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Residential Solar Data Center Data Resources and Reports

Patricia M. Christopher
Joan E. Krzewick

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

June 1979

Prepared for:
Department of Housing and Urban Development
Division of Energy, Building Technology and Standards
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U.S. DEPARTMENT OF COMMERCE, Juanita M. Kreps, *Secretary*
Jordan J. Baruch, *Assistant Secretary for Science and Technology*
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

FOREWORD

From January to October, 1978, the Residential Solar Data Center (SDC) of the National Bureau of Standards (NBS) issued a bimonthly publication known as "Status Reports" (SDC Report No. 4*). These reports contained sets of tables and charts designed to inform selected participants (primarily the Department of Housing and Urban Development and its contractors) in the Residential Solar Heating and Cooling Demonstration Program about the volume of data stored in the solar data base maintained by the SDC, and about the types of computer printouts that were available. The availability of computer printouts to a larger, more varied group of potential users was announced at the Department of Energy's Solar Heating and Cooling Systems Operational Results Conference held in Colorado Springs, Colorado, November 28 - December 1, 1978.

The present document, "Residential Solar Data Center Data Resources and Reports," is published in an effort to enhance comprehension of the computer printouts of Residential Solar Demonstration Program data by this more general audience. Included is a summary of the history and background of the SDC and the Demonstration Program, an explanation of grant cycles and data collection procedures, and a full description of the files which comprise the solar data base.

This publication will be updated as needed by the SDC. For information on the availability of updated material, contact the Franklin Research Center:

Franklin Research Center
1030 15th Street, N.W., Suite 720
Washington, D.C. 20005
Attn: Dr. Gerald Mara
Telephone: (202) 233-8109

*See Section 8.

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Geoffrey Thomas
Rehab Group, Inc.

William Freeborne, Mechanical Engineer
Solar Heating and Cooling Demonstration Program
Department of Housing and Urban Development

RESIDENTIAL SOLAR DATA CENTER
DATA RESOURCES AND REPORTS

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RESIDENTIAL SOLAR DATA CENTER

DATA RESOURCES AND REPORTS

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ABSTRACT

The Residential Solar Data Center (SDC) is responsible for the establishment and operation of a computerized data base containing non-instrumented residential data collected from the DOE/HUD Solar Heating and Cooling Demonstration Program. This document includes a summary of the history and background of the SDC and it's role in the Demonstration Program, a list of the computer reports which are available and sample pages of representative reports, a description of the data files which comprise the solar data base, a description of the interactive access to the solar data base, a set of figures showing the amount of data on the computer, and a list of other Solar Data Center publications.

Key Words: Automatic data processing; data base; residential buildings; solar data base; solar heating and cooling; solar energy systems.

1. BACKGROUND

In 1974, Congress passed the Solar Heating and Cooling Demonstration Act to establish a program of research, development and demonstration directed towards reducing the nation's dependence upon non-renewable resources through stimulating the development and use of solar energy systems. The Department of Energy (DOE) is responsible for the management of the total Federal Solar Energy Research, Development and Demonstration Program. DOE is assisted in the demonstration portion of the program by the Department of Housing and Urban Development (HUD), the National Bureau of Standards (NBS) and other Federal agencies and private contractors.

The Demonstration Program is divided into two parts: a Residential Program for which HUD has prime responsibility; and a Commercial Program, directed by DOE. In both programs, funds are allocated for new and retrofit building projects in a variety of climatic and geographic regions. These projects are designed to demonstrate the economic viability of the use of solar energy systems for heating and cooling.

A principal objective of the Demonstration Program is to provide data on the technical aspects of solar energy systems and on their acceptance by the building industry, regulatory agencies and the consumer. Data are collected in two ways: manually (*non-instrumented data*) and electronically (*instrumented data*).

Non-instrumented data, technical and non-technical, are collected on questionnaires or take-off forms for entry into the computer.

Included are data describing the demonstration projects and their solar energy systems as well as data concerning the progress of the grant from construction through marketing, market acceptance, etc.

Instrumented technical data are derived principally from sensors installed when construction activities are completed at selected project sites. These data, when analyzed, define the thermal performance of the solar energy systems and the climatic conditions affecting that performance.

DOE contractors are responsible for the collection of both instrumented and non-instrumented data in the commercial program and for the collection of instrumented data only in the residential program.* The responsibility for collection of non-instrumented data in the residential program resides with HUD. Figure 1 illustrates the assignment of data collection, evaluation and dissemination responsibilities in the Solar Demonstration Program. The Residential Solar Data Center (as shown in Figure 1) is the entity responsible for storage, retrieval and dissemination of non-instrumented solar data in the Residential Program.

In implementing the Residential Demonstration Program, HUD has established four main objectives. They are:

1. Residential demonstrations of solar equipment;
2. Development of performance criteria and certification standards for solar equipment;

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*See Appendix for a list of reports on instrumented residential data.

3. Encouragement of the acceptance and use of solar technology by the housing industry and the general public; and

4. Dissemination of demonstration and market development data.

In order to accomplish these objectives, HUD is funding demonstration projects (by awarding grants) in cycles initiated approximately every nine to twelve months.* Data collected from funded projects in each cycle enable HUD and its contractors to apply increased awareness of solar technology, marketplace dynamics and data collection techniques towards enhancing the effectiveness of projects in succeeding cycles.

In addition, HUD, in cooperation with DOE, has established a national clearinghouse and reference center**for the effective dissemination of information regarding solar energy systems - technical and non-technical, domestic and foreign, residential and commercial. The Center functions as a major reference resource for all elements of the solar community, as well as for the general public. The latest demonstration information is made available by the Center through publications, conferences and exhibits and through its toll-free telephone and national mailing response mechanism.

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* For a count of grants per cycle, see Section 7, page 49.

**National Solar Heating and Cooling
Information Center
P. O. Box 1607
Rockville, MD 20850
(800) 523-2929
(800) 462-4983 (in PA)

FIGURE 1. SOLAR DEMONSTRATION PROGRAM
DATA COLLECTION, EVALUATION AND DISSEMINATION
ACTIVITIES AND RESPONSIBILITIES

<table>
<tr><th>Responsibilities
Activities</th><th colspan="2">Commercial</th><th colspan="2">Residential</th></tr>
<tr><th></th><th>Instrumented Data</th><th>Non-Instr. Data</th><th>Instrumented Data</th><th>Non-Instr. Data</th></tr>
<tr><td>Store, Retrieve, and Disseminate Data</td><td colspan="2" rowspan="2">DOE/
Contractors</td><td colspan="2">HUD
Contractor
(Solar Data
Center of
NBS)</td></tr>
<tr><td>Evaluate Data and Document Results</td><td colspan="2">HUD/
Contractors</td></tr>
<tr><td>Maintain Printed Reports, etc.</td><td colspan="4">DOE Technical Information Center (TIC)</td></tr>
<tr><td>Disseminate Information</td><td colspan="4">National Solar Heating and Cooling Information Center</td></tr>
</table>

2. THE RESIDENTIAL SOLAR DATA CENTER

In the Fall of 1976, the design for a solar data center was initiated by the Institute for Computer Sciences and Technology (ICST) at the National Bureau of Standards (NBS). A series of publications ("ICST Planning Reports 1-5")* developed the framework for what was to become the Residential Solar Data Center (SDC).

In March, 1977, the SDC became operational at NBS. The SDC is responsible for the establishment and operation of a data base containing non-instrumented solar data collected by participants in the Residential Solar Demonstration Program which is managed by the Department of Housing and Urban Development (HUD).

Currently, the principal data collection contractor for HUD in the Demonstration Program is the Boeing Aerospace Corporation (BAC) which has subcontracted with the American Institute of Architects/ Research Corporation (AIA/RC); Dubin, Bloome Associates (DBA); and the Real Estate Research Corporation (RERC). These contractors collect and forward data to the SDC which maintains a solar data base consisting of the following files:

1. Grant File: This file contains basic project and system information for each application funded by HUD. These data are derived from grant applications submitted to HUD and updated with information from periodic field reports.
2. Grantee Report File: Data in this file are based upon reports submitted by each grantee to BAC describing

*See Section 8.

the progress of his grant from design and award of construction financing through actual construction, sale and permanent financing. The grantee's perceptions of the ease or difficulty in obtaining construction or permanent financing and building and zoning approval, as well as construction, equipment or installation problems are included.

3. Technical Description File: This file contains basic system design and predicted performance data collected by DBA from a large number of selected non-instrumented systems. A more detailed set of data is collected by AIA/RC for those systems which are to be instrumented.
4. Technical Concerns File: Contained in this file are data on problems found during the design, construction or operational phase which were recorded in field activity reports submitted by DBA and BAC field representatives. It also contains data on problems found after construction, as recorded by the grantee.
5. Marketing Survey File: This file contains extensive survey questionnaire results collected by RERC from selected builders, lenders, homebuyers, code officials, utility companies and other market participants. The data sample includes representatives of those who chose to build, lend or buy a funded solar house and "comparatives" who did not become involved. Data are

also collected after the sale to gauge builder and consumer reactions over a period of time.

6. Utility Consumption File: This file contains information on auxiliary or "back-up" fuel consumed for selected projects. The data are collected from utility companies (with purchaser agreement). "Comparative" data are also collected.*

The following is a brief description of the services provided by the SDC:

Receipt and Maintenance of Data

The SDC provides a central location for the receipt, storage, processing and reduction of non-instrumented, residential solar data collected from the Solar Demonstration Program. Data are collected and transcribed onto computer forms by HUD and its contractors. These forms are sent to the SDC and from there to NBS contractors who key the information into machine-readable formats. The incoming data are then edited, catalogued, reformatted, translated and validated. These activities provide the necessary control and prepare the data for use in the production of appropriate reports.

Production of Printed Reports

A major function of the SDC is the production of reports ranging from complete listings of all data in a file to more detailed "custom" computer reports. Custom reports are produced to meet specific user requirements and may print only selected data from a file and may

*A more complete description of data files and specific data elements is contained in Section 5, page 27.

re-sort the selected data into a new sequence. New report requirements are defined by HUD or its contractors in the Residential Demonstration Program. These reports are generated whenever a data file is updated.*

Provision of Online Access to the Data

Some data files can be accessed by authorized users (as determined by HUD) via a computer terminal. Access is made possible through the use of query packages. These packages are described in Section 6.

Ad Hoc and Other Continuing Functions

In addition to the operation and maintenance of the data base, the SDC also provides the following user services:

1. technical expertise to answer user questions and to provide assistance;
2. development of computer programs in response to users' special needs;
3. user training in online access to the data base and in procedures for transcription and validation of data;
4. documentation of available data, reports and online access techniques;
5. interface with data collectors and users;
6. planning for archiving of files, documentation and programs;

---

*See Table 1, Section 3, pages 11-14, for a list of reports available through SDC.
See Table 2, Section 3, page 15, for dates of current SDC reports.

7. development of standards for terminology, programs and documentation.

3. SUMMARY OF COMPUTER REPORTS AVAILABLE

The tables in this Section show computer output reports currently available. Tables 1.1 - 1.6 summarize content, indicate report sequence (i.e., sorted by grant number, sorted by manufacturer, etc.) and availability. Table 2 lists the dates of the latest reports and, for some reports, indicates the frequency of update.

The following is an explanation of terms used in the headings of Tables 1.1 - 1.6:

Description: A brief description of the data elements included in each report. (See Section 5 for additional information.)

Sequence of Data: The order in which line items are sorted.

Number of Report: Number by which the report is referenced when requesting a copy from Franklin Research Center. This same number appears at the top of each page of the report.

Availability: Availability codes:

1 = HUD permission needed

2 = Available from Solar Data Center through Franklin Research Center. (See page i.)

SUMMARY OF COMPUTER REPORTS AVAILABLE

Table 1.1 Grant File Data

Description	Sequence of Data	Number of Report	Availability
(The following reports are available for Cycles 1, 2, 3, 4 and 4A, combined or separate.)			
Complete listing of all data collected for each grant awarded. (270 pages)	Grant Number	HA-C1*	2
Analysis of units and costs for grant awarded showing average unit cost. (2 pages)	System Type	HA-C2*	2
Listing of grants awarded with grantee name, project city and state, housing type, construction type, unit count, system type, system kind, cost to government and solar manufacturer. (8 pages)	Grant Number	HA-C3*	2
Same as HA-C3 except collector sq. ft. and cost per MBtu is shown instead of cost to government. (12 pages)	Manufacturer	HA-C4BC	2
Same as HA-C3 except collector sq. ft. is also shown. (12 pages)	Manufacturer	HA-C3CG	2
Same as HA-C3 except grantee city and state are shown instead of project city and state. (12 pages)	Grantee City and State	HA-C5AS	2
Same contents as HA-C3. (12 pages)	Project City and State	HA-C5PS	2
Same as HA-C3 except HUD region is also shown	HUD Region	HA-C7	2
Same as HA-C3 except additional cost per MBtu information is shown. (Can be sorted by manufacturer and project city/state also.) (12 pages)	Grant Number	HA-R2	2

*Sample pages from these reports are contained in Section 4, pages 16-26.

