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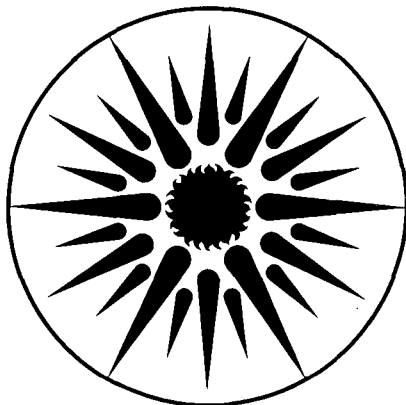
A SURVEY OF END USE METERING IN THE UNITED STATES

E.L. Vine

June 1983

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A SURVEY OF END USE METERING IN THE UNITED STATES

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June 1983

This work was supported by the Building Division and the Systems Analysis Division, Office of Buildings and Community Systems, U.S. Department of Energy under Contract Number DE-AC03-76SF00098.

A SURVEY OF END USE METERING IN THE UNITED STATES*

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The need for accurate information on how much energy is being used for specific end uses (e.g., heating, cooling, cooking, refrigeration, water heating, etc.) has been increasing over time. This demand has arisen largely as a result of the increased sophistication in residential energy use models requiring this type of information and also as a result of the increased need for estimating the impacts of energy conservation technologies and programs on residential energy use.

In this paper, we present the results of a survey of metering studies of space heating, space cooling, and water heating in the United States since 1970. We attempted to contact as many of the major utilities involved in end use metering as possible. While we recognize that this survey does not include all utilities in the country, we do feel that it is representative of the extent of end use metering conducted in the United States in the last 13 years.

We also present in this paper a questionnaire that is to be used in a survey of households that have been metered for space heating and/or air conditioning. The questionnaire contains questions on occupants' attitudes, behavior, billing, and building data. In this survey, we hope to analyze the role of occupant behavior and attitudes in improving our understanding of the determinants of energy use in occupied buildings, and to develop statistical measures of occupant behavior for inclusion in residential energy audit models.

*This work was supported by the Building Division and the Systems Analysis Division, Office of Buildings and Community Systems, U.S. Department of Energy under Contract No. DE-AC03-76SF00098.

APPROACH

We first reviewed the energy literature and personally contacted key people in the energy field to prepare a list of utility companies, educational institutions, and other organizations involved in sub-metering energy use in the home. We contacted over 75 organizations around the country (Table 1).

[Table 1 about here]

For each organization, we selected projects (past, current, and proposed) that met the following criteria:

1. Metered end uses must include space heating, space cooling, and/or water heating.
2. All studies must have been conducted since 1970.
3. The number of households in each study must number 20 or more.

We found that not all the organizations contacted have sub-metered energy use in the residential sector, primarily because of the expense involved. In addition, several companies have sub-metered selected appliances for only a few households. However, we were able to identify almost 100 projects that met the criteria described above. For each project, we asked ten questions about each of the projects (Table 2).

[Table 2 about here]

Using the information garnered from the responses to these questions, we compiled lists of 100 sub-metered projects by utility company and by end use (cooling, heating and water heating) (Tables 3 to 6).

[Tables 3 to 6 about here]

We characterized each project using the following descriptors:

1. Name and location of utility.
2. Size of sample metered.
3. Years in which project began and ended.
4. Extent of data collected on house characteristics and occupants.
5. Collection of whole house energy use (in addition to the metering of specific end use)
6. Metering of other end uses in same houses.
7. Problems in analyzing metered data.
8. Collection of indoor air temperature.
9. Extent of published material on project.

SURVEY RESULTS

One of the most surprising results of this survey was the discovery of many end use projects around the country that have collected end use energy use from a large number of households. In fact, the number of metering projects appears to be increasing in number and in sample size. Most of these studies have not collected much data on house and occupant characteristics: the most common information collected was floor area and number of occupants. Only a few organizations collected data on socioeconomic characteristics of occupants, appliance saturation, thermal integrity (e.g., wall and ceiling insulation), indoor air temperatures, and air infiltration. We also found that many of the projects were concerned with peak energy demand (kW) rather than energy use (kWh), and some were actually part of load control programs. In addition to metering specific end uses, whole house energy use was also metered in many of these projects. Finally, we were able to obtain and review 39 reports on these projects (Appendix 1).

QUESTIONNAIRE DEVELOPMENT

We have constructed a draft questionnaire (Appendix 2) that is to be used in a survey of households that have been metered for space heating and/or air conditioning. The questionnaire was developed after an extensive literature review (Appendix 3) and after examining questionnaires that we previously formulated in earlier studies. The survey instrument contains numerous questions on occupant attitudes and behavior, the key area which we are interested in investigating and which was found to be missing in the metering projects.

CONCLUSIONS

In conclusion, we found about 100 studies of metered energy use for space cooling, space heating, and water heating. We intend to use one or two of the data bases collected in these projects for analyzing the effects of occupant behavior on energy use in occupied households. We plan on recontacting those homes that have been metered and ask additional questions of the occupants to obtain data on their attitudes, behavior, socioeconomic background, and housing characteristics. A questionnaire has been constructed for this purpose.

By focusing on occupant behavior and attitudes, we hope to use this information to improve our understanding of the determinants of energy use in occupied buildings. Moreover, the knowledge gained from this project potentially offers the greatest improvement in developing procedures for evaluating results of residential energy audits and retrofits.

We plan on contacting more utilities about end use metering projects as part of an ongoing project on energy use and behavior. Information on any additional projects should be sent to the author at LBL.

Table 1

ORGANIZATIONS CONTACTED ON END USE METERING

Alabama Power
Arizona Public Service
Arkansas Power and Light
Association of Edison Illuminating Companies
Baltimore Gas and Electric
Bonneville Power Authority (Oregon)
Boston Edison
California Energy Commission
Carolina Power and Light
Central Maine Power
Central Power and Light (Corpus Christi, Texas)
Commonwealth Edison (Chicago)
Consolidated Edison (New York)
Consumers Power (Jackson, Michigan)
Dallas Power and Light
Delmarva Power (Wilmington, Delaware)
Detroit Edison
Duke Power
Edison Electric Institute (Washington, D.C.)
Electric Power Research Institute
Eugene Water and Electric Board
Fleming Associates
Florida Power and Light
Florida Power Corporation
General Public Utility (New Jersey)
Georgia Power
Gulf Power (Pensacola, Florida)
Gulf States Utilities (Beaumont, Texas)
Honeywell
Houston Lighting and Power
Illinois Power
Iowa Power and Light

Iowa State University
Kansas City Power and Light
Kansas Corporation Commission
Kansas Energy Office
Kansas Gas and Electric
Kansas Power and Light
Kissimee Utilities (Kissimee, Florida)
Lawrence Berkeley Laboratory
Lincoln Electric Systems (Lincoln, Nebraska)
Load Research Council
Lubbock Power and Light (Lubbock, Texas)
Minnesota Department of Energy
National Bureau of Standards
National Rural Electric Cooperative
Nebraska Public Power
New England Electric System
New England Power Planning
New Orleans Public Service
New York State Electric and Gas
New York State Energy Office
New York Energy and Research Development Agency
Niagara Mohawk (Niagara, N.Y.)
Northeast Utilities
Northern States Power (Minneapolis)
Oklahoma Gas and Electric
Omaha Public Power District
Pacific Gas and Electric
Pacific Power and Light (Portland, Oregon)
Peoples Gas System (Florida)
Philadelphia Electric
Portland General Electric (Oregon)
Potomac Edison (Maryland)
Potomac Electric Power (Washington, D.C.)
Princeton University
Public Service Electric and Gas (New Jersey)
Public Service Company of Colorado

Public Service Indiana
Puget Sound Power and Light
Robington Products
Sacramento Municipal Utility District
San Diego Gas and Electric
Seattle City Light
Solar Energy Research Institute
Southern California Edison
Southwestern Electric Service (Jacksonville, Texas)
Tacoma City Light
Tampa Electric
Tennessee Valley Authority
Texas Electric Cooperatives
Texas Electric Service
Texas Power and Light
Tucson Gas and Electric
Union Electric (St. Louis, Missouri)
University of Kentucky (Lexington)
Utah Power and Light
Washington Water and Power (Spokane, Washington)
Wisconsin Public Service Corporation

Table 2

QUESTIONS ASKED IN END USE METERING SURVEY

1. What appliances have you metered?
2. When was the metering conducted?
3. How many households were metered?
4. Did you collect data on housing characteristics?
5. Did you collect attitudinal, behavioral, or demographic data on the occupants?
6. Did you meter whole house energy use?
7. Did you collect indoor air temperatures and/or measure air infiltration?
8. Are there any problems in analyzing the data?
9. Is there a report available on this project?
10. Would it be possible to interview some of these households for collecting attitudinal and behavioral data?

Table 3

END USE METERING STUDIES BY UTILITY

Company	State	Appliance	Sample Size	Start Date	Finish Date	House Data		Whole House Energy		Report
						↓	↓	↓	↓	
Alabama Power	Al	Heater	30	1982	Cont.				SAME	
Alabama Power	Al	Air conditioner	30	1982	Cont.				SAME	
Alabama Power Co.	Al	Air conditioner	50	1976	1977				SAME	Report*
Alabama Power Co.	Al	Water heater	50	1976	1977				SAME	Report*
Alabama Power Co.	Al	Air conditioner	50	1976	1977	Size	Some			
Arizona Public Serv.	Az	Air conditioner	19	1972	1973	Some	Some	Yes	SAME	Report
Arizona Public Serv.	Az	Heat pump	16	1972	1973	Some	Some	Yes	SAME	Report
Arizona Public Serv.	Az	Water heater	18	1972	1973	Some	Some	Yes	SAME	Report
Arkansas P + L	As	Water heater	70	1983	1984					
Baltimore Gas + Elec	Md	Water heater	32	1978	1979	Some	Some	Yes	Problems	Report
Baltimore Gas + Elec	Md	Heat pump	32	1977	1978	Some	Some	Yes	Problems	Report
Baltimore Gas + Elec	Md	Air conditioner	32	1974	1975	Some	Some	Yes	Problems	Report
Baltimore Gas + Elec	Md	Heater	32	1970	1971	Some	Some	Yes	Problems	Report
Baltimore Gas + Elec	Md	Heater	32	1981	1982	Some	Some	Yes	Problems	Report*
Bonneville Power Aut	Or	Heater	450	1984?		Some	Some	No	Appliances	
Bonneville Power Aut	Or	Water heater	52	1983?	1984	Some	Some	No		
Bonneville Power Aut	Or	Water heater	450	1984?		Some	Some	No	SAME	
Central Maine Power	Me	Heater	33	1974	1974			Yes	SAME	Report
Central Maine Power	Me	Water heater	33	1974	1974			Yes	SAME	Report
Consumers Power Co.	Mi	Water heater	53	1978	1979			Yes		Report
Consumers Power Co.	Mi	Air conditioner	42	1977	1978	Lots	Some			Report
Consumers Power Co.	Mi	Water heater	62	1980	1981	Lots	Some			Report
Detroit Edison	Mi	Air conditioner	35	1978	1978	Some	Some	Yes		Report
EPRI/Ohio State Univ	Ch	Heater	60	1976	1977	Lots	Some	Yes	SAME	Report
EPRI/Ohio State Univ	Ch	Air conditioner	60	1976	1977	Lots	Some	Yes	SAME	Report
Eugene Water + Elec.	Or	Water heater	24	1980	Cont.	Size	Some	Yes	SAME	No report
Eugene Water + Elec.	Or	Heater	24	1980	Cont.	Size	Some	Yes	SAME	No report
Florida P + L	Fl	Air conditioner	165	1978	1979	Some	Some	Yes		Report
Florida Power Corp.	Fl	Heater	227	1978	1979			Yes	SAME	Report
Florida Power Corp.	Fl	Air conditioner	227	1978	1979			Yes	SAME	Report
Florida Power Corp.	Fl	Water heater	275?	1983						
Georgia Power	Ga	Air conditioner	110	1981	Cont.	Lots	Some		Problems	No report
Gulf Power Company	Fl	Heater	140	1978	1980	Some	Lots	Yes	Indoor tmp	Report
Gulf Power Company	Fl	Air conditioner	140	1978	1980	Some	Lots	Yes	SAME	Report
Gulf Power Company	Fl	Air conditioner	90	1983?		Lots	Lots	Yes	Appliances	
Gulf Power Company	Fl	Water heater	90	1983?		Lots	Lots	Yes	SAME	

Table 3 Continued

Company	State	Appliance	Sample Size	Start Date	Finish Date	House	Whole	Same Houses	Report
						Data	House Energy		
						↓	↓		
						People			
						Data			
Houston L + P	Tx	Water heater	27	1979	1980	Some	Some	Yes	Report
Houston L + P	Tx	Heat pump	27	1979	1980	Some	Some	Yes	Report
Kansas City P + L	Ks	Heater	55	1980	Cont.	Some	Some	Yes	Appliances No report
Kansas City P + L	Ks	Air conditioner	110	1980	1980				Report
Kissimee Utilities	Fl	Water heater	50	1983	1983	None	None	Yes	
Minnesota Dept. of E	Mn	Water heater	50	1983?		Some	Lots		Indoor tmp
N.Y. State Elec + Ga	NY	Water heater	35	1977	1980	Some	Some	No	Report*
New England Service	Ma	Heater	35	1981	1982	Some	Some	Yes	No report
New England Service	Ma	Water heater	35	1981	1982	Some	Some	Yes	Report
New Orleans Public S	La	Air conditioner	200	1980	1983	Some	Some		Indoor tmp
Niagara Mohawk	NY	Heater	200	1983		Some	Some	Yes	SAME
Niagara Mohawk	NY	Water heater	200	1983		Some	Some	Yes	SAME
Northeast Utilities		Water heater	20	1982	1984			No	
Pacific Gas + Elec.	Ca	Water heater	300	1980	Cont.	Lots	Lots	Yes	Report
Pacific Gas + Elec.	Ca	Air conditioner	300	1980	Cont.	Lots	Lots	Yes	Report
Pacific Gas + Elec.	Ca	Heater?	750	1983?		Lots	Lots	Yes	SAME
Pacific Gas + Elec.	Ca	Water heater?	750	1983?		Lots	Lots	Yes	
Pacific Gas + Elec.	Ca	Air conditioner	750	1983?		Lots	Lots	Yes	SAME
Pacific P + L	OR	Heater	325	1983?	1986?	Lots	Lots	Yes	Indoor tmp
Pacific P + L	Or	Water heater	325	1983?	1986?	Lots	Lots	Yes	SAME
Pacific P + L	Or	Heater	60	1982	1983	Some	Lots		SAME
Pacific P + L	Or	Water heater	60	1982	1983	Some	Lots		SAME
Philadelphia Elec.	Pa	Water heater	60	1980	1981	Size	Some		Int report
Philadelphia Elec.	Pa	Heat pump	40	1978	1979	Some			Int report
Philadelphia Elec.	Pa	Air conditioner	39	1978	1978	None	None	No	Int report
Philadelphia Elec.	Pa	Heater	60	1983	1984			Yes	Int report
Philadelphia Elec.	Pa	Heat pump	120	1983	1984			Yes	Int report
Philadelphia Elec.	Pa	Water heater	60	1983	1984			No	
Portland General Ele	Or	Water heater	48	1981	1983	Some	Some	No	
Portland General Ele	Or	Water heater	20	1982	1984	Lots	Some	Yes	SAME
Portland General Ele	Or	Heater	20	1982	1984	Lots	Some	Yes	SAME
Potomac Edison Co.	Md	Air conditioner	60	1982	1983	Size	Some	No	SAME Int report
Potomac Edison Co.	Md	Water heater	74	1978	Cont.	Size	Some	No	SAME Int report
Potomac Edison Co.	Md	Water heater	93	1982	Cont.	Size	Some	No	Int report
Potomac Electric Pow	DC	Water heater	68	1981	1981	Size	Some	Yes	SAME Report
Potomac Electric Pow	DC	Air conditioner	68	1981	1981	Size	Some	Yes	SAME Report
Potomac Electric Pow	DC	Heater	68	1981	1981	Size	Some	Yes	SAME Report
Potomac Electric Pow	DC	Heat pump	52	1975	1979	None	None	Yes	Report

Table 3 Continued

Company	State	Appliance	Sample Size	Start Date	Finish Date	House	Whole	Same Houses	Report	
						Data	House Energy			
						↓	↓			
Public Service Co.	Co	Heater	20	1976	1977	Some	Some	Yes	SAME	Int report
Public Service Co.	Co	Heat pump	20	1976	1977	Some	Some	Yes	SAME	Int report
Public Service E + G	NJ	Air conditioner	50	1979	1980	Some	Some	No		No report
Public Service E + G	NJ	Heat pump	75	1984?	1985	Some	Some	No		
SMUD	Ca	Water heater	37	1981	1983	Some	None	Yes		
SMUD	Ca	Heat pump	67	1979	Cont.	Some	None	Yes		No report
San Diego Gas + Elec	Ca	Air conditioner	500	1980	Cont.	Some	Lots	Yes	Indoor tmp	Report*
San Diego Gas + Elec	Ca	Water heater	500	1980	Cont.	Some	Lots	Yes	SAME	Report*
Seattle City Light	Wa	Water heater	30	1978	1979	None	None	No		Report
Tampa Electric Co.	Fl	Heater	200	1982	1984	Lots	Some	Yes	SAME	
Tampa Electric Co.	Fl	Air conditioner	200	1982	1984	Lots	Some	Yes	SAME	
Texas Power + Light	Tx	Heater	30	1972	1972			Yes	SAME	Report
Texas Power + Light	Tx	Air conditioner	30	1972	1972			Yes	SAME	
Texas Power + Light	Tx	Water heater	30	1972	1972			Yes	SAME	

