

# Are Participants of Demand-Side Management Programs Different?

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Utility Demand-Side Management (DSM) programs serve to balