ potable water
☐ potable hot water

11. Type of Project
☒ public ☐ private
☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 5-661US-34

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 5-661US-35

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Wood Waste as a Power Plant Fuel in the Ozarks

2. Date *(Form Completed)*

5/12/77

3. Performing Organization *(Complete Mailing Address)*

University of Missouri - Rolla
Rolla, Missouri 65401
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Virgil J.Flanigan, Assoc. Prof. of Mech. Eng. Dept. of Mech. and Aerospace Engr.
University of Missouri - Rolla
Rolla, Missouri 65401
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

H.M.Freeman
U.S.EPA
ORD, IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

10/76 to 9/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$50,000 FY76

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

It is proposed that part of the large reserves and part of the production of oak wood waste in the Ozark region be used as a boiler fuel. The waste is to be blended with coal to take advantage of existing furnace design. The blend is to be optimized for stack conditions, ash content, amount of fuel, boiler efficiency, and economics.

The objectives of the project are to assist the wood products industry with its problems in using and disposing of wood waste and to examine the environmental consequences of co-firing wood waste with coal.

Use Box No. 15 if additional space is needed

9. Status and Results

Tests are underway. Separate environmental testing was accomplished by the Midwest Research Institute (under contract to the EPA) during the first quarter of 1977.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11 Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-661US-35

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-OC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No (Secretariat Use Only) 5-731US-36

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Salvage Fuel Boiler Plant

2. Date *(Form Completed)*

Feb. 7, 1977

3. Performing Organization *(Complete Mailing Address)*

Navy Public Works Center
Norfolk, Virginia 23511
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

N/A

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Naval Facilities Engineering Command
Alexandria, Virginia 22332
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

N/A

7. Estimated Funding and Manpower *(Monies and Manyears)*

$2,220,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

After a thorough analysis of the quantity and nature of the refuse produced by ships and activities in the complex, construction of a combination refuse incinerator and boiler plant was proposed to accommodate future disposal requirements and also, to provide for projected requirements for additional steam generating capacity on the station. A plant consisting of two (2) 180-ton per day incinerator furnaces, each with waterwalls and steam boiler capable of producing 50,000 pounds of steam per hour was built.

Use Box No. 15 if additional space is needed

9. Status and Results

Steam production averages about 35,000 pounds per hour and is used to supplement other primary sources on the station. Presently, a constant steam supply from this plant is not absolutely necessary and the operation is primarily oriented to the incineration of available refuse while producing as much steam as possible. The normal operating schedule is 5 days per week, 24 hours per day, with one unit in service.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water
- X Steam

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-731US-36

project location Norfolk, Virginia

degree-days (heating) —

degree-days (cooling) — —

energy source Solid Waste - Residual Fuel Oil

expected payback period

plant load capacity

a. power (MW) — — — — —

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

See Enclosure

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS OC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-801US- 37

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Instrumentation of Sewage Sludge Processing Operations Including Anaerobic Digestion & Vacuum Filtration

2. Date *(Form Completed)*
11/23/76

3. Performing Organization *(Complete Mailing Address)*
Metropolitan Waste Control Commission
350 Metro Square Bldg.
St. Paul, MN 55101
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
Dr. Robert Polta
Metropolitan Waste Control Commission
350 Metro Square Bldg.
St. Paul, MN 55101
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
N/A

6. Duration of Investigation *(Beginning and ending)*
5/12/75 - 5/11/80

7. Estimated Funding and Manpower *(Monies and Manyears)*
$500,000 and 8 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
The initial work is being done on automation of the sludge thickening, sludge conditioning, vacuum filtration, incineration and anaerobic digestion processes. The automation of sludge thickening is now being demonstrated. Key parameters for automating the sludge conditioning, vacuum filtration and incineration of processes are to be studied by February 1977 with the intent of demonstrating the automation of these processes. A mathematical model for the anaerobic digester has been completed for the purpose of evaluating control strategies. Successful control strategies will then be piloted and demonstrated. It is anticipated that automation of these sludge handling process will improve process reliability, reduce operating costs and conserve energy. For example, substantial energy will be saved by providing a consistent low moisture sludge feed to the incinerator.

Use Box No. 15 if additional space is needed

9. Status and Results
The project is now ongoing. A report has been drafted describing the instrumentation at the Metro plant. The report includes problem areas and recommend solutions. Equipment has been ordered and installed for the demonstration of sludge thickening. Specifications are now being drawn for the equipment for the automation and monitoring of sludge conditioning, vacuum filtration and incineration. This equipment should be installed by Jan. 1977 after which time a monitoring program will be initiated to determined key parameters and their effect on the process.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-801US-37

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 5-802GB-38

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Effect of Load and Flow Variability on Sewage Works Performance (975)

2. Date *(Form Completed)*: 3/15/77

3. Performing Organization *(Complete Mailing Address)*

Southampton University
Department of Civil Engineering
Institute of Sound and Vibration Research
Southampton, Hampshire SO95NH
England

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. P.R. Hellizwell
R.J.R. Reed
S.R. Kothair
Southampton University
Department of Civil Engineering

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Science Research Council

6. Duration of Investigation *(Beginning and ending)*: 2/75 to 7/77

7. Estimated Funding and Manpower *(Monies and Manyears)*: 50,800

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The effect of balancing the organic load of urban foul sewage on treatment plant performance will be examined in a pilot plant treating 50 m^3/day. An on-line quality monitor and a magnetic flow meter will provide input signals to a control system system which will regulate flow to and from a stirred balance tank. Otherwise the treatment will be conventional, using diffused air activated sludge.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 5-802GB- 38

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. *(Secretariat Use Only)*
5-802US- 39

1. Title of Project *(Official Title)*
Investigate Heat Treatment of Sludge & Processing of Supernatant to Reduce BOD & COD

2. Date *(Form Completed)*
11/22/76

3. Performing Organization *(Complete Mailing Address)*

Hydroscience Assocs., Inc.
363 Old Hook Road
Westwood, N.J. 07675
U.S.A.

4 Principal Investigator *(Name and Complete Mailing Address)*

Stanley C. Kmietz
Hydroscience Assocs., Inc.
363 Old Hook Road
Westwood, N.J. 07675
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Vincent Salotto
U.S. EPA MERL, Ultimate Disp. Sec.
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
9/76 to 8/78

7. Estimated Funding and Manpower *(Monies and Manyears)*
$197,000 2 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To demonstrate that the anaerobic filter process is an efficient and technically viable method for treating heat conditioned sludge liquor.

Use Box No. 15 if additional space is needed

9. Status and Results

The pilot scale work is now beginning.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ wastewater treatment
- ☐ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☐ potable hot water

11 Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☒ No

13. Technical Data

Identification No. 5-802US-39

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-821DE- 40

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Fuel conservation in (conventional) hot water heating systems by gas-operated heat pumps (ET5164A thru ET5167A)

2. Date *(Form Completed)*

June 30, 1978

3. Performing Organization *(Complete Mailing Address)*

Ruhrgas AG, 4270 Dorsten
AUDI-NSU AG, F.-Wankel-Str.,
7107 Nec Karsulm
H-NordhoffstraBe, 3180 Wolfsburg
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*

Mr. Rostek, Ruhrgas AG
Dr. Wilmers, AUDI-NSU
Mr. Pohle, VW AG
Federal Republic of Germany

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-5170 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*

Jan. 2, 1975 - June 30, 1978

7. Estimated Funding and Manpower *(Monies and Manyears)*

3,811,538.-$ US

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The energy consumption of hot water heating systems is to be reduced by 50% by the use of gas-operated heat pumps.

The prime movers of the compressors will be mass-progines converted to gas operation. In addition, compact units are to be developed from the above-mentioned car engines; the compact units will perform both the prime mover and the compressor functions. On the basis of these drive units, gas-fuelled heat pump systems suitable for the recoverey of heat from the atmosphere will be designed and constructed.

Use Box No. 15 if additional space is needed

9. Status and Results

The results of the tests of the first pilot gas-fueled heat pump system consisting of commercial components were consistent with the theoretical computed data values. The tests are being continued. Modifications to increase the life of natural gas-fueled rotary and reciprocating car engines were successful. The test results, so far, show that the preliminary targets of 10,000 full-load operating hours at a speed of 3,000 min under natural gas operation can be reached.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-821DE-40

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a power (MW) — — — — —
- b heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-OC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only)

PROJECT SUMMARY FORM

5-82.41DE-41

1. Title of Project *(Official Title)*

Gasification of municipal and industrial waste

2. Date *(Form Completed)*

Dec. 31, 1977

3. Performing Organization *(Complete Mailing Address)*

Saarberg-Fernwarme GmbH
Postfach 238
D-66 Saarbrucken
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. Huck
address see 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-517 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*

May 23, 1974 - Dec. 31, 1977

7. Estimated Funding and Manpower *(Monies and Manyears)*

245,745.-$US

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

A process for conversion of municipal and industrial waste into a heating gas with a high BTU value without increase of pollution will be developed to the commercial stage. The waste material wiil be gasified by means of partial oxidation. The resulting gas is purified of harmful components after removal of heavier fractions by means of condensation.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-82.41DE- 41

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-831US-42

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Conceptual Design & Cost Estimation for Heating an Anaerobic Digester by Solar Energy

2. Date *(Form Completed)*

11/23/76

3. Performing Organization *(Complete Mailing Address)*

Environmental System, Inc.
150 South Street
Annapolis, MD 21401
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Jess W. Malcolm
Environmental Systems, Inc.
150 South Street
Annapolis, MD 21401
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

R.V. Villiers
U.S. EPA, MERL, WRD
Cincinnati, OH 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

11/75 to 8/76

7. Estimated Funding and Manpower *(Monies and Manyears)*

$30,000 1 man year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Feasibility study of the concept of heating an anaerobic digester by means of low energy solar energy so that the methane gas produced during anaerobic digestion of sludge can be used for a high energy application. Study will consist of detailing specifications for the equipment required for the solar energy system and of preparing a research plan for demonstrating the advantages of using solar energy as compared to methods presently used.

Use Box No. 15 if additional space is needed

9. Status and Results

Results of the study show that it is technologically and economically feasible to heat an anerobic digester with solar energy. Information is presented which shows that for maintaining a digester in the temperature range of 32°-38°C year around for weather condition similar to those at Annapolis, Maryland, the lowest cost method of heating the digester is to supply about 90 percent of the annual heat load with solar energy. The study also details specifications for a complete solar energy system for heating an anaerobic digester.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ wastewater treatment
- ☐ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☐ potable hot water

11 Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-831US- 42

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-OC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 5-831US-43

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Evaluate Cost of Heat Treatment of Sludge Including Cost of Treating Side Streams

2. Date *(Form Completed)*

5/12/76

3. Performing Organization *(Complete Mailing Address)*

Culp-Wesner-Culp
P.O. Box 40
El Dorado Hills, California 95630
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Gordon Culp
Culp-Wesner-Culp, P.O. Box 40
El Dorado Hills, California 95630
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

R.V. Villiers
U.S. EPA, MERL, WRD
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

8/75 to 7/76

7. Estimated Funding and Manpower *(Monies and Manyears)*

$50,000 1 man year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objective of this research is to determine the total costs of thermal conditioning of sludge. The study will include the impact of handling and diposing of the liquid process streams from the heat treatment of sludge on treatment plant costs.

Use Box No. 15 if additional space is needed

9. Status and Results

Results of the study give a general review of heat treatment processes and identify the various process side streams and present methods of dealing with them. Actual operating history of 28 heat treatment plants is given and the experience of these plants collectively is summarized. Based principally on actual cost information, all costs including those associated with the handling and treating of side streams are developed for heat treatment plants of various capacities. Summary report has been published. Final report is in preparation.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 5-831US-43

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only)

PROJECT SUMMARY FORM

5-831US-44

1. Title of Project *(Official Title)*

Evaluation of Waste-to-Energy Processes

2. Date *(Form Completed)*

5/12/77

3. Performing Organization *(Complete Mailing Address)*

Ralph M. Parsons Company
100 W. Walnut Street
Pasadena, California 91124
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

E.M.Wilson
Ralph M. Parsons Company
100 W. Walnut Street
Pasadena, California 91124
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

H.M.Freeman
U.S.EPA
ORD, IERL
Cincinnati, Ohio 45268
U.S.A.

6. Duration of Investigation *(Beginning and ending)*

6/75 to 2/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$225,000 FY75
44,640 FY76
54,000 FY77

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objective of this project is to provide an objective third-party engineering evaluation of emerging waste-to-energy processes. The evaluation is to include cost figures and potential technical problems for the most prominent of the current and developing processes. A final report from this work will be available during the third quarter of 1977

Use Box No. 15 if additional space is needed

9. Status and Results

The work is completed and the draft final report is currently being revised. The final report will be available in late 1977.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-831US- 44

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. *(Secretariat Use Only)*: 5-831NL- 45

1. Title of Project *(Official Title)*

Several projects concerning recycling and reuse.

2. Date *(Form Completed)*

7/13/77

3. Performing Organization *(Complete Mailing Address)*

N/A

4 Principal Investigator *(Name and Complete Mailing Address)*

Ir. B.G. Kreiter
Institute for Waste Disposal
P.O. Box 184
Amersfoort
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Institute for Waste Disposal
P.O. Box 184
Amersfoort
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

Continuously

7. Estimated Funding and Manpower *(Monies and Manyears)*

Projects are of evaluating nature

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Supporting several projects like:

recycling of paper
recycling of scrap
use of waste components for brick manufacturing
separate collection of waste glass
etc.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 5-831NL - 45

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) — U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. (Secretariat Use Only): 5-832BE- 46

1. Title of Project *(Official Title)*
Miscellaneous SCK/CEN activities related to MIUS

2. Date *(Form Completed)*
7/29/77

3. Performing Organization *(Complete Mailing Address)*

SCK/CEN
Boeretang 200
B-2400 MOL
Belgium

4. Principal Investigator *(Name and Complete Mailing Address)*

G. SPAEPEN
W. GOOSSENS

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Several

6. Duration of Investigation *(Beginning and ending)*
1976-1980

7. Estimated Funding and Manpower *(Monies and Manyears)*
$3 M
Man year: not yet determined

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objectives: use of residual heat
Topical: A - refuse incinerator heat, preparation of drinking water
B - development of high-performance fluid bed heat exchanger for utility services

Approach and Plans:
A - evaluation and analysis
B - experimental (scale 500 kW)

Use Box No. 15 if additional space is needed

9. Status and Results

A is in progress
B is planned

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No.
5-832BE-46

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — 500,000kg/day
e. solid waste processing-kilograms/day
f. potable water-liters/day to be determined
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m²)
c. commercial (square area-m²)
d industrial (thermal + elec.-MW)

B/NOT YET DETERMINED

14 Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

SECTION 6 COMPONENT/EQUIPMENT

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 6-002GB-01

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Energy Conservation via the CN Heat Generator (891)

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

CURWEN and Newbury LTD
Westcraft Works, Alfred St. Wesbury, Wilts
BA13 3DZ
England

4 Principal Investigator *(Name and Complete Mailing Address)*

George Applegate
David Applegate
Westcraft Works, Alfred St., Wesbury, Wilts
BA13 3DZ
England

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

CURWEN and Newbury LTD
Westcraft Works, Alfred St. Wesbury, Wilts
BA13 3DZ
England

6. Duration of Investigation *(Beginning and ending)*

Present (1976)

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To develop and test CN heat generator and other heat recovery and energy conservation equipment.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 6-002GB-01

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 6-002GB-02

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Total Heat Systems - Stirling Engine and other Prime Movers for use as Heat Pumps and Circulators (925)

2. Date *(Form Completed)* 3/15/77

3. Performing Organization *(Complete Mailing Address)*

Reading University
Department of Engineering and Cybernetics
Whitenights, Reading, Berks RG6 2BU
England

4. Principal Investigator *(Name and Complete Mailing Address)*

P.D. Dunn
G. Rice
Reading University
Department of Engineering and Cybernetics
Whitenights, Reading, Berks RG6 2BU
England

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Science Research Council

6. Duration of Investigation *(Beginning and ending)*

5/70 to 4/75

7. Estimated Funding and Manpower *(Monies and Manyears)*

13,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The Stirling engine programme covers all aspects of Stirling engine design and development. Particular features include the development of fluidized bed heat source; the use of heat pipe for heat transmission, and the development of a number of new engine geometric.

In addition, consideration is given to the application of the Stirling engine cycle to buildings.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No.
6-002GB-02

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 6-002GB-03

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Utilization of Low Grade Heat Energy (936)

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

South Bank Polytechnic
Faculty of Environmental Science and Technology
Borough Road, London, SE10AA
England

4. Principal Investigator *(Name and Complete Mailing Address)*

R.C.Blood
Dr. D.R. Scott
Dr. S.N. Salvja
R.W.James
South Bank Polytechnic
Faculty of Environmental Science and Technology

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

South Bank Polytechnic
Faculty of Environmental Science and Technology
Borough Road, London, SE10AA, England

6. Duration of Investigation *(Beginning and ending)*

NA

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To study the performance of a heat pump using the subsurface soil as a source. The nature of the sub-soil varies with location and this affects the performance of the pump. Methods are being evolved for measuring significant properties. An electrical analogue will be used to simulate the heat pump system and to determine optimum values of the design parameters. The optimum heat pump system appropriate to a particular location will be constructed and its performance studied under year round conditions.

Use Box No 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No 16 if additional space is needed

10. Utility Services

☐ electrical power
☐ space heating
☐ space cooling
☐ potable hot water
☐ wastewater treatment
☐ solid waste processing
☐ potable water

11. Type of Project

☐ public ☐ private
☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No.
6-002GB-03

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 6-101GB-04

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Heat Pumps (885)

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

Building Research Establishment
Bucknells Lane
Garston, Watford Herts WD2-7JR
England

4. Principal Investigator *(Name and Complete Mailing Address)*

K. Seymour- Walker
Building Research Establishment
Bucknells Lane
Garston, Watford Herts WD2-7JR
England

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Building Research Establishment
Bucknells Lane
Garston, Watford Herts WD2-7JR
England

6. Duration of Investigation *(Beginning and ending)*

Present (1976)

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The evaluation and development of heat pump systems, for existing buildings and future designs.

Particular attention will be paid to heat pumps for individual houses.

Several commerically available machnies will be studied experimentally. Studies of less conventional machines, and boosting techniques, will be made and some experimental units developed. The consequences for building design will be examined, both for simple heat pumps and for machines forming parts of complete building environment systems.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No.
6-101GB-04

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 6-101US-05

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Solar Heat System for Indoor Swimming Facility

2. Date *(Form Completed)*
February 14, 1977

3. Performing Organization *(Complete Mailing Address)*
Bureau of Bridges and Public Buildings
City of Milwaukee
Room 311 Municipal Building
841 North Broadway
Milwaukee, Wisconsin 53202
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
Mr. Henry J. Balconi, Superintendent
Bureau of Bridges and Public Buildings
Room 311 Municipal Building
841 North Broadway
Milwaukee, Wisconsin 53202
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Application to be submitted to ERDA for financial support of the solar heat system.

6. Duration of Investigation *(Beginning and ending)*
(Apply & receive February, 1977 - June, 1977 ERDA Grant)

7. Estimated Funding and Manpower *(Monies and Manyears)*
Solar Heat System - $250,000.00
Indoor Swimming Facility $1,475,000.00

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
Due to the scaricity and high cost of existing energy sources, we are exploring the possibility of using solar energy for heating purposes on our proposed indoor Swimming Facility. An application will be submitted to the Federal Energy Research Development Administration for a grant to fund the additional cost of incorporating a solar heat system to our proposed Indoor Swimming facility. The purpose of the grant will be two fold: 1) Reduce energy requirement from existing energy sources and 2) to develop technical data for the advancement of solar energy. Expected energy savings would be approximately $7,500.00 per year based on today's energy costs.

Use Box No. 15 if additional space is needed

9. Status and Results
Contracts have been awarded to construct the Swimming facility. Construction is expected to begin March 7, 1977. The initial design of the facility has incorporated those structural elements necessary to accommodate the future installation of a solar heating system.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☒ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No.
6-101US-05

project location — — — — Milwaukee
degree-days (heating) — 7,635
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
a. power (MW) — 125 KW
b. heating (MW) — ~~2700 MBH~~
c. cooling (MW) — ~~Not applicable~~ Not applicable
d. wastewater treatment-liters/day — — — — Not applicable
e. solid waste processing-kilograms/day — Not applicable
f. potable water-liters/day — — — — — — — — 50,000
heat to power ratio (average expected) 19

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)
e. recreational - 22,000 $ft.^2$

14. Other Related Projects *(Titles)*

None

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 6-102GB-06

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Applications of Heat Pumps, Heat Pipes and Similar Devices for Heat Recovery and Energy Conservation (908)

2. Date *(Form Completed)*: 3/15/77

3. Performing Organization *(Complete Mailing Address)*

International Research and Development Company LTD.
Fossway, Newcastle-upon-Tyne NE62YD
England

4. Principal Investigator *(Name and Complete Mailing Address)*

D.A.Reay
Fossway, Newcastle-upon-Tyne NE62YD
England

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Vickers LTD, & Reyrolle Parsons LTD (joint owners of IRD)

6. Duration of Investigation *(Beginning and ending)*: 3/74 to 3/76

7. Estimated Funding and Manpower *(Monies and Manyears)*: 10,000 - 25,000

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Review of current state of art and economics for domestic and industrial heat pumps. Use of heat pipes for heat exchange in heat recovery system, involving practical design and development of prototype system. A prototype heat exchanger has been constructed and is being tested.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13 Technical Data

Identification No.
6-102GB-06

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 6-151US-07

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Coal Fueled, Fluidized-Bed Gas Turbine Unit for MIUS Applications

2. Date *(Form Completed)*
11/15/76

3. Performing Organization *(Complete Mailing Address)*
Energy Division
Oak Ridge National Laboratory
P.O. Box X
Oak Ridge, Tennessee 37830
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
R.S.Holcomb
Energy Division
Oak Ridge National Laboratory
P.O. Box X
Oak Ridge, Tennessee 37830
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
J.H.Rothenberg, Director
HUD/MIUS Program
Dept. of Housing and Urban Development
451 7th St. S.W., Rm. 8158
Washington, D.C. 20410
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
5/74 to 10/80

7. Estimated Funding and Manpower *(Monies and Manyears)*
$7,000,000 for 5-1/2 years; 38 man-years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
The objective of this project, jointly sponsored by HUD and ERDA/Fossil Energy, is to develop a Modular Integrated Utility System (MIUS) test unit, using coal or coal-derived fuels, to provide electricity, space heating and cooling, water heating, and solid waste combustion for residential-commercial developments. The shortages of gas and oil in 1973 led to the realization that viability of the MIUS concept would be greatly enhanced if gas- or oil-fueled engine-generators could be replaced by units using coal, especially the high sulphur coal that constitutes about 90% of the Northeast United States coal reserves. This project was initiated in four phases: I - Conceptual Preliminary Evaluation; II - Conceptual Design; III - Detailed Design and Construction; and IV - Performance and Endurance Testing. Phase I included a comprehensive investigation and evaluation of the various ways in which coal and coal-derived fuels might be used for MIUS application and the potential performance and development problems of power conversion units (in the size range of about 300-1000 KWe). Direct combustion of coal in a fluidized-bed furnace coupled to a closed-cycle gas turbine was recommended as the most promising concept. Phase II - IV were directed towards a
(continued)
Use Box No. 15 if additional space is needed

9. Status and Results
To date, Phase I and II of the project have been completed and detailed design and equipment specification activities of Phase III are well underway. In the context of design criteria established by the intended MIUS application. Phase I efforts led to the conclusion that the coal-fueled fluidized-bed combustion system coupled to a closed-cycle gas turbine appears to have outstanding advantages over any other coal-using system. Analyses indicated that this concept would convert about 30% of fuel energy into electricity and about 50% into heat that could be used for space heating and
(continued)

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☒ space heating
- ☒ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 6-151US-07

project location ORNL

degree-days (heating) —

degree-days (cooling) — —

plant load capacity

a. power (MW) — 0.35 —

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — — —

f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source

expected payback period

Type and size of user

a. residential (dwelling units)

b. residential (square area-m²)

c. commercial (square area-m²)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

more detailed analysis and design of the concept, and actual construction and testing of a small test unit. The test unit represents one module of a multi-unit MIUS installation and will include the furnace and turbine-generator system, coal feed and metering systems, a recuperator, and various other heat exchangers for the recovery of waste heat.

16. Additional space for Status and Results

cooling and potable water heating. By burning coal in a fluidized-bed of limestone, sulphur emissions are reduced to the point that high-sulphur coal can be used within the residential sector without violating air quality standards. In Phase II, an effort was made to explore a wide variety of concepts for the geometry of the fluidized-bed as well as for various heat exchangers, duct arrangements, and provisions for instrumentation and control. Other aspects examined included furnace design, the modification of an available turbine, pulsation and heat transfer within the fluidized-bed, materials of construction, flow diagrams, and the coal feed and metering systems. Detailed design (Phase III) of a 350 KWe test unit is in progress. The potential for also using this concept in the commercial/industrial market, with possible scale-up of unit size, is currently undergoing review.

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 6-532US-08

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Resource Recovery - Montgomery County, Ohio

2. Date *(Form Completed)*

February 17, 1977

3. Performing Organization *(Complete Mailing Address)*

Montgomery County Solid Waste Management
451 West Third Street
Dayton, Ohio 45401
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Earnie S. Philpot, Administrator

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Board of County Commissioners
Montgomery County, Ohio
451 West Third Street
Dayton, Ohio 45401, U.S.A.
Mr. Ray Wolfe, President

6. Duration of Investigation *(Beginning and ending)*

May 1974 - July 1980

7. Estimated Funding and Manpower *(Monies and Manyears)*

Figure dependent on bids

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

1. Reasonable cost to the County based on maximum economic benefit to the citizens.
2. Minimum recovery to include energy and ferrous metal.
3. Maximum recovery of materials which are guaranteed to be economically feasible.
4. Minimum consumption of energy and other resources.
5. Minimum impact on the environment through discharges or effluents (emissions, wastewater, or landfills).
6. Providing a solution to the solid waste disposal problem for the future in Montgomery County and the surrounding areas.
7. Efforts at utilizing the latest technology and equipment in the solid waste recovery industry.
8. Minimum complexity and interface to establish adjustments for quantity variations and inflation.

Use Box No. 15 if additional space is needed

9. Status and Results

Request for Proposals was issued December 30, 1976
Proposals will be received May 25, 1977
Bids will be evaluated by August 24, 1977
Contract will be finalized by May 1, 1978
Construction completion & Start-up - July 1, 1980

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No.
6-532US-08

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 6-582NL-09

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Solar Energy and Utility Buildings

2. Date *(Form Completed)*: 6/6/77

3. Performing Organization *(Complete Mailing Address)*

Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

4 Principal Investigator *(Name and Complete Mailing Address)*

F.J.H. van Woerkom
Oostmaaslaan 59-65
Rotterdam, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

6. Duration of Investigation *(Beginning and ending)*: 1/77 - 6/78

7. Estimated Funding and Manpower *(Monies and Manyears)*: N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To develop and design and integrated solar/window system for big buildings. This project includes also a search to an optimal system for energy-storage.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☒ space heating
- ☒ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? [x] Unknown ☐ Yes ☐ No

13. Technical Data

Identification No. 6-582NL-09

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)* 6-601DE-10

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Study concerning seasonal thermal storage devices for low temperatures (ET 4048)

2. Date *(Form Completed)*

June 30, 1976

3. Performing Organization *(Complete Mailing Address)*

Messerschmitt-Bolkow-Blohm
GMBH
Postfach 80 11 69
D-8000 Munchen
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. Weissenbach
address see 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

PLE/KFA Julich
Dr. Plantikow
Postfach 1913
D-517 Julich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*

July 1, 1974 - June 30, 1976

7. Estimated Funding and Manpower *(Monies and Manyears)*

430,164.- $US

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The aim is to investigate the possibility of storage waste heat by introducing it into the ground, aquifiers in lakes. Low-temperature heat could be stored in this way during the warmer seasons to be extracted for heating purposes in the winter. Exploitation of the waste heat from power stations and a more economic use of primary energy are the aims here. At the same time, this is associated with reduced emissions in congested regions in the winter peak and less waste heat from power stations in summer.

Use Box No. 15 if additional space is needed

9. Status and Results

The study was finished in 1976.
The following topics have been dealt with:

- Investigations of the geological prerequisites for establishing storage devices in the congested regions of the FRG.
- Concepts for storage devices in aquifiers and in mainly artifical lakes (storage devices near the surface and at greater depths, displacement storage devices, storage devices in caverns, tube-system ground storage devices, among others).

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 6-601DE-10

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

- Component investigations for water retention and drainage, insulation, extraction and distribution, safety concept and approval potential.

USCOMM-NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 6-601DE-11

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
"Long Distance Heat Transport Line Saar"
Long Distance Heat Supply of the City Volklingen
(ET 4137A)

2. Date *(Form Completed)*
Dec. 31, 1978

3. Performing Organization *(Complete Mailing Address)*
Saarberg-Fernwarme GMBH
Postfach 238
D-6600 Saarbrucken
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*
Dipl.-Ing. Besch
address see 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-5170 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
3/15/75 - 12/31/78

7. Estimated Funding and Manpower *(Monies and Manyears)*
18,067,615.- $ US

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

a) Utilization of industrial waste heat for long distance heat.
b) Design and production of a "long distance heat rail Saar" which is directed towards a high capacity line for a supraregional long distance heat supply system. It allows the use of different sources of waste heat and supra-regional shifting of power.
c) Construction of an innercity long-distance heat distribution network with a capacity of ca. 75 Gcal/hr in the medium-sized city Volklingen with ca. 50,000 inhabitants.
d) Investigation and development of new processes such as the improvement of well-known processes of long distance heat technology with regard to the special requirements and possibilities for the use of waste heat.

Use Box No. 15 if additional space is needed

9. Status and Results

The development of new long range heating pipe networks, in particular the testing of innovatory pipe material and the consequent methods of installation is still at the planning stage. By the end of January an experimental program will have been evolved. The use of a gas-fired heat absorption pump will also be investigated, which - as currently envisaged - would, among other things, transfer the residual heat of the coke gas to the long distance heating network so that cooling by river water would become to a very large degree unnecessary (contribution to the protection of the

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 6-601DE-11

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

environment) and submitted to the Steering Committee for approval.

a) Negotiations with the city of Volklingen concerning their cooperation as well as compulsory connections and use are almost completed.

b) The necessary measures will be started in September 1976.

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 6-601DE-12

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Long-distance heat rail Ruhr: Middle Section (ET 4145)

2. Date *(Form Completed)*

3-15-77

3. Performing Organization *(Complete Mailing Address)*

STEAG AG
4300 Essen
Federal Republic of Germany

4 Principal Investigator *(Name and Complete Mailing Address)*

Dr. H. Volcker
STEAG AG
4300 Essen
Federal Republic of Germany

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Bundesministerium fur Forschung und Technologie
Stresemannstrasse 10
5300 Bonn-Bad Godesberg
(60 percent) Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*

1/7/75 to 6/30/78

7. Estimated Funding and Manpower *(Monies and Manyears)*

9 910 000.--DM

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

1. Objective:

A first section of a heat rail to be constructed in order to ensure the connection of existing local heat distribution networks including a heat power-station and other heat sources. The installation is to provide proof of feasibility of the total system concept. It is to be laid out in such a way as to enable it to be integrated into a large system at a later time. The project should provide information as to what extent transition to a connected system makes better use of existing power stations, whereby the storage capabilities of the network are to be made use of. Information will be available as to how to use existing fuels most efficiently. Questions related to ensuring supply will be taken account of.

2. Work Program:

a) Test of different types of compensations to accommodate the expansion due to heat, taking special account of the anchorage-point stress occuring during one sided depletion.

(cont.) Use Box No. 15 if additional space is needed

9. Status and Results

Building of the delivery stations has begun.
In the region of Gelsenkirchen and Essen several tracks have been laid.
The first partial operation will begin the end of 1976.

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

☐ electrical power
☐ space heating
☐ space cooling
☐ potable hot water
☐ wastewater treatment
☐ solid waste processing
☐ potable water

11. Type of Project

☒ public ☐ private
☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 6-601DE-12

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project (cont.)

b) Test of depletion systems.
c) Development and operation of ventilation and de-venting systems suitable for winter operations.
d) Test of different shut-off mountings and their respective drive mechanisms for the existing pressure and temperature situation.
e) Development and test of dynamic pressure reduction mechanisms in case of trouble.
f) Test of circuit and mode of operation of the return pumps.
g) Development of a trouble event management.
h) Test of circuits to directly connect the heat rail with local networks varying nominal pressures.
i) Building and test of a load distribution for the supra-regional connective system.
Optimizing of fuel input (grand load. peak load).
Use of storage capabilities of the complete network systems.
Considerations for electricity need.
j) Test of a reliable control system for power, temperature and pressure.

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
6-601DE-13

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Study of energy storages in systems of heat-power coupling (ET 4197A)

2. Date *(Form Completed)*
Nov. 30, 1976

3. Performing Organization *(Complete Mailing Address)*
Messerschmitt-Bolkow-Blohm GmbH
Postfach 80 11 69
D-8000 Munchen 80
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*
Dipl.-Ing.G.Pulkert
address see 3

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-517 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*
Nov. 30, 1976

7. Estimated Funding and Manpower *(Monies and Manyears)*
Apr. 2, 1975 - Nov. 30, 1976

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
Supply systems with storage of heat and electricity are to be designed, analysed, evaluated with respect to their economic, ecological consequences and their effects on the national economy.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☐ space cooling
- ☐ potable water
- ☒ potable hot water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No.
6-601DE- 13

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

3-691DE-39 to 43

15. Additional space for Purpose of Project

16. Additional space for Status and Results

Study available from:

Projektleitung Energieforschung
Kernforschungsanlage
D-5170 Juelich
Postfach 19 13, Germany

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No (Secretariat Use Only)

PROJECT SUMMARY FORM

6-601FR-14

1. Title of Project *(Official Title)*

Thermal Storage of Energy

2. Date *(Form Completed)*

3/15/77

3. Performing Organization *(Complete Mailing Address)*

Electricite De France
Direction Des Etudes et Recherches
Paris, France

4. Principal Investigator *(Name and Complete Mailing Address)*

UNKNOWN

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Electricite De France
Direction Des Etudes et Recherches
Paris, France

6. Duration of Investigation *(Beginning and ending)*

NA

7. Estimated Funding and Manpower *(Monies and Manyears)*

NA

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Show the benefits of an energy storage system used for simultaneously providing steam and electricity. Test the system's fluids and components.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No.
6-601FR-14

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075
(2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No.
(Secretariat Use Only)
6-602NL-15

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
"Gas/Gas Regenerator"

2. Date *(Form Completed)*
6/6/77

3. Performing Organization *(Complete Mailing Address)*
Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
F.J.H. van Woerkom
Oostmaaslaan 59-65
Rotterdam, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

6. Duration of Investigation *(Beginning and ending)*
6/75 - 12/77

7. Estimated Funding and Manpower *(Monies and Manyears)*
N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To develop a new type (pipes instead of plates) gas/gas regenerator for energy recovery in combination with a gas turbine.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 6-602NL-15

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
6-602NL-16

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Heat-pumps

2. Date *(Form Completed)*

6/6/77

3. Performing Organization *(Complete Mailing Address)*

Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

F.J.H. van Woerkom
Oostmaaslaan 59-65
Rotterdam, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

6. Duration of Investigation *(Beginning and ending)*

1/77 - ?

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Study concerning application of heat pumps in power generation as well as in energy saving and storage. Follow-up will be several system designs.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ wastewater treatment
- ☒ space heating
- ☐ solid waste processing
- ☒ space cooling
- ☐ potable water
- ☐ potable hot water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others?

[x] unknown
☐ Yes ☐ No

13. Technical Data

Identification No 6-602NL-16

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PROJECT SUMMARY FORM

Identification No. *(Secretariat Use Only)*: 6-602NL- 17

1. Title of Project *(Official Title)*

Rankine-Systems

2. Date *(Form Completed)*

6/6/77

3. Performing Organization *(Complete Mailing Address)*

Rijn-Schelde-Verolme NV
Oostmaaslaan 59-65
Rotterdam, Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

F.J.H. van Woerkom
Oostmaaslaan 59-65
Rotterdam, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Rijn-Schelde-Verolme
Oostmaaslaan 59-65
Rotterdam, Netherlands

6. Duration of Investigation *(Beginning and ending)*

2/77 - 12/78

7. Estimated Funding and Manpower *(Monies and Manyears)*

N/A

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objective: To develop an optimal cycle for low temperature heat recovery in combination with a gas turbine.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others?

[x] unknown
☐ Yes ☐ No

13. Technical Data

Identification No. 6-602NL-17

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 6-603NL-18

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Development of a Multi-Stage Flash/Fluidized Bed Evaporator (MSF/FBE)

2. Date *(Form Completed)*

6/8/77

3. Performing Organization *(Complete Mailing Address)*

Delft University of Technology
Laboratory for Thermal Power Engineering
Rotterdamsweg 139A
Delft
The Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*

Ir. A.W. Veenman
Laboratory for Thermal Power Engineering
Rotterdamseweg 139A
Delft
The Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Delft University of Technology
Laboratory for Thermal Power Engineering
Rotterdamseweg 139A
Delft
The Netherlands

6. Duration of Investigation *(Beginning and ending)*

1971 till 1979

7. Estimated Funding and Manpower *(Monies and Manyears)*

$ 2.10^6 and 20 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Development of a new type of Multi-Stage Flash Evaporator, a Multi-Stage Flash-Fluidized Bed Evaporator (MSF/FBE).

The MSF/FBE process in which a fluidized bed heat exchanger is used represents an attractive process for water distillation f.i. in combination with power generation. The main characteristics of the plant is its vertical concept with short flash chambers accommodating a large number of parallel heat exchanger tubes. Due to the fluidized bed in the heat exchanger the exchanger can be kept clean from fouling which results in a lower specific heat consumption than conventional evaporators.

The MSF/FBE can apply very small temperature differences over the stages, this makes it possible to design the MSF/FBE for a far greater number of stages and consequently for much lower specific heat consumption than the conventional Multi-Stage Evaporators Due to the superior process characteristics a higher loading of the evaporator volume can be achieved which results in a reduction of the invest

Use Box No. 15 if additional space is needed

9. Status and Results

Pilot plant status is reached with good results.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☒ potable water
- x process water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No. 6-603NL-18

project location Delft The Netherlands

degree-days (heating) —

degree-days (cooling) — —

energy source

expected payback period

plant load capacity

a. power (MW) — — — — —

b. heating (MW) — — — — —

c. cooling (MW) — — — — —

d. wastewater treatment-liters/day — — — — —

e. solid waste processing-kilograms/day — —

f. potable water-liters/day — — 50,000 — —

heat to power ratio (average expected)

Type and size of user

a. residential (dwelling units)

b. residential (square area-m^2)

c. commercial (square area-m^2)

d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

ment costs .

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 6-612NL-19

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Diesel Engine TM620 - An Uncommonly Large Medium Speed Diesel Engine for Power Generation

2. Date *(Form Completed)*
3/15/77

3. Performing Organization *(Complete Mailing Address)*
Stork Werkspcor Diesel
P.O. Box 4196
Amsterdam, Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
Unknown
Stork Werkspcor Diesel
P.O. Box 4196
Amsterdam, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Netherlands
Stork Werkspoor Disel

6. Duration of Investigation *(Beginning and ending)*
7/75 to 6/76

7. Estimated Funding and Manpower *(Monies and Manyears)*
Unknown

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

A new engine, designation TM 620, of considerably larger capacity is under development. The unit power per cylinder is 1700 bhp, finally 2000 bhp/cycl. at 428 rpm.

The TM 410 engine has been successfully applied for the generation of electricity. We expect that the TM 620 will meet the increasing requirements in this field.

In 1978 18 cylinder units will be available at 22.5 MW at generator terminals. (25 MW in 1980). The engine uses residual fuel oil and can easily be modified to use natural gas.

Economy comparison with steam plants shows advantage over 22.5 MW steam units at all load-schemes; at some load-schemes even over 45 MW steam-turbine units. This means, that this engine shifts the economical limit of diesel power stations to certainly 100 MW, probably 200 MW, and could fit into decentralized power systems.

An environmental advantage is a reduction of thermal pollution, because only about 27% of the total fuel heat will be found in the cooling water. If wanted, thermal water pollution can be completely avoided by the use of air-cooling, as is already applied in desert climates.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 6-612NL-19

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project (cont.)

A further rise in total efficiency is possible by the use of waste heat in a steam-boiler and steam turbine. An efficiency of 43% for pure electricity production is obtainable with safe conventional equipment. A feasibility study is on hand. Of course a much higher efficiency is possible for the combined production of electricity and heat. (Total energy systems).

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 6-612NL-20

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Technical & Economical Evaluation of Gas-fired Heat-pump Systems for Space-heating Purposes.

2. Date *(Form Completed)*
31 May 1977

3. Performing Organization *(Complete Mailing Address)*
Organization for Industrial Research TNO
Institute for Mechanical Constructions
P.O. Box 29
Delft, Netherlands

4. Principal Investigator *(Name and Complete Mailing Address)*
R.J. Collect
Org. for Industr. Research TNO
Inst. for Mechanical Constr.
Delft, Netherlands

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
-Org. for Industr. Research TNO
Netherlands

-VEG Gasinstituut
P.O. Box 137
Apeldoorn, Netherlands

6. Duration of Investigation *(Beginning and ending)*
5/76 - 1/78

7. Estimated Funding and Manpower *(Monies and Manyears)*
400.000,- (approx. 2 1/2 manyears)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Determination of gas-fired heat-pump systems with the best potential for further development. The main investigated variables include the system capacity (degree of centralization) and the types of prime mover, heat pump(s) and heat transfer system inside the building. A computer program is written to perform the calculations. The results of the evaluation are to be used as a basis for continued evaluation and experimental investigation of selected configurations of heat-generating eqiupment.

Use Box No. 15 if additional space is needed

9. Status and Results

1st stage completed (use of yearly averaged performance values and simplified cost assumptions).

2nd stage planned (part-load operation accounted for in detail, use of more sophisticated costing procedures).

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☒ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project
- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? Restricted ☐ Yes ☐ No

13. Technical Data

Identification No. 6-612NL- 20

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only): 6-631US-21

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*
Harrisburg Steam Main

2. Date *(Form Completed)*
January 21, 1977

3. Performing Organization *(Complete Mailing Address)*
Engineer
Gannett Fleming Cordry and Carpenter, Inc.
P.O. Box 1963
Harrisburg, Pennsylvania 17105
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
Project Engineer
Paul W. Bricker

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*
Mr. Louis Einhorn
Public Works Director
City of Harrisburg
423 Walnut Street
Harrisburg, Pennsylvania 17101
U.S.A.

6. Duration of Investigation *(Beginning and ending)*
May 1977 to May 1978

7. Estimated Funding and Manpower *(Monies and Manyears)*
$2,506,700 (construction cost)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*
The Harrisburg Steam Main will convey high pressure steam, produced by the incineration of solid waste in the City's Incinerator, to the Pennsylvania Power & Light Company's Steam Heat Plant. This steam will supplement the utility's steam supply to the City's district heating system.

Use Box No 15 if additional space is needed

9. Status and Results
The project is expected to be advertised for bid during 1977.

This project is: ☒ planned ☐ in-progress ☐ completed

Use Box No 16 if additional space is needed

10. Utility Services
- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water
- X steam heating

11. Type of Project
- ☒ public
- ☐ private
- ☐ cooperative

12. Exchange of data
Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data See below	Identification No. 6-631US-21
project location — — — —	
degree-days (heating) —	energy source
degree-days (cooling) — —	expected payback period
plant load capacity	Type and size of user
a. power (MW) — — — — —	a. residential (dwelling units)
b. heating (MW) — — — — —	b. residential (square area-m^2)
c. cooling (MW) — — — — —	c. commercial (square area-m^2)
d. wastewater treatment-liters/day — — — — —	d. industrial (thermal + elec.-MW)
e. solid waste processing-kilograms/day — — —	
f. potable water-liters/day — — — — — — — — —	
heat to power ratio (average expected)	

14. Other Related Projects *(Titles)*

(LP) Harrisburg Refuse Incinerator
(SP) Harrisburg Advanced Wastewater Treatment Facility

15. Additional space for Purpose of Project

~~16 Additional space for Summary and Results~~

13. Technical Data:

a. Quantity of steam supplied - maximum - 120,000 pounds/hour; average - 35,000 pounds/hour

b. Quality of steam supplied - pressure - 250 psig; temperature - 456 degrees F; heat content - 1237 BTU/pound

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. *(Secretariat Use Only)*

PROJECT SUMMARY FORM

6-801DE- 22

1. Title of Project *(Official Title)*

Large heat storage unit with a heat capacity of 1500 Gcal, in the KFA, Juelich (ET 4139A)

2. Date *(Form Completed)*

June 30, 1976

3. Performing Organization *(Complete Mailing Address)*

Forschungsinstitut fur Energietechnik
Prof.Dr.-Ing.G.Scholl
Hauffstr. 14
D-7441 Wolfschlugen
Federal Republic of Germany

4. Principal Investigator *(Name and Complete Mailing Address)*

Prof.-Dr.-Ing.G.Scholl

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

PLE/KFA Juelich
Dr. Plantikow
Postfach 1913
D-517 Juelich
Federal Republic of Germany

6. Duration of Investigation *(Beginning and ending)*

Oct. 1, 1975 - June 30, 1976

7. Estimated Funding and Manpower *(Monies and Manyears)*

48,076.- $US

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Drafting and production of the necessary plans, construction drawings and calculations for production of the heat storage unit.

Use Box No. 15 if additional space is needed

9. Status and Results

This project is: ☐ planned ☐ in-progress ☒ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☒ space heating
- ☐ space cooling
- ☒ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13 Technical Data

Identification No.
6-801DE- 22

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source
expected payback period

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15 Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only) 6-802BE-23

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

H_2 - Production by Water Electrolysis

2. Date *(Form Completed)* 7/29/77

3. Performing Organization *(Complete Mailing Address)*

SCK/CEN
Boeretang 200
B-2400 MOL
Belgium

4. Principal Investigator *(Name and Complete Mailing Address)*

Project Leader
Dr. L.H.Baetsle

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

European Economic Community
Wetstraat/rue de la Loi, 200
B-1040 Brussel/Bruxelles
Belgium

6. Duration of Investigation *(Beginning and ending)*

Beginning: 9/1/76 (2 & 3 phase): 1985
Ending (1st phase) 7/1/79

7. Estimated Funding and Manpower *(Monies and Manyears)*

$2.5M 60 man-year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objectives: Demonstrate a new type of electrolyser for energy storage in 3 phases (1, 50, 150 kW)
Motivations: Belgium goes nuclear, hence H_2 becomes important SCK/CEN possesses patents and know-how in this field
Approach: a new technology based on IME (Inorganic Membrane Electrolyte) is used
Plans and Expected Results:
a target is set of very low production costs of H_2 at present off-peak electricity costs.

Use Box No. 15 if additional space is needed

9. Status and Results

All testing equipment is in operation
Short-term cell tests have reached the desired performance
Long-term tests are prepared on stacks up to 1 kW

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

☒ electrical power
☐ space heating
☐ space cooling
☐ potable hot water
☐ wastewater treatment
☐ solid waste processing
☐ potable water

11. Type of Project

☐ public ☒ private
☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No if EEC agrees with it

13. Technical Data

Identification No
6-802BE- 23

project location — — — — Not applicable
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

Electrodes for fuel cells

15. Additional space for Purpose of Project

16. Additional space for Status and Results

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only)

PROJECT SUMMARY FORM

6-802BE- 24

1. Title of Project *(Official Title)*

ELECTRODES FOR FUEL CELLS

2. Date *(Form Completed)*

7/29/77

3. Performing Organization *(Complete Mailing Address)*

SCK/CEN
Boeretang 200
B-2400 MOL
Belgium

4. Principal Investigator *(Name and Complete Mailing Address)*

G.SPAEPEN
SCK/CEN
Boeretang 200
B-2400 MOL
Belgium

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

N.B. ELENCO
Manager H. VAN DEN BROECK
p.a SCK/CEN
Boeretang 200
B-2400 MOL
Belgium

6. Duration of Investigation *(Beginning and ending)*

Beginning 1969
Ending (present program) 1979

7. Estimated Funding and Manpower *(Monies and Manyears)*

From 76-79
$500,000 per year
9 man-year per year

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

Objectives:
- Support to a large industrial fuel cell development program
- Improvement of electrode performance
- Long-lasting tests of electrodes, cells and stacks
- Demonstration of 2 x 20 kW units

Motivations:
- Patents and know-how available on low-cost, high-performance electrodes

Approach and Plans:
- Cooperation with industrial firms for - series production of electrodes and stacks
  - quality control
  - development of production techniques
  - market evaluation
- Use of very low concentration of noble metal catalysts in H_2-air fuel cells
- First demonstration oriented towards motive application

Use Box No. 15 if additional space is needed

9. Status and Results

- All testing equipment in operation
- Life testing up to 14,000 h low density
  4,500 h high density

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☒ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No.
6-802BE-24

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

H_2 - production by water electrolysis
(cfr. other Project Summary Form)

15. Additional space for Purpose of Project

Expected results:
- High-power density, low cost modules of up to 20 kW
- Coupling to H_2- electrolysis unit as an energy-storage device

16. Additional space for Status and Results

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*: 6-802BE- 25

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Study and development of new alloys showing the shape memory effect, and their applications, i.a. in a "metal engine" or "solid state engine".

2. Date *(Form Completed)*: 8/8/77

3. Performing Organization *(Complete Mailing Address)*

Katholieke Universiteit Leuven
Department Metaalkunde
de Croylaan 2
B-3030 Heverlee (Belgium)

4. Principal Investigator *(Name and Complete Mailing Address)*

A. DERUYTTERE

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Ministry of Scientific Policy

6. Duration of Investigation *(Beginning and ending)*: 1976-1981

7. Estimated Funding and Manpower *(Monies and Manyears)*

50 million BF - 24 man years

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objective is to develop new alloys, mainly martensitic copper alloys which show the shape memory effect and related effects such as superelasticity and damping. The composition and the technology to prepare such alloys in a useable form has to be optimized. The properties, not only the special ones but also the normal design properties such as strength, ductility, fatique, corrosion have to be determined and improved. One possible application is their use in a novel type of engine in which the active element is not a fluidum like steam or gas or petrol but one of the alloys considered: cycling such an alloy between two temperatures causes a cycling between two crystal structures and therefore between two shapes. The change of shape allows forces to be exerted. So heat can be transformed into mechanical energy. The high temperature source (e.g. warm water from a utility service) need not be much warmer than the low temperature source (e.g. cold water from a utility service) (the temperature difference may be as low as 10°C).

Use Box No. 15 if additional space is needed

9. Status and Results

A prototype engine has been built for demonstration purposes. Work is in progress on the thermodynamics of the system and on the improvement of the shape memory alloys and the geometry of the system.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10 Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☐ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☒ private
- ☐ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 6-802BE- 25

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

energy source primary source: any
expected payback period secondary: warm water

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77)

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Identification No. *(Secretariat Use Only)*
6-833US-26

PROJECT SUMMARY FORM

1. Title of Project *(Official Title)*

Study of Modifications Required to Convert a Multiple Hearth Incinerator to Pyrolytic Operation

2. Date *(Form Completed)*
11/23/76

3. Performing Organization *(Complete Mailing Address)*

Interstate Sanitary Commission
10 Columbia Circle
New York, N.Y. 10019
(212) 582-0380
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*
Alan I. Mytelka, Ph.D.
Assistant Chief Engineer
Interstate Sanitary Commission
10 Columbus Circle
New York, N.Y. 10019
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

MERL, Wastewater Research Division
EPA
Cincinnati, Ohio 45268, U.S.A.
ATTN: Howard Wall

6. Duration of Investigation *(Beginning and ending)*
7/76 to 7/77

7. Estimated Funding and Manpower *(Monies and Manyears)*

$177,000 (168,725 funded by Grant)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

The objective of the study is to develop a workable design for conversion of a plant scale multiple hearth sludge incinerator to the pyrolytic or limited air mode of operation.

SPECIFIC OBJECTIVES ARE:

1. To determine what physical modifications must be made to an existing multiple hearth system to convert that system to pyrolytic operation.

2. To determine the most appropriate methods for handling the products of pyrolysis from standpoints of energy efficiency and emissions control.

3. To develop an estimate of costs of conversion methods and of subsequent operations: what, if any, will be the advantages over heat recovery of multiple heart incinerator.

Use Box No. 15 if additional space is needed

9. Status and Results

Project just started. Most of pilot plant equipment is set up for operation. Bench tests have been made on sludge and the plans for the first test of three have been completed.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☐ wastewater treatment
- ☒ solid waste processing
- ☐ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☐ Yes ☐ No [x] Unknown

13. Technical Data

Identification No. 6-833US-26

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
- a. power (MW) — — — — —
- b. heating (MW) — — — — —
- c. cooling (MW) — — — — —
- d. wastewater treatment-liters/day — — — — —
- e. solid waste processing-kilograms/day — — —
- f. potable water-liters/day — — — — — — — —

heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
- a. residential (dwelling units)
- b. residential (square area-m^2)
- c. commercial (square area-m^2)
- d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM-NBS-DC

NBS-1075 (2-77) | U.S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS | Identification No. (Secretariat Use Only)

PROJECT SUMMARY FORM

6-833US- 27

1. Title of Project *(Official Title)*

Optimization of Activation of Solid Wastes

2. Date *(Form Completed)*

11/23/76

3. Performing Organization *(Complete Mailing Address)*

Stanford University
Department of Civil Engineering
Stanford, California 94305
U.S.A.

4. Principal Investigator *(Name and Complete Mailing Address)*

Dr. J.O. Leckie
Stanford University
Department of Civil Engineering
Stanford, California 94305
U.S.A.

5. Supporting Organization *(Complete Mailing Address and Name of Contact)*

Dr. R. Dobbs
U.S. EPA
OR&D, MERL, WRD
Cincinnati, Ohio 45268, U.S.A.

6. Duration of Investigation *(Beginning and ending)*

7/76 to 3/79

7. Estimated Funding and Manpower *(Monies and Manyears)*

$85,000 (first year)

8. Purpose of Project *(Objectives, Motivations, Approach, Plans and Expected Results)*

To evaluate the optimum procedures to activate chars from municipal refuse and other solids waste sources. The activated char will be used as an adsorbent in wastewater treatment.

Use Box No. 15 if additional space is needed

9. Status and Results

Preliminary data indicates activated solid waste char has at least the same capacity as commercial powdered activated carbon.

This project is: ☐ planned ☒ in-progress ☐ completed

Use Box No. 16 if additional space is needed

10. Utility Services

- ☐ electrical power
- ☐ space heating
- ☐ space cooling
- ☐ potable hot water
- ☒ wastewater treatment
- ☒ solid waste processing
- ☒ potable water

11. Type of Project

- ☐ public
- ☐ private
- ☒ cooperative

12. Exchange of data

Will data be available from this project that will be shared with others? ☒ Yes ☐ No

13. Technical Data

Identification No. 6-833US- 27

project location — — — —
degree-days (heating) —
degree-days (cooling) — —

plant load capacity
a. power (MW) — — — — —
b. heating (MW) — — — — —
c. cooling (MW) — — — — —
d. wastewater treatment-liters/day — — — — —
e. solid waste processing-kilograms/day — — —
f. potable water-liters/day — — — — — — — —
heat to power ratio (average expected)

energy source
expected payback period

Type and size of user
a. residential (dwelling units)
b. residential (square area-m^2)
c. commercial (square area-m^2)
d. industrial (thermal + elec.-MW)

14. Other Related Projects *(Titles)*

15. Additional space for Purpose of Project

16. Additional space for Status and Results

USCOMM NBS DC

NBS-114A (REV. 7-73)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NBS SP-515	2. Gov't Accession No.	3. Recipient's Accession No.