Table 4

AIR CONDITIONING METERING STUDIES

<u>Company</u>	<u>State</u>	<u>Sample Size</u>	<u>Start Date</u>	<u>Finish Date</u>	<u>House</u>	<u>Whole</u>	<u>Same Houses</u>	<u>Report</u>	
					<u>Data</u>	<u>House Energy</u>			
					↓	↓			
					<u>People</u>	<u>Data</u>			
Texas Power + Light	Tx	30	1972	1972			Yes	SAME	
Arizona Public Serv.	Az	19	1972	1973	Some	Some	Yes	SAME	Report
Baltimore Gas + Elec	Md	32	1974	1975	Some	Some	Yes	Problems	Report
Alabama Power Co.	Al	50	1976	1977				SAME	Report*
Alabama Power Co.	Al	50	1976	1977	Size	Some			
EPRI/Ohio State Univ	Oh	60	1976	1977	Lots	Some	Yes	SAME	Report
Consumers Power Co.	Mi	42	1977	1978	Lots	Some			Report
Philadelphia Elec.	Pa	39	1978	1978	None	None	No		Int report
Detroit Edison	Mi	35	1978	1978	Some	Some	Yes		Report
Florida Power Corp.	Fl	227	1978	1979			Yes	SAME	Report
Florida P + L	Fl	165	1978	1979	Some	Some	Yes		Report
Gulf Power Company	Fl	140	1978	1980	Some	Lots	Yes	SAME	Report
Public Service E + G	NJ	50	1979	1980	Some	Some	No		No report
Kansas City P + L	Ks	110	1980	1980					Report
New Orleans Public S	La	200	1980	1983	Some	Some		Indoor tmp	
Pacific Gas + Elec.	Ca	300	1980	Cont.	Lots	Lots	Yes		Report
San Diego Gas + Elec	Ca	500	1980	Cont.	Some	Lots	Yes	Indoor tmp	Report*
Potomac Electric Pow	DC	68	1931	1981	Size	Some	Yes	SAME	Report
Georgia Power	Ga	110	1981	Cont.	Lots	Some		Problems	No report
Potomac Edison Co.	Md	60	1982	1983	Size	Some	No	SAME	Int report
Tampa Electric Co.	Fl	200	1982	1984	Lots	Some	Yes	SAME	
Alabama Power	Al	30	1982	Cont.				SAME	
Gulf Power Company	Fl	90	1983?		Lots	Lots	Yes	Appliances	
Pacific Gas + Elec.	Ca	750	1983?		Lots	Lots	Yes	SAME	

Table 5

HEATING METERING STUDIES

<u>Company</u>	<u>State</u>	<u>Appliance</u>	<u>Sample Size</u>	<u>Start Date</u>	<u>Finish Date</u>	<u>House Data</u>	<u>People Data</u>	<u>Whole House Energy</u>	<u>Same Houses</u>	<u>Report</u>
Arizona Public Serv.	Az	Heat pump	16	1972	1973	Some	Some	Yes	SAME	Report
Potomac Electric Pow	DC	Heat pump	52	1975	1979	None	None	Yes		Report
Public Service Co.	Co	Heat pump	20	1976	1977	Some	Some	Yes	SAME	Int report
Baltimore Gas + Elec	Md	Heat pump	32	1977	1978	Some	Some	Yes	Problems	Report
Philadelphia Elec.	Pa	Heat pump	40	1978	1979	Some				Int report
Houston L + P	Tx	Heat pump	27	1979	1980	Some	Some	Yes		Report
SMUD	Ca	Heat pump	67	1979	Cont.	Some	None	Yes		No report
Philadelphia Elec.	Pa	Heat pump	120	1983	1984			Yes		Int report
Public Service E + G	NJ	Heat pump	75	1984?	1985	Some	Some	No		
Baltimore Gas + Elec	Md	Heater	32	1970	1971	Some	Some	Yes	Problems	Report
Texas Power + Light	Tx	Heater	30	1972	1972			Yes	SAME	Report
Central Maine Power	Me	Heater	33	1974	1974			Yes	SAME	Report
EPRI/Ohio State Univ	Oh	Heater	60	1976	1977	Lots	Some	Yes	SAME	Report
Public Service Co.	Co	Heater	20	1976	1977	Some	Some	Yes	SAME	Int report
Florida Power Corp.	Fl	Heater	227	1978	1979			Yes	SAME	Report
Gulf Power Company	Fl	Heater	140	1978	1980	Some	Lots	Yes	Indoor tmp	Report
Kansas City P + L	Ks	Heater	55	1980	Cont.	Some	Some	Yes	Appliances	No report
Eugene Water + Elec.	Or	Heater	24	1980	Cont.	Size	Some	Yes	SAME	No report
Potomac Electric Pow	DC	Heater	68	1981	1981	Size	Some	Yes	SAME	Report
New England Service	Ma	Heater	35	1981	1982	Some	Some	Yes		No report
Baltimore Gas + Elec	Md	Heater	32	1981	1982	Some	Some	Yes	Problems	Report*
Pacific P + L	Or	Heater	60	1982	1983	Some	Lots		SAME	
Portland General Ele	Or	Heater	20	1982	1984	Lots	Some	Yes	SAME	
Tampa Electric Co.	Fl	Heater	200	1982	1984	Lots	Some	Yes	SAME	
Alabama Power	Al	Heater	30	1982	Cont.				SAME	
Niagara Mohawk	NY	Heater	200	1983		Some	Some	Yes	SAME	
Philadelphia Elec.	Pa	Heater	60	1983	1984			Yes		Int report
Pacific P + L	OR	Heater	325	1983?	1986?	Lots	Lots	Yes	Indoor tmp	
Bonneville Power Aut	Or	Heater	450	1984?		Some	Some	No	Appliances	
Pacific Gas + Elec.	Ca	Heater?	750	1983?		Lots	Lots	Yes	SAME	

Table 6

WATER HEATER METERING STUDIES

Company	State	Sample Size	Start Date	Finish Date	House Data	People Data	Same Houses		Report
							Whole House Energy	↓	
Texas Power + Light	Tx	30	1972	1972			Yes	SAME	
Arizona Public Serv.	Az	18	1972	1973	Some	Some	Yes	SAME	Report
Central Maine Power	Me	33	1974	1974			Yes	SAME	Report
Alabama Power Co.	Al	50	1976	1977				SAME	Report*
N.Y. State Elec + Ga	NY	35	1977	1980	Some	Some	No		Report*
Seattle City Light	Wa	30	1978	1979	None	None	No		Report
Baltimore Gas + Elec	Md	32	1978	1979	Some	Some	Yes	Problems	Report
Consumers Power Co.	Mi	53	1978	1979			Yes		Report
Potomac Edison Co.	Md	74	1978	Cont.	Size	Some	No	SAME	Int repor
Houston L + P	Tx	27	1979	1980	Some	Some	Yes		Report
Philadelphia Elec.	Pa	60	1980	1981	Size	Some			Int repor
Consumers Power Co.	Mi	62	1980	1981	Lots	Some			Report
Pacific Gas + Elec.	Ca	300	1980	Cont.	Lots	Lots	Yes		Report
San Diego Gas + Elec	Ca	500	1980	Cont.	Some	Lots	Yes	SAME	Report*
Eugene Water + Elec.	Or	24	1980	Cont.	Size	Some	Yes	SAME	No report
Potomac Electric Pow	DC	68	1981	1981	Size	Some	Yes	SAME	Report
New England Service	Ma	35	1981	1982	Some	Some	Yes		Report
SMUD	Ca	37	1981	1983	Some	None	Yes		
Portland General Ele	Or	48	1981	1983	Some	Some	No		
Pacific P + L	Or	60	1982	1983	Some	Lots		SAME	
Portland General Ele	Or	20	1982	1984	Lots	Some	Yes	SAME	
Northeast Utilities		20	1982	1984			No		
Potomac Edison Co.	Md	93	1982	Cont.	Size	Some	No		Int repor
Florida Power Corp.	Fl	275?	1983						
Niagara Mohawk	NY	200	1983		Some	Some	Yes	SAME	
Kissimee Utilities	Fl	50	1983	1983	None	None	Yes		
Arkansas P + L	As	70	1983	1984					
Philadelphia Elec.	Pa	60	1983	1984			No		
Gulf Power Company	Fl	90	1983?		Lots	Lots	Yes	SAME	
Minnesota Dept. of E	Mn	50	1983?		Some	Lots		Indoor tmp	
Bonneville Power Aut	Or	52	1983?	1984	Some	Some	No		
Pacific P + L	Or	325	1983?	1986?	Lots	Lots	Yes	SAME	
Bonneville Power Aut	Or	450	1984?		Some	Some	No	SAME	
Pacific Gas + Elec.	Ca	750	1983?		Lots	Lots	Yes		

NOTES TO TABLES 3 TO 6

1. Question marks: A question mark (?) next to an appliance or year indicates uncertainty: the project may start in that year (e.g., if funds are available) and the appliance may be metered.
2. Finish date: On-going projects are indicated by "Cont."
3. House data: "Some" indicates that house area (size) and a few other house characteristics have been collected; "Lots" indicates the collection of a great deal of data on house characteristics.
4. People data: "Some" indicates that the number of occupants has been recorded; "Lots" indicates the collection of a great deal of data on occupants (behavior and attitudes).
5. Whole house energy use: "Yes" indicates that total energy use for the house has been collected in addition to specific appliance data.
6. Same houses: "SAME" indicates that these households have been metered for more than one appliance (e.g., water heater and heat pump). This category is also used for noting other information collected on these households: indoor temperature ("Indoor tmp"), appliance saturation data ("Appliances"). In addition, problems in collecting or analyzing the data are indicated by "Problems".
7. Report: "Report*" indicates that the report is currently being written; "Report" indicates that the report resides at LBL; "No report" indicates that there is no report; and "Int report" indicates that an internal report has been written and is not available to the public.
8. Pacific Gas and Electric's water heater and air conditioner projects have 1200 and 60,000 households, respectively.

