NBSIR 76-1103

Some Institutional Factors Affecting MIUS -- A Case Study and Annotated Bibliography

Jacqueline Elder

Sensory Environment Section
Center for Building Technology
Institute for Applied Technology
National Bureau of Standards
Washington, D.C. 20234

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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

Prepared for
Office of Policy Development and Research
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U.S. DEPARTMENT OF COMMERCE, Juanita M. Kreps, *Secretary*

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NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Acting Director*

FOREWORD

The Department of Housing and Urban Development (HUD) is conducting the Modular Integrated Utility System (MIUS) Program to develop and demonstrate the technical, economic and institutional advantages of integrating the systems for providing all or several of the utility services for a community. The utility services include electric power, heating and cooling, potable water, liquid waste treatment and solid waste management. The objective of the MIUS concept is to provide the desired utility services consistent with reduced use of critical natural resources, protection of the environment and minimization of cost. The program goal is to foster, by effective development and demonstration, early implementation of the integrated utility system concept by private or public organizations.

Under HUD direction, several agencies are participating in the HUD-MIUS Program including the Energy Research and Development Administration, Department of Defense, Environmental Protection Agency, Department of Health, Education and Welfare, National Aeronautics and Space Administration, and National Bureau of Standards. The National Academy of Engineering has provided an independent assessment of the Program. Drafts of technical documents are reviewed by the agencies participating in the HUD-MIUS program. The draft of this publication received such a review and all comments were resolved with HUD.

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Contents

Abstract

This report considers some of the institutional factors which might affect the development and implementation of an innovative utility project and in particular of a Modular Integrated Utility System (MIUS). A case study of the planning and implementation stages of a major utility project was undertaken along with several studies of less complex utility projects. An annotated bibliography exploring the literature on institutional response to existing or proposed utility projects and to innovation in general is included. The case studies and literature survey indicated a number of institutional factors along with a wide range of issues associated with these factors. Specifically, the institutional factors which are considered fall into the following areas: utility company response, local citizen group response, environmental group response, labor interests, builder/developer role, local planning agency and local, state and Federal agency involvement. Economic and legal/regulatory factors are not considered in any detail. In addition to the case studies and the annotated bibliography, the report contains a list of researchers currently working on related programs and a list of journals and other major references which are likely to include relevant material.

Key Words: Institutional Factors; Modular Integrated Utility System; Total Energy; Utility System

1. Introduction

This project was begun in order that some of the institutional factors which might affect the development and implementation of a Modular Integrated Utility System (MIUS) could be identified and their impacts determined.

The project was originally conceived as a literature review. The literature concerning institutional factors affecting innovative projects and in particular innovative utility projects was surveyed. It soon became evident, however, that written documentation in the institutional area is quite scarce and existing documentation tends to be extremely theoretical.

The orientation of the project was then altered. Several case studies were undertaken to determine what institutional factors would affect utility projects similar to MIUS, and also to determine the possible impacts of these factors. A case study of the planning and implementation stages of a major utility project was conducted along with several studies of less complex utility projects. The case studies allowed a categorization of institutional factors and served to provide a perspective for the literature surveyed.

In addition to the case studies and the annotated bibliography, the report lists researchers currently working in relevant areas and journals (and other major references) likely to include pertinent material.

The institutional area is presently receiving a great deal of attention and new studies are rapidly appearing. Therefore, the report aims at providing an overview of the research related to institutional factors along with a strategy to keep current on new developments.

1.1 Scope of Study

The scope of the study is necessarily limited by the scarcity of relevant material and by the particular characteristics of the case studies chosen. Information was available concerning total energy plants constructed by a party other than an existing electric-generating utility. No information was available concerning total energy plants independently developed and built by a utility. Furthermore, in many of the cases in which information was available, the information centered around a conflict between the party building the total energy plant and the existing utility involved. It should not be assumed, however, from this limited information, that the total energy concept *per se* is incompatible with the concept of existing large electric utilities.

The institutional factors considered in this report fall into the following areas: utility company response, local citizen group response, environmental group response, labor interests, builder/developer role, local planning agency and local, state and Federal agency involvement. Economic and legal/regulatory factors have not been discussed in any detail. They are mentioned, however, when their impact is critical and when they are of overriding importance to a project.

1.2 Modular Integrated Utility System (MIUS) -- A Definition

"The MIUS concept brings together subsystems that serve different utility needs and builds them into a master system that performs these combined functions in lieu of separate conventional utility systems. MIUS is the most recent and most comprehensive version of what engineers refer to as 'total energy systems.' An integrated utility system provides

all services -- electricity, heating, air conditioning, water and waste treatment and disposal -- in a single plant which conserves natural resources, reduces energy consumption, and minimizes environmental impact. The advantages of this total system are that in treating various problems simultaneously, it reduces operating costs, improves operation and maintenance through single management responsibility, and reduces energy requirements." (HUD, 1974, p. 2)*

The goals of the MIUS concept are as follows:

° "Provide options in utility services needed for urban/suburban development that reduce the time span from planning to operation; reduce risk, . . . reduce plant operating cost, add capacity in phase with actual demand; and make possible more flexible and economic urban/suburban growth patterns through a self-contained utility system that is independent of the existing infrastructure.

° Provide more efficient utilization of energy and other resources by improving utility systems fuel usage efficiency by recovering energy from power generation, by using solid wastes for its energy content, by using recovered energy to provide heating and cooling services and to enhance liquid waste treatment processes, and by improving the efficiency of domestic water usage.

° Reduce total cost of providing utility services.

° Improve the quality and the environment of life by reducing thermal pollution, air pollution, solid waste pollution, and water pollution." (Request for Proposal, p. 3)

*See Section 7 for a list of references and contacts.

2. Summary of Findings

The case studies and survey, both conducted during 1973 through 1975, indicated a number of institutional considerations and associated issues. Many of these institutional factors were foreseen by the Integrated Utility Systems Board report (see Section 5.1).* The following discussion groups the major factors and gives examples from both the case studies and the literature of some of the possible impacts of these factors.

2.1 Utility Company Involvement

Utility company response was a major concern in every case study.** A utility company may view a proposed plant as a needed innovation or as a threat. The Medical Area Service Corporation (MASCO) proposed a total energy plant and the utility, Boston Edison, expressed a great deal of concern about the Corporation using its "tax exempt status to produce cheaper electricity." The Long Island Lighting Company (LILCO) allowed total energy plants within its system, but the plants were not totally independent. Due to uncertainty as to the reliability of such plants, LILCO could not risk total dependence on experimental plants to maintain the existing level of electric service. The Commonwealth Gas Company of Worcester, Massachusetts has successfully integrated several total energy plants into its system.

Large utility companies appear to have a number of characteristics in common with other large organizations. The research findings cited in Section 5.5 deal with the subject of how large organizations respond to and handle change.

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*References for the reports cited in this section may be found in Section 5, Annotated Bibliography.

**The case studies are presented in Section 3 and Section 4.

2.2 Citizen Involvement

Local citizens' groups are likely to have an interest in any proposed new utility project. The MASCO project was the only case reviewed in enough detail to consider citizen group response. In the case of MASCO, the utility presented its concerns to local citizens during the initial planning of the project. Initial citizen response was opposed to the plant and centered around the issues of relocation of residents, air pollution, noise, traffic problems, and possible increases in utility rates. MASCO approached the neighborhood residents with a distinct disadvantage; the residents were already opposed to the plant. Under normal circumstances, the residents would probably have continued to fight strongly against the plant. However, the fact that a new housing development was contingent upon the construction of the plant served to alter the residents' initial opposition. Local citizens have often played a decisive role in power plant decisions. The MASCO experience indicates that local residents should be brought into the planning process early.

The findings of other researchers reflect these same concerns. Best (Section 5.2) argues that decisions about power plant sitings should be open to public participation. She indicates that participation would allow conflicts to be identified early and resolved before they reach the crisis stage. Buchan (Section 5.2) confirms this idea and suggests that public participation can be brought about by requiring local referenda to approve power plant sitings. Jopling (Section 5.2) and Mazur (Section 5.3) discuss the stages of public resistance to nuclear power plants. Emphasis is placed on the fact that public awareness of the projects often came about when the utility filed for licenses to

build and operate a plant. Jopling stresses that the public should be included in the planning and decision processes.

Myhra (Section 5.2) discusses an innovative arrangement in which a utility company agreed to provide impact payments to a community in order to obtain local approval for construction of a nuclear power plant. Peelle (Section 5.2) also stresses that large construction projects should not be built without considering their impact on the people living in the surrounding area.

Several of the reports discussed present research methods useful in predicting public reaction to utility projects, prior to their implementation (Byrne, Section 5.2; Citizens' Views about the Proposed Hartsville Nuclear Power Plant, Section 5.2; Lackey, Section 5.2; Motz Section 5.2; Ramirez, Section 5.3; York, Section 5.3). One such study concluded that those who supported a nuclear power plant in their community, did so with the expectation that the plant would bring economic benefits to the community (Citizens' Views about the Proposed Hartsville Nuclear Power Plant, Section 5.2). Two researchers used results similar to the one presented above to suggest the most appropriate means for informing and educating the public about planned utility projects (Lackey, Section 5.2; Ramirez, Section 5.3).

Although environmental groups, per se, were not involved with the MASCO project, they have been active in utility plant considerations. Local citizens' groups may join with the environmentalists when such involvement will serve to strengthen the position of each group.

In summary, issues of interest to local citizens' and environmental groups (see Sections 5.2 and 5.3) may include environmental concerns

such as noise, vibration, traffic problems, air pollution, water pollution, and the appearance of the plant and of the associated plume. Also of interest are safety and health considerations, possible relocations, effects on housing and land values, changes in land use, employment opportunities, demographic changes, effects of the labor force on community services (schools, hospitals, police and fire services, etc.) especially in remote locations and possible unemployment after construction.

2.3 Labor Concerns

Labor concerns were a factor in each of the case studies. Labor unions in the Boston area supported the proposed utility plant as a means of providing jobs for some of the unemployed construction workers. Boston Edison raised a labor related issue in its opposition to the project. Boston Edison pointed out that its own plants are supplied with fuel by underground pipes whereas the MASCO plant would be supplied by trucks. A strike by truck drivers could therefore block fuel deliveries to the plant.

LILCO indicated that maintenance problems were one of the reasons for the failure of two total energy plants in its system. LILCO did not provide maintenance for these plants. Commonwealth Gas, on the other hand, maintains a 24-hour service capability on the plants for which it is responsible.

Biswas (Section 5.2) discusses the labor related impacts of large construction projects on a community. Labor issues include changing employment opportunities and movement of workers into the area. Effects on the local community during construction depend upon the size of the community and how easily the construction workers and activities can be

assimilated. After construction is completed, unemployment may become a problem. A Westinghouse Electric Corporation report (Socioeconomic Effects of Construction and Operation, Section 5.2) stresses that a sizable labor force required to construct large utility projects causes growth and change in a community that can lead to unwanted problems. The report discusses three labor-related factors which affect the impact of a utility project on a community: 1) location of plant site with respect to driving time from large metropolitan area 2) number of craft and trade employees within commuting distance and 3) ability of surrounding area to accomodate construction and operational personnel.

Labor considerations include employment opportunities provided by plant construction, the maintenance and operation (including strike possibilities) of the plant and possible unemployment following construction.

2.4 Builder/Developer Role

Generally, a builder/developer is involved with site improvements (landscaping, architecture) and utility availability and is not actively engaged in utility plant construction. The builder/developer will have to change his normal mode of operation and play an important role in the process of planning and building a development with a MIUS-type utility. Since Harvard University with its unique financial and organizational structure and goals is acting in the role of developer on the MASCO project, the concerns which normally would be experienced by a builder/developer of a MIUS-type facility may not be present.

The research findings summarized in Section 5.4, Innovation and the Housing Industry, consider the acceptance of innovative concepts in the housing and construction industries. Several reports indicate that

the housing and construction industries tend to be regional and tradition-oriented thereby making the acceptance of innovation difficult. (Hirshberg, Section 5.4; Constraints to Builder's User of Cost Saving Innovations, Section 5.4; Schoen, Section 5.4; Ventre, Section 5.4).

2.5 Government Agency Involvement

In the case of MASCO, the local planning agency wanted to determine how the plant fit into the community, and whether it served the best interests of the neighborhood. Since local planning agencies are usually led by political appointees, political issues often are important factors when such projects are considered.

There are many local, State and Federal agencies, whose interest in a MIUS project will vary depending upon the specific locality.

3. MASCO - A Case Study

The MASCO utility plant project provided valuable background information for an understanding of the institutional factors which might affect MIUS.

In 1972, a group of hospitals and medical institutes in Boston, Massachusetts formed the Medical Area Service Corporation (MASCO) for the purpose of providing the utility needs of the member institutions in the most efficient manner possible. The member institutions of MASCO occupy about a ten block area along Brookline and Longwood Avenues in Boston and include:

Beth Israel Hospital

Boston Hospital for Women

Peter Bent Brigham Hospital

Robert B. Brigham Hospital

Sidney Farber Cancer Center

Children's Hospital Medical Center

Harvard University

- Medical School
- School of Dental Medicine
- School of Public Health

Joslin Diabetes Foundation Inc.

Massachusetts College of Pharmacy

New England Deaconess Hospital

A new affiliated hospital is being planned and will join MASCO when completed.

MASCO has proposed a total energy plant with trash collection and incineration as the most reliable and economical means of meeting the utility needs of its members.

This section covers the non-technical aspects of the MASCO utility plant project. The case study was conducted with the assumption that the plant was technically feasible. Initial telephone contacts were made with the major parties involved in the project. Two trips were made to the Boston area and interviews were conducted with individuals concerned with the MASCO project. (See Section 7 for a list of references and contacts.) Information was gathered concerning non-technical factors related to the plant which might cause the plant to be a success or a failure.

3.1 History

The hospitals have a history of on-site power generation.

In 1904, a plant was built to provide electricity, heat, hot water, and steam to several hospitals through an underground distribution network. The electric power was d.c.

In 1940, with the growing need for air conditioning, chillers were put in and because of the shortage of space, generators were taken out. This action resulted in an increased use of purchased power from the public utility, Boston Edison Company.

In 1967, the hospital system went on total purchase power, mainly due to the impracticality of d.c. power.

In 1970, the hospitals funded a feasibility study for the design of a new power plant. The design did not consider the total energy concept (use of waste heat and less fuel) and the hospitals decided that the proposed plant would be uneconomical.

In 1972, MASCO was formed and a study was funded which considered a total energy plant design. MASCO indicated that the new design would result in a 50% reduction in cost over the previously proposed design. The proposed plant is based on the total energy concept to produce electricity, heat, air conditioning, hot water, and steam. In addition, the MASCO project proposes to pneumatically collect trash from the member institutions, deliver it to the plant, and incinerate it for its heat energy. At the time that the total energy design was being considered, a policy decision was made by the trustees of the hospitals that MASCO would work together with the Boston Edison Company on the utility project. (Six trustees of the hospitals also sat on the Board of Directors of Boston Edison.) As a result of this decision all proposals were sent to Boston Edison for comment and discussion.

In May 1973, the President of Boston Edison Company held a meeting with the presidents of the member institutions of MASCO. At this time the utility company announced plans for a new substation in the area which would serve the hospitals. In addition, a new steam plant was to be built which would also serve the hospitals.

In June 1973, Boston Edison, in a letter to the Boston Redevelopment Authority (the independent regulating body responsible for approving or disapproving the utility plant), indicated numerous problems involved

with the MASCO project and stated that it would be unwise for the city to allow such a project to set a trend.

In August 1973, MASCO proposed to Boston Edison the formation of a joint operation for owning and operating the proposed plant. Boston Edison declined citing tax shelter problems and the duplication of facilities since the new substation would be built despite any decision the hospitals made.

In April 1974, Harvard University (the most influential member of the hospital group is Harvard Medical Center and the University owns most of the land in the area occupied by the medical institutions) agreed to fund the utility project until the time that a construction contract was signed. The engines for the plant were ordered. Also at this time MASCO hired a contractor to conduct an environmental impact study.

In May 1974, Boston Edison again cautioned the Boston Redevelopment Authority about problems associated with the proposed MASCO utility plant. Specifically mentioned were traffic congestion resulting from the oil trucks needed to supply the plant, noise resulting from the plant, appearance of the cooling stack and most importantly the tax-exempt status of the plant. Also at this time, Boston Edison alerted the hospitals to possible severe shortages during 1975-1976 if construction did not begin immediately on the proposed new substation. A letter was sent to a new research center scheduled to open in the fall of 1974, and to those hospitals which had requested or were expected to request new or increased service. In this letter Boston Edison stated that the new facility could not be supplied with electricity unless it, along with the other hospitals, signed an agreement to purchase electricity from Boston

Edison through 1985.

In July 1974, Boston Edison proposed that the hospitals enter into co-ownership of a steam plant with Boston Edison and that the hospitals continue to purchase electric power from Boston Edison.

In October 1974, an agreement was reached for the supply of power to the new facility. MASCO agreed to pay for a new cable from an existing substation. On April 1, 1978, Boston Edison has the right to disconnect the new facility. (The MASCO project is scheduled to be completed in late 1978.)

In August 1975, the Boston Redevelopment Authority held a public hearing on the application of the Medical Area Total Energy Plant.

In October 1975, the Boston Redevelopment Authority approved the Medical Area Total Energy Plant.

3.2 Parties Involved

A brief description of the parties involved and their positions (in 1975) regarding the MASCO project will help to illustrate the complexity of this project.

MASCO, as explained previously, is the organization formed by the medical institutions for the purpose of providing the utility needs of its members.

The most influential member of the hospital group is the Harvard Medical School. Harvard University owns most of the land in the area and has taken responsibility for the project under the Financial Vice-President. In April 1974, Harvard agreed to fund the project up to the time of the signing of a construction contract and at this time two

engines were purchased for the plant by Harvard. The Harvard Planning Office is co-ordinating the MASCO project and has hired various consultants to the project.

A consultant, Environmental Research and Technology, Inc., was hired to advise on environmental factors and to conduct an independent environmental impact study.

Another consultant, Charles Hilgenhurst and Associates, was contracted to look at the project from an urban planning viewpoint and they in turn hired a contractor, Wilbur Smith Associates, to study traffic problems associated with the site. (It is currently estimated that 12 to 20 oil trucks per day will be required to keep the plant supplied with fuel.)

In addition, Harvard has hired an architectural firm, Benjamin Thompson Associates, to design the power plant so that it will be compatible with the neighborhood. (The design calls for the power plant to be totally underground with a warehouse and distribution center on the ground floor and six levels of parking above the warehouse. The stack is planned to be 315 feet in height. The architect indicates that the design has eliminated the plume normally associated with power plants. He also states that he has designed the cooling towers in such a way that there will be no mist associated with them.)

The Harvard Planning Office has given the Harvard Office of Community Affairs responsibility for co-ordinating with the residents in the power plant neighborhood. The residents have a strong community group in the Roxbury Tenants of Harvard (RTH). RTH was formed in 1968 when new housing for the area was first discussed.

A new housing project (Mission Park Community) has been designed and construction was originally scheduled to begin in the fall of 1974. The new community will be located mainly on a site currently occupied by a parking lot and owned by Harvard University. It was hoped that residents displaced by the power plant could be relocated in the new community. This now appears unlikely. Residents of the present housing pay extremely low rents. The rents were frozen in 1968 as a condition accepted by the landlord -- Harvard University -- to end a student strike. The new housing offers some subsidized rents equal to what the families are currently paying, but only for the first year. After that the rents are projected to rise to a level most of the families feel they cannot afford. In an attempt to satisfy the tenents, Harvard is paying for exterior rehabilitation of all neighborhood housing not slated for demolition.

RTH was originally quite favorable to Harvard and the proposed changes. However, some members of the Mission Hill Planning Commission (a community group located in a neighborhood across a major highway and the parent organization for RTH) have been trying to convince RTH to unite against Harvard and against the power plant.

The fate of the Mission Park housing has had a major influence on community group reaction. Mission Park has been planned since the late 1960s as a community of 750 units of mixed income housing. Construction was planned to begin in 1974 but inflation increased costs so greatly that the housing became prohibitively expensive and plans for the development were dropped. MASCO and the developers then reached an agreement whereby the power plant will supply Mission Park with steam, hot water

and chilled water at no charge. The public utility will provide electrical service. The savings resulting from this agreement make the project economically feasible. As a result of this agreement a majority of the residents dropped their opposition to the power plant. The residents see Mission Park as a means of establishing the residential character of their neighborhood and if the power plant is necessary for the development to be built, they will support the plant.

Boston Edison Company, the public utility, strongly opposes the MASCO project. Boston Edison objects to a private tax-exempt institution making electricity. One of the main arguments against the plant centers around the fact that the city will lose tax money since hospitals are exempt from property tax. Boston Edison has indicated that it might be willing to test the "use of tax exempt privileges to produce cheaper electricity" in the courts. Representatives from the company have attended meetings of the citizens' associations and voiced Boston Edison's objections. After meeting with representatives of Boston Edison, the residents were of the opinion that if the MASCO project is built, their electric bills will rise substantially. (The residents referred to here are both those currently living close to the power plant site and who will not be served by MASCO and those who hope to be relocated in the new community which will be served by MASCO and Boston Edison.)

Finally, there is the Boston Redevelopment Authority (BRA), an independent regulating body which reviews zoning changes and acts as judicial review board for large scale projects. BRA has responsibility for recommending approval or disapproval of the MASCO power plant. BRA is staffed primarily by planners who are looking at the project from

the viewpoint of what would be best for the community. The staff members make a recommendation and present the facts to a board appointed by the mayor and governor. It is this board that will make the final decision on the proposed MASCO power plant project.

Other regulating bodies involved with the MASCO project include:

Bureau of Air Pollution

Institutional Tax Collector

Tax Assessor

Traffic Commission

Public Works Commission

Department of Public Utilities (State of Massachusetts)

3.3 Issues Involved

The issues surrounding the proposed MASCO total energy plant (in 1975) fall into four major categories: financial, labor, environmental, and community impact. The issues have been reported as they were presented to the author. No attempt has been made to resolve the inconsistencies which may exist in the arguments of the various parties. This mode of presentation provides an indication of the pattern of communication among the various parties.

In the financial area, Boston Edison argues that the total energy plant should not be granted a tax exempt status. Boston Edison states that the proposed power plant is a departure from the type of facility normally owned and operated by charitable organizations and that the same services can be provided to the hospitals by Boston Edison -- a taxpaying enterprise. Boston Edison feels that MASCO is using its tax exempt status to produce less expensive electricity. Tax exempt facilities

can obtain bonds at lower rates. Boston Edison indicates (May 1974) that if MASCO proceeds with the proposed power plant, the City of Boston will lose a substantial amount in annual tax revenues.

MASCO counters with the following arguments. The hospitals will make annual payments to the City of Boston in lieu of taxes. Boston Edison's tax shelters on a plant this size would amount to a larger savings that the savings realized by the hospitals' tax exempt status. This is due to Boston Edison's depreciation allowances and investment credits. MASCO argues that utility costs are increasing faster than other health care costs (from 1972 to 1975, utility costs increased from 1/2% of total health care costs to over 4%) and the the total energy design of the plant will reduce these costs and therefore help hold down other health care costs.

In the labor area Boston Edison has expressed concern over the possibility of strikes by the fuel truck drivers.

MASCO indicates that the plant design allows for storage of enough fuel to supply the plant for thirty days. MASCO also stresses that the Boston construction industry is currently (1975) experiencing an unemployment rate of 25%. Construction of the plant would provide 1200 to 1500 jobs over a two and one-half year period.

In the environmental area, Boston Edison concentrates its criticism on the problems of traffic congestion, noise and vibration, and air pollution. Boston Edison emphasizes that 12 to 20 oil trucks per day will be needed to supply the plant with fuel. Boston Edison expresses concern that the MASCO plant will cause higher noise and vibration levels in the neighborhood. Boston Edison's plants are located in

industrial areas away from hospitals and residences. The same arguments apply in the area of air pollution -- Boston Edison's plants are located away from institutional and residential areas. Boston Edison further argues that MASCO should not be applying for a power plant in an area that is currently zoned institutional and residential.

MASCO indicates the 1800 fuel trucks a year currently come into the area to serve the present power plant and 5200 trash trucks also enter the area. The number of trash trucks will be greatly reduced due to the pneumatic trash collection provided by the MASCO plant. MASCO, the contractor studying environmental impact, and the architect all agree that the design of the power plant is such that there will be no noticeable effects from noise, vibration, or air pollution, except during construction.

In the area of community impact, Boston Edison again indicates that a power plant does not belong in an institutional and residential neighborhood.

MASCO stresses that the plant has been designed so that it is compatible with the existing neighborhood. Also the Mission Park Community planned for the area cannot be built if the power plant is not built. Mission Park would provide mixed income housing and serve to set the residential character of the neighborhood.

3.4 The Public Hearing

"NOTICE OF PUBLIC HEARING

Notice is hereby given that the Boston Redevelopment Authority, (hereinafter called the "Authority"), will hold a public hearing in the cafeteria of Boston State College at 625 Huntington Avenue, Boston, Massachusetts, on August 25, 1975, at 7:30 P.M., on the Application of

the Medical Area Total Energy Plant, Inc., for the Authority's Approval of an Urban Redevelopment Project to be undertaken by the Applicant. Approval is sought pursuant to Chapter 121A of the General Laws, Commonwealth of Massachusetts, as amended, Chapter 652 of the Acts of 1960 and the applicable Rules and Regulations of the Authority. Said hearing shall include the consideration of the Environmental Impact of the Project pursuant to Massachusetts General Laws, Chapter 30, Sections 61 and 62 and the Rules and Regulations of the Authority.

The Project involves the construction of a total energy facility which will provide services to the member institutions of the Medical Area Service Corporation and the proposed Mission Park Housing Project. The Project will also include a related three story office building.

Said Project is to be located at Brookline Avenue and Francis Street in the Fenway Urban Renewal Area. Project No. Mass. R-115. A complete description of the Project and the premises involved appears in the Application on file with the Authority. Said Application and all Exhibits filed therewith may be examined by all interested persons in the office of the Boston Redevelopment Authority, Room 982, New City Hall, Boston, Massachusetts, during the regular business hours of the Authority from 9:00 A.M. to 5:00 P.M., Monday through Friday.

BOSTON REDEVELOPMENT AUTHORITY
Kane Simonian, Secretary
Aug. 11 18 25"

(The Boston Globe, August 18, 1975)

The first individuals to speak were those favoring the proposed MASCO total energy plant.

The first speaker was an administrator from the hospitals who stated that the total energy plant will help hold down health care costs. He stressed the fact that utility costs are rising faster than other health care costs. (In 1972 utility costs represented 1/2% of total health care costs and in 1975 they represented over 4% of total costs.)

The plant engineer then spoke, emphasizing the energy conservation aspects of the total energy plant design. (The total energy design allows for the recovery and use of waste heat.)

The engineer was followed by the architects responsible for the plant design. They showed slides indicating the proposed plant design and also showing how the plant will appear in the neighborhood. The architects stated that the stack will be 315 feet in height and that the closest buildings are 214 feet and 180 feet high, and the planned affiliated hospital will be 200 feet in height.

A representative from the firm which conducted the environmental impact study stated that his company is satisfied that there will be no visible smoke plume and that the proper steps have been taken to reduce noise, vibration, and air pollution. He discussed the number of trucks that will be entering the area and indicated that 12 to 20 trucks a day will be needed to supply fuel. However, the 1800 trucks a year supplying the present plant no longer will be needed and the 5200 trash trucks a year currently in the area should be greatly reduced due to the planned pneumatic trash collection.

The developer of the Mission Park housing presented his views. He indicated that the 750 units of mixed income housing have been planned for some time. Roxbury Tenants of Harvard (RTH) has supported this housing from the very beginning as a means of firmly establishing the residential character of the neighborhood. However, with the inflation in 1974, it became obvious that the housing was too expensive and could not be built. MASCO and the housing developer were then able to reach an agreement whereby MASCO will supply the development with steam, hot water, and chilled water at no charge. This service will save the development $300,000 a year and make the project economically feasible. The developer emphasized that Mission Park can be built only if the power

plant is built.

The president of Roxbury Tenants of Harvard (900 members) expressed the community group's support of the power plant. This support centers around a desire to have the Mission Park community built. The president also stated his opinion that those houses being torn down are definitely blighted.

An attorney for MASCO stressed the fact that Boston Edison had been given an opportunity to build and operate the plant. He indicated that payments will be made to the City of Boston in lieu of property taxes for both the power plant and the Mission Park development. In addition, he stressed the increased conservation and reliability which can be attributed to the total energy design.

A representative from the Mission Hill district stressed that the plant construction will create jobs and that the Mission Park housing development will serve to stabilize the community.

Finally, the president of the Building and Construction Trades Council spoke indicating that the plant construction would provide 1200 to 1500 jobs over a two and one-half year period. This project would employ 30% minority workmen. Boston currently (1975) has 25% unemployment in the construction trades.

Most of the individuals who spoke in opposition to the plant were neighborhood residents who read prepared statements stressing similar issues. It is for this reason that the opposition has received less coverage in this summary.

Several citizens from the Mission Hill area spoke in opposition to the plant. The major emphasis was that the plant should not be entitled

to tax exempt status. Also emphasized were the opinions that Harvard is trying to avoid the zoning code, that the housing to be torn down is not blighted, that the plant will create noise, air pollution and traffic problems.

Finally, the chief lawyer for the Boston Edison Company spoke. He filed a brief with the Boston Redevelopment Authority contending that the public hearing was being held illegally. (Boston Edison maintained that the hearing had not been properly announced.) He also spoke out against the power plant receiving tax exempt status and against allowing an exception to the existing zoning laws.

Rebuttal time was then provided for those favoring the plant. This time was primarily used by Mission Hill residents and officers of the Mission Hill Planning Commission. They emphasized that the previous opponents from Mission Hill had not been representative of the community.

On October 8, 1975, the Boston Redevelopment Authority approved the Medical Area Total Energy Plant.

4. Other Case Studies

Prior to undertaking the MASCO study, several less complex total energy projects were examined. In contrast to the MASCO study which presented a wide spectrum of factors along with a large number of interested and involved groups, the case studies presented here provide examples of a limited number of institutional factors. The studies were usually conducted by means of telephone interviews with one or two individuals while the MASCO study involved personal interviews with large numbers of people.

However, these studies are of interest in that a public utility, either gas or electric, was involved in the implementation of each plant. In a conversation with J. Hunicutt of Total Energy Publications, Mr. Hunicutt indicated that in the 1950s and 1960s when total energy plants were first proposed and built, gas suppliers viewed them as a means of increasing their market, while the electric utilities were generally opposed to an electrical generating system which would free buyers from the need to purchase electricity from the central plant. Gas companies promoted total energy and advertised its successes; electric companies pointed out its failures. As natural gas supplies dwindled and gas companies had problems meeting their previous obligations, they slowed active promotion of total energy systems. (Conversation with J. Hunicutt)*

This section of the report will provide an overview of representative electric utility company reaction to the total energy concept, a summary of a total energy project that failed, and a look at an operational total energy project.

*See Section 7 for a list of references and contacts.

4.1 Representative Electric Utility Company Reaction to Total Energy

In 1973, integrated utility packages incorporating the concept of selective total energy were being considered for remote, inaccessible communities. (A selective total energy system supplies all the thermal needs of a complex and supplies whatever electricity is produced in keeping an efficient balance with heat requirements. The remaining electricity required for the system is purchased from the electric utility company's grid.) Researchers at Carnegie-Mellon University wanted to determine utility company response to this proposed concept.

Mayo and Purcupile of Carnegie-Mellon sent letters to 134 electric utility companies asking for their opinions on selective total energy. "Of the 50 letters received in return, 7 companies appeared extremely interested; 25 flatly rejected the idea, sometimes rather vehemently; the remainder did not commit themselves and merely wished to be kept informed on our progress." (Mayo and Purcupile, 1973, p. 4) These generally negative responses cited economic and reliability shortcomings, but also, the attitudes of the utility companies were shaped by the feelings of encroachment on the electricity supply franchise. (The author does not have access to a copy of the letter sent to the utility companies. The letter is important because its wording could have influenced the responses by the utility companies.)

Consolidated Edison of New York is a major utility with a positive reaction to total energy. "Because of the grave concern that the Public Service Commission and we have as to the adequacy and reliability of the supply of electricity for the growing needs of the city, Consolidated Edison has revised its position regarding total energy plants." (New

York Times, July 7, 1973, p. 1)

Consolidated Edison has had difficulty meeting the electricity demand of its customers and environmental considerations precluded the construction of any large new power plants. The agreement which allowed Consolidated Edison to build its last fossil fuel plant included a provision that "no more fossil-fueled boilers for electrical generating plants" be built. (New York Times, July 7, 1973, p. 1) To increase capacity, the company began to accept and encourage total energy plants.

Citing environmental benefits of such total energy systems, the New York State Public Service Commission agreed to allow small on-site fossil fuel burning plants. Consolidated Edison, in turn, agreed to help plan such systems and integrate them into its system. Furthermore, "in appropriate cases and consistent with regulatory requirements, the company is prepared to construct, own or operate on-site facilities." (New York Times, July 7, 1973, p. 1). In accepting and encouraging total energy systems, Consolidated Edison is in the minority among large electric utility companies.

4.2 Long Island Lighting Company - Experiences with Total Energy

In a series of articles published in Actual Specifying Engineer, a critic of total energy systems states, "Total Energy is a sound engineering principle." (Echols, 1970, p. 108) If this statement is accurate, it would appear that since the technology is not to blame for the failure of some total energy plants, then other factors must be considered.

The Long Island Lighting Company (LILCO) provides a case in point. Grant City is a medium-sized shopping center (department store, supermarket and several small shops) in East Patchoque, New York. A total

energy plant was originally proposed for the center, and after consultation with LILCO, a partially independent total energy system was constructed. This system took advantage of LILCO's load situation in that Grant City was to operate the total energy plant in the summer when gas was in good supply and electricity use at a peak. During the winter, Grant City was to purchase electricity on a regular basis from LILCO. After a short operating period, the system reverted to the nominal year round purchased power scheme and the theoretical benefits of total energy were never put to the test.

In an evaluation of the LILCO total energy experience, Mr. R. Hickson of LILCO states, "Total energy plant construction costs for ordinary items greatly exceeded the original estimates made by the consultants. The owners then did not provide the test facilities agreed upon." (Conversation with R. Hickson)

According to Hickson, three main factors contributed to the demise of this total energy system -- poor planning, unforeseen costs and an apparent lack of commitment on the part of the institutions involved to make this total energy system work.

In drawing conclusions from this failure, Hickson notes that Grant City was too small for the total energy plant and that the economies were long in coming. Furthermore, total energy had been "sold" to the owners of Grant City as a completely automated plant, which it was not. Unanticipated labor costs were responsible for the closing down of a second total energy system with which LILCO was working.

One cause of such failures is the lack of a single institution responsible for making the total energy system work. LILCO agreed

to install the regular electric grid links at Grant City, but other than this equipment, LILCO had no economic stake in the project. The manufacturers of the plant equipment were interested in making sales and may have overestimated the simplicity of the total energy concept. After they sold the equipment, they had no further economic interest in the project. LILCO expressed interest in continuing the total energy project as an experiment, but the Public Service Commission of New York viewed the Grant City Shopping Center as a commercial venture and not as a research project. Thus, LILCO was prevented from operating it at a loss, for that would be viewed as a subsidy from some rate payers for other commercial electricity purchasers.

4.3 Worcester Science Center - An Operational Total Energy Project

The Worcester Science Center serves as an example of a total energy success. The Commonwealth Gas Company of Worcester, Massachusetts is responsible for maintaining the Worcester Science Center plant both as an exhibit and as the energy plant for the museum. In 1973, Commonwealth Gas was supplying three total energy plants and planning a fourth. Like other gas suppliers, Commonwealth Gas viewed the total energy approach as a means of increasing revenues. The different outcomes of the LILCO and Worcester projects are indicative of the relative importance of the projects to the existing local utility. When the total energy approach proved unsuccessful at Long Island Lighting, LILCO lost no business because buyers had to fall back on the conventional electricity grid supplied by LILCO. If total energy fails in Worcester, however, Commonwealth Gas loses a customer. This economic stake in the total energy systems has led Commonwealth Gas to participate in the planning, design, purchasing and installation

of the systems. The company serves as the single institution responsible for the implementation of the system.

There were three reasons for considering a total energy system as a potential alternative to conventional electrical service for the Worcester Science Center. These reasons were: 1) the need for an uninterruptible power supply, 2) the non-pollution nature of total energy, and 3) the economic advantages of the system (Dirksen, 1973). It was felt that in these areas, the total energy concept might have the potential for better performance. To guard against breakdown of the Worcester total energy system, Commonwealth Gas maintains a 24-hour service capability. While planning and design are crucial to the success of total energy plants, failure to implement an adequate maintenance program is commonly the "death blow" to the longterm economic viability of such systems. Guaranteed service by the utility, therefore, is a major difference in the experiences of Long Island Lighting and Commonwealth Gas.

5. Annotated Bibliography

Since almost no research has been done in the area of institutional factors affecting MIUS, the literature discussed focuses on institutional response to existing or proposed utility projects and to innovation in general. The relevant literature falls into five major categories each of which will be treated in a separate subsection. The subsections are as follows:

5.1 Documents Directly Related to MIUS. Only one published document was found by the author which was directly concerned with institutional factors affecting MIUS.

5.2 Social Impact of Utility Installations. The literature discussed here addresses the subject of public reaction related specifically to utility installations and includes studies concerned with social or community impact assessment.

5.3 Other Utility Studies. This subsection is concerned with other utility studies of less relevance to MIUS than those covered in subsection 5.2. A considerable amount of work has been done on institutional considerations in the area of water resource development and management and in the area of water basin studies.

5.4 Innovation and the Housing Industry. The literature included here considers institutional factors affecting innovation in the housing industry and with the institutional similarities between the housing industry and the utility industry.

5.5 Literature Concerning Innovation and Organizations. This subsection contains mostly academic and theoretical literature.

The relevant documents in each subsection have been summarized and included in alphabetical order. Following these annotated references less relevant items are listed by author and title only.

5.1 Documents Directly Related to MIUS

Only one published document was found to be relevant in this area. However, the category was retained as a separate subsection in order to emphasize the lack of information related directly to institutional factors affecting MIUS.

5.1.1 Annotated Reference

Evaluating Integrated Utility Systems, Integrated Utility Systems Board, National Academy of Sciences, Washington, D.C. (1974).

The Integrated Utility Systems Board was established by the Department of Housing and Urban Development to consider the feasibility of integrated utility systems. One of the areas the Board considered was the identification of institutional constraints or incentives to the implementation of an integrated utility system.

In this area the Board made the following observations: "Adoption and dissemination of any new technology generally necessitates changes to the prevailing institutions. This is especially so in the case of MIUS. Some institutions will be aided by the new MIUS technology. For others MIUS may be a threat. In all cases, MIUS will be unfamiliar and strange, and will require a period of adjustment. It is reasonable, therefore, to anticipate resistance to the dissemination of the MIUS technology."

The Board identified the following individuals and institutions as those which might be affected by MIUS: residents, builders/developers, existing utility companies, local and state governments, labor, regulatory agencies, mortgage and financial institutions, housing investors/owners, and Federal agencies.

Institutional factors which the Board members judged as having the highest priority centered around economic factors but also included medical and health concerns about water reuse and public acceptance of MIUS. In the area of public acceptance the following factors were cited as possible causes of negative public response: the presence of outside equipment close to the residences; perception of MIUS as a cause of illnesses; complaints about real or imaginary noises, odors, pollution or other nuisances; and consumer doubts as to the safety, reliability and performance of MIUS.

At the conclusion of its report, the Board made two recommendations in the area of institutional factors. The first indicated that institutional practices will have to be altered if integrated utility systems are to be widely developed and the second stressed the need for disseminating information about the benefits of integrated utility systems in order to increase public acceptance.

5.2 Social Impact of Utility Installations

This section will be primarily concerned with the literature addressing the subject of public reaction related specifically to utility installations. Studies in this category are largely concerned with social or community impact assessment.

Utility companies operating with public funds are required by the National Environmental Policy Act (NEPA) of 1969 to submit environmental impact statements prior to beginning construction of new facilities.

"An emerging area of concern in the preparation of impact statements has been the effects of large-scale construction projects on people living near the site. A number of research efforts conducted in the past three to five years have attempted to describe social impacts that are related to power plant construction, dam building, strip mining in the western United States, as well as other large-scale projects." (In the report "Citizens' Views About the Proposed Hartsville Nuclear Power Plant," cited on page 38 of this report).

The Social Impact Assessment Group of Oak Ridge National Laboratory has categorized the range of social impacts under seven major headings:

1) Governmental Services and Public Finance

2) Local Economic Impacts

3) Land Use and Land-Use Management

4) Sociological and Psychological Impacts

5) Impacts on Human Activity Patterns

6) Aesthetics and Recreation

7) Medical and Safety

Social impacts related to economic factors affecting power plant construction and operation have received detailed study, while sociological and psychological impacts have received very little attention.

The reports which follow consider the social impacts of utility projects.

5.2.1 Annotated References

Best, Judith A., New Institutional Arrangements to Resolve Power Plant Siting Conflicts: A Political Analysis, NTIS PB-227 861 (February 1972).

This report examines the following issues related to institutional arrangements concerning power plant siting:

1. Should there be a uniform mandatory certification process?
2. Who should be designated to certify sites and facilities?
3. What standards or criteria should govern agency decisions?
4. Who should be responsible for long-range planning?
5. Should the decision-making process be fully open to the public?
6. What should be the standard for judicial review of agency decisions?

Of particular interest to this report is item number five "Should the decision-making process be fully open to the public?"

Those in favor of public participation argue: conflicts could be identified and headed off before a crisis develops; public intervention at a late date can be very costly; and full public participation reduces public suspicion and mistrust. Those opposed argue: the utility industry would not have any flexibility in negotiations with suppliers of fuel, transportation and equipment.

The author concludes that conflicts between the environment and energy must be resolved by taking into account the parties to the conflict. The various parties are identified as follows: "1) an industry which accepted its original mandate to provide reliable power at the lowest possible cost and is reluctant to give up old practices and perogatives to meet relatively new environmental demands; 2) a vocal group of awakened environmentalists who believe that the industry and the regulatory agencies are using the power

crisis as a justification to insult the environment with impunity, and who demand equal status in the decision-making process; 3) the states and localities who fear increasing federal encroachments into their jurisdiction; 4) the bureaucrats, federal, state, and local, each with a vested interest in their respective agency's primary mission, ready to assert their rights over rival agencies; 5) the scientific community pressured by all to resolve technical problems today with funding arriving tomorrow; 6) the people who want cheap, plentiful electric power with no power plants polluting the air, water and landscape of their local communities."

Biswas, Asit K. and Durie, Robert W., Sociological Aspects of Water Development, Water Resources Bulletin, 7, No. 6, 1137-1143 (December 1971).

The authors discuss possible social impacts at the various stages in a water development project.

1. Planning Impacts - Public announcement of a planned project along with possible public hearings causes interest groups to develop and accelerates political activities. The issues involved at this stage may be relocation of residents, reassessment of land values, and land transactions.

2. Construction Impacts - Issues during this stage may involve changing employment opportunities, movement of workers into the area, escalation of rents and home prices, strains on available local facilities. Effects felt on the local community during construction depend upon the size of the community and how easily the construction workers and activities can be assimilated.

3. Operation and Management Impacts - During this stage workers leave the area and unemployment may become a problem. The community must then realign itself in accordance with the new style of life brought about by the new project.

The authors stress that one of the best predictors of a successful project is an involved and informed public.

Buchan, Glenn, Institutional Design for Energy Systems/Environmental Decision Making, in Macrakis, Michael S. (ed.), Energy: Demand, Conservation, and Institutional Problems, MIT Press, Cambridge, Mass., 261-271 (1974)

Buchan examines some areas which he feels will aid in the solution of institutional problems demanding a balance between energy and environmental quality demands (such as the siting of nuclear power plants). Of particular interest to this report is the political area.

Buchan argues in favor of local referenda for the approval of power plant sitings. He sees two benefits which would result from this process. First, low cost information would be generated and second, conflicts, and the various parties involved, would be identified early in the power plant licensing process.

"The fact that the issue will be decided by referendum gives both proponents and opponents of the power plant strong incentives to provide low-cost information to voters and provides political entrepreneurs with opportunities to generate alternatives and supply still more information to the public. Therefore, the existence of a referendum causes more information to be generated and more interests to be defined and represented than would otherwise be the case. Use of the political system in this fashion coupled with analyses of citizen feedback, opinion polls, and so forth, provides a reasonably reliable means of determining societal preferences for public goods."

Byrne, J. F. and Sucov, E. W., Two Tools for Predicting Community Acceptance of Power Plant Sites, Westinghouse Research Laboratories, Pittsburgh, Pennsylvania (1975).

Byrne and Sucov looked at the correlation between descriptors of a community and four possible outcomes of a nuclear power plant siting controversy (1. easy acceptance 2. acceptance after negotiations 3. acceptance after lawsuit 4. rejection). The following nine descriptors correlated highly with the outcomes:

	Descriptor Category	Descriptor Name
1.	Ecological-economic	Recreational land use
2.	Ecological-economic	Agricultural land use
3.	Ecological-economic	Degree of thermal pollution
4.	Socio-political	Number of citizens groups in the county
5.	Socio-political	Number of conservationist-environmentalist leaders living in the county
6.	Socio-political	Proportion of families in county below poverty level
7.	Socio-political	Proportion of families earning over $15,000
8.	Socio-political	Proportion of professsionals in the affected area
9.	Socio-political	Educational level in county

Citizens' Views about the Proposed Hartsville Nuclear Power Plant: A Preliminary Report of Potential Social Impacts, Oak Ridge National Laboratory, Regional and Urban Studies Department, Oak Ridge, Tennessee (May, 1975).

This report presents the results of a survey of public attitudes toward a proposed nuclear power plant. The researchers conducted 350 interviews with randomly selected individuals in the community prior to construction of the plant. The questions asked covered nine general areas: 1) Residents' satisfaction with their homes, neighborhoods, and town or county 2) Satisfaction with services provided by the public and private sector 3) Patterns in the use of geographical sections of the community for various activities such as shopping, socializing, working and recreation 4) Residents' information about nuclear power, and the proposed plant 5) Sources of information about events in the town and the proposed plant and the perceived reliability of these sources 6) Attitudes toward the proposed plant and toward TVA 7) Residents' perceived control over their feelings regarding their past and future 8) Respondents' perceived likelihood of various outcomes that could accompany the plant and the desirability of these outcomes 9) Basic demographic information about respondents such as age, education, and occupation.

The results indicated that 65% of the respondents favored construction of the plant, 26% opposed it and 10% were undecided. The strongest supporters were in business and labor. The supporters tended to feel that the community would experience economic benefits as a result of the plant. A small majority of farmers opposed the plant and women were the most adamant opponents. Opponents tended to be concerned about radiation dangers and the possibility of accidents at the facility. No differences between supporters and opponents were found in the areas of formal education, age and length of residence in the community.

The researchers stress the importance of collecting data prior to plant construction in order that a data base is available from which to assess changes directly related to the construction and/or operation of the plant.

Jopling, David G. and Gage, Stephen J., The pattern of public potential resistance, Nuclear News (March 1971).

The authors followed and reported on five cases of public resistance to major proposals for nuclear power plants. The research took into account technical and semi-technical areas along with information from the general news and opinion media. Results showed that each case study followed a definite pattern and that the pattern quite naturally broke down into seven distinct stages.

Stage One
- The utility company began the process to obtain the necessary licenses and to satisfy Federal and State legal requirements.
- The utility company did not contact conservation groups or groups or individuals concerned with environmental pollution.

Stage Two
- The first show of public concern took place usually in the form of a challenge to the safety aspects of the siting proposal.

Stage Three
- The individuals or groups who showed concern in Stage Two presented their concerns to the general public.
- The utility company's licensing application continued to move forward.

Stage Four
- A broad base of public activism developed. Ad hoc citizens groups were formed to fight the power plant proposal.
- The utility company failed to take the growing public concern seriously.

Stage Five
- Organized public resistance failed to die down. The media gave the controversy extensive coverage; government agencies held hearings; threats of special legislation appeared.
- The utility company began to engage in technical arguments with its critics.
- This stage saw the beginning of disagreement among the experts which made the controversy amenable only to political solution.

Stage Six
- Political activity increased.

Stage Seven
- Two types of resolution resulted. In three cases, the utility company withdrew its siting proposal. In two cases, the dispute was taken to the courts.

The authors make the following recommendations:

1. "Consultation with state and public groups should begin, therefore, long before any public resistance to the reactor proposal exists. The utility company should pull the public into the planning and decision process for nuclear plants including the design, siting, and construction activities."

2. "A utility should make both formal and informal efforts to incorporate the public into the decision processes."

"In conclusion, the electric power utility must recognize that only resolution, not solution, of power reactor siting is possible that political processes based on a continued working out of differences is the reality to be expected."

Lackey, L. L., Jacobs, T. O., Steward S. R., Public Attitudes Toward Hazardous Waste Disposal Facilities, Human Resources Research Organization, Columbus, Georgia (April 1974).

The authors report on a study which they conducted to assess community reaction to proposed national disposal sites (NDS) for hazardous wastes. The study had three purposes: 1. to survey public attitudes to proposed national disposal sites (NDS) 2. to develop a behavioral model which would predict citizen reaction to a specific NDS and 3. to propose an information campaign to inform the public about disposal sites.

The survey of public attitudes indicated that respondents wanted additional information before deciding whether or not to favor a NDS in their community. The information obtained in the survey was used to develop the behavioral model, a diagram of which is shown below.

Contextural Variables		Situational Variables		Individual Variables		Dependent Variable
Physical/Economic Environment (e.g., population)	→	Social Environment (e.g., history of past county reaction)	→	(e.g., attitude toward an NDS)	→	Citizen Reaction to an NDS
		Predictor Variables				Criterion Variable

Three classes of predictor variables were identified. The first of these was labelled contextural variables and included factors related to the physical/economic environment of the location. Information was obtained from public records and encompassed: population, population change, median income, median educational level, unemployment rate, impact of plant on local economy (ratio of project input of plant to local economy to the total payroll of the county), main income source (measured by the ratio of industrial/manufacturing payroll to non-industrial/non-manufacturing payroll), industrial exposure, growth-rate index, awareness of proximal plants. The second class of predictor variables was labelled situational and involved the social environment including such things as: reaction of local ecology groups, communication media, college or university study and faculty groups, key influentials, and community reaction history. The last category of predictor variables was individual variables. The following were covered: age, education, sex, individual attitudes/beliefs concerning plant, willingness to be employed at plant, type of information desired concerning plant, level of concern with environmental and ecological issues, ratings of general activity level and social interaction,

acceptable behaviors which might be engaged in to support the respondent's position concerning a plant located in the county. Along with the three classes of predictor variables there was one criterion variable defined as citizen reaction to a national disposal site (the dependent variable of the study).

Finally, the authors discuss a "strategy for introducing regional processing facilities to selected locations." The authors suggest three possible targets for a communications program: (1) the nation (2) populations around proposed sites (3) key influentials and groups at the local and national levels. Emphasis is placed on the fact that a national information program should commence six months prior to the time approval is sought for installation.

Announcement of the project would take place at a press conference given by leaders from the various agencies involved with the project. This conference would address the following subjects: provide factual information about the system and its advantages over present systems, discuss anticipated objections by the public, and distribute a press information kit.

The authors emphasize the importance of collecting attitudinal and demographic data from the proposed location prior to beginning a local information program. The literature indicates that the local campaign should stress the following issues: impact on local economy, impact on land values, impact on land use patterns, impact on the general environment, aesthetic impact on the environment, and safety factors.

Motz, Annabelle Bender, A Tale of Three Cities: Content Analysis of Archival Materials, The American University, Washington, D.C. (1975).

This paper describes a project which uses content analysis of archival data to assess the effects of technology changes on small-sized cities.

The author conducted longitudinal case studies of three cities to assess the effects of the McClellan-Kerr Multiple Purpose Arkansas River Project. The following archival resources were employed: records of public hearings, the contents of the Dun and Bradstreet Reference Book (which provides recommended credit ratings of business and industrial firms), U.S. Census data, local newspapers, histories of the states or portions of them and economic and other reports of the county and the area.

The author concentrates specifically on the use of the weekly newspaper as an information source. A coding system was developed which took into account six major areas: 1) the nature of business establishments 2) community leadership as identifiable from the papers 3) voluntary associations or organizations that served to bring people together 4) articles that reflected dominant interests of the city as reported by the editors 5) references to the Arkansas River 6) relationships between the city and the nation. Information collected in this manner is being compared with public hearing data, the Dun and Bradstreet Reference Book, and U.S. Census data. The final result is expected to be a research technique for the use of archival data to aid in the understanding of social impacts.

Although she sees this as a useful technique, the author warns that there are many areas of possible bias. In particular it is difficult to assess how items are selected for print, and to assess the reliability of stories that are printed. Finally, it is difficult to determine the effect of specific events on a city or community.

Myhra, David, The Use of Zoning to Mitigate Adverse Socioeconomic Impact: An Example of Compromise in the Siting of a Nuclear Power Plant, Westinghouse Electric Corporation, Pittsburgh, Pennsylvania (Dec. 1974).

Myhra documents a case where the local utility company agreed to provide impact payments to the community in exchange for a rezoning permit which allowed construction of a nuclear power plant. Myhra indicates that this agreement is probably unique and could have far-reaching consequences.

"The rezone agreement which Puget entered into with Skaget County is a dramatic use of zoning to mitigate adverse socioeconomic impact. It is perhaps a first in the United States where a private utility acknowledges that its actions can create financial problems for small communities surrounding the construction of a power plant. In addition, Puget agreed to make tax prepayments to schools and law enforcement agencies for any additional costs they are forced to incur in terms of supplies, manpower and equipment. This practice is rare. Even more significant is the attitude of both Skaget County and the utility regarding each other's responsibilities. Skaget County recognizes the need for additional electric power and the desirability of having the nuclear project in the county. On the other hand, the county is unwilling to bear the full initial socio-economic disruption: that is, the county believes that Puget through its customers should be willing to assist the county financially during the construction period. Through compromise, the county and Puget have adopted a far-reaching zoning agreement."

"The significance of the Skaget County agreement and its applicability to projects in other states is readily apparent. During a period of rapid population growth services may be needed immediately while revenues from property tax from the project may lag. It is during this period that a community can suffer, not only financial problems, but secondary adverse impact as well. Educational quality can decline, infrastructure can become overloaded and overused, and manpower and supplies can become scarce, all because of the community's inability to finance the influx. Eventually, tax revenues will match needs for services but the lag may last several years. For these reasons, arguing that those responsible for impact should pay in advance is a proper request to make before allowing a rezone change.

"In the case of Puget the significance of the action from a public relations point of view is also valuable. It shows both that Puget is willing to become a good neighbor and that responsiveness to public concern can greatly alleviate opposition to a proposed facility."

Peelle, Elizabeth, Social Effects of Nuclear Power Plants, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830 (1974).

The author stresses that the social effects of nuclear power plants result from impacts upon 1) socially-valued aspects of the physical environment and 2) the social structure.

The author sees the following questions as important in a consideration of the social impact of a large power plant: "What are the current and projected uses of the land pre-empted by the power station, its exclusion zone and cooling lake? What is the effect of new long-term demands on the water supply now to be used in addition for cooling the nuclear generator(s)? Will roads become congested by construction traffic, aquatic resources destroyed or pre-empted from their former human uses, scenic coastlines impacted by the intrusion of transmission corridors, cooling towers, or buildings where formerly there was open space? Is access to public good resources (air, water, scenery) reduced or impeded by building the plant?"

The following are listed as possible impacts on the social structure of the community: "Population growth and resulting demands upon local services and communities are the major construction impacts upon social structures. Schools, housing facilities, water supplies, law enforcement, commercial facilities, etc. may be heavily overloaded if a large construction force must live temporarily in a small rural, underserviced area. Likewise, the administrative infrastructure of local government is often relatively undeveloped in rural areas, and lacks the organizational resources/ professional expertise needed to plan effectively for sudden population growth and services expansion. . . "

The author concludes with the statement that social impact analysis should consider impact on humans with the same rigor devoted to studying impact on other living species and inanimate resources.

Socioeconomic Effects of Construction and Operations of WNP-3 and WNP-5 and Alternatives to Alleviate Adverse Effects, Westinghouse Electric Corporation, Environmental Systems Department, Pittsburgh, Pennsylvania (December 1974).

This report examines the potential social and economic effects on a community resulting from the construction of a nuclear power plant.

The first part of the report discusses the social costs involved with plant construction and operation. A major factor affecting these costs has been found to be the number of new residents moving into the local area. The authors suggest four factors affecting this consideration: (1) location of plant site with respect to driving time from large metropolitan area (2) number of craft and trade employees within commuting distance (3) nature of highway network which can be used for daily commuting (4) ability of surrounding area to accommodate some construction and operational personnel.

In an effort to further assess social costs, the authors conducted in-depth interviews with 72 key informants, including mayors, council members, police officials, merchants and chamber of commerce directors. An effort was made to talk to individuals who were known to be opposed to the project.

Questionnaires were developed and sent to 130 people in twelve communities where nuclear power plants were currently in operation. Questionnaires were mailed to local public officials, chambers of commerce, bankers, planners, superintendents of schools and police officials. The mail questionnaires were backed up by personal interviews in these areas.

The last part of the report is devoted to a discussion of the impact of the specific plant proposed for Grays Harbor County, Washington. The impact is based mainly on the projection of the number of construction and operation personnel who will move into the immediate area supplemented by the questionnaire data. It is interesting to note the areas of impact covered by the authors. As possible temporary external costs they include manpower requirements and availability, housing, cost of living, traffic, noise, aesthetic disturbances, schools, hospitals, water systems, waste water systems, community services, other public facilities, disruption of people's lives due to land acquisition, land acquisition and its removal from productivity. The discussion of possible long-term external costs includes impact on recreational values, reduced species of

wildlife and sport fish, restrictions on access to land and water areas, removal of land from present or contemplated alternative use, creation of locally adverse meteorological conditions, real estate values, increased costs to local government, noise, aesthetic effects, effect on groundwater, deterioration of aesthetic and scenic values.

An interesting aspect of this study is the fact that it was funded by a public utility company.

5.3 Other Utility Studies

A considerable amount of work appears to have been done on institutional considerations in the area of water resource development and management and in the area of water basin studies. The reason for this probably results from the fact that water basins normally cover a large area often including more than one state. In managing these areas numerous agencies or organizational structures must be considered. Therefore, the literature on institutional and organizational factors has quite naturally developed in this area.

Literature related to fluoridation is also included here. Although many of the fluoridation references are not directly relevant to MIUS, some do contain insights into community reaction to an innovative concept.

5.3.1 Annotated References

Mazur, Allan, Opposition to Technological Innovation, Minerva, 58-81 (Spring 1975)

The author looks at opposition to technological innovations by comparing the dispute over fluoridation of water supplies with the controversy over nuclear power plants. The table below looks at the stages of community reaction to each issue and at the stages each issue has in common.

Stages of a Local Controversy

Stages of a Local Dispute about Fluoridation	Stages of a Local Dispute about a Nuclear Site	Stages Common to Local Disputes
A small group of proponents discuss the desirability of local fluoridation.		Initial plans to introduce the innovation.
Proponents gather support; open opposition may appear. Formal proposal to have fluoridation approved is submitted to the appropriate governmental authority.	The electricity company proceeds to satisfy requirements of the USAEC and the state government regarding site. First public opposition to, or questioning of, the utility's proposal.	Proponents submit a proposal to appropriate governmental authorities for approval; the first opposition appears.
Broadening of public opposition; local activity against proposal; formation of active groups for and against fluoridation; public debate; news organs become involved; campaigning along political lines.	Early opponents warn the public of the dangers inherent in the proposal. Broad public opposition emerges: civic groups form to resist the proposal. The electrical companies, reactor industry and the USAEC are unable to allay public opposition; national publicity results; dispute on technical issues discloses disagreement among experts.	The opposition gains broad public support; formation of active civic groups; public meetings, demonstrations, and election-like campaigns; news organs become involved; disagreement among experts.
The governmental authority makes a decision on the proposal. The defeated party either appeals against the decision or raises the issue again.	Public demonstrations and campaigns against the electrical company and its proposal. The electrical company withdraws its proposal, or a governmental authority (e.g., the judiciary), decides the issue. The defeated party may appeal or prepare for a new confrontation.	A decision is reached by some governmental authority, or else the proposal is withdrawn. But the issue is not necessarily settled. The defeated party may appeal against the decision or raise the issue again at a later date.