SUMMARY OF COMPUTER REPORTS AVAILABLE

Table 1.2 Grantee File

Description	Sequence of Data	Number of Report	Availability
Listing of all Grantee Report data. (200 pages)	Grantee Report, Card Number, Project ID	BA-R1* BB-R1 BC-R1	2
One page per project of all Grantee Report 1, 3 and 4 data, with field titles. (400 pages)	Project ID	BA-R2* BB-R2 BC-R2	2
Listing of all project IDs for each grantee report in the data base. (5 pages)	Project ID	B-P4	2

Table 1.3 Technical Description File

Description	Sequence of Data	Number of Report	Availability
One page for selected non-instrumented systems with field titles. (75 pages)	Project ID, System Number	DA-R1*	2
Listing of data on instrumented systems including: - the site and building with a solar system - the collector subsystem - the thermal storage subsystem - the controls subsystem - the circulation subsystem - the auxiliary energy subsystem, and - the predicted system performance. (200 pages - about seven pages per system.)	Project ID	AC-R1*	2

*Sample pages from these reports are contained in Section 4, pages 16-26

SUMMARY OF COMPUTER REPORTS AVAILABLE

Table 1.4 Technical Concerns File

Description	Sequence of Data	Number of Report	Availability
Listing of solar system hardware element, maintenance/repair actions taken, and event which caused action. (12 pages)	Hardware Element	CB-R1	1
Listing of three dictionaries used to code activity report data: hardware, action and event. (105 pages) Side-by-side listing. (35 pages)	Code	CB-R2 CB-R3	1
Double-spaced listing of data without codes translated. (40 pages)	Grant Number	CB-D1	1
Listing of data with codes translated. (40 pages)	Hardware Element	CB-D2	1
Same as CB-D2 except in a different sequence. (40 pages)	Grant Number, Date	CB-D3*	1
Same as CB-D2 except in a different sequence. (40 pages)	Phase	CB-D4	1
Same as CB-D2 except in a different sequence. (40 pages)	Performance area	CB-D5	1

*Sample pages from these reports are contained in Section 4, pages 16-26.

Table 1.5 Marketing Survey File

Description	Sequence of Data	Number of Report	Availability
Question and answer dictionary, showing abbreviated forms for all marketing survey questions and all the answers, both coded and uncoded. (250 pages)	Questionnaire ID, Question number, Project ID	RA-R1* thru RZ-R1	2
Listing of all answers for the marketing survey questionnaire from single family builder thru follow-up comparative renter	Questionnaire ID, Question number, Project ID	RA-R2 thru RZ-R2	2

Table 1.6 Utility Consumption File

Description	Sequence of Data	Number of Report	Availability
Listing of all utility consumption data and comparative data.	Project ID Fuel type, billing start date	BF-R1* BG-R2	2

*Sample pages from these reports are contained in Section 4, pages 16-26.

Table 2 Dates of Current SDC Reports

Number of Report	Current Report Date
Grant	
HA-C series	Residential Solar Data Center Grant Reports (March, 1979, with data through Cycle 4A)
HA-R2	On request
Grantee Reports	
BA-R1, BB-R1, BC-R1 B-P4, BA-R2, BB-R2 BC-R2	Updated monthly
Technical Description	
DA-R1	March, 1979
AC-R1	November, 1978
Technical Concerns	
All	March, 1979
Marketing Survey	
RA-R1 thru RZ-R1	March, 1979
RA-R2 thru RZ-R2	December, 1978
Utility Consumption	
BF-01, BG-01	Updated monthly

4. SAMPLE PAGES OF REPORTS

This section contains copies of actual pages from representative reports listed in Section 3. In most cases only one page is reproduced from each report. Since these examples may contain out-of-date or out-of-context data, they should be viewed as "samples" only. The title of the report and the date it was produced are shown on the top line of the page. The report identification number and sequential page number are shown in the upper left corner. An explanation of "not applicable" codes is given below. Other codes may be directly translatable since mnemonics were used whenever possible; however, the code dictionary associated with each report is frequently required. Codes are more fully explained when the complete report is distributed.

"Not Applicable" Codes

Missing data in these reports are usually indicated by one of four "not applicable" codes. The four codes and their translations are shown below. When space is available in the report, the code is translated and only the interpretation is printed.

N/A Code	Translation
XX	Information will be available later
XA	Information will not be collected
XB	Information not required
XC	See additional comments

GRANT/ ID NUM	APPLCT NUMBER	APPLICANT NAME AND ADDRESS	CONTACT PERSON	ORGN TYPE	TOT COST OF SOLAR	APPL REQUEST	GRANT AWARD
H2470	026A	SIR GALAHAD COMPANY VIRGINIA BEACH VA TEL: -	MYRON J. COHEN (ACENT) TEL: 804 340-9711 EXT:	BUILDER/DE	$ 29344	$ 29344	$ 12500

PROJ LOC 01 ADR: CSZ: VIRGINIA BEACH VA 23452 COUNTY: VIRGINIA BEACH
HUD/GSA REGION: 03 SEA:

MOD SEQ 1 HOUSING TYPE: SFD NUMBER DWELLING UNITS: 1 NUMBER SOLAR SYSTEMS: 1
CONSTRN TYPE: NEW NUMBER BUILDINGS: 1 COND AREA/BUILDING: 1510 SQ FT

SYSTEM:	TYPE	KIND	TRNF MED	COL TYPE	COL SQ-FT	TOT COST OF SOLAR	COST TO GVT	LOAD M-BTU/YR	SOL USED M-BTU/YR	SOLAR MANUFACTURER	CLASS KEYS
1	H W	ACTIVE	LIQUID	FLP	600	$ 29344	$ 12500	91	52	REVERE	NNNNNEEE

GRANT/ ID NUM	APPLCT NUMBER	APPLICANT NAME AND ADDRESS	CONTACT PERSON	ORGN TYPE	TOT COST OF SOLAR	APPL REQUEST	GRANT AWARD
H2472	025A	RITTER BUILDINGS INC BERRYVILLE VA TEL: -	FREDERICK L. SPENCER, JR. PRES. TEL: 703 955-1158 EXT:	BUILDER/DE	$ 5886	$ 5886	$ 5886

PROJ LOC 01 ADR: CSZ: BERRYVILLE VA 22611 COUNTY: CLARKE
HUD/GSA REGION: 03 SEA:

MOD SEQ 1 HOUSING TYPE: SFD NUMBER DWELLING UNITS: 1 NUMBER SOLAR SYSTEMS: 1
CONSTRN TYPE: NEW NUMBER BUILDINGS: 1 COND AREA/BUILDING: 1900 SQ FT

SYSTEM:	TYPE	KIND	TRNF MED	COL TYPE	COL SQ-FT	TOT COST OF SOLAR	COST TO GVT	LOAD M-BTU/YR	SOL USED M-BTU/YR	SOLAR MANUFACTURER	CLASS KEYS
1	HCW	ACTIVE	LIQUID	FLP	210	$ 5886	$ 5886	86	56	SUNWORKS	NNNNNEEE

GRANT/ ID NUM	APPLCT NUMBER	APPLICANT NAME AND ADDRESS	CONTACT PERSON	ORGN TYPE	TOT COST OF SOLAR	APPL REQUEST	GRANT AWARD
H2473	999A	CREEK NATION HOUSING AUTHORITY HIGHWAY 75 PO BOX 297 OKMULGEE OK TEL: -	RACSDALE & CHRISTENSEN TEL: 918 749-8378 EXT:	BUILDER/DE	$ 39935	$ 39935	$ 39935

PROJ LOC 01 ADR: CSZ: OKMULGEE OK 74447 COUNTY: OKMULGEE
HUD/GSA REGION: 06 SEA:

MOD SEQ 1 HOUSING TYPE: SFD NUMBER DWELLING UNITS: 5 NUMBER SOLAR SYSTEMS: 5
CONSTRN TYPE: RETRO NUMBER BUILDINGS: 5 COND AREA/BUILDING: 1060 SQ FT

SYSTEM:	TYPE	KIND	TRNF MED	COL TYPE	COL SQ-FT	TOT COST OF SOLAR	COST TO GVT	LOAD M-BTU/YR	SOL USED M-BTU/YR	SOLAR MANUFACTURER	CLASS KEYS
1	H W	ACTIVE	LIQUID	FLP	223	$ 7987	$ 7987			RAYPAK	NNNNNEEE

78 AUG 12 PRINTED
78 AUG 12 LOADED

UNITS AND COST ANALYSIS FOR GRANTS SELECTED ON CLASS KEYS EEENEEEE CYCLES 1,2,3 AND 4
HA-C2

	** DWELLING UNITS **			******** COST TO GOVT ********			** AVERAGE UNIT COST **			SOLAR	NO OF
	NEW	RETRO	TOTAL	NEW	RETRO	TOTAL	NEW	RETRO	TOTAL	SYSTS	BLDGS
SINGLE FAMILY DETACHED											
HOT WATER ONLY	22	46	68	57951	62754	120705	2634	1364	1775	68	68
HOT WATER &/OR HEATING	417	23	440	3515653	206985	3722638	8431	8999	8461	436	440
HEATING & COOLING	4	0	4	35210	0	35210	8803	0	8803	4	4
HEATING, COOLING & HOTWATER	13	0	13	224211	0	224211	17247	0	17247	14	13
ALL UNITS TOTAL	456	69	525	3833025	269739	4102764	8406	3909	7815	522	525
SINGLE FAMILY ATTACHED											
HOT WATER ONLY	48	7	55	70939	7100	78039	1478	1014	1419	51	29
HOT WATER &/OR HEATING	175	8	183	1357336	67870	1425206	7756	8484	7788	159	80
HEATING & COOLING	0	0	0	0	0	0	0	0	0	0	0
HEATING, COOLING & HOTWATER	6	2	8	120000	23400	143400	20000	11700	17925	3	2
ALL UNITS TOTAL	229	17	246	1548275	98370	1646645	6761	5786	6694	213	111
GARDEN APARTMENTS											
HOT WATER ONLY	188	578	766	250200	352437	602637	1331	610	787	28	29
HOT WATER &/OR HEATING	235	173	408	789216	706751	1495967	3358	4085	3667	104	43
HEATING & COOLING	0	0	0	0	0	0	0	0	0	0	0
HEATING, COOLING & HOTWATER	30	92	122	310500	313500	624000	10350	3408	5115	4	6
ALL UNITS TOTAL	453	843	1296	1349916	1372688	2722604	2980	1628	2101	136	78
MULTI-FAMILY MID RISE											
HOT WATER ONLY	506	1525	2031	423761	1265952	1689713	837	830	832	32	33
HOT WATER &/OR HEATING	253	240	493	523000	552055	1075055	2067	2300	2181	7	6
HEATING & COOLING	0	0	0	0	0	0	0	0	0	0	0
HEATING, COOLING & HOTWATER	0	12	12	0	69729	69729	0	5811	5811	1	1
ALL UNITS TOTAL	759	1777	2536	946761	1887736	2834497	1247	1062	1118	40	40
MULTI-FAMILY HI RISE											
HOT WATER ONLY	554	1376	1930	328904	1031222	1360126	594	749	705	11	11
HOT WATER &/OR HEATING	0	317	317	0	209159	209159	0	660	660	1	1
HEATING & COOLING	0	0	0	0	0	0	0	0	0	0	0
HEATING, COOLING & HOTWATER	0	0	0	0	0	0	0	0	0	0	0
ALL UNITS TOTAL	554	1693	2247	328904	1240381	1569285	594	733	698	12	12
OTHER	0	0	0	0	0	0	0	0	0	0	0
ALL UNITS											
HOT WATER ONLY	1318	3532	4850	1131755	2719465	3851220	859	770	794	190	170
HOT WATER &/OR HEATING	1030	761	1841	6185205	1742820	7928025	5727	2290	4306	707	570
HEATING & COOLING	4	0	4	35210	0	35210	8803	0	8803	4	4
HEATING, COOLING & HOTWATER	49	106	155	654711	406629	1061340	13361	3836	6847	22	22
ALL UNITS GRAND TOTAL	2451	4399	6850	8006881	4868914	12875795	3267	1107	1880	923	766

NUMBER OF ACTIVE SYSTEMS 882
NUMBER OF PASSIVE SYSTEMS 21
NUMBER OF HYBRID SYSTEMS 20

GRANT NO	GRANTEE NAME	PROJECT CITY & STATE		HOUS TYPE	CNST TYPE	DWELL COUNT	SOLAR SYS	NBR BLDGS	SYS TYPE	SYS KIND	CLTR SQFT	COST TO GOV	SOLAR MANUFACTURER
H2423	INNOVATIVE BUILDING SYSTEMS	HAMBURG	NY	SFD	NEW	1	1	1	H W	A	700	15000	PPG INDUSTRIES
H2424	ARMSTRONG DEVELOPMENT CORP	CLAREMONT	CA	SFD	NEW	3	3	3	H W	A		(29679)	SOLARCOA INC
H2425	CITY OF ST PETERSBURG	ST PETERSBURG	FL	CAL	RET	4	4	1	W	A	576	9428	GULF THERMAL
H2426	PERL-MACK ENTERPRISES CO	AURORA	CO	SFD	NEW	1	1	1	HCW	A	576	23920	LENNOX-HONEYWELL
H2427	SPECTRUM DEVELOPMENT CORP	MOODY	AL	SFD	NEW	1	1	1	H W	A	273	(8000)	SOLARON
H2428	CAMBRIDGE DEVELOPMENT GROUP INC	COLUMBIA	SC	SFA	NEW	4	2	2	H W	A	1000	39000	SITE BUILT
H2429	FRIEDMAN ROSEN & ZIEN	SUMMIT	WI	SFD	NEW	1	1	1	H W	A	720	9732	ZIEN
H2430	LAMAR SAVINGS ASSN	AUSTIN	TX	SFD	NEW	1	1	1	HCW	A		DELETED	NORTHRUP
H2431	W BROWN CUSTOM BUILDERS	DALLAS	TX	SFD	NEW	1	1	1	H W	A	461	18800	MIROMIT
				SFD	NEW	1	1	1	H W	A	538	18800	MIROMIT
H2432	BLDG INDUSTRY ASSN OF CEN OHIO	DUBLIN	OH	SFD	NEW	1	1	1	H W	A	1166	(19100)	SOLARON
H2433	WAYNE NICHOLS COMMUNICO	SANTA FE	NM	SFD	NEW	1	1	1	H W	P	409	7958	SITE BUILT
H2434	THE YEONAS COMPANY	VIENNA	VA	SFD	NEW	1	1	1	W	A	63	1875	SUNWORKS
H2435	SELF HELP ENTERPRISES	SELMA	CA	SFD	NEW	3	3	3	HC	P	3450	12210	SKYTHERM
H2436	DREXEL UNIVERSITY	PHILADELPHIA	PA	GAL	RET	5	1	1	W	A	270	6780	PPG INDUSTRIES
H2437	WILLIAM F ETTLICH	SHINGLE SPRINGS	CA	SFD	NEW	1	1	1	H W	A		(4000)	THOM
H2438	RUST CONSTRUCTION CO	ALEXANDRIA	VA	SFD	NEW	1	1	1	H W	A		(6000)	SCAM
H2439	WINFORD LINDSAY	DACULA	GA	SFD	NEW	1	1	1	H W	A	222	6400	REVERE
H2440	ECO-ERA INC	FORT COLLINS	CO	SFD	NEW	1	1	1	H W	A	390	6000	SOLARON
H2441	TERRACOR UTAH	STANSBURY PARK	UT	SFD	NEW	1	1	1	H	A	585	15600	SOLARON
H2442	LEISURE TECH OF CALIFORNIA INC	CAMARILLO	CA	SFA	NEW	4	4	2	W	A	576	4400	RAYPAK
H2443	KORMAN CORP	BLACKWOOD	NJ	SFD	NEW	1	1	1	H W	A	614	15593	GENERAL ELECTRIC
				SFD	NEW	1	1	1	H W	A	614	15593	GENERAL ELECTRIC
H2444	CITY OF SANTA CLARA	SANTA CLARA	CA	SFD	NEW	5	5	5	H W	A	7360	40000	SOLAR KING
H2445	CITY OF PUEBLO	PUEBLO	CO	SFD	RET	5	1	5	H	A	165	16000	RAYPAK
H2446	HOOKER BARNES	ATLANTA	GA	SFD	NEW	1	1	1	H W	A		(11411)	REVERE
H2447	GORDON DEERING	LUBBOCK	TX	SFD	NEW	1	1	1	H W	A	312	9000	SOLARON
H2448	SOLAR STRUCTURES INC	LAGRANGEVILLE	NY	SFD	NEW	1	1	1	H W	A	1200	15000	REVERE
H2449	CITY OF COLORADO SPRINGS	COLORADO SPRINGS	CO	MFM	RET	12	1	1	HCW	A	1500	69729	SOLARIS
H2450	HELIO THERMICS INC	GREENVILLE	SC	SFD	NEW	1	1	1	HCW	A	412	3000	HELIO THERMICS
H2451	UNIVERSITY OF PENNSYLVANIA	PHILADELPHIA	PA	SFA	RET	1	1	1	H W	A	475	12980	PPG/INT ENVIR
H2452	JESPA ENTERPRISES	OLD BRIDGE	NJ	SFD	NEW	1	1	1	H W	A	443	10800	SUNWORKS
H2453	CLASSIC DEVELOPMENT CORP	BREA	CA	SFD	NEW	1	1	1	H W	A		(7000)	RAYPAK
H2454	LONG ISLAND SAVINGS BANK	MT SINAI	NY	SFD	NEW	1	1	1	H W	A		(10000)	GRUMMAN ENERGY SYS
H2455	STONEBRAKER INVESTMENTS	BOULDER	CO	GAL	NEW	8	1	1	H W	A	835	22450	KTA CORP
H2456	UNITED DEVELOPMENT CO	VERNON HILLS	IL	SFA	NEW	4	4	1	H W	A	1000	40000	OWENS ILLINOIS
H2457	BABCOCK COMPANY	MIAMI	FL	SFD	NEW	1	1	1	W	A	21	915	CAPITAL
		MIAMI	FL	SFA	NEW	1	1	1	W	A	21	915	CAPITAL
H2458	CHURCH COMMUNITY CORPORATION	NEWPORT	RI	SFD	NEW	1	1	1	H W	A	432	5000	SITE BUILT
H2459	COLBURN DEVELOPMENT CORP	STOW	MA	SFD	NEW	1	1	1	H W	A	646	(17062)	SOLARON
H2460	MARVIN H ANDERSON CONSTRUCTN CO	BLOOMINGTON	MN	SFD	NEW	1	1	1	H W	A	378	16250	LENNOX-HONEYWELL
H2461	KELLEY FISCHER CO	ST LOUIS	MO	SFD	NEW	1	1	1	H W	A		(17000)	REVERE
H2462	UNIVERSITY OF WISCONSIN	MILWAUKEE	WI	SFD	RET	1	1	1	H W	A	655	13800	SOLARON
H2463	SAN ANTONIO RANCH LTD	HELOTES	TX	SFD	NEW	3	3	3	HCW	A	7650	75000	LENNOX-HONEYWELL
H2464	W J FAULK	CLEVELAND	TN	SFD	NEW	1	1	1	H W	A		(16000)	REVERE
H2465	SOLAR ENGINEERING CONST CO	FORT COLLINS	CO	SFD	NEW	1	1	1	H W	A	640	10500	REYNOLDS
H2466	VINCENT L OREDSON	ASHLAND	OR	SFD	NEW	1	1	1	H W	A	320	6100	SUNWATER
H2467	GRASSY BROOK VILLAGE	BROOKLINE	VT	GAL	NEW	10	1	1	H W	A	2520	(66500)	SUNWORKS
H2468	WAVERLY HOMES INC	WESTMINSTER	CO	SFD	NEW	1	1	1	H	A	96	6000	INTL SOLARTHERMICS
H2469	CRANE BUILDERS	GRANBY	CT	SFD	NEW	1	1	1	HCW	A		(5500)	SUNWORKS
H2470	SIR GALAHAD COMPANY	VIRGINIA BEACH	VA	SFD	NEW	1	1	1	H W	A	600	12500	REVERE
H2471	DANIEL W BROCK	MESA	AZ	SFD	NEW	1	1	1	H W	A		(6593)	SSRC
H2472	RITTER BUILDINGS INC	BERRYVILLE	VA	SFD	NEW	1	1	1	HCW	A	210	5886	SUNWORKS
H2473	CREEK NATION HOUSING AUTHORITY	OKMULGEE	OK	SFD	RET	5	5	5	H W	A	1115	39935	RAYPAK

**NUMBER 1 CARDS

PROJ ID	GRANT AWARD DATE	REPT 1 DATE	INST OR NOT (GRANT)	NEW OR RETRO
21501BA01	012376	040276	NO	RE
21502BA01	012376	020976	NO	NE
21504BA01	012376	020576	NO	NE
21505BA01	012376	030376	NO	NE
21507BA01	012376	020376	NO	NE
21509BA01	012376	022576	NO	NE
21510BA01	012376	030376	NO	NE
21511BA01	012376	020676	NO	RE
21512BA01	012376	031777	NO	NE
21514BA01	012376	112276	NO	NE
21515BA01	012376	031276	NO	NE
21519BA01	012376	020476	NO	NE
21521BA01	012376	032576	NO	RE
21522BA01	012376	060276	NO	NE
21525BA01	012376	060376	NO	NE
21527BA01	012376	031276	NO	NE
21530BA01	012376	030276	NO	NE
21531BA01	012376	032476	NO	RE
21532BA01	012376	020676	NO	NE
21533BA01	012376	022776	NO	NE
21534BA01	012376	020976	NO	NE
21535BA01	012376	042276	NO	NE
21536BA01	012376	030176	NO	NE
21537BA01	012376	022076	NO	NE
21538BA01	012376	072678	NO	NE
21539BA01	012376	021776	NO	NE
21540BA01	012376	021176	NO	RE
21541BA01	012376	081976	NO	NE
21543BA01	012376	020276	NO	NE
21544BA01	012376	012876	NO	NE
21545BA01	041476	012976	NO	
21546BA01	012376	021176	NO	NE
21547BA01	012376	012676	NO	NE
21548BA01	012376	021676	NO	NE
21549BA01	012676	032376	NO	RE
21550BA01	012376	022776	NO	NE
21551BA01	XX	041076	NO	XX
21552BA01	012376	031176	NO	NE
21554BA01	012376	020676	NO	NE
21555BA01	012376	021176	NO	NE
22001BA01	102876	112276	IN	NE

```
      ************************************
      * GRANTEE REPORT 1 DATA SUMMARY *
      ************************************
PROJECT ID = 23090BA010000
  GRANT AWARD DATE = 06/07/77     REPORT DATE  = 06/08/77
 INSTRUMENTATION (GRANT) = NO     CONSTRUCTION = NE
  ADDRESS = ALBUQUERQUE
            BERNALILLO
            NM    87122
CONSTRUCTION FINANCIAL STATUS = YES
CONSTRUCTION FINANCE PROBLEMS:
    - NO PROBLEM
```

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      ************************************
      * GRANTEE REPORT 4 DATA SUMMARY *
      ************************************
PROJECT ID = 23090BC010000
 REPORT DATE = 06/08/78    INSTRUMENTATION (UNIT) = NO
 INITIAL SALES PRICE = 0119000          UNIT STATUS =   SOLD
   FINAL SALES PRICE =  0119000
 INITIAL RENTAL RATES:  1 BR =        OTHER  =
                        2 BR =        STUDIO =
                        3 BR =
   FINAL RENTAL RATES:  1 BR =        OTHER  =
                        2 BR =        STUDIO =
                        3 BR =
MORTGAGE DATA:   APPROVAL DATE = 06/20/78     TYPE = CONV
  AMOUNT = 0088000      INT RATE =  9.78%  PERIOD (MOS) = 360
 POINTS/FEES =         MTG ARRANGED BY = PURCHASER
 MORTGAGOR = ALBUQUERQUE FEDERAL SAVINGS & LOAN
  ADDRESS =  6400 UPTOWN BLVD. N.E.
             ALBUQUERQUE       NM  87110 PHONE:(505) 883-3100
MORTGAGE PROBLEMS:
    - NONE
    - NONE
    - FAVORABLE. ENTHUSIASTIC
MARKETING DATA: HOUSE IST OFFERED XB       MKT PER (WKS) XA
 SALES CONTRACT = 06/20/78   OCCUP DATE = 07/15/78
 NO. OF VISITORS = XA      NO OF PURCHASERS =  XA
MARKETING PROBLEMS:
MARKETING PUBLIC REACTION:
```



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      ************************************
      * GRANTEE REPORT 3 DATA SUMMARY *
      ************************************
PROJECT ID = 23090BB010000  REPORT 2 DATE = 09/07/77
  REPORT 3 DATE = 08/21/78  FINAL DESIGN COMPLETE DATE = 08/01/77
CONSTRUCTION: BEGIN = 08/28/77   BEGIN SOLAR INSTAL    = 10/25/77
            COMPLETE = 06/14/78   SOLAR TEST COMPLETE   = 05/10/78
BUILDING PERMIT DATA:             PERMIT APPROVAL DATE  = 08/17/77
    APPROVING AUTHORITY = BERNALILLO COUNTY ZONING
  BUILDING PERMIT PROBLEMS: - NONE
  ADDRESS = 513 6TH N.W.
            ALBUQUERQUE       NM   87102
OCCUPANCY PERMIT DATA:            PERMIT APPROVAL DATE  = 07/07/78
    APPROVING AUTHORITY = BERNALILLO COUNTY ZONING
 OCCUPANCY PERMIT PROBLEMS: - NO PROBLEM
  ADDRESS = 513 6TH N.W.
            ALBUQUERQUE       NM   87102
ZONING/LAND USE DATA:             ZONING APPROVAL DATE  = 08/31/73
    APPROVING AUTHORITY = BERNALILLO COUNTY ZONING
  ZONING/LAND USE PROBLEMS: - NO PROBLEM
  ADDRESS = 513 6TH N.W.
            ALBUQUERQUE       NM   87102
BUILDING CODES:   LOCAL CODE BASED/NOT BASED ON NAT'L CODE = NO
 NATIONAL =               LOCAL =BERNALILLO COUNTY UNIFORM BLDG CO
CONSTRUCTION FINANCING:  APPROVAL DATE = 08/17/77
  TYPE = NORMAL  AMT = $70.500    RATE =  9.00% PERIOD (MOS): 009
FINANCING ORGANIZATION =   UTAH MORTGAGE CO.
  ADDRESS = 8015 MOUNTAIN RD. PL. N.E.
            ALBUQUERQUE       NM  87122  PHONE: (505) 265-8555
SOLAR WARRANTY = YES OWNERS MANUAL = YES  SALES/RENTAL TERMS = YES
   HUD TERMS = YES AUX TYPE = ELECTRIC  AUX OTHER =
CONSTRUCTION PROBLEMS; ETC:
         DELIVERY PROBLEMS: - NONE
       BREAKDOWN PROBLEMS: - NONE
           LABOR PROBLEMS: - NONE
   BLDG INTERFACE PROBLEMS: - NONE
                            - MORE INFO. IN FILES
     OTHER CONSTR PROBLEMS: - NONE
ADDITIONAL COMMENTS:
            SOLD DURING CONSTRUCTION - NO MARKETING
```

COLLECTOR: MANUFACTURER = DAYSTAR CORP. ORIENTATION = SOUTH TILT = 57 DEGREES

TYPE = FLAT PLATE GROSS AREA = 315 SQFT NET AREA = 294 SQFT AREA/LIVING UNIT = 294 SQFT

ABSORBER PLATE = COPPER PLATE W/ COPPER TUBES FLAT BLACK CASING = ALUM. W/ BAKED ENAMEL FIN

INSULATION = 1 1/2" ISOCYANURATE COVER PLATE = 3/16" TEMP. GLASS , HEAT TRAP

PERFORMANCE = 58.0 % FREEZE PROTECTION = ANTIFREEZE

STORAGE SYSTEM: CAPACITY = 500 GALS PERFORMANCE = 3165 BTU/F HEAT EXCHANGER EFFECTIVENESS = . %

TRANSPORT SYSTEM: MEDIUM = 60% GLYCEROL/40% WATER SPECIFIC HEAT = 0.76 FLOW RATE = 7.0 GALS/MIN

BACK-UP SYSTEM: TYPE = OI INPUT = 75000 BTUH EFFICIENCY = . %

DHW SYSTEM: CAPACITY = 82 GALS USAGE = 80 GALS/DAY

OTHER INFORMATION: VENTILATION = XE. AIR CHANGES/HR BUILDING HEAT LOSS FACTOR = 478.0 BTUH/F

PREDICTED SYSTEM PERFORMANCE:

MONTH	AVAILABLE INSOLATION (MBTU)	PREDICTED SYSTEM PERFORMANCE (%)	PREDICTED SOLAR ENERGY DELIVERED (MBTU)	COOLING LOAD (MBTU)	HEATING LOAD (MBTU)	DHW LOAD (MBTU)	TOTAL LOAD (MBTU)	SOLAR ENERGY COLLECTED (MBTU)	SOLAR PARTICIPATION (%)
1	9.52	53.6	5.1	XA .	15.3	1.7	17.0	5.1	30.
2	9.88	54.7	5.4	XA .	13.2	1.5	14.7	5.4	37.
3	11.25	55.1	6.2	XA .	11.5	1.7	13.2	6.2	47.
4	10.12	56.3	5.7	XA .	7.0	1.6	8.6	5.7	66.
5	10.00	51.0	5.1	XA .	3.4	1.7	5.1	5.8	100.
6	9.45	17.9	1.7	XA .	0.1	1.6	1.7	5.6	100.
7	10.34	16.4	1.7	XA .	0.0	1.7	1.7	6.4	100.
8	11.57	14.7	1.7	XA .	0.0	1.7	1.7	7.3	100.
9	11.12	30.6	3.4	XA .	1.8	1.6	3.4	6.9	100.
10	10.75	61.4	6.6	XA .	5.5	1.7	7.2	6.6	93.
11	7.14	58.8	4.2	XA .	9.2	1.6	10.8	4.2	39.
12	7.57	54.2	4.1	XA .	14.1	1.7	15.8	4.1	26.
TOTAL	.00	.0	50.9	XA .	81.1	19.8	100.9	.00	50.5

COMMENTS:

```
**********************************
*  BUILDING AND SITE DESCRIPTION  *
**********************************
 PROJECT LOCATION
  CITY:    MEDWAY
  STATE:    MA
  ZIP:    02053
 BUILDING DESIGNER
  FIRM:    DAYSTAR CORP
  CONTACT:    DOUG PECK LESS NELSON
  ADDRESS:    90 LAMBRIDGE ST.
  CITY:    BURLINGTON
  STATE:    MA
  ZIP:    01803
  PHONE:    617    2728460
 SOLAR SYSTEM DESIGNER
  FIRM:    DAYSTAR CORP
  CONTACT:    DOUG PECK LESS NELSON
  ADDRESS:    90 LAMBRIDGE ST.
  CITY:    BURLINGTON
  STATE:    MA
  ZIP:    01803
  PHONE:    617    4353509
 OTHER PARTICIPANT
  FIRM:    PATTEN'S PLUMBING AND HEATING
  CONTACT:    GORDON HENDERSON
  ADDRESS:    2 WOOD ST.
  CITY:    HOPKINTON
  STATE:    MA
  ZIP:    01748
  PHONE:    617    4353509
 DI MONITOR
  FIRM:    MASSDESIGN INC.
  CONTACT:    JOHN M BUCHANAN
  ADDRESS:    18 BRATTLE ST.
  CITY:    CAMBRIDGE
  STATE:    MA
  ZIP:    02138
  PHONE:    617    4910961
 TYPE OF SOLAR SYSTEM INTEGRATION:
  AFTER BLDG DESIGN WAS FIXED
 APPLICABLE REGULATORY CODES
  STATE
 NAME AND YEAR OF CODE/REGULATION
  BUILDING:    MASS. STATE BUILDING CODE 1975
  MECHANICAL:    MASS.STATE BUILDING CODE 1975
  ELECTRICAL:    MASS.STATE BUILDING CODE 1975
  PLUMBING:    MASS STATE BUILDING CODE 1975
 MODEL CODES: BASIS FOR REGS-NAME/YR
  BUILDING:    BOCA
  MECHANICAL:    BOCA
  ELECTRICAL:    BOCA
  PLUMBING:    BOCA
 GENERAL CHARACTERISTICS
  BUILDING TYPE
   SINGLE FAMILY DETACHED
  PLANNED TYPE OF OWNERSHIP
   INDIVIDUAL OR FAMILY
  PLANNED TYPE OF OCCUPANCY
   OWNER
  DEVELOPMENT TYPE
   SUBDIVISION
 SITE
  LATITUDE (DEGREES)    42
  LONGITUDE (DEGREES)    71
  ALTITUDE (FEET)    200
 BUILDING
  FRONT OF BUILDING FACES
   N
  AVERAGE STORIES ABOVE GROUND    2.0
  AVERAGE STORIES BELOW GROUND    1.0
  TOTAL HGT ABOVE GROUND (FEET)    33
  CONDITIONED FLOOR AREA (SQ FT)    1913
  ROOF TYPE AT COLLECTOR LOCATION
   SLOPED: PITCH ANGLE (DEG)    42
  ATTIC:
   VENTILATED
  DESIGN SHADED GLASS AREAS
   HEATING SEASON (SQ FT)    0
   COOLING SEASON (SQ FT)    0
  BUILDING VENTILATION RATES
   HEATING SEASON-MECHANICAL (CHG PER HR)    0.0
   HEATING SEASON-NATURAL(CHG PER HR)    1.3
  INTERNAL HEAT GAIN ASSUMPTIONS:
   METABOLIC LOAD(BTU PER OCCUPANT PER HR)    480
   NUMBER OF OCCUPANTS . . . . . .    6
   DOMESTIC HOT WATER DAILY DEMAND (GAL/DAY)    120
 SITE
          (1)     (2)
  MONTH HEATNG  INSOLTN
        DEGREE  BTU/FT2
         DAYS   PER DAY
   JAN   1088     555
   FEB    972     797
   MAR    846    1144
   APR    513    1438
   MAY    208    1776
   JUN     36    1994
   JUL      0    1881
   AUG      9    1622
   SEP     60    1314
   OCT    316     941
   NOV    603     592
   DEC    983     482
  HEATING DEGREE DAYS PER YEAR:    5634
  FOOTNOTE (1)    ASHRAE-SYSTEMS 1973
  FOOTNOTE (2)    NAT'L CLIMATIC CENTER    01
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SORTING KEYS ARE : GRANT #, DATE

CR #	DATE	PHASE	PERF AREA	HARDWARE ELEMENT	ACTIONS	EVENTS	FREQ
8186	04/11/78	OPER	MECH	CONTROLS	REPAIR	OPERATING, BUT IMPROPERLY INCORRECT INSTALLATION	1
8186	10/06/77	CONS	GENE	COLLECTOR ARRAY	NONE	SHPMT/PARTS & MATERIALS INCOMPLETE	1
8186	11/03/77	CONS	MECH	COLLECTOR ARRAY	NONE BUT ACTION REQD AWAITING SHIPMT OF	DESIGN CHANGE FAILED TO OPERATE INCOMPATIBLE	1
8186	11/03/77	CONS	MECH	COLLECTOR ARRAY	REPAIR	FAILED OUTGASSING OF VOLITALS	1
8186	11/03/77	CONS	MECH	REFLECTOR ARRAY	REPAIR	DAMAGED	1
8187	05/22/78	CONS	MECH	GASKETS/SEALANTS	REPLACE W/ IDENT ITEM	OPERATING, BUT IMPROPERLY INCORRECT INSTALLATION	1
8198	01/00/78	CONS	GENE	COLLECTOR ARRAY	NONE	SHPMT/PARTS & MATERIALS INCOMPLETE	1
8198	01/00/78	CONS	GENE	TRACKING MOUNT	NONE	SHPMT/PARTS & MATERIALS INCOMPLETE	1
8204	01/00/78	CONS	MECH	COLLECTOR UNITS	REPAIR	DAMAGED LEAKAGE OF MOISTURE OR RAIN	2
8205	01/00/78	CONS	GENE	SHS-H/C/HW-ACT/PASS	NONE	SHPMT/PARTS & MATERIALS INCOMPLETE	1
8205	03/15/78	CONS	GENE	TANK/CONTN UNITS	NONE	SCHEDULING INADEQUACIES	1
8205	12/00/77	CONS	MECH	COVER ASSY	REPLACE W/ IDENT ITEM	DAMAGED ACCIDENT IN TRANSIT	1
8206	04/10/78	CONS	GENE	COLLECTOR ARRAY	NONE BUT ACTION REQD	SCHEDULING INADEQUACIES	1
8207	04/04/78	CONS	GENE	BLOWERS	NONE BUT ACTION REQD	SHPMT/PARTS & MATERIALS INCOMPLETE	1
8207	10/00/77	CONS	STRU	COLLECTOR UNITS	REPAIR	DAMAGED LEAKAGE OF MOISTURE OR RAIN LIVE LOADS WIND	1
8207	10/00/77	CONS	STRU	ROOFING	REPAIR	DAMAGED LEAKAGE OF MOISTURE OR RAIN LIVE LOADS WIND	1

R.E.R.C. QUESTION/ANSWERS DICTIONARY

SINGLE FAMILY BUILDER QUESTIONAIRE

QUESTION NUMBER	QUESTION	CODED VALUES WHAT CODE MEANS	CODE
		TECHNICAL FEASIBILTY	08
		FINAN INST ACCPTNCE	09
91A	OTHER BLDRS OUTLOOK TOWARD SOLAR IN RES		
		INTRSTD & COMMITTED	01
		INTRSTD, NOT COMMITD	02
		NOT INTERESTED	03
		NOT AT ALL INTRSTD	04
		NO OPINION/DON'T KNW	05
		DID NOT ANSWER	06
91B	PLEASE EXPLAIN		
		WAIT & SEE ATTITUDE	01
		LACK OF FIN COMTMNT	02
		PAYBACK/FIN FEASBLTY	03
		LACK OF PAYBCK KNOWL	04
		PUBLIC INTEREST	05
		NOT ENUF RES + DEVEL	06
		CONVNTL HOMES SELLNG	07
		UNAWRE OF FUTRE TRND	08
		LACK OF KNOWLEDGE	09
		EXPRESSED INTREST	10
92A	TRADE PUBL AS SOURCE FOR MECH/OPER DATA		
		YES	01
		NO	02
92B	OTHR DEVS AS SOURCE FOR MECH/OPER DATA		
		YES	01
		NO	02
92C	MFRS AS SOURCE FOR MECH/OPER DATA		
		YES	01
		NO	02
92D	NTL/LOC ASN AS SOURCE FOR MECH/OPER DATA		
		YES	01
		NO	02
92E	UNIV/IND ORG AS SOURCE FOR MECH/OPER DAT		
		YES	01
		NO	02
92F	GOVT AGENCY AS SOURCE FOR MECH/OPER DATA		
		YES	01
		NO	02

BACK-UP ENERGY CONSUMPTION REPORT

PROJECT ID: 22041BF030000

ENERGY TYPE: GAS

SUPPLIER: PUBLIC SERVICE CO. OF COLORADO
ADDRESS: P.O.BOX 840 550 15 TH ST.
DENVER CO 80202

REPORT DATE	START DATE OF BILLING PERIOD	END DATE OF BILLING PERIOD	PRESENT METER READING	PREVIOUS METER READING	ENERGY CONSUMED	UNITS	IF GAS-THERMS	IF NOT UTILITY-QUANTITY	UNITS	RATE CODE	ENERGY COST	SURCHARGE	TAX	TOTAL COST THIS PERIOD	IF NOT UTILITY-UNIT COST
010779	110677	120677	000654	000556	000098	CC				H26	0017.31			0017.31	
010879	.20677	010678	000788	000654	000134	CC				H26	0022.29			0022.29	
010979	010678	020678	000964	000788	000176	CC				H26	0029.51			0029.51	
011079	020678	030678	001090	000964	000126	CC				H26	0022.22			0022.22	
011179	030678	040678	001132	001090	000042	CC				H26	0009.16			0009.16	
011279	040678	050678	001162	001132	000030	CC				H26	0007.19			0007.19	
011379	050678	060678	001198	001162	000036	CC				H26	0008.15			0008.15	
011479	060678	070678	001218	001198	000020	CC				H26	0005.46			0005.46	

5. DATA FILE ELEMENTS

GRANT FILE ELEMENTS

The data are requested by HUD from organizations or individuals applying for grants for building homes with solar energy systems. Subsequently, data concerning applicants who receive grants are stored in a file on the NBS computer. To date, there have been about 450 grants awarded.

Description of Data

Project ID

Grantee Information:
- Name, type and address of grantee contact person(s)
- Total solar energy system cost ($)
- Portion of solar system cost requested by grantee ($)

Project Information:
- Project location address

Model Information:
- Housing type
- Number of dwelling units
- Number of buildings
- Number of solar systems
- Total conditioned area per building
- State economic area code

Solar Energy System Information:
- System type (heating, cooling or water)
- System kind (active, passive or hybrid)
- Transfer media (air or liquid)
- Solar collector - manufacturer code, type, aperture area in square feet
- Total cost for each solar system ($)
- Cost to government for each solar system ($)
- Total load in Btu x 10^6
- Solar energy used in Btu x 10^6

GRANTEE FILE ELEMENTS

Data are received via three separate input forms. Grantee Reports 1, 3 and 4, which are completed by grantees during different phases of the solar project. Grantee Report 1 is filed after the grant is completed for the solar project. Grantee Report 4 is filed after the building(s) or unit(s) is sold or rented.

Description of Data

Grantee Report #1

- Project ID
- Project Information:
  - Address
  - Grant award date
  - Report #1 date
  - Instrumented or non-instrumented data (yes or no)
  - New or retrofit
- Construction financing:
  - Financing arrangements (yes, no, pending)
  - Experience/problems

Grantee Report #3

- Dates:
  - Date Grantee Report #2 submitted (see Technical Description File)
  - Date Grantee Report #3 submitted
  - Final design completion date
  - Begin solar installation date
  - Solar test completion date
  - Construction completion date
- Building permit data:
  - Approval date
  - Approving authority
  - Address
  - Experience/problems
- Occupancy permit data:
  - Approval date
  - Approving authority
  - Address
  - Experience/problems

GRANTEE FILE ELEMENTS (Continued)

Grantee Report #3 (Continued)

Building codes:
- National code models, if any
- Local codes
- Experience/problems

Construction financing data:
- Confirmed approval date
- Mortgage type
- Period (months)
- Interest rate
- Amount ($)
- Financing organization
- Address

Rental/sales agreement:
- Sales/rental terms
- HUD access terms

Construction problems:
- Equipment delivery problems
- Equipment breakdown problems
- Labor problems
- Building interface problems
- Other construction problems

Solar oriented events:
- Warranty on file
- Owner's manual on file
- Auxiliary energy type

Grantee Report #4

Sale price and mortgage data:
- Final sale price ($)
- Final rental rate ($)
- Mortgage amount ($)
- Period (months)
- Interest rate
- Mortgage approval date
- Mortgage type (FHA, VA, private, etc.)
- Points/fees
- Mortgagor
- Address
- Unit status (model, sold, rental)
- Report date
- Initial sales price ($)
- Initial rental rate ($)
- Instrumentation (unit)
- Mortgage arranged by (purchaser, builder, grantee)
- Problems obtaining mortgage

GRANTEE FILE ELEMENTS (Continued)

Grantee Report #4 (Continued)

Marketing data:

- Marketing period (weeks)
- Date house first offered
- Sales contract date
- Occupancy date
- Number of visitors
- Number of prospective buyers