Appendix 1

REPORTS ON METERED ENERGY PROJECTS

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Baltimore Gas and Electric Company, "Residential Customer Load Study: Homes With Electric Food Freezers, Twelve Months Ended September 30, 1974," 1976.

Baltimore Gas and Electric Company, "Residential Customer Load Study: Homes With Electric Central Air Conditioners, Twelve Months Ended April 30, 1974," 1975.

Baltimore Gas and Electric Company, "Residential Customer Load Study: Homes With Electric Room Air Conditioner, Twelve Months Ended March 31, 1972," 1973.

Baltimore Gas and Electric Company, "Residential Customer Load Study: Homes With Electric Furnaces, Twelve Months Ended April 30, 1970," 1971.

Central Maine Power Company, "Residential Space and Water Heating Load Study (January-December 1974)."

Commonwealth Edison Company, "Description and Results of Commonwealth Edison's Residential Air Conditioner Control Experiment."

Commonwealth Edison Company, "Test of Water Heater/Air Conditioner (WHAC) Demand Interlock on Commonwealth Edison's Residential Customers," 1982.

Consumers Power Company, "1977/78 Electric Air-Conditioning Load Study: Residential Central Air Conditioning."

Consumers Power Company, "Gas Appliance Sub-Metering Study," 1981.

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Consumers Power Company, "Appliance Sub-Metering Study: Freezer Phase," 1981.

Consumers Power Company, "Appliance Sub-Metering Study: Microwave Ovens," 1978.

Consumers Power Company, "Continuous Residential Electric Load Study: 1980 Report," 1981.

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Detroit Edison Company, "Residential Central Air-Conditioning Study: Summer 1975, 1976, 1978."

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Kansas City Power and Light Company, "Updated Report on Load Management Research Projects," 1980.

Northern States Power Company, "Residential Appliance Test Metering," 1980.

Pacific Gas and Electric Company, "Residential Peak Load Reduction Program: First Progress Report," 1982.

Potomac Edison Company, "Employee Heat Pump Water Heater Program."

Potomac Edison Company, "Domestic Electric Water Heating Usage Study," 1979.

Potomac Edison Company, "Room Air Conditioner Use Study," 1982.

Potomac Edison Company, "Domestic Electric Range and Clothes Dryer Usage Study," 1981.

Potomac Edison Company, "Domestic Refrigerator Energy Usage Study," 1981.

Potomac Edison Company, "Domestic Freezer Usage Study," 1980.

Potomac Electric Power Company, "Residential Heat Pump Load Study: Twelve Months Ending December 1977," 1979.

Potomac Electric Power Company, "Residential All-Electric Home Load Study: Twelve Months Ending December 1981," 1982.

Seattle City Light Department, "Residential Electric Water Heater Conservation Potential," 1981.

Tennessee Valley Authority, "Appliance Metering," 1978.

Texas Electric Cooperatives, Inc., "Load Research for Innovative Rate Designs and Load Management Options for Texas Rural Electric Cooperatives," 1982.

Appendix 2

PENSACOLA
RESIDENTIAL ENERGY USE SURVEY
1983

Before asking you about how you heat and cool your house, I'm going to start by asking some questions about your community, your home, and your appliances.

1. How many years have you lived in Pensacola? _____ YEARS

2. How many years have you lived in your home? _____ YEARS

[IF MORE THAN TWO YEARS, GO TO 5; OTHERWISE CONTINUE]

3. What year did you move in? _____ YEAR

4. What month? _____ MONTH

5. What type of residence do you live in?

[READ CATEGORIES 1-4]

SINGLE FAMILY DETACHED 1

SINGLE FAMILY ATTACHED/DUPLEX . . . 2

APARTMENT 3

MOBILE HOME 4

OTHER (SPECIFY) _____ 5

NO RESPONSE 9

6. Do you own or rent your house?

OWN 1

RENT 2

OTHER (SPECIFY) _____ 3

NO RESPONSE 9

COMPUTER CODE
DECK: COLUMN
1:17-18
1:19-20
1:21
1:22-23
1:24
1:25

7. How many rooms does your house have?

(Excluding bathrooms)

ONE ROOM 1
TWO ROOMS 2
THREE ROOMS 3
FOUR ROOMS 4
FIVE ROOMS 5
SIX ROOMS 6
SEVEN ROOMS OR MORE 7
DON'T KNOW 8
NO RESPONSE 9

1:26

8. What year was your house constructed?

ENTER YEAR BUILT _____ YEAR
DON'T KNOW 88
NO RESPONSE 99

1:27-28

9. How many stories is your house?

ONE STORY 1
TWO STORY 2
OTHER (SPECIFY) _____ 3
NO RESPONSE 9

1:29

10. What kind of exterior wall does your house have?

[READ CATEGORIES 1-5]

BRICK VENEER 1
FRAME WITH WOODEN SIDING 2
FRAME WITH ALUMINUM SIDING 3
FRAME WITH STUCCO 4
CONCRETE BLOCK 5
OTHER (SPECIFY) _____ 6
DON'T KNOW 8
NO RESPONSE 9

1:30

11. Does your house have a basement, or a crawl space, or does it rest on the ground?

- BASEMENT 1
- CRAWL SPACE 2
- REST ON GROUND (SLAB ON GRADE) . 3
- OTHER (SPECIFY) _____ 4
- DON'T KNOW 8
- NO RESPONSE 9

1:31

12. Is the ceiling or attic area insulated?

- YES 1
- NO 2
- INAPPLICABLE, NO ATTIC 7
- DON'T KNOW 8
- NO RESPONSE 9

1:32

[IF "YES" CONTINUE, OTHERWISE GO TO 15]

13. Do you know the R-value of the attic (or ceiling) insulation?

- ENTER R-VALUE R-VALUE
- INAPPLICABLE 77
- DON'T KNOW 88
- NO RESPONSE 99

1:33-34

[IF "DON'T KNOW" CONTINUE; OTHERWISE GO TO 15]

14. Do you know the thickness of the attic (or ceiling) insulation?

- ENTER THICKNESS IN INCHES _____ INCHES
- INAPPLICABLE 77
- DON'T KNOW 88
- NO RESPONSE 99

1:35-36

15. Are your walls insulated?

YES 1
 NO 2
 DON'T KNOW 8
 NO RESPONSE 9

1:37

[IF "YES" CONTINUE, OTHERWISE GO TO 18]

16. Do you know the R-value of the wall insulation?

ENTER R-VALUE R-VALUE
 INAPPLICABLE 77
 DON'T KNOW 88
 NO RESPONSE 99

1:38-39

[IF "DON'T KNOW" CONTINUE; OTHERWISE GO TO 18]

17. Do you know the thickness of the wall insulation?

ENTER THICKNESS IN INCHES _____ INCHES
 INAPPLICABLE 77
 DON'T KNOW 88
 NO RESPONSE 99

1:40-41

18. Which of the following appliances do you have?

[INDICATE FUEL SOURCE BY CIRCLING THE NUMBER BELOW]

	<u>ELECTRIC</u>	<u>GAS</u>	<u>OTHER</u>	<u>DON'T HAVE</u>	<u>DON'T KNOW</u>	<u>NO RESPONSE</u>	
CLOTHES DRYER	1	2	3	4	8	9	1:42
CLOTHES WASHER	1	2	3	4	8	9	1:43
OVEN	1	2	3	4	8	9	1:44
DISHWASHER	1	2	3	4	8	9	1:45
REFRIGERATOR #1	1	2	3	4	8	9	1:46
REFRIGERATOR #2	1	2	3	4	8	9	1:47
FREEZER #1	1	2	3	4	8	9	1:48
FREEZER #2	1	2	3	4	8	9	1:49
WATER HEATER	1	2	3	4	8	9	1:50

19. Could you tell me whether they are located in an area which is heated in the winter and/or cooled in the summer?

	HEATED, NOT COOLED	COOLED, NOT HEATED	HEATED AND COOLED	NOT HEATED OR COOLED	NO RESPONSE	
CLOTHES DRYER	1	2	3	4	9	1:51
CLOTHES WASHER	1	2	3	4	9	1:52
REFRIGERATOR #1	1	2	3	4	9	1:53
REFRIGERATOR #2	1	2	3	4	9	1:54
FREEZER #1	1	2	3	4	9	1:55
FREEZER #2	1	2	3	4	9	1:56
WATER HEATER	1	2	3	4	9	1:57

Now, I would like to obtain some information on how you use your appliances during winter and summer months.