The author sees the opposition to technological innovations as falling into five categories: 1) danger, 2) ignorance, 3) alienation, 4) beliefs about larger issues, and 5) social influence.

Ramirez, Albert, et. al., Social Psychological Correlates of Resistance to Change and Their Effects on Attitudes Toward Fluoridation, University of Alabama, School of Dentistry, Birminghan, Alabama (August 1968).

The authors hypothesized that resistance to social change would be related to anomie (feelings of social alienation), powerlessness (feelings of political alienation), rigidity (resistance to change of thoughts and actions), and socioeconomic level. Fluoridation was chosen as the measure of social change.

A questionnaire was developed using portions of established scales for anomie, powerlessness, and rigidity. Socioeconomic information was taken from census data. Response to a bond issue referendum for civic improvements was used to test a hypothesis concerning voting against the establishment. The results appearing to have the greatest relevance to MIUS are as follows:

1. Appeals for acceptance of a program involving social change should come from an alienated individual's own reference group and not from the establishment.

2. Appeals should be made by individuals having high credibility.

3. Appeals should contain not only factual materials but emotional arguments as well.

4. The alienated individual should be given responsibilities in the campaign as early as possible.

5. All the above mentioned actions should be taken quite early, in fact before the project under consideration becomes an issue.

A Review of the Wastewater Crisis - Montgomery County - November '72, Clearwater, 18-24 (November 1972).

This article presents an interesting, complete and non-technical review of all facets of a county wastewater crisis. This overview of all the parties involved in attempting to resolve the problem is quite relevant to a consideration of the implementation of MIUS.

York, C. Michael, Instruments for Measuring Attitude Toward a Community Water Issue, Georgia Institute of Technology, Atlanta, Georgia (March 1969).

York developed two methods of attitude measurement for use in the investigation not only of the fluoridation issue but also of similar public policy issues. The author's discussion of the methodologies includes such topics as: reliability estimates, pretesting, group comparison data, item evaluation, contrast validation. In addition to attitudinal information, the author collected data on respondents' factual knowledge of the fluoridation issue thus enabling a comparison of attitude with type and accuracy of knowledge. Finally, an evaluation was made of the effect of persuasive communications on community attitudes.

This report has been included since the fluoridation issue is seen as having several major institutional factors in common with the development and installation of an innovative utility system. These include the generation of community interest and concern; concern among elected officials; reaction of environmentalists, technical specialists, and the public at large. Although the specific questions asked and issues discussed are not directly relevant to the MIUS effort, the methodological discussion would prove valuable in the development of MIUS assessment techniques. Of particular interest is the correlation of factual and attitudinal data and the data relating the effect of various types of media on attitudes.

5.3.2 Further References

Crain, Robert L.; Katz, Elihu; Rosenthal, Donald B., The Politics of Community Conflict: The Fluoridation Decision, Chapter 10, The Bobbs-Merrill Company, Inc., New York.

Fox, Irving K., Volume 1. Water Resources Policy in Wisconsin: A Summary Assessment, The University of Wisconsin, Water Resources Center (1971)

Kaynor, Edward R. and Howards, Irving, Limits on the Institutional Frame of Reference in Water Resource Decision-Making, Water Resources Bulletin, 7, No. 6 (Dec. 1971).

Mann, Deane E., Interbasin Water Transfers: A Political and Institutional Analysis, National Water Commission, Arlington, Virginia (March 1972)

Ostrom, Vincent, Institutional Arrangements for Water Resources Development, Indiana University, Bloomington, Indiana (Dec. 1971).

Ranney, D. C. and Nasoff, J. K., Water Quality Management -- An Analysis of Institutional Patterns, University of Wisconsin Press, Madison, Wisconsin (1972).

Trock, W. L., Institutional Factors Affecting Land and Water Development, Lower Rio Grande Valley, Texas, Water Resources Research, 5, No. 6, 1344-6 (Dec. 1969).

Urban Systems Research and Engineering, Inc., Metropolitan Water Management: Case Studies and National Policy Implications, Cambridge, Massachusetts (June 1971).

5.4 Innovation and the Housing Industry

Most total energy plants have been built by the developer of the site served by the plant and are owned and often operated by the developer. On this basis, private developers may be looked upon as possible MIUS implementors. Therefore, the acceptance of innovative projects by the housing and construction industries becomes an important consideration.

The housing industry and the utility industry have a number of factors in common. An understanding of institutional barriers to innovation in the housing industry could be quite relevant to understanding institutional factors affecting MIUS.

5.4.1 Annotated References

Constraints to Builder's Use of Cost Saving Innovations, NAHB Research Foundation, Inc., Rockville, Md. (July 1971).

This study was aimed at determining why builders do not always adopt cost saving techniques.

A questionnaire was sent to a random sample of 2500 builders. A portion of the questionnaire was concerned with why the respondents might have been reluctant to institute twelve specific cost saving innovations. The greatest number of builders responded, "Although we know about the item, we have never really considered using it." Other important constraints included, "We have heard about the item, but do not have enough technical information to use it;" "The potential benefits are not worth the possible risk of poor performance;" "It is not marketable in our area," "The item is not applicable to our design or materials;" "It is prohibited by the building code;" "Although not prohibited specifically by code, local building officials frown on it and we comply with their desires."

Hirshberg, Alan and Schoen, Richard, Failure and Success in Technological Innovation in the U. S. Housing Industry.

The authors stress that even though an innovative concept may be technically feasible and economically competitive, it often fails to achieve acceptance in the housing industry. "In our opinion attempts to achieve commercial acceptance must include a combination of technical, economic and institutional activities to provide an adequate information base upon which major diffusion efforts can successfully develop. Furthermore, it can be shown that some of the commercial failures of cost-reducing innovation in this U.S. industry stem directly from a failure to understand the industry's somewhat unique nature, and in particular, the institutional forces which operate within it to deter diffusion of innovations."

The authors indicate three conditions necessary for successful innovation. First, the innovation must be technologically feasible; second, it must be economically feasible; and third, the innovation must overcome institutional factors.

Institutional resistance is seen as being a result of three organizational characteristics of the housing industry -- the industry tends to be regional, fragmented, and horizontally stratified. In addition, two cultural characteristics effect innovation -- the industry is craft-based and tradition-oriented. Tradition is seen as being a very powerful barrier to innovation, especially in the construction industry.

Schoen, Richard; Hirshberg, Alan S.; and Weingart, Jerome M. New Energy Technologies for Buildings: Institutional Problems and Solutions, Ballinger Publishing Company, Cambridge, Mass. (1975)

The authors have identified characteristics of the construction industry which present barriers to applications of new energy technologies. They specifically discuss total energy systems, fuel cells and solar conversion and indicate approaches within the construction industries which they feel might increase commercial acceptance of these and other technologies.

Ventre, Francis, Social Control of Technological Innovation, Dissertation, Massachusetts Institute of Technology (1973)

This study considers the diffusion of innovations in the residential construction industry. The author examines the social, economic, political and engineering factors which affect the rate of diffusion. Two factors are seen to contribute significantly to a slow acceptance of innovations in the construction industry -- the diverse, dispersed and discontinuous nature of the industry and the conservative tastes of homebuyers.

5.4.2 Further References

Nelkin, Dorothy, The Politics of Housing Innovation: The Fate of the Civilian Industrial Technology Program, Cornell University Press, Ithaca, New York (1971).

5.5 Literature Concering Innovation and Organizations

The literature in this area is largely theoretical and only of peripheral relevance to MIUS. The George Washington University Program of Policy Studies in Science and Technology (Innovation Information and Analysis Project, The George Washington University, 2130 H Street, N.W., Suite 714, Washington, D.C. 20052), has several bibliographic compilations and accession lists of references in this area. Also, the National Science Foundation funds research in the area of innovation and diffusion of innovation. A file of research currently being funded is available from the National Science Foundation (1800 G Street, N.W., Washington, D.C.).

5.5.1 Annotated References

Schon, Donald A., The Fear of Innovation, International Science and Technology (November 1966).

Schon discusses the reaction of the modern industrial corporation to innovation. He places particular emphasis on the ways in which a corporation may try to prevent innovation while at the same time professing to be committed to it. Schon's discussion has particular relevance to an understand of utility company response to innovative systems.

5.5.2 Further References

Ayres, Robert V., On the Sustenance of Technological Innovation, Technological Forecasting and Social Change, 3, 273-278 (1972).

Czepiel, John A., Patterns of Interorganizational Communications and the Diffusion of a Major Technological Innovation in a Competitive Industrial Community, Academy of Management Journal, 18, No. 1, 6-24 (March 1975).

Davis, Ruth M., Institutional Barriers to the Diffusion of Technology for the Benefit of Society, Talk given at American Association for the Advancement of Science, San Francisco, California (February 24-March 1, 1974)

Ezra, Arthur A., Technology Utilization: Incentives and Solar Energy, Science, 187, No. 4178 (23 February 1975).

Gibbons, Michael, Factors Affecting Technological Innovation in British Industry, Industrial Marketing Management, 2, 101-112 (1973).

Jefferson, Ray, Planning and the Innovation Process, Pergamon Press, New York (1973).

Lambright, W. Henry, Government and Technological Innovation: Weather Modification as a Case in Point, Public Administration Review, 1-10 (January/February 1972).

Michaelis, Michael, Obstacles to Innovation, International Science and Technology (November 1965).

Rogers, Everett M. with Shoemaker, Floyd, F., Communication of Innovations: A Cross Cultural Approach, The Free Press, New York (1971).