- Marketing problems
- General reaction by public

TECHNICAL DESCRIPTION FILE ELEMENTS

Two sets of technical data are collected. The first is collected on most non-instrumented systems. It contains a brief description of the solar energy system to be installed and information concerning predicted system performance. These data are basically extracted from Grantee Report #2, a report submitted by the grantee when the design of his system is complete and approved by HUD.

Description of Data

Project ID

Collector information:
- Manufacturer
- Orientation
- Tilt angle
- Type
- Gross total area
- Net total area
- Area/living unit
- Absorber plate
- Casing
- Insulation
- Cover plate
- Performance (%)
- Freeze protection

Storage and transport system information:
- Storage capacity
- Storage performance
- Heat exchanger effectiveness (%)
- Transport medium
- Specific heat
- Flow rate

Backup and DHW systems information:
- Backup type
- Backup system input
- Backup system efficiency (%)
- DHW capacity
- DHW usage

TECHNICAL DESCRIPTION FILE (Continued)

Predicted system performance information (for each month):
- Available insolation
- Predicted system performance
- Solar delivered
- Cooling load
- Heating load
- DHW load
- Total design load
- Solar energy collected
- Solar participation (%)

Other predicted system performance information:
- Ventilation
- Building heat loss factor
- Total solar delivered (per year)
- Cooling design load (per year)
- Heating design load (per year)
- DHW design load (per year)
- Total design load (per year)
- Total solar (%) (per year)

Comments:
- Additional information on this system

The second set of technical data is collected on the components of the solar energy system to be instrumented. Predicted performance data, schematics of the system and a site drawing are also included. Most of the data collected go onto the computer. All of the data are recorded on microfilm or microfiche.

Description of Data*

System schematics and site drawings

Project ID

Building and site description:
- Project location
- Building designer

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*Italicized items are available only on microfilm or microfiche.

Building and site description (Continued):
- *Mechanical designer**
- Solar system designer
- *General contractor*
- *Mechanical contractor*
- *Solar contractor*
- Other participants (if any)
- Design integration monitor
- Type of solar system integration
- Regulatory codes
- Name and year of state or local code/regulation
- Model codes which are the basis for regulations
- General characteristics:
  - Building type
  - Planned type of ownership
  - Planned type of occupancy
  - Development type

Site:
- Latitude
- Longitude
- Altitude
- *Average summer temperature*
- *Average winter temperature*

Heating design temperatures:
- *Outdoor*
- *Indoor*

Cooling design temperatures:
- *Outdoor*
- *Indoor*

Building:
- Front of building faces (direction)
- Average number of stories above ground
- Average number of stories below ground
- Total height above grade
- Total conditioned floor area
- Roof type

Design heat loss/load and related building data:
- *Design heat loss/load at design conditions*
- *Heat loss/load calculation method*
- Attic

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*Italicized items are available only on microfilm or microfiche.

TECHNICAL DESCRIPTION FILE (Continued)

Design heat loss/load and related building data (Continued):
- Design shaded glass areas
- Building ventilation rates
- Internal heat gain assumptions

Site:
- Heating degree days per month
- Insolation per month
- Heating degree days per year

Solar system description:
- System ID:
  - *Firm**
  - Model name/number
- Type of system:
  - Air, active
  - Air, passive
  - Liquid, active
  - Liquid, passive
- System and component summary:
  - Number of collector types
  - Number of circulation loops
  - Number of thermal storage units
  - Number of operational modes
  - Number of pumps
  - Number of valves
  - Number of blowers
  - Number of dampers
  - Number of sensors
  - Number of flow regulators
  - Number of pressure regulators
  - Number of subsystem fail-safe controls

Solar system cost and lifetime estimates:
- System design life
- Design life collector #1
- Design life collector #2

Equipment costs:
- Collectors ($)
- Storage units ($)
- Distribution and controls ($)

Other costs:
- Installation costs ($)
- Other ($)

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*Italicized items are available only on microfilm or microfiche.

TECHNICAL DESCRIPTION FILE (Continued)

Collector:
- Identification (manufacturer, address)
- Model name/number
- Type
- Location, orientation, tilt
- Array and collector characteristics
- *Collector shading**

Cover plates:
- Number of cover plates
- *Location*
- Manufacturer
- Product name/number
- Material
- Physical dimensions
- Optical properties
- Edge or surface treatment

Absorber:
- Identification
- Material
- *Number of absorbers per collector*
- Coating
- Heat transfer fluid passages

Insulation:
- Layer one - sides
- Layer two - sides
- Layer one - back
- Layer two - back

Gaskets and sealants:
- Location
- Material (sealants)
- Material (gaskets)

Frame:
- Identification
- Material
- Protective coating
- Standoffs
- Number of structural attachment points
- Built-in collector

Reflector:
- Identification
- Number of reflectors

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*Italicized items are available only on microfilm or microfiche.

TECHNICAL DESCRIPTION FILE (Continued)

Reflector (Continued):
- Substrate material
- Reflective coating
- Protective coating
- Physical dimensions

Other information:
- Desiccant
- Freeze protection
- Overheating protection
- Passive collector heat transfer control

Collector performance

Thermal storage unit

Sensible heat solid:
- Container information
- Storage medium
- *Heat transport to and from medium**
- *Container construction*
- Container materials
- Interior lining
- Container location
- Insulation types
- Exterior finish types
- Filters

Sensible heat liquid:
- Container information
- Storage medium
- *Heat transport to and from medium*
- *Container construction*
- Container materials
- Interior lining
- Container location
- Auxiliary heaters
- Container insulation
- Exterior finish types
- Filters
- *Getters*

Latent storage medium:
- Container information
- Storage medium
- Materials
- Additives

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*Italicized items are available only on microfilm or michrfiche.

Latent storage medium (Continued):
- Properties of medium
- Module for latent medium
- *Heat transport to and from medium**
- Auxiliary heaters
- *Container construction*
- Container materials
- Interior lining
- Container location
- Exterior insulation types
- Exterior finish types
- *Getters*
- Auxiliary heaters

Circulation loop:
- Air:
  - *Flow rate*
  - *Components within circulation loop*
- Ducting:
  - Duct types
  - Location types
  - Joint types
  - Internal duct insulation
  - Internal finish
  - External duct insulation
  - External finish
  - *Filters*
- Liquid:
  - *Flow rate*
  - Heat transfer medium
- Piping:
  - Rigid piping type
  - Interior coating type
  - Flexible coupling type
  - Coupling reinforcement type
  - Piping and coupling connection type
  - Piping insulation type
  - Location
  - Exterior finish types
  - Finish and insulation - joint type
  - *Filter types*
  - *Strainer types*
  - *Getters*

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*Italicized items are available only on microfilm or microfiche.

- Distribution:
  - Pump (Circulator):
    - Pump information
    - *Design conditions**
  - Valve
  - Blower:
    - Blower information
    - *Design conditions*
  - Damper

- Heat exchanger:
  - Air to air
  - Air to liquid:
    - Material types
    - *Heating*
    - *Cooling*
  - Liquid to liquid:
    - Material types
    - *Heating*
    - *Cooling*
  - Air to refrigerant
  - Liquid to refrigerant

- Controls:
  - Control mode selector information
  - Sensors
  - *Subsystem fail-safe controls*
  - Tracking mount drive controls

- Auxiliary energy:
  - Domestic water heater:
    - Energy source
    - *Burner ignition method*
    - *Automatic flue vent*
  - Furnace:
    - Energy source
    - *Burner ignition method*
    - *Automatic flue vent*
  - Electric resistance heaters
  - Boiler:
    - Energy source
    - *Burner ignition method*
    - *Automatic flue vent*

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*Italicized items are available only on microfilm or microfiche.

TECHNICAL DESCRIPTION FILE (Continued)

- Auxiliary Energy (Continued):
  - Air Conditioning:
    - *Air conditioning information**
    - Refrigeration machine:
      - Description
      - Operating characteristics
      - *Burner ignition method*
      - *Automatic flue vent*
    - *Heat rejection device*
  - Dehumidifiers:
    - *Description*
    - *Operating conditions*
  - Humidifiers:
    - *Description*
    - *Operating conditions*
  - *Supplemental heater*
  - Heat pumps (reverse cycle air conditioner):
    - Type
    - *Heating mode*
    - *Cooling mode*
  - Heat pumps (reverse cycle refrigeration machine):
    - *Description*
  - Heat pump heat exchanger:
    - Liquid to refrigerant
    - Air to refrigerant

- Predicted system performance:
  - Space temperature (heating)
  - Space temperature (cooling)
  - *Domestic hot water temperature*
  - Total demand load (MMBtu)
  - Energy supplied by solar system (MMBtu)
  - Energy supplied by auxiliary systems (MMBtu)
  - Solar system operating energy (KWH)
  - Simulation time period

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*Italicized items are available only on microfilm or microfiche.

TECHNICAL CONCERNS FILE ELEMENTS

Data for this file are generated when a technical representative makes contact with a solar project where technical concerns are being experienced. These technical concerns range from non-significant concerns (such as delivery delays due to weather) to significant concerns (such as outgassing due to faulty material selection). Selected reports documenting technical concerns during design, construction or operational phase of the project are transcribed and put onto the computer.

Description of Data

Project ID

Date of contact

Hardware element with a technical concern

Action taken (i.e., repair, replace, etc.)

Event(s) which caused technical concern (i.e., breakage, delivery delay, etc.)

Performance area (thermal, structural, mechanical, etc.)

Phase (design, construction, operation)

UTILITY CONSUMPTION FILE ELEMENTS

The utility consumption reports contain data solicited from utility companies which supply service to grant units. Information regarding auxiliary (non-solar) fuel consumed by housing units equipped with solar devices is collected along with comparative fuel consumption data on non-solar equipped units of similar size and design.

Description of Data

Project ID

Supplier:
- Energy type
- Meter number
- Supplier code

Billing information:
- Start of billing period
- End of billing period
- Present meter reading
- Previous meter reading
- Energy consumed
- Billing frequency

Cost information:
- Rate code
- Energy cost ($)
- Surcharge, if any
- Tax
- Total cost this period ($)

MARKETING SURVEY FILE ELEMENTS

This file contains survey research data from builders, lenders, zoning officials, solar homebuyers and other market participants. Data are non-technical and designed to provide marketplace and attitudinal information as well as perceptions of constraints on the entry of solar energy to the residential housing market.

The data are obtained using one or a combination of 26 sets of interview questionnaires. Most collected information is used in several studies and analyses, including studies of building code regulations, economic performance modeling, financial feasibility, consumer attitides, legal issues and land use.

Description of Data

Single family builder/developer
Comparative single family builder/developer
Multi-family builder/developer
Comparative multi-family builder/developer
Purchaser
Comparative purchaser
Prospective purchaser
Renter
Comparative renter
Building management
Participating construction lender
Participating permanent lender
Non-participating lender
Insurance company
Utility company (auxiliary)
Utility company (alternatives)
Local planning and zoning official
Local building code official
Local tax assessor
Purchaser follow-up
Comparative purchaser follow-up
Renter follow-up
Comparative renter follow-up
Participating builder follow-up
Comparative builder follow-up
Site/house description

6. INTERACTIVE ACCESS TO SOLAR DATA

Some users of the data which is collected in the Residential Solar Heating and Cooling Demonstration Program (those specifically authorized by HUD to do so) may directly access files in the solar data base through remotely situated computer terminals which are tied to the main computer at the National Bureau of Standards by telephone lines. The Solar Data Center (SDC) has provided three separate query packages which facilitate interactive (or "online") access to the files. Through the use of these packages, terminal operators interact conversationally with the computer to access and manipulate data and to designate output format quickly and efficiently.

Figure 2 is an illustration of the solar data base indicating the data files by name and the query packages available for accessing each of them online. The following is a description of available query packages:

MIRADS

The Marshall Information Retrieval and Display System is an online storage and retrieval system generally used for retrieval of non-technical data, such as Grant File and Grantee File data. Under MIRADS, in response to the issuance of four basic commands: QUERY, SORT, COMPUTE and PRINT; the system searches the data base (based on the selection criteria in the query command), sorts and retrieves selected data as specified, performs any computations requested, and prints the results.

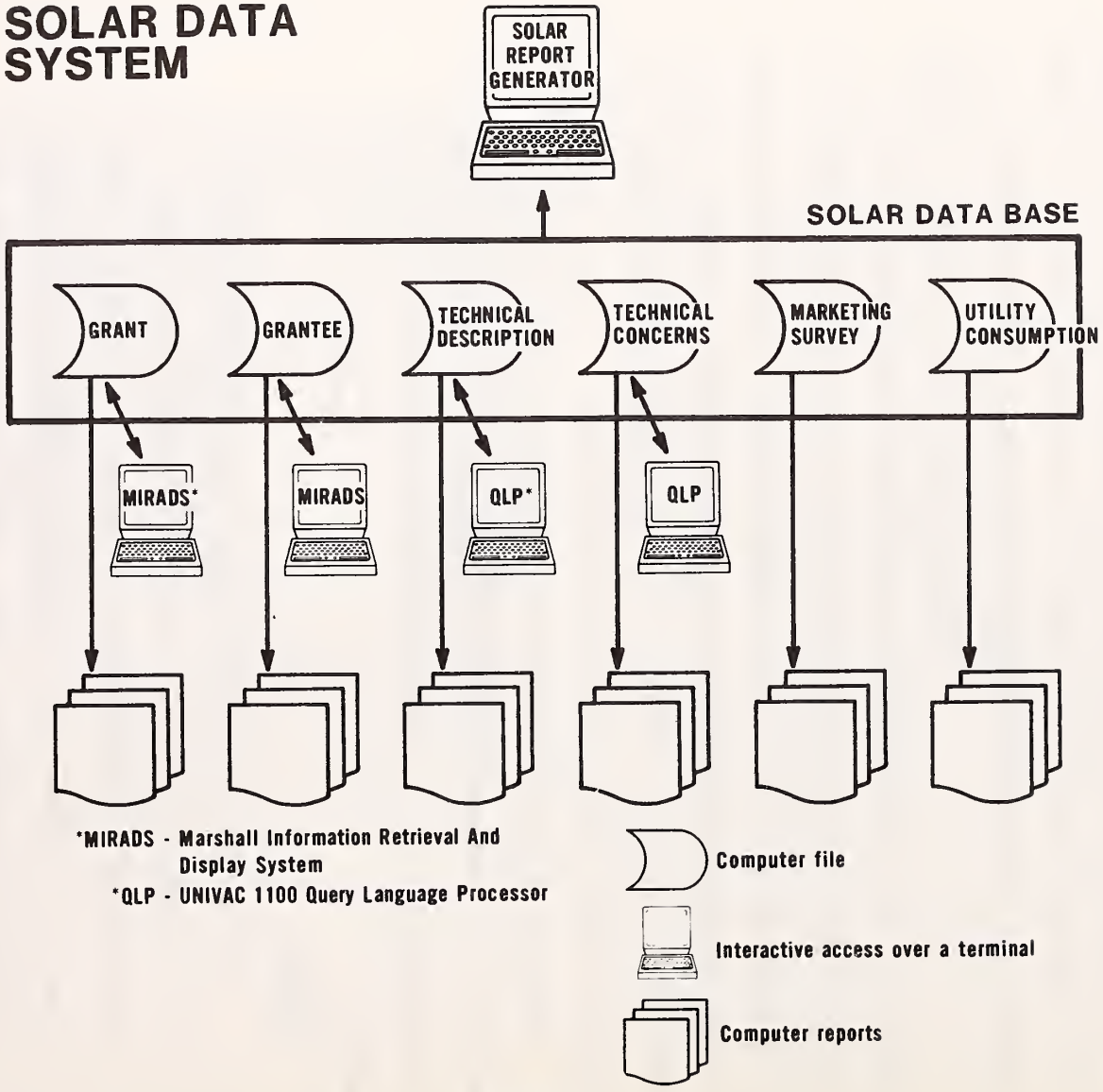
SOLAR DATA SYSTEM
SOLAR REPORT GENERATOR
SOLAR DATA BASE
GRANT
GRANTEE
TECHNICAL DESCRIPTION
TECHNICAL CONCERNS
MARKETING SURVEY
UTILITY CONSUMPTION
MIRADS*
MIRADS
QLP*
QLP
*MIRADS - Marshall Information Retrieval And Display System
*QLP - UNIVAC 1100 Query Language Processor
Computer file
Interactive access over a terminal
Computer reports

FIGURE 2

QLP

The Query Language Processor package features an "English-like" series of commands executed interactively through a terminal. It is used primarily to provide online retrieval of technical data located in the Technical Description and Technical Concerns data files. Using QLP, terminal operators may look at specific elements of information, count the number of times a specified item exists in the data base, and print out the items in either horizontal or columnar output format and in the desired report sequence.

SRG

The Solar Report Generator is a generalized online query and report generating package which is being developed by the SDC staff to meet the needs of the primary users (HUD and its contractors) of the SDC to access and utilize data across files. Initially, the SRG was implemented in a pilot mode to demonstrate the ability to do basic searches across two files. Subsequent versions demonstrate increased sophistication such as the capability to access across all files, to permit queries based on multiple selection criteria, and to generate reports with varying formats. The SRG uses a table-driven approach which permits the user to think in terms of grouping data elements regardless of the data files in which they are contained. To the user, the data base is one logical

SRG (Continued)

"master file." The package includes a data dictionary and a directory to all files.

The SRG will eventually be used to produce batch reports, replacing the present system which requires a separate software package operating on a single file for each report produced. Currently, the SRG is being enhanced to make it a more versatile and flexible accessing tool. The nature and number of enhancements to the SRG will be based upon the requirements of the users of the data base files. In its final form, the Solar Report Generator will have most of the capabilities of both QLP and MIRADS with the added flexibility of "master file" access to the data.

7. AMOUNT OF DATA ON THE COMPUTER

The figures in this section show the amount of data currently stored in the computer. Figure three indicates the growth in the size of the data base to date, and the anticipated increase over the next few years.

Figures four through nine indicate by cycle the extent to which computerization of data has been accomplished.

Even though a file may be shown to be "complete," it is important to note that the information contained therein is not necessarily static. Updating information is entered whenever required to accurately reflect the dynamic state of the projects.

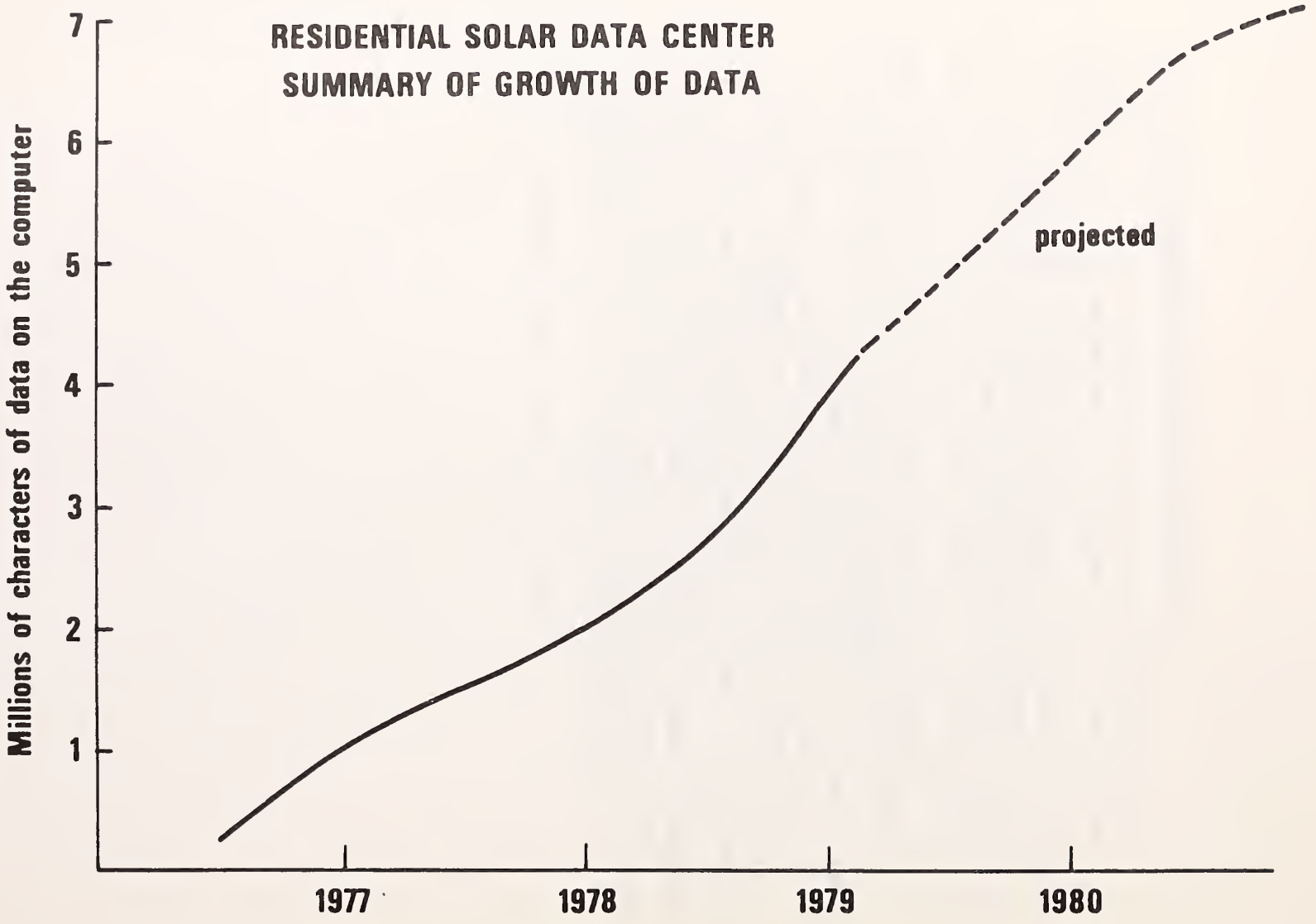
RESIDENTIAL SOLAR DATA CENTER
SUMMARY OF GROWTH OF DATA
Millions of characters of data on the computer
7
6
5
4
3
2
1
projected
1977
1978
1979
1980

FIGURE 3

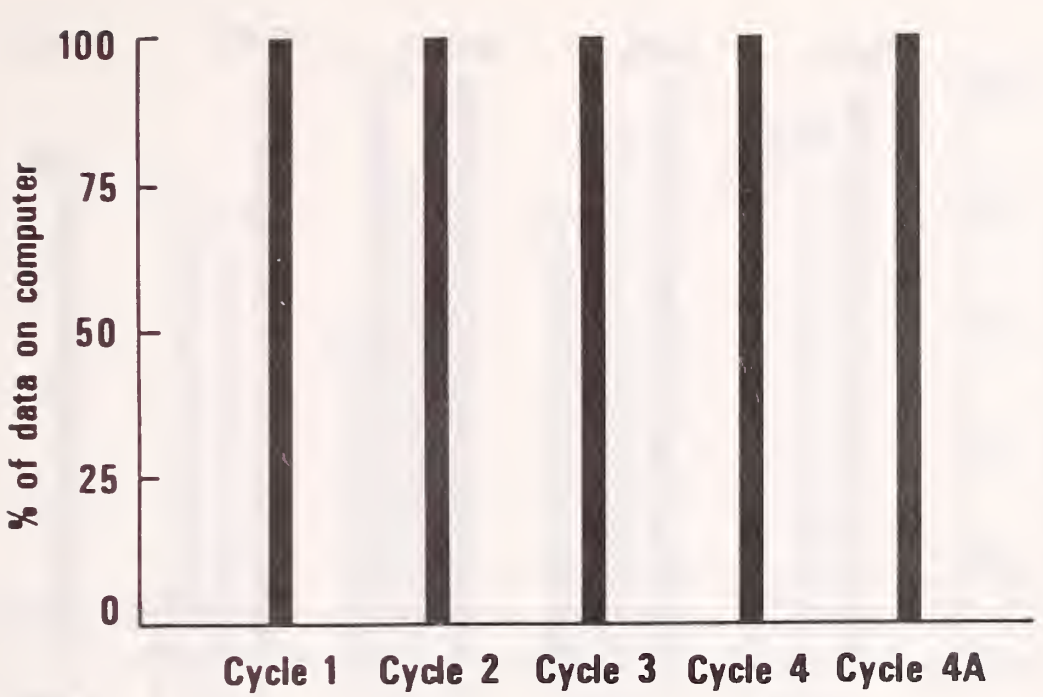

FIGURE 4

Data collection for the Grant File is complete through cycle 4A. Data are collected and put into the Grant File for each grant awarded.

For cycle 1, there have been 49 grants awarded.
For cycle 2, there have been 80 grants awarded.
For cycle 3, there have been 164 grants awarded.
For cycle 4, there have been 48 grants awarded.
For cycle 4A, there have been 96 grants awarded.

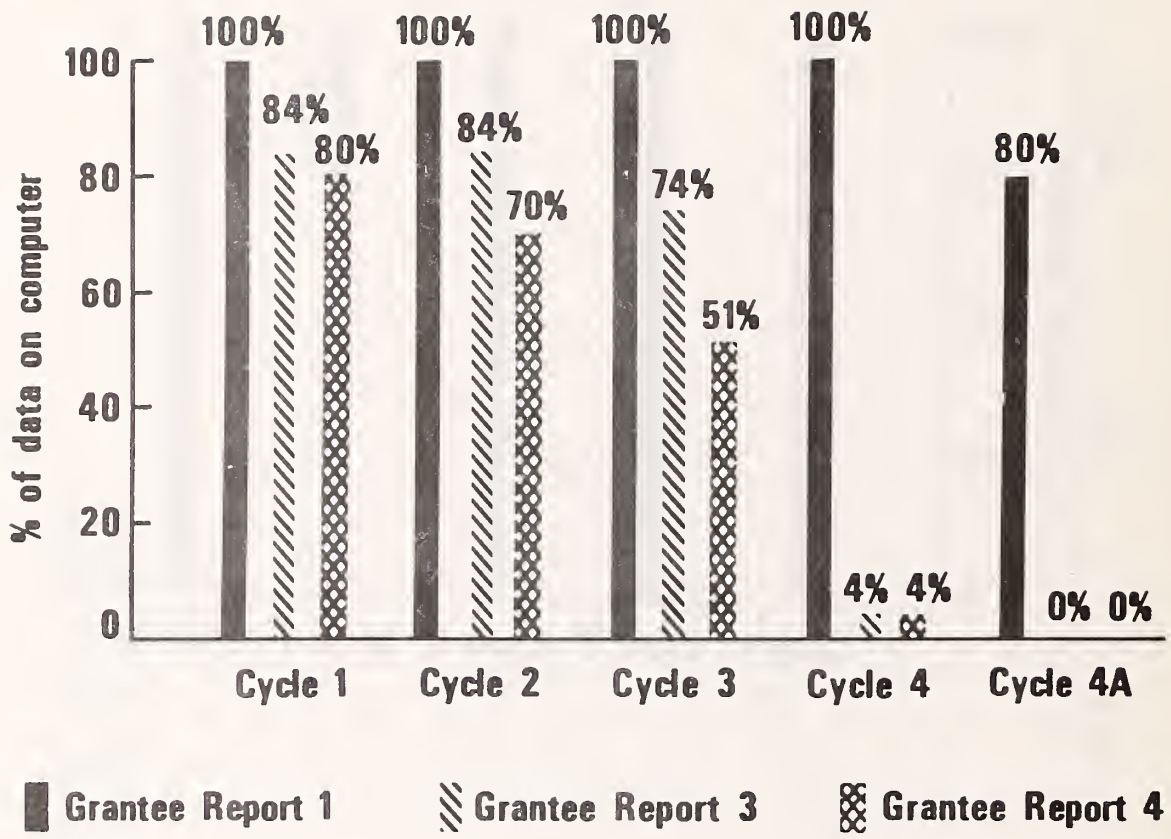

FIGURE 5

When data collection is complete for this file, data will be extracted and put into the Grantee Report File for each grant awarded.

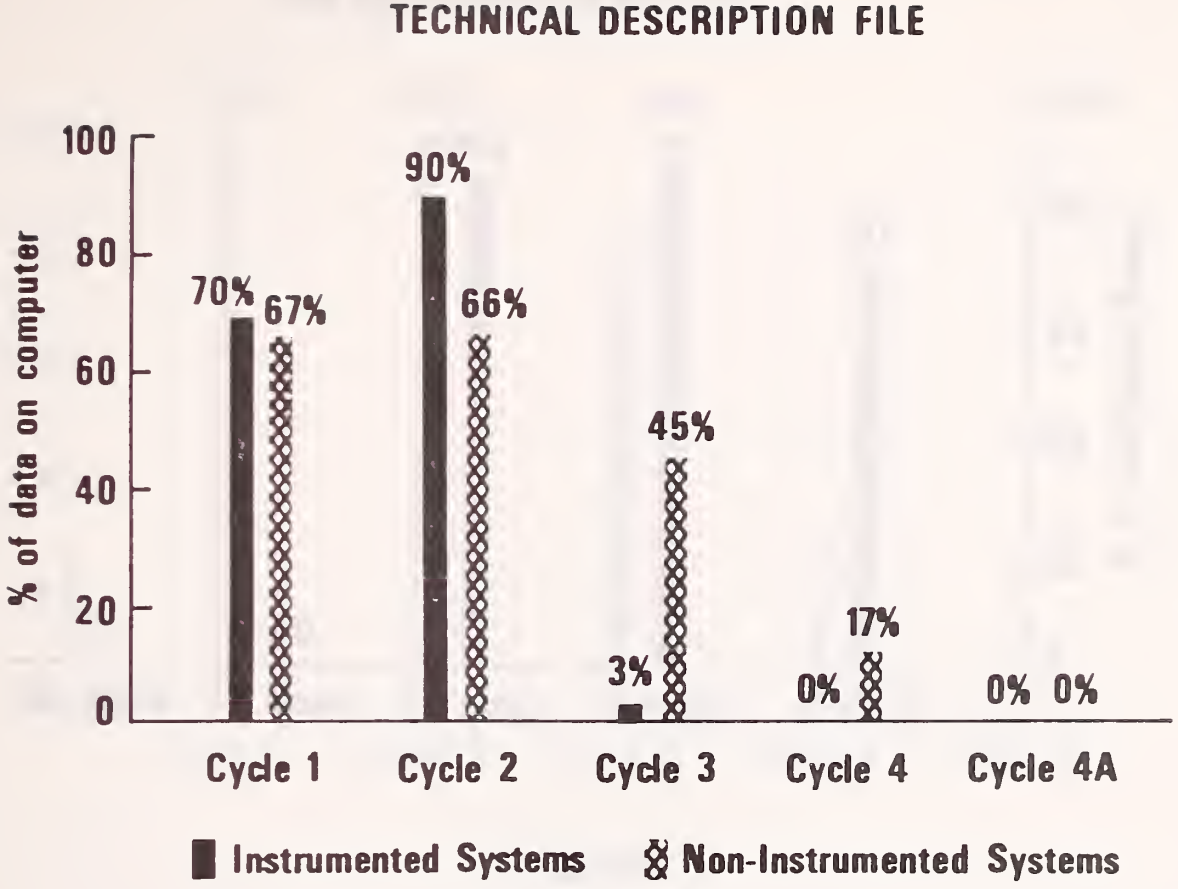

FIGURE 6

When data collection is complete for the Technical Description File, the total number of solar systems surveyed will be:

For cycle 1, 13 instrumented systems and 46 non-instrumented systems.
For cycle 2, 32 instrumented systems and 67 non-instrumented systems.
For cycle 3, 32 instrumented systems and 93 non-instrumented systems.
For cycle 4, 12 instrumented systems and 23 non-instrumented systems.
For cycle 4A, 7 instrumented systems and 56 non-instrumented systems.
For all cycles, 96 instrumented systems and 285 non-instrumented systems.

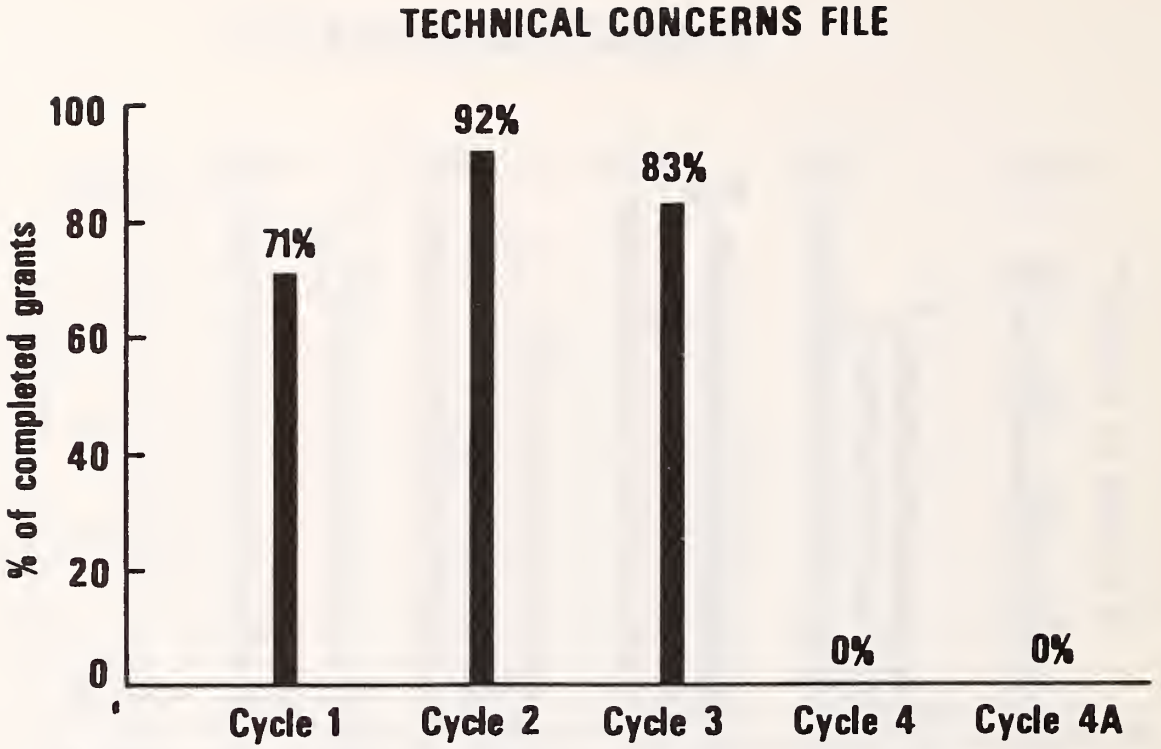

FIGURE 7

The percentage shown for this file pertains to completed grants with technical concerns. It is impossible to predict how much data will be on the computer for the Technical Concerns File when data collection is complete. The figure should be interpreted as in the following statement: "71% of all cycle 1 grants which have been completed had at least one technical concern associated with them."

Data for cycle 1 represents 32 out of 45 completed grants.
Data for cycle 2 represents 56 out of 61 completed grants.
Data for cycle 3 represents 81 out of 98 completed grants.

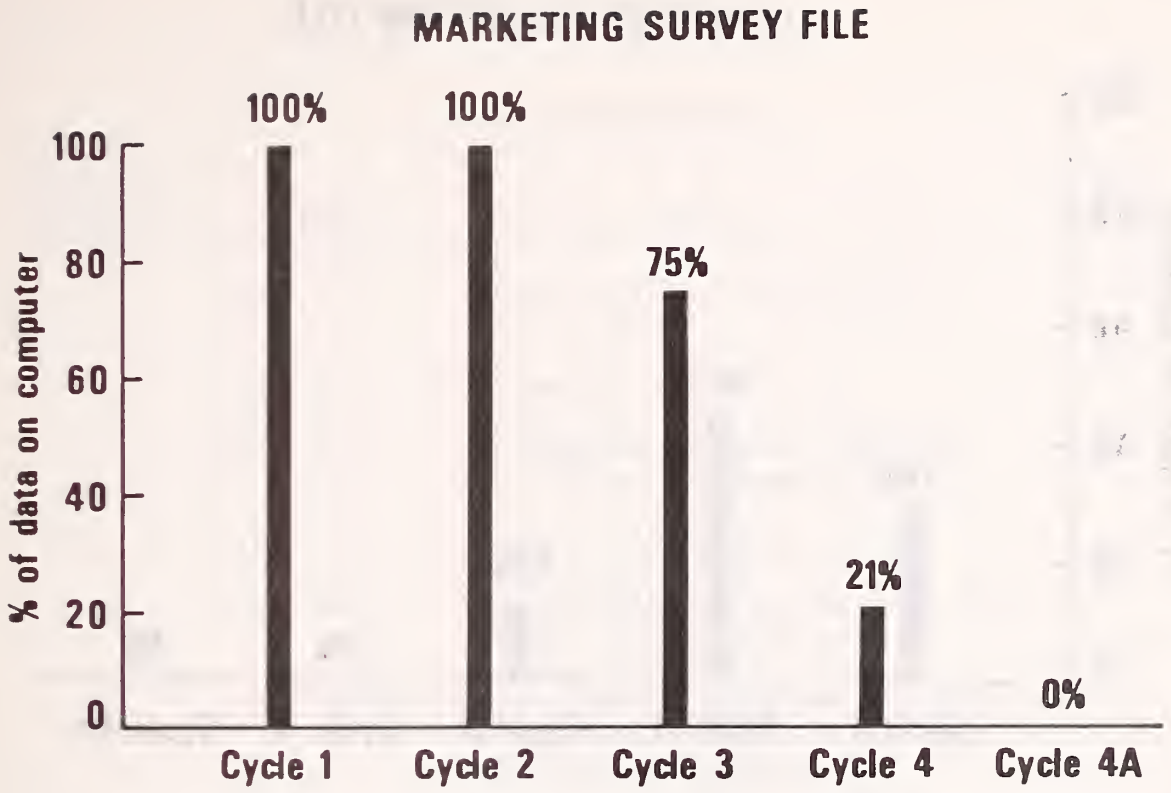

FIGURE 8

Data are collected and put into the Marketing Survey File for selected residential units (i.e. a house or apartment) of a HUD funded project. Marketing survey data are collected from various participants in the solar energy market: the builder, resident, lender, zoning official, etc. The surveys can occur over a period of time. For example, one survey on the builder during the construction phase, another on the resident after the unit is sold and another to gather "follow up" data on the resident one year later. Therefore, the completeness of data collection for one cycle may not accurately reflect the completeness of data collection for a particular unit which was funded during that cycle.

When data collection is complete for this file, data will be collected and put into the Marketing Survey File for the following number of grants and units:

For cycle 1, 34 grants or 64 units.
For cycle 2, 49 grants or 142 units.
For cycle 3, 99 grants or 207 units.
For cycle 4, 19 grants or 46 units.
For cycle 4A, 40 grants or 127 units.
For all cycles, 241 grants or 586 units.

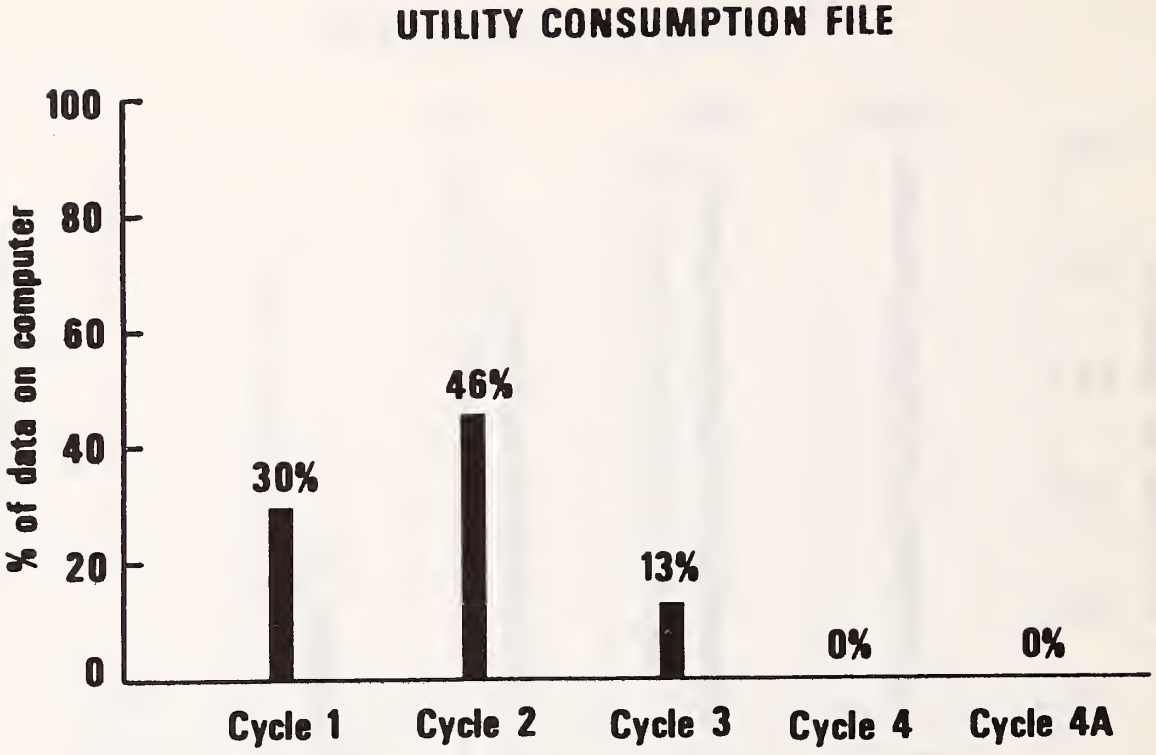

FIGURE 9

Data are collected and put into the Utility Consumption File for selected solar systems of residential units (i.e. a house or apartment). The data are obtained from utility bills and indicate how much fuel (gas, electricity, etc.) is used other than solar. Utility bills must accumulate over a period of time before meaningful analysis can be done. Therefore, the completeness of data collection for one cycle may not accurately reflect the completeness of data collection for a particular system.

When data collection is complete for this file, data will be extracted and put into the Utility Consumption File for the following number of grants and systems:

For cycle 1, 32 grants or 59 systems.
For cycle 2, 45 grants or 99 systems.
For cycle 3, 72 grants or 123 systems.
For cycle 4, 16 grants or 35 systems.
For cycle 4A, 24 grants or 63 systems.
For all cycles, 189 grants or 379 systems.

8. LIST OF PUBLICATIONS

ICST PLANNING REPORT NO.	DATE	TITLE	AVAIL-ABILITY*
1	Jan., 1977	Project Plan for Development of Data Center	1
2	Jan., 1977	Estimation of Input Data	1
3	Mar., 1977	NBS Computer Resources Meeting Data Center Requirements	1
4	Mar., 1977	Design of Data Dictionary	1
5	Aug., 1977	User's Manual for Online Retrieval of Grant Application Data	3
	Mar., 1977	User's Manual for Online Retrieval of AIA/RC and Dubin, Bloome Data with QLP 1100 (Draft)	3
SDC REPORT NO.			
1	Nov., 1977	Description of Data	1
2	Sept., 1978	Grant Application Reports	1
3	Nov., 1978	User's Manual for Online Retrieval of Grantee Report Data	3
4	Jan., 1978	Status Reports	1
	Apr., 1978	Update Packet for Status Reports	1
	June, 1978	Update Packet for Status Reports	1
	Aug., 1978	Update Packet for Status Reports	1
	Oct., 1978	Status Reports	1

*AVAILABILITY CODES:
1=Not available (out of print)
2=Available from Solar Data Center through Franklin Research Center
3=Limited availability (HUD permission needed)

LIST OF PUBLICATIONS (Continued)

SDC REPORT NO.	DATE	TITLE	AVAIL-ABILITY*
5	May, 1978	User's Manual for Online Retrieval of Activity Report Data	3
6	June, 1978	User's Manual for Online Retrieval of Data from a Prototype Residential Solar Master File (Draft)	1
7	Dec., 1978	User's Manual for SRG (Version 1)	1
	Jan., 1979	Update packet for SDC Report No. 7 (Version 3)	1
NBSIR's			
(Draft)	Jan., 1979	Solar Report Generator User's Manual	3
(Draft)	Mar., 1979	Grant and Grantee Files - MIRADS User's Manual	3
(Draft)	Mar., 1979	Grant Reports	2

*AVAILABILITY CODES:
1=Not available (out of print)
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3=Limited availability (HUD permission needed)

APPENDIX

HUD SOLAR DEMONSTRATION PROJECT REPORTS FOR INSTRUMENTED RESIDENTIAL PROJECTS

(NOTE: Approximately nine percent (100 systems) of all solar energy systems in the Residential Demonstration Program are selected for instrumented data collection.)

SITE NAME	REPORT NUMBER	DATE	STATE
HEATING AND HOT WATER - LIQUID COLLECTORS			
Albuquerque Western - II	SOLAR/1090-78/09	Sept., 1978	NM
Chester West	SOLAR/1030-78/07	July, 1978	AL
"	SOLAR/1030-78/08	Aug., 1978	"
"	SOLAR/1030-78/09	Sept., 1978	"
Homes by Marilynn	SOLAR/1008-78/01	Jan., 1978	NM
"	SOLAR/1008-78/02	Feb., 1978	"
"	SOLAR/1008-78/09	Sept., 1978	"
"	SOLAR/1008-78/10	Oct., 1978	"
Matt Cannon	SOLAR/1044-78/06	June, 1978	FL
"	SOLAR/1044-78/07	July, 1978	"
"	SOLAR/1044-78/08	Aug., 1978	"
"	SOLAR/1044-78/09	Sept., 1978	"
Montecito Pines	SOLAR/1045-78/08	Aug., 1978	CA
"	SOLAR/1045-78/09	Sept., 1978	"
Ortiz & Reill - Lot 5	SOLAR/1086-78/08	Aug., 1978	CA
"	SOLAR/1086-78/09	Sept., 1978	"
Perl-Mack	SOLAR/1015-78/01	Jan., 1978	CO
"	SOLAR/1015-78/02	Feb., 1978	"
"	SOLAR/1015-78/03	Mar., 1978	"
"	SOLAR/1015-78/04	Apr., 1978	"
"	SOLAR/1015-78/05	May, 1978	"
"	SOLAR/1015-78/06	June, 1978	"
"	SOLAR/1015-78/07	July, 1978	"
"	SOLAR/1015-78/08	Aug., 1978	"
"	SOLAR/1015-78/09	Sept., 1978	"
"	SOLAR/1015-78/10	Oct., 1978	"
"	SOLAR/1015-78/11	Nov., 1978	"
"	SOLAR/1015-78/21	Seasonal	"
Sir Galahad	SOLAR/1028-78/10	Oct., 1978	VA

HUD SOLAR DEMONSTRATION PROJECT REPORTS FOR
INSTRUMENTED RESIDENTIAL PROJECTS (Continued)

SITE NAME	REPORT NUMBER	DATE	STATE
HEATING AND HOT WATER - LIQUID COLLECTORS (Cont.)			
Stewart-Teele-Mitchell	SOLAR/1018-78/04	Apr., 1978	NY
"	SOLAR/1018-78/05	May, 1978	"
"	SOLAR/1018-78/06	June, 1978	"
"	SOLAR/1018-78/07	July, 1978	"
"	SOLAR/1018-78/08	Aug., 1978	"
"	SOLAR/1018-78/09	Sept., 1978	"
"	SOLAR/1018-78/10	Oct., 1978	"
Twin City Builders	SOLAR/1007-78/06	June, 1978	OR
"	SOLAR/1007-78/07	July, 1978	"
"	SOLAR/1007-78/08	Aug., 1978	"
"	SOLAR/1007-78/10	Oct., 1978	"
HEATING AND HOT WATER - AIR COLLECTORS			
Alpha Construction	SOLAR/1034-78/02	Feb., 1978	OH
"	SOLAR/1034-78/03	Mar., 1978	"
"	SOLAR/1034-78/04	Apr., 1978	"
"	SOLAR/1034-78/05	May, 1978	"
"	SOLAR/1034-78/06	June, 1978	"
"	SOLAR/1034-78/07	July, 1978	"
"	SOLAR/1034-78/08	Aug., 1978	"
"	SOLAR/1034-78/14	Seasonal	"
DuMac Investment	SOLAR/1003-77/10	Oct., 1977	KS
Heliothermics - Lot 6	SOLAR/1015-78/09	Sept., 1978	SC
Houston Construction Co.	SOLAR/1006-78/02	Feb., 1978	MN
"	SOLAR/1006-78/09	Sept., 1978	"
Moulder	SOLAR/1001-77/12	Dec., 1977	IN
"	SOLAR/1001-78/01	Jan., 1978	"
"	SOLAR/1001-78/04	Apr., 1978	"
"	SOLAR/1001-78/07	July, 1978	"
"	SOLAR/1001-78/08	Aug., 1978	"
"	SOLAR/1001-78/09	Sept., 1978	"
Zein	SOLAR/1057-78/08	Aug., 1978	WI
"	SOLAR/1057-78/09	Sept., 1978	"

HUD SOLAR DEMONSTRATION PROJECT REPORTS FOR
INSTRUMENTED RESIDENTIAL PROJECTS (Continued)

SITE NAME	REPORT NUMBER	DATE	STATE
PASSIVE HEATING SYSTEMS			
Greenmoss	SOLAR/1009-77/12	Dec., 1977	VT
"	SOLAR/1009-78/01	Jan., 1978	"
"	SOLAR/1009-78/03	Mar., 1978	"
"	SOLAR/1009-78/04	Apr., 1978	"
"	SOLAR/1009-78/05	May, 1978	"
"	SOLAR/1009-78/06	June, 1978	"
"	SOLAR/1009-78/07	July, 1978	"
"	SOLAR/1009-78/08	Aug., 1978	"
Hullco Construction	SOLAR/1043-78/03	Mar., 1978	AZ
"	SOLAR/1043-78/04	Apr., 1978	"
"	SOLAR/1043-78/05	May, 1978	"
"	SOLAR/1043-78/06	June, 1978	"
"	SOLAR/1043-78/08	Aug., 1978	"
"	SOLAR/1043-78/09	Sept., 1978	"
"	SOLAR/1043-78/10	Oct., 1978	"
HYBRID SYSTEMS			
William C. Burdick	SOLAR/1036-78/08	Aug., 1978	WI
Spence-Urban	SOLAR/1037-78/08	Aug., 1978	IA
"	SOLAR/1037-78/09	Sept., 1978	"
Living Systems	SOLAR/1046-78/08	Aug., 1978	CA
"	SOLAR/1046-78/09	Sept., 1978	"
"	SOLAR/1046-78/10	Oct., 1978	"
DOMESTIC HOT WATER SYSTEMS			
Albuquerque Western - I	SOLAR/1011-78/05	May, 1978	NM
"	SOLAR/1011-78/06	June, 1978	"
"	SOLAR/1011-78/07	July, 1978	"
"	SOLAR/1011-78/08	Aug., 1978	"
"	SOLAR/1011-78/09	Sept., 1978	"
Facilities Development	SOLAR/1017-78/03	Mar., 1978	CA
"	SOLAR/1017-78/04	Apr., 1978	"
"	SOLAR/1017-78/05	May, 1978	"
"	SOLAR/1017-78/06	June, 1978	"
"	SOLAR/1017-78/07	July, 1978	"
"	SOLAR/1017-78/08	Aug., 1978	"
"	SOLAR/1017-78/14	Seasonal	"

HUD SOLAR DEMONSTRATION PROJECT REPORTS FOR
INSTRUMENTED RESIDENTIAL PROJECTS (Continued)

SITE NAME	REPORT NUMBER	DATE	STATE
DOMESTIC HOT WATER SYSTEMS (Continued)			
Hei Wai Wong	SOLAR/1014-78/04	Apr., 1978	HI
"	SOLAR/1014-78/05	May, 1978	"
"	SOLAR/1014-78/06	June, 1978	"
"	SOLAR/1014-78/07	July, 1978	"
"	SOLAR/1014-78/08	Aug., 1978	"
A-Frame	SOLAR/1010-78/02	Feb., 1978	HI
"	SOLAR/1010-78/03	Mar., 1978	"
"	SOLAR/1010-78/04	Apr., 1978	"
"	SOLAR/1010-78/05	May, 1978	"
"	SOLAR/1010-78/06	June, 1978	"
"	SOLAR/1010-78/07	July, 1978	"
"	SOLAR/1010-78/08	Aug., 1978	"
"	SOLAR/1010-78/09	Sept., 1978	"
"	SOLAR/1010-78/14	Seasonal	"
COOLING, HEATING AND HOT WATER			
College House	SOLAR/1024-78/08	Aug., 1978	TX
Florida Gas	SOLAR/1005-78/05	May, 1978	FL
"	SOLAR/1005-78/06	June, 1978	"
"	SOLAR/1005-78/07	July, 1978	"
"	SOLAR/1005-78/08	Aug., 1978	"
"	SOLAR/1005-78/14	Seasonal	"

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SOURCES

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7. Fong, E., "Description of Solar Data Collection," Institute of Computer Sciences and Technology, NBS, August, 1978.

8. Conner, C., "Solar Demonstration Program Overview," Revised Proceedings, The Department of Energy's Solar Update, Conference No. 780701, November, 1978.

9. "Summary of Demonstration Data Available thorugh Residential Solar Demonstration Program," presentation given by Franklin Research Center at DOE Solar Heating and Cooling Systems Operational Results conference in Colorado Springs, Colorado, November, 1978.

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11 "Cycle 5 Residential Solar Demonstrations," U.S. Department of Housing and Urban Development, March, 1979.

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15. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

16. ABSTRACT *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)*

The Residential Solar Data Center (SDC) is responsible for the establishment and operation of a computerized data base containing non-instrumented residential data collected from the DOE/HUD Solar Heating and Cooling Demonstration Program. This document includes a summary of the history and background of the SDC and it's role in the Demonstration Program, a list of the computer reports which are available and sample pages of representative reports, a description of the data files which comprise the solar data base, a description of the interactive access to the solar data base, a set of figures showing the amount of data on the computer, and a list of other Solar Data Center publications.

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)*

Automatic data processing; data base; residential buildings; solar data center; solar heating and cooling; solar energy systems.

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