[IF RESPONDENT HAS "CLOTHES WASHER" CONTINUE; OTHERWISE GO TO 22]

20. On the average, how many loads per week are done in the clothes washer during the winter?

ONE LOAD PER WEEK	1
TWO LOADS PER WEEK	2
THREE LOADS PER WEEK	3
FOUR LOADS PER WEEK	4
FIVE LOADS PER WEEK	5
SIX OR MORE LOADS PER WEEK	6
INAPPLICABLE	7
DON'T KNOW	8
NO RESPONSE	9

1:58

21. On the average, how many loads per week are done
in the clothes washer during the summer?

- ONE LOAD PER WEEK 1
- TWO LOADS PER WEEK 2
- THREE LOADS PER WEEK 3
- FOUR LOADS PER WEEK 4
- FIVE LOADS PER WEEK 5
- SIX OR MORE LOADS PER WEEK 6
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

1:59

[IF RESPONDENT HAS "CLOTHES DRYER" CONTINUE; OTHERWISE GO TO 24]

22. On the average, how many loads per week are done
in the clothes dryer during the winter?

- ONE LOAD PER WEEK 1
- TWO LOADS PER WEEK 2
- THREE LOADS PER WEEK 3
- FOUR LOADS PER WEEK 4
- FIVE LOADS PER WEEK 5
- SIX OR MORE LOADS PER WEEK 6
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

1:60

23. On the average, how many loads per week are done
in the clothes dryer during the summer?

- ONE LOAD PER WEEK 1
- TWO LOADS PER WEEK 2
- THREE LOADS PER WEEK 3
- FOUR LOADS PER WEEK 4
- FIVE LOADS PER WEEK 5
- SIX OR MORE LOADS PER WEEK 6
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

1:61

[IF RESPONDENT HAS "DISHWASHER" CONTINUE, OTHERWISE GO TO 26]

24. On the average, how many loads per week are done
in the dishwasher during the winter?

- ONE LOAD PER WEEK 1
- TWO LOADS PER WEEK 2
- THREE LOADS PER WEEK 3
- FOUR LOADS PER WEEK 4
- FIVE LOADS PER WEEK 5
- SIX OR MORE LOADS PER WEEK 6
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

1:62

25. On the average, how many loads per week are done
in the dishwasher during the summer?

- ONE LOAD PER WEEK 1
- TWO LOADS PER WEEK 2
- THREE LOADS PER WEEK 3
- FOUR LOADS PER WEEK 4
- FIVE LOADS PER WEEK 5
- SIX OR MORE LOADS PER WEEK 6
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

1:63

[ASK ONLY IF RESPONDENT OWNS DISHWASHER OR OVEN; REFER TO QUESTION 18].

26. How many hours are your dishwasher and oven used during an
average winter week, Monday through Friday?

		Inap.	DK	NR
DISHWASHER	_____ HOURS/WEEK	7	8	9
OVEN	_____ HOURS/WEEK	7	8	9

1:64

1:65

[ASK ONLY IF RESPONDENT OWNS DISHWASHER OR OVEN; REFER TO QUESTION 18]

27. How many hours are your dishwasher and oven used during an average summer week, Monday through Friday?

		Inap.	DK	NR	
DISHWASHER	_____ HOURS/WEEK	7	8	9	1:66
OVEN	_____ HOURS/WEEK	7	8	9	1:67

28. [BLANK]

29. Is your water heater covered with a blanket or jacket?

YES	1	
NO	2	
INAPPLICABLE	7	
DON'T KNOW	8	
NO RESPONSE	9	1:68

[IF "NATURAL GAS WATER HEATER" CONTINUE; OTHERWISE GO TO 31]

30. Does the gas water heater have electronic ignition?
(i.e., no pilot light)

YES	1	
NO	2	
INAPPLICABLE	7	
DON'T KNOW	8	
NO RESPONSE	9	1:69

31. Does your house have a fireplace or wood stove?

FIREPLACE 1
WOOD STOVE 2
BOTH 3
NEITHER 4
DON'T KNOW 8
NO RESPONSE 9

1:70

[IF "FIREPLACE" OR "BOTH" CONTINUE; OTHERWISE GO TO 34]

32. Is the fireplace flue kept open or closed during the winter?

OPEN 1
CLOSED 2
NO FLUE 3
DON'T KNOW 8
NO RESPONSE 9

1:71

33. And during the summer, is the flue open or closed?

OPEN 1
CLOSED 2
NO FLUE 3
DON'T KNOW 8
NO RESPONSE 9

1:72

34. Do you have a heated swimming pool, hot tub or sauna?

SAUNA 1
HOT TUB 2
HEATED POOL 3
SAUNA AND HOT TUB 4
SAUNA AND POOL 5
HOT TUB AND POOL 6
NONE OF THE ABOVE 7
DON'T KNOW 8
NO RESPONSE 9

1:73

[IF "NONE OF THE ABOVE" GO TO 37; OTHERWISE CONTINUE]

35. What fuel do you heat your pool, hot tub, or sauna?

	<u>ELECTRIC</u>	<u>GAS</u>	<u>SOLAR</u>	<u>OTHER</u>	<u>DON'T KNOW</u>	<u>NO RESPONSE</u>	
SAUNA	1	2	3	4	8	9	1:74
HOT TUB	1	2	3	4	8	9	1:75
POOL	1	2	3	4	8	9	1:76

[IF "POOL" CONTINUE, OTHERWISE GO TO 37]

1:77-80 [BLANK]

[CARD 2]

INTERVIEW NUMBER 2

2:1-4

36. Which months during the year do you heat your pool?

[READ MONTHS]

	<u>YES</u>	<u>NO</u>	<u>DON'T KNOW</u>	<u>NO RESPONSE</u>	
JANUARY	1	2	8	9	2:5
FEBRUARY	1	2	8	9	2:6
MARCH	1	2	8	9	2:7
APRIL	1	2	8	9	2:8
MAY	1	2	8	9	2:9
JUNE	1	2	8	9	2:10
JULY	1	2	8	9	2:11
AUGUST	1	2	8	9	2:12
SEPTEMBER	1	2	8	9	2:13
OCTOBER	1	2	8	9	2:14
NOVEMBER	1	2	8	9	2:15
DECEMBER	1	2	8	9	2:16

ADD UP NUMBER OF HEATING MONTHS: _____ MONTHS

2:17-18

Now I'm going to ask you some questions about how you heat your home in the winter.

37a. Do you have central heating or do you heat rooms separately?

CENTRAL 1
HEAT SEPARATELY 2
NO HEATING 3
DON'T KNOW 8
NO RESPONSE 9

2:19

[IF "NO HEATING" GO TO 53; OTHERWISE CONTINUE]

37b. Is your heater(s) located in an area which is heated in the winter?

YES 1
NO 2
DON'T KNOW 8
NO RESPONSE 9

2:20

38. What type of heating system do you have?

[READ CATEGORIES 1-4]

NATURAL GAS 1
ELECTRIC 2
SOLAR 3
OTHER (SPECIFY) _____ 4
DON'T KNOW 8
NO RESPONSE 9

2:21

[IF "GAS" CONTINUE; OTHERWISE GO TO 41]

39. Does your gas heater have electronic ignition?

(i.e. no pilot light)

YES 1
NO 2
DON'T KNOW 8
NO RESPONSE 9

2:22

[IF "YES" CONTINUE; OTHERWISE GO TO 41]

40. Do you turn off the pilot light to your gas heater in the summer?

YES 1
NO 2
INAPPLICABLE, NO PILOT OR ACCESS . . . 7
DON'T KNOW 8
NO RESPONSE 9

2:23

41. Do you have a thermostat for your heater?

YES 1
NO 2
DON'T KNOW 8
NO RESPONSE 9

2:24

[IF "NO" GO TO 47; OTHERWISE CONTINUE]

42. Does your heat go on automatically every day, or do you have to turn it on?

AUTOMATICALLY SET 1
MANUAL 2
OTHER (SPECIFY) _____ 3
DON'T KNOW 8
NO RESPONSE 9

2:25

43. If your heater goes on every day, do you ever turn it off manually?

YES 1
NO 2
INAPPLICABLE 7
DON'T KNOW 8
NO RESPONSE 9

2:26

44. What temperature do you set your thermostat in the winter?

Off	64° or less	65°- 67°, Low	68°- 70°, Med	71°- 73°, Hi	74°- 76°	77° or more	INAP	Don't Know	No Response
0	1	2	3	4	5	6	7	8	9