Schon, Donald A., Technology and Change, Dell Publishing Company, New York (1967).

Selznick, Philip, Leadership in Administration: A Sociological Interpretation, Row, Peterson and Company, Evanston, Illinois (1952)

Selznick, Philip, TVA and the Grass Roots: A Study in the Sociology of Formal Organization, University of California Press, Berkeley, California (1949).

Smith, Richard Allen, Community Structure and Innovation: A Study of the Effects of Social Structure on Program Adoption and Implementation, Cornell Dissertations in Planning (April 1973).

Stanland, Raymond, Innovation and New Towns, Center for Urban and Regional Studies, University of North Carolina (Jan. 1972).

Utterback, James M., Innovation in Industry and the Diffusion of Technology, Science, 183, 620-626 (15 February 1974).

Zaltman, Gerald; Duncan, Robert; Holbek, Jonny, Innovations and Organizations, John Wiley and Sons, New York (1973).

6. Sources of Information

6.1 Researchers and Research Organizations

This section contains a list of researchers and research organizations currently working in areas relevant to a consideration of institutional factors affecting MIUS.

American Water Resources Association
Urbana, Illinois

Battelle Memorial Institute
Columbus, Ohio

Department of the Interior
Office of Water Resources Research
Washington, D.C.

The George Washington University
Program of Policy Studies in
Science and Technology
2130 H Street, N.W.
Washington, D.C. 20052

Human Resources Research Organization
1214 First Street
Columbus, Georgia 31901
Contact: Larry Lackey

National Science Foundation
1800 G Street N.W.
Washington, D.C.

National Water Commission
Arlington, Virginia

Oak Ridge National Laboratory
Oak Ridge, Tennessee 37830
Contact: Elizabeth Peelle
Bruce Purdy

School of Architecture and Urban Planning
UCLA
Los Angeles, California
Contact: Richard Schoen

Stanford Institute for Energy Studies
Stanford University
Stanford, California
Contact: William Reynolds

Westinghouse Electric Corporation
Environmental Systems Division
Pittsburgh, Pennsylvania
Contact: David Myhra
J. F. Byrne
E. W. Sucov

6.2 Major References

This subsection includes a list of journals and other major references which are likely to include relevant material on a regular basis.

Academy of Management Journal

International Science and Technology

Journal of Marketing Research

Journal of the New England Water Works Association

Land Economics

Minerva

Nuclear News

Public Administration Review

Public Utilities Fortnightly

Technological Forecasting and Social Change

Tech Bulletin

Technology and Culture

Water Resources Bulletin

Water Resources Research

7. References and Contacts

Since each section deals with substantially different material, the references and contacts have been listed by section.

Section 1, Introduction

Bartlett, Parker M. and Aistrop, William D., Integrated Utility Systems, Proceedings of 28th Annual Conference of CCAIA, Monterey, California (November 4, 1973)

HUD, Modular Integrated Utility System (1974).

Leighton, Gerald S., Modular Integrated Utility System Program, ASHRAE Journal, 43-46 (December 1973).

Modular Integrated Utility System Offers Prospect of Important Energy Savings, HUD Research, No. 1 (February 1974).

Request for Proposal No. H-86-74, Design, Installation and Demonstration of a Modular Integrated Utility System (MIUS), Department of Housing and Urban Development, Washington, D.C., (June 20, 1974).

Section 3, MASCO - A Case Study

The Boston Globe (August 18, 1975)

Strauss, Sheldon D., Heat Recovery Takes a Fresh Turn, Power, 120, No. 1, 18-23 (January 1976)

The MASCO utility plant project was first discussed in late 1973. During the summer of 1974, it was decided to explore the MASCO project as a possible candidate for a case study. Initial telephone contacts were made with MASCO, Boston Edison Company and Harvard University. The project was selected as the primary case Study and two trips were made to the Boston area. Personal interviews were conducted with individuals from the major organizations listed below.

MEDICAL AREA SERVICE CORPORATION (MASCO)
David Elovitz - Executive Vice President
398 Brookline Avenue
Boston, Massachusetts 02215
617-738-5000

ENGINEERS
Paul L. Geirenger, Associates
Stephen Geirenger - Project Engineer
425 Park Avenue, South
New York, New York
212-689-5320

HARVARD UNIVERSITY
Hale Champion - Vice President (former Director of BRA)
Don Moulton - Community Affairs Office 617-494-4955
Barbara Powell - Community Affairs Office
Dick Fryberger - Planning Office, in charge of MASCO Project.
Cambridge, Massachusetts 02138

ENVIRONMENTAL IMPACT STUDY
Environmental Research and Technology, Inc. (ERT)
John Goodrich
Dave Bearg
3 Militia Road
Lexington, Massachusetts
617-861-1490

URBAN PLANNER
Charles Hilgenhurst and Associates
Mr. Ludgren, Planner in Charge
Boston, Massachusetts
617-723-8082

TRAFFIC CONSULTANT
Wilbur Smith Associates
John Schoon

ARCHITECT
Benjamin Thompson Associates
Bruno D'Agostino - Project Architect
1 Story Street
Cambridge, Massachusetts
617-876-4300

LOCAL CITIZEN GROUPS
RTH (Roxbury Tenants of Harvard)
Robert Parks - President
Barbara Westmoreland
Mission Hill Planning Commission

BOSTON EDISON COMPANY
Thomas J. Gallinger, Jr. - President
Francis M. Staszesky - Executive Vice President
John Murphy (#3) - Assistant Manager, Electric and Steam Sales
617-424-2276
John J. Murphy (#4) - Sales Engineer, Technical and Promotional Sales, Assigned to monitor HUD-MIUS project
617-424-2306
35th Floor Prudential Building
800 Boylston Street
Boston, Massachusetts

PLANNING COMMISSION
Boston Redevelopment Authority (BRA)
Mase Wenninger - "Liaison" man for MASCO in BRA
617-722-4300
Mitch Fischman - District Planner for MASCO area
617-722-4300
City Hall
Boston, Massachusetts 02201

OTHER REGULATING BODIES
Bureau of Air Pollution - David Standly
617-227-4300
Institutional Tax Collector - Jim Young - Mayor's Office
617-722-4100
Assessor - Burnie Shaedrie - Assessing Department - Boston City Hall
Traffic Commission
Public Works Commission
Public Improvements Commission
Department of Public Utilities (State of Massachusetts)

OTHER
Faulkner Hospital
Carl Haugen, Plant Engineer
Boston, Massachusetts
617-522-5800
Faulkner has a total energy plant. Boston Edison convinced the hospital to use the plant only for peak shaving and to purchase power on fixed demand.

Section 4, Other Case Studies

Capron, William M. (ed.), Technological Change in Regulated Industries, The Brookings Institution, Washington, D.C. (1971).

Dirksen, Peter C., Jr., Gas Total Energy Case History, ASHRAE Journal, 39-41 (April 1973).

Echols, H. Murray, Problems of Total Energy Systems, Actual Specifying Engineer (October 1970).

Federal Power Commission, The 1970 Federal Power Survey (1970).

Hirshberg, Alan and Schoen, Richard, Failure and Success in Technological Innovation in the U.S. Housing Industry, Environmental Quality Lab, Caltech, Pasadena, California.

Mayo, W. E. and Purcupile, J. C., A Selective Total Energy System for a Residential Complex, Processing Research Institute, Carnegie-Mellon University, Pittsburgh, Pennsylvania (1973).

News from PEPCO, PEPCO, Washington, D.C. (August 16, 1972).

New York Times (July 7, 1973).

Novick, Sheldon, The Electric Power Industry, Environment, 17, No. 8 (November 1975)

Personal visits were made to Long Island Lighting Company, Potomac Electric Power Company, and the Worcester Science Center during the summer of 1974. Telephone contacts were made with the other firms during 1973, 1974, and 1975.

Stanley Bloys
Pacific Gas & Electric Company
San Francisco, California
415-781-4211

David Elovitz
Medical Area Service Corporation
Boston, Massachusetts
617-738-5000

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Citizens Gas & Coke Utility
Indianapolis, Indiana
317-924-3341 ext. 435

Carl Haugen
Faulkner Hospital
Boston, Massachusetts
617-522-5800

R. Hickson
Long Island Lighting Company
Mineola, New York 11501

Jeff Hunicutt
Total Energy Publications
522 Briar Oak Lane
San Antonio, Texas
512-344-1421

Mr. Howard King
Los Angeles Department of Water
and Power
Los Angeles, California

Joseph Kirdahy
Consolidated Edison
New York, New York
212-460-4600

Glenn Lovin
Electric Energy Association
Washington, D.C.
223-2720

Mike Mathews
Tennessee Valley Authority
615-755-3011

Bill Mayo
Carnegie-Mellon University
Pittsburgh, Pennsylvania
412-621-2600

Craig Peffer
Boston Edison Company
Boston, Massachusetts
617-424-2276

Dr. Starr
Electric Power Research Institute
213-826-6040

Jack Stuart
A. D. Little Company
Worcester, Massachusetts
617-864-5700

Harold Sundell
Head of Physical Plant
Commonwealth Gas Company
Worcester, Massachusetts
617-481-7900

John Whitney
Potomac Electric Power Company
1900 Pennsylvania Avenue, Room 514
Washington, D.C.
872-3078

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WASHINGTON, D.C. 20234

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Department of Housing and Urban Development
Washington, D.C. 20410

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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.*)

This report considers some of the institutional factors which might affect the development and implementation of an innovative utility project and in particular of a Modular Integrated Utility System (MIUS). A case study of the planning and implementation stages of a major utility project was undertaken along with several studies of less complex utility projects. An annotated bibliography exploring the literature on institutional response to existing or proposed utility projects and to innovation in general is included. The case studies and literature survey indicated a number of institutional factors along with a wide range of issues associated with these factors. Specifically, the institutional factors which are considered fall into the following areas: utility company response, local citizen group response, environmental group response, labor interests, builder/developer role, local planning agency and local, state and Federal agency involvement. Economic and legal/regulatory factors are not considered in any detail. In addition to the case studies and the annotated bibliography, the report contains a list of researchers currently working on related programs and a list of journals and other major references which are likely to include relevant material.

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*)

Institutional Factors; Modular Integrated Utility System; Total Energy; Utility System

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