4. TITLE AND SUBTITLE
International Project Catalog of Modular Integrated Utility Systems

5. Publication Date: July 1978

6. Performing Organization Code

7. AUTHOR(S)
M.H.Nimmo and C.W.Phillips

8. Performing Organ. Report No.

9. PERFORMING ORGANIZATION NAME AND ADDRESS

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, D.C. 20234

10. Project/Task/Work Unit No. 4654370

11. Contract/Grant No.

12. Sponsoring Organization Name and Complete Address (*Street, City, State, ZIP*)
Division of Energy, Building Technology and Standards
Office of Policy Development and Research
U.S. Department of Housing and Urban Development
Washington, D.C. 20410

13. Type of Report & Period Covered

14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

Library of Congress Catalog Card Number: 78-600056

16. ABSTRACT (*A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.*)

The International Project Catalog prepared for the Committee on the Challenges of Modern Society-Rational Use of Energy Pilot Study - Modular Integrated Utility Systems (CCMS-MIUS Project) is a compilation of project descriptions on more than 200 Modular Integrated Utility Systems (MIUS) type of projects being conducted in the participating countries. Each project description includes a description of each project, its status, the approach, expected results, some technical data, the principal investigator, an indication whether or not data is/or will be available and other miscellaneous project information. The catalog is useful to the experts in identifying the various projects being conducted and seeking further technical information on those particular projects in which they are interested.

The catalog is the first of a three level reporting system to report on MIUS type of projects. The second and third level reporting systems, which are expected to be improved and completed in future activities under another international organization, will provide information and guidelines for reporting progress and supplying data. The catalog consists of three parts: an Introduction, list of Projects by Country, and Project Descriptions, one for each project reported.

17. KEY WORDS (*six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons*)
Catalog, CCMS-MIUS Project Catalog, International Project Catalog, Project Catalog, Project Summary Forms, Reporting System

18. AVAILABILITY
[XX] Unlimited
[ ] For Official Distribution. Do Not Release to NTIS
[X] Order From Sup. of Doc., U.S. Government Printing Office Washington, D.C. 20402, SD Stock No. 003-003-
[ ] Order From National Technical Information Service (NTIS) Springfield, Virginia 22151

19. SECURITY CLASS (THIS REPORT) UNCLASSIFIED

21. NO. OF PAGES 455

20. SECURITY CLASS (THIS PAGE) UNCLASSIFIED

22. Price $ 6.50

USCOMM-DC 29042-P74

NBS TECHNICAL PUBLICATIONS

PERIODICALS

JOURNAL OF RESEARCH—The Journal of Research of the National Bureau of Standards reports NBS research and development in those disciplines of the physical and engineering sciences in which the Bureau is active. These include physics, chemistry, engineering, mathematics, and computer sciences. Papers cover a broad range of subjects, with major emphasis on measurement methodology, and the basic technology underlying standardization. Also included from time to time are survey articles on topics closely related to the Bureau's technical and scientific programs. As a special service to subscribers each issue contains complete citations to all recent NBS publications in NBS and non-NBS media. Issued six times a year. Annual subscription: domestic $17.00; foreign $21.25. Single copy, $3.00 domestic; $3.75 foreign.

Note: The Journal was formerly published in two sections: Section A "Physics and Chemistry" and Section B "Mathematical Sciences."

DIMENSIONS/NBS

This monthly magazine is published to inform scientists, engineers, businessmen, industry, teachers, students, and consumers of the latest advances in science and technology, with primary emphasis on the work at NBS. The magazine highlights and reviews such issues as energy research, fire protection, building technology, metric conversion, pollution abatement, health and safety, and consumer product performance. In addition, it reports the results of Bureau programs in measurement standards and techniques, properties of matter and materials, engineering standards and services, instrumentation, and automatic data processing.

Annual subscription: Domestic, $12.50; Foreign $15.65.

NONPERIODICALS

Monographs—Major contributions to the technical literature on various subjects related to the Bureau's scientific and technical activities.

Handbooks—Recommended codes of engineering and industrial practice (including safety codes) developed in cooperation with interested industries, professional organizations, and regulatory bodies.

Special Publications—Include proceedings of conferences sponsored by NBS, NBS annual reports, and other special publications appropriate to this grouping such as wall charts, pocket cards, and bibliographies.

Applied Mathematics Series—Mathematical tables, manuals, and studies of special interest to physicists, engineers, chemists, biologists, mathematicians, computer programmers, and others engaged in scientific and technical work.

National Standard Reference Data Series—Provides quantitative data on the physical and chemical properties of materials, compiled from the world's literature and critically evaluated. Developed under a world-wide program coordinated by NBS. Program under authority of National Standard Data Act (Public Law 90-396).

NOTE: At present the principal publication outlet for these data is the Journal of Physical and Chemical Reference Data (JPCRD) published quarterly for NBS by the American Chemical Society (ACS) and the American Institute of Physics (AIP). Subscriptions, reprints, and supplements available from ACS, 1155 Sixteenth St. N.W., Wash., D.C. 20056.

Building Science Series—Disseminates technical information developed at the Bureau on building materials, components, systems, and whole structures. The series presents research results, test methods, and performance criteria related to the structural and environmental functions and the durability and safety characteristics of building elements and systems.

Technical Notes—Studies or reports which are complete in themselves but restrictive in their treatment of a subject. Analogous to monographs but not so comprehensive in scope or definitive in treatment of the subject area. Often serve as a vehicle for final reports of work performed at NBS under the sponsorship of other government agencies.

Voluntary Product Standards—Developed under procedures published by the Department of Commerce in Part 10, Title 15, of the Code of Federal Regulations. The purpose of the standards is to establish nationally recognized requirements for products, and to provide all concerned interests with a basis for common understanding of the characteristics of the products. NBS administers this program as a supplement to the activities of the private sector standardizing organizations.

Consumer Information Series—Practical information, based on NBS research and experience, covering areas of interest to the consumer. Easily understandable language and illustrations provide useful background knowledge for shopping in today's technological marketplace.

Order **above** *NBS publications from: Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.*

Order **following** *NBS publications—NBSIR's and FIPS from the National Technical Information Services, Springfield, Va. 22161.*

Federal Information Processing Standards Publications (FIPS PUB)—Publications in this series collectively constitute the Federal Information Processing Standards Register. Register serves as the official source of information in the Federal Government regarding standards issued by NBS pursuant to the Federal Property and Administrative Services Act of 1949 as amended, Public Law 89-306 (79 Stat. 1127), and as implemented by Executive Order 11717 (38 FR 12315, dated May 11, 1973) and Part 6 of Title 15 CFR (Code of Federal Regulations).

NBS Interagency Reports (NBSIR)—A special series of interim or final reports on work performed by NBS for outside sponsors (both government and non-government). In general, initial distribution is handled by the sponsor; public distribution is by the National Technical Information Services (Springfield, Va. 22161) in paper copy or microfiche form.

BIBLIOGRAPHIC SUBSCRIPTION SERVICES

The following current-awareness and literature-survey bibliographies are issued periodically by the Bureau:

Cryogenic Data Center Current Awareness Service. A literature survey issued biweekly. Annual subscription: Domestic, $25.00; Foreign, $30.00.

Liquified Natural Gas. A literature survey issued quarterly. Annual subscription: $20.00.

Superconducting Devices and Materials. A literature survey issued quarterly. Annual subscription: $30.00. Send subscription orders and remittances for the preceding bibliographic services to National Bureau of Standards, Cryogenic Data Center (275.02) Boulder, Colorado 80302.

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington, D.C. 20234

OFFICIAL BUSINESS

Penalty for Private Use, $300

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM-215

SPECIAL FOURTH-CLASS RATE
BOOK