2:27

45. Do you lower your thermostat or turn off the heater at night in the winter?

YES	1
NO	2
DON'T KNOW	8
NO RESPONSE	9

2:28

46. Do you lower your thermostat or turn off the heater when no one is home during the day in the winter?

YES	1
NO	2
INAPPLICABLE	7
DON'T KNOW	8
NO RESPONSE	9

2:29

47. How often do you normally use your heater during the winter?

[READ CATEGORIES 1-5]

NEVER	1
ALMOST NEVER	2
SOMETIMES	3
OFTEN	4
ALMOST ALWAYS	5
INAPPLICABLE	7
DON'T KNOW	8
NO RESPONSE	9

2:30

[IF "NEVER" GO TO 53; OTHERWISE CONTINUE]

48. How many hours per day, on the average, is your heater on during the winter?

ENTER HOURS	_____	HOURS
INAPPLICABLE		77
DON'T KNOW		88
NO RESPONSE		99

2:31-32

49. At what time of the day does your heater usually go on?

ENTER THE TIME	_____
INAPPLICABLE	7777
DON'T KNOW	8888
NO RESPONSE	9999

2:33-36

50. Is there a second time of the day when your heater goes on?

YES (WRITE IN TIME)	_____
NO	6666
INAPPLICABLE	7777
DON'T KNOW	8888
NO RESPONSE	9999

2:37-40

Now, I would like to ask you about how you heat and use certain areas of your house during the winter.

51. Do you close off any of your rooms when heating in the winter?

YES	1
NO	2
INAPPLICABLE	7
DON'T KNOW	8
NO RESPONSE	9

2:41

[IF "YES" CONTINUE; OTHERWISE, GO TO 53]

52. How many rooms are closed off when heating?

ONE ROOM 1
TWO ROOMS 2
THREE ROOMS 3
FOUR ROOMS 4
FIVE ROOMS 5
SIX ROOMS 6
SEVEN ROOMS OR MORE 7
DON'T KNOW 8
NO RESPONSE 9

2:42

53. During the winter, do you spend more time in fewer, warmer rooms than during the rest of the year?

YES 1
NO 2
DON'T KNOW 8
NO RESPONSE 9

2:43

54. Do any of your bathrooms have a built-in heater or heat lamp?

YES 1
NO 2
DON'T KNOW 8
NO RESPONSE 9

2:44

55. Do you use electric blankets or portable heaters in some of the rooms in your house in the winter?

ELECTRIC BLANKET(S) 1
PORTABLE HEATER(S) 2
BOTH 3
NEITHER 4
DON'T KNOW 8
NO RESPONSE 9

2:45

[IF "PORTABLE HEATER" CONTINUE; OTHERWISE GO TO 59]

56. What type of portable heater do you use?

- ELECTRIC PORTABLE 1
- ELECTRIC RADIATOR 2
- KEROSUN TYPE 3
- OTHER (SPECIFY) _____ 4
- NONE 5
- DON'T KNOW 8
- NO RESPONSE 9

2:46

57. How many hours per day on the average do you use your portable heater?

- ENTER HOURS PER DAY . . . _____ HOURS
- INAPPLICABLE 77
- DON'T KNOW 88
- NO RESPONSE 99

2:47-48

58. Do you generally use the portable heater to supplement other sources of heat, or as the only source of heat?

- AS A SUPPLEMENT 1
- AS THE ONLY SOURCE OF HEAT 2
- DON'T KNOW 8
- NO RESPONSE 9

2:49

My last two heating questions concern your family's health and your response to heating costs.

59. Do you, or anyone living with you, have any health conditions which make you sensitive to the cold?

- YES 1
- NO 2
- DON'T KNOW 8
- NO RESPONSE 9

2:50

60. Do you ever leave your home to save heating costs?
 (For example, go to a friend's house, stores, office,
 library, community center, or restaurant.)

- YES 1
- NO 2
- DON'T KNOW 8
- NO RESPONSE 9

2:51

Now I'm going to ask you some questions about how
 you cool your home in the summer.

61. During the summer, how often are the windows
 opened at night for ventilation?

[READ CATEGORIES 1-5]

- ALWAYS 1
- USUALLY 2
- OFTEN 3
- OCCASIONALLY 4
- NEVER 5
- DON'T KNOW 8
- NO RESPONSE 9

2:52

[IF "NEVER" CONTINUE; OTHERWISE GO TO 63]

62. Why aren't your windows opened at night?

- SECURITY 1
- HEALTH 2
- COMFORT 3
- HUMIDITY IS TOO HIGH 4
- OTHER (SPECIFY) _____ 5
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

2:53

63. During the summer, are the windows closed during the day?

[READ CATEGORIES 1-5]

- ALWAYS 1
- USUALLY 2
- OFTEN 3
- OCCASIONALLY 4
- NEVER 5
- DON'T KNOW 8
- NO RESPONSE 9

2:54

64. Do you have an air conditioner?

- YES 1
- NO 2
- DON'T KNOW 8
- NO RESPONSE 9

2:55

[IF "NO", GO TO 78, OTHERWISE CONTINUE]

65. What type of air conditioner is this?

- CENTRAL ELECTRIC 1
- ONE ELECTRIC ROOM OR WALL 2
- TWO ELECTRIC ROOM OR WALL 3
- THREE ELECTRIC ROOM OR WALL 4
- ELECTRIC HEAT PUMP 5
- "SWAMP" EVAPORATIVE COOLER 6
- OTHER (SPECIFY) _____ 7
- DON'T KNOW 8
- NO RESPONSE 9

2:56

66. Is your air conditioner(s) located in an area which is cooled in the summer?

- YES 1
- NO 2
- DON'T KNOW 8
- NO RESPONSE 9

2:57

67. Do you have a thermostat for your air conditioner?

- YES 1
- NO 2
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

2:58

[IF "NO" GO TO 73; OTHERWISE CONTINUE]

68. Does your air conditioner go on automatically every day, or do you have to turn it on?

- AUTOMATICALLY SET 1
- MANUAL 2
- OTHER (SPECIFY) _____ 3
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

2:59

69. If your air conditioner goes on every day, do you ever turn it off manually?

- YES 1
- NO 2
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

2:60

70. When you do use the air conditioner, what temperature do you set your thermostat on hot summer days between 1 p.m. and 7 p.m.?

Off	81° or more	78° - 80°, Low	75° - 77°, Med	72° - 74°, Hi	69° - 71°	68° or less	INAP	Don't Know	No Response
0	1	2	3	4	5	6	7	8	9

2:61

71. Do you raise your thermostat or turn off the air conditioner at night in the summer?

YES 1
 NO 2
 DON'T KNOW 8
 NO RESPONSE 9

2:62

72. Do you raise your thermostat or turn off the air conditioner when no one is home during the day in the summer?

YES 1
 NO 2
 INAPPLICABLE 7
 DON'T KNOW 8
 NO RESPONSE 9

2:63

73. How often do you normally use your air conditioner during the summer?

[READ CATEGORIES 1-5]

- NEVER 1
- ALMOST NEVER 2
- SOMETIMES 3
- OFTEN 4
- ALMOST ALWAYS 5
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

2:64

[IF "NEVER" GO TO 78; OTHERWISE CONTINUE]

74. How many hours per day, on the average, is your air conditioner on during the summer?

- ENTER HOURS PER DAY . . . _____ HOURS
- INAPPLICABLE 77
- DON'T KNOW 88
- NO RESPONSE 99

2:65-66

75. At what time of day does the air conditioner usually go on?

- ENTER TIME _____
- INAPPLICABLE 7777
- DON'T KNOW 8888
- NO RESPONSE 9999

2:67-70

Now I would like to ask you how you use and cool certain areas of your house in the summer.

76. Do you close off any of your rooms when air conditioning in the summer?

- YES 1
- NO 2
- DON'T KNOW 8
- NO RESPONSE 9

2:71

[IF "YES" CONTINUE; OTHERWISE GO TO 78]

77. How many rooms are closed off when air conditioning?

- ONE ROOM 1
- TWO ROOMS 2
- THREE ROOMS 3
- FOUR ROOMS 4
- FIVE ROOMS 5
- SIX ROOMS 6
- SEVEN ROOMS OR MORE 7
- DON'T KNOW 8
- NO RESPONSE 9

2:72

The next two cooling questions concern your family's health and your response to cooling costs.

78. Do you, or anyone living with you, have any health conditions which make you sensitive to the heat?

- YES 1
- NO 2
- DON'T KNOW 8
- NO RESPONSE 9

2:73

79. Do you ever leave your home to save cooling costs?

(For example, go to a friend's house, stores, office, library, community center, restaurant, or swimming pool.)

- YES 1
- NO 2
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

2:74

I have just a few questions about when your house is occupied during the winter and summer seasons.

80. Is there usually someone home in your house on winter weekdays from 12 to 5 in the afternoon?

YES 1
NO 2
DON'T KNOW 8
NO RESPONSE 9

2:75

81. Is there usually someone home on winter weekends?

YES 1
NO 2
DON'T KNOW 8
NO RESPONSE 9

2:76

82. Is there usually someone home summer weekdays from 12 to 5 in the afternoon?

YES 1
NO 2
DON'T KNOW 8
NO RESPONSE 9

2:77

83. Is there usually someone home on summer weekends?

YES 1
NO 2
DON'T KNOW 8
NO RESPONSE 9

2:78

2:79-80 [BLANK]

Now I'm going to ask your thoughts on some current topics concerning energy and the environment. I will read some statements and ask you if you strongly agree, mildly agree, are neutral, mildly disagree, or strongly disagree. The statements are grouped into three sections dealing with heating use, cooling use, and general energy and environmental issues.

Heating

Strongly Agree
Mildly Agree
Neutral
Mildly Disagree
Strongly Disagree
Inapplicable
Don't Know
No Response

84. I often try to wear a sweater, exercise, 1 2 3 4 5 7 8 9
eat hot food, or drink hot liquids to
get warm instead of turning up the heater.

3:5

85. In the winter, I find it quite easy 1 2 3 4 5 7 8 9
to adjust to a cool indoor temperature.

3:6

86. It is not worth it at all to be a 1 2 3 4 5 7 8 9
little chilly inside the house in
the winter to try to save a little
energy.

3:7

87. It's essential to my family's health 1 2 3 4 5 7 8 9
and well being for the house to be
warmly heated.

3:8

88. People should keep their home warmly heated when they have guests over.	1 2 3 4 5 7 8 9	3:9
89. While others might tolerate lowering their thermostat settings in the winter, my own need for being warm is high.	1 2 3 4 5 7 8 9	3:10
90. People are more susceptible to various illnesses if their houses are not kept warm.	1 2 3 4 5 7 8 9	3:11
<u>Cooling</u>		
91. I find it very difficult to fall asleep in the summer without an air conditioner on at night.	1 2 3 4 5 7 8 9	3:12
92. It is just not worth the trouble to turn off the air conditioner and open the windows every time it gets a little cooler outside.	1 2 3 4 5 7 8 9	3:13
93. It's essential to my health and well being for the house to be air conditioned in the summer.	1 2 3 4 5 7 8 9	3:14
94. I find it extremely difficult to adjust to a warm indoor temperature in the summer months.	1 2 3 4 5 7 8 9	3:15
95. I often try to take a cool bath or shower or make a cold drink instead of turning up the air conditioner.	1 2 3 4 5 7 8 9	3:16

General energy and environmental issues

96. The only reason I conserve energy is to save money.	1 2 3 4 5 7 8 9	3:17
97. Public utility companies are only concerned with making profits.	1 2 3 4 5 7 8 9	3:18
98. I take pride in using as few natural resources as possible.	1 2 3 4 5 7 8 9	3:19
99. Consumers have the right to use as much energy as they can pay for.	1 2 3 4 5 7 8 9	3:20
100. Public utilities operate with the interest of the consumer in mind.	1 2 3 4 5 7 8 9	3:21
101. The earth is like a space ship with only limited room and resources.	1 2 3 4 5 7 8 9	3:22
102. The nation does not face an energy shortage for at least the next ten years.	1 2 3 4 5 7 8 9	3:23
103. Wasteful use by individuals has greatly contributed to this country's energy problem.	1 2 3 4 5 7 8 9	3:24
104. More conservation of energy on the part of individuals will help solve the energy problem.	1 2 3 4 5 7 8 9	3:25
105. The United States should not build more nuclear power plants.	1 2 3 4 5 7 8 9	3:26

106. The benefits of modern consumer products are more important than the pollution that results from their production and use.	1 2 3 4 5 7 8 9	3:27
107. The energy crisis is largely due to supply and price manipulation by the major oil companies.	1 2 3 4 5 7 8 9	3:28
108. Most people in my community don't try to conserve energy.	1 2 3 4 5 7 8 9	3:29
109. My friends do not care if I conserve energy.	1 2 3 4 5 7 8 9	3:30
110. Energy conservation leads to higher utility rates.	1 2 3 4 5 7 8 9	3:31
111. Many common suggestions to save energy are too expensive or inconvenient for most people to use.	1 2 3 4 5 7 8 9	3:32
112. I am less concerned with energy conservation now than I was five years ago.	1 2 3 4 5 7 8 9	3:33

Now I'm going to ask a few questions about the way you live.

113. In an average year, about what percent of the fruits and vegetables that you eat do you grow yourself?

[READ CATEGORIES 1-5]

NONE	1
1%-25%	2
26%-50%	3
51%-75%	4
76%-100%	5
INAPPLICABLE	7
DON'T KNOW	8
NO RESPONSE	9

3:34

114. Do you recycle your newspaper?

[READ CATEGORIES 1-5]

NEVER	1
OCCASIONALLY	2
OFTEN	3
USUALLY	4
ALWAYS	5
INAPPLICABLE	7
DON'T KNOW	8
NO RESPONSE	9

3:35

115. Do you recycle your bottles or cans?

[READ CATEGORIES 1-5]

NEVER	1
OCCASIONALLY	2
OFTEN	3
USUALLY	4
ALWAYS	5
INAPPLICABLE	7
DON'T KNOW	8
NO RESPONSE	9

3:36

116. Do you think of yourself as an active participant in the environmental movement, sympathetic towards the movement but not active, neutral toward it, or unsympathetic to the environmental movement?

ACTIVE PARTICIPANT 1
 SYMPATHETIC BUT NOT ACTIVE 2
 NEUTRAL 3
 UNSYMPATHETIC 4
 DON'T KNOW 8
 NO RESPONSE 9

3:37

117. Have you learned about energy conservation in the home from any of the following sources?

	YES	NO	DON'T KNOW	NO RESPONSE
UTILITY BILL	1	2	8	9
TV	1	2	8	9
RADIO	1	2	8	9
NEWSPAPER	1	2	8	9
GOVERNMENT	1	2	8	9
BOOKS	1	2	8	9
MAGAZINES	1	2	8	9
FRIENDS	1	2	8	9
COWORKERS	1	2	8	9
OTHER	1	2	8	9
(SPECIFY _____)				

3:38

3:39

3:40

3:41

3:42

3:43

3:44

3:45

3:46

3:47

118. Have you heard and seen a lot of information about saving energy or do you need more information?

YES 1
 NO, NEED MORE INFORMATION 2
 INAPPLICABLE 7
 DON'T KNOW 8
 NO RESPONSE 9

3:48

119. If you don't need more information on saving energy at home, why not?

[READ CATEGORIES 1-3]

- I ALREADY KNOW ABOUT HOME ENERGY CONSERVATION . . . 1
- I DON'T CARE ABOUT HOME ENERGY CONSERVATION 2
- HOME ENERGY CONSERVATION IS NOT WORTH THE
TROUBLE OR EXPENSE 3
- OTHER (SPECIFY) _____ 4
- DON'T KNOW 8
- NO RESPONSE 9

3:49

The next two questions concern how the price of energy has affected and will affect your lifestyle.

120. Have increases in energy prices made your life much better, somewhat better, neither better nor worse, somewhat worse, or much worse?

- MUCH BETTER 1
- SOMEWHAT BETTER 2
- NEITHER BETTER NOR WORSE 3
- SOMEWHAT WORSE 4
- MUCH WORSE 5
- DON'T KNOW 8
- NO RESPONSE 9

3:50

121. In the future, if energy prices continue to rise, do you think your quality of life will get much better, somewhat better, neither better nor worse, somewhat worse, or much worse?

- MUCH BETTER 1
- SOMEWHAT BETTER 2
- NEITHER BETTER NOR WORSE 3
- SOMEWHAT WORSE 4
- MUCH WORSE 5
- DON'T KNOW 8
- NO RESPONSE 9

3:51

122. Have you lived for more than one year in a climate
much warmer or colder than where you now live?

YES 1
NO 2
DON'T KNOW 8
NO RESPONSE 9

3:52

[IF "YES" CONTINUE; OTHERWISE GO TO 124]

123. I lived in a climate which was:

COLDER THAN HERE 1
WARMER THAN HERE 2
I HAVE LIVED IN CLIMATES WHICH WERE BOTH
WARMER AND COLDER THAN THIS ONE . . . 3
DON'T KNOW 8
NO RESPONSE 9

3:53

124. Would it be possible for you to reduce your daily use of
electricity or do you think you already use as little
electricity as possible?

POSSIBLE TO REDUCE 1
ALREADY USE MINIMUM 2
OTHER (SPECIFY) _____ 3
DON'T KNOW 8
NO RESPONSE 9

3:54

[IF "ALREADY USING MINIMUM" GO TO 126; OTHERWISE CONTINUE]

125. Suppose your utility company was willing to pay you
to cut back on your energy use. How much would they
have to pay to get you to agree to cut your electricity
by one-third?

125a. WOULD \$20 BE ENOUGH?
 YES 1 [SKIP TO 125b]
 NO OR DON'T KNOW . . . 2 [SKIP TO 125d]
 NO RESPONSE 9 [SKIP TO 126]

125b. WOULD \$15 BE ENOUGH?
 YES 1 [SKIP TO 125c]
 NO OR DON'T KNOW . . . 2 [SKIP TO 126]
 NO RESPONSE 9 [SKIP TO 126]

125c. WOULD \$10 BE ENOUGH?
 YES 1
 NO 2
 DON'T KNOW 8
 NO RESPONSE 9

[SKIP TO 126]

125d. WOULD \$30 BE ENOUGH?
 YES 1 [SKIP TO 126]
 NO OR DON'T KNOW . . . 2 [SKIP TO 125e]
 NO RESPONSE 9 [SKIP TO 126]

125e. WOULD \$40 BE ENOUGH?
 YES 1
 NO 2
 DON'T KNOW 8
 NO RESPONSE 9

Lowest amount marked "Yes" _____

3:55

126. In the past 5 years, have you made any home improvements
 (e.g., replacing or adding appliances or insulation) that
 might affect the amount of energy you use in your home?

YES 1
 NO 2
 DON'T KNOW 8
 NO RESPONSE 9

3:56

[IF "NO", GO TO 131; OTHERWISE CONTINUE]

127a. What was that?

FIRST RESPONSE _____

3:57-58

SECOND RESPONSE _____

3:59-60

127b. [IF AN APPLIANCE, INDICATE IF IT REPLACED AN
ENERGY-INEFFICIENT APPLIANCE OR IF IT IS AN
ADDITION TO THE CURRENT STOCK OF APPLIANCES]

FIRST RESPONSE _____

3:61

SECOND RESPONSE _____

3:62

128. When was that?

FIRST RESPONSE

MONTH _____

3:63-64

YEAR _____

3:65

SECOND RESPONSE

MONTH _____

3:66-67

YEAR _____

3:68

129. What was your main reason for doing this?

FIRST RESPONSE _____

3:69

SECOND RESPONSE _____

3:70

130. If you have replaced appliances to save energy,
have you switched fuel sources?

- FROM ELECTRIC TO GAS 1
- FROM GAS TO ELECTRIC 2
- HAVE NOT SWITCHED FUEL 3
- OTHER (SPECIFY) _____ 4
- INAPPLICABLE 7
- DON'T KNOW 8
- NO RESPONSE 9

3:71

131. Were there any periods during the last two years when
your energy consumption was extremely low because your
house was unoccupied for one week or more?

- YES 1
- NO 2
- DON'T KNOW 8
- NO RESPONSE 9

3:72

[IF "YES" CONTINUE, OTHERWISE GO TO 133]

132. What were the dates and length of absence:

Date #1 _____ How long _____
Date #2 _____ How long _____
Date #3 _____ How long _____

YEAR #1 _____

3:73

MONTH #1 _____

3:74-75

NUMBER OF WEEKS #1 _____

3:76-77

3:78-80 BLANK

[CARD 4]

INTERVIEW NUMBER _____ 4

4:1-4

YEAR #2 _____

4:5

MONTH #2 _____

4:6-7

NUMBER OF WEEKS #2 _____

4:8-9

YEAR #3 _____

4:10

MONTH #3 _____

4:11-12

NUMBER OF WEEKS #3 _____

4:13-14

Finally, I'm going to ask a few questions about yourself for statistical purposes, and as always, you may refuse to answer any of these.

133. How old are you? _____ YEARS

4:15-16

134. [RECORD SEX OF RESPONDENT]

MALE 1

FEMALE 2

4:17

135. What is your ethnic background?

ASIAN AMERICAN 1

BLACK 2

CAUCASIAN 3

MEXICAN AMERICAN 4

NATIVE AMERICAN 5

OTHER (SPECIFY) _____ 6

NO RESPONSE 9

4:18

136. Are you now single or married?

- SINGLE 1
- MARRIED 2
- OTHER (SPECIFY) _____ 3
- NO RESPONSE 9

4:19

137. How many people live here and how old is each one?

- 1. AGE _____
- 2. AGE _____
- 3. AGE _____
- 4. AGE _____
- 5. AGE _____
- 6. AGE _____
- 7. AGE _____
- 8. AGE _____
- 9. AGE _____
- 10. AGE _____

NUMBER OF PEOPLE _____

4:20-21

- AGE OF OLDEST PERSON _____
- AGE OF SECOND OLDEST _____
- AGE OF THIRD OLDEST _____
- AGE OF FOURTH OLDEST _____
- AGE OF FIFTH OLDEST _____
- AGE OF SIXTH OLDEST _____
- AGE OF SEVENTH OLDEST _____
- AGE OF EIGHTH OLDEST _____
- AGE OF NINTH OLDEST _____
- AGE OF TENTH OLDEST _____

4:22-23
 4:24-25
 4:26-27
 4:28-29
 4:30-31
 4:32-33
 4:34-35
 4:36-37
 4:38-39
 4:40-41

138. How many years of schooling have you completed?

(HIGH SCHOOL GRAD = 12; COLLEGE GRAD = 16)

- _____ YEARS
- DON'T KNOW 88
- NO RECORD 99

4:42-43

139. Are you working now, unemployed or looking for work, retired and not working, taking care of the home, or what?

- RETIRED, NOT WORKING 1
- HOMEMAKER 2
- STUDENT 3
- WORKING 4
- UNEMPLOYED 5
- WORKING AND STUDENT 6
- HOMEMAKER AND STUDENT 7
- OTHER (SPECIFY) _____ 8
- NO RESPONSE 9

4:44

[IF "NOT WORKING OR UNEMPLOYED", GO TO 141; OTHERWISE CONTINUE]

140. What is your main occupation?

- _____
- _____
- INAPPLICABLE 7
 - DON'T KNOW 8
 - NO RESPONSE 9

4:45

141. In terms of your political views, do you think of yourself as very liberal, somewhat liberal, moderate or middle of the road, somewhat conservative or very conservative?

- VERY LIBERAL 1
- SOMEWHAT LIBERAL 2
- MODERATE 3
- SOMEWHAT CONSERVATIVE 4
- VERY CONSERVATIVE 5
- OTHER (SPECIFY) 6
- DON'T KNOW 8
- NO RESPONSE 9

4:46

142. Which of the following categories best describes the total amount of your wages and salaries including second job, overtime and bonuses in 1982, that is before anything was deducted for taxes or other things?

- LESS THAN \$5,000 01
- \$5,000 - \$9,999 02
- \$10,000 - \$14,999 03
- \$15,000 - \$19,999 04
- \$20,000 - \$24,999 05
- \$25,000 - \$34,999 06
- \$35,000 - \$49,999 07
- \$50,000 OR MORE 08
- DON'T KNOW 88
- NO RESPONSE 99

4:47-48

[IF "SINGLE", GO TO 146; OTHERWISE CONTINUE]

143. Is your spouse (or person you live with) employed, unemployed, retired and not working, studying full time, taking care of the house, or what?

- RETIRED, NOT WORKING 1
- HOMEMAKER 2
- STUDENT 3
- WORKING 4
- UNEMPLOYED 5
- WORKING AND STUDENT 6
- HOMEMAKER AND STUDENT 7
- OTHER (SPECIFY) _____ 8
- NO RESPONSE 9

4:49

144. What is your spouse's main occupation?

-
- INAPPLICABLE 7
 - DON'T KNOW 8
 - NO RESPONSE 9

4:50

145. Now, which of the following categories best describes the total amount of your combined wages and salaries including second job, overtime, and bonuses in 1982, that is before anything was deducted for taxes or other things?

- LESS THAN \$5,000 01
- \$5,000 - \$9,999 02
- \$10,000 - \$14,999 03
- \$15,000 - \$19,999 04
- \$20,000 - \$24,999 05
- \$25,000 - \$34,999 06
- \$35,000 - \$49,999 07
- \$50,000 OR MORE 08
- DON'T KNOW 88
- NO RESPONSE 99

4:51-52

146. Did you receive any income from social security, interest, dividends, rent, child support, scholarships, unemployment compensation, welfare, help from friends or relatives, or anything else?

- YES 1
- NO 2
- DON'T KNOW 8
- NO RESPONSE 9

4:53

147. Now taking into consideration all the things we've just discussed, what was your total family income before taxes in 1982?

- LESS THAN \$5,000 01
- \$5,000 - \$9,999 02
- \$10,000 - \$14,999 03
- \$15,000 - \$19,999 04
- \$20,000 - \$24,999 05
- \$25,000 - \$34,999 06
- \$35,000 - \$49,999 07
- \$50,000 OR MORE 08
- DON'T KNOW 88
- NO RESPONSE 99

4:54-55

Appendix 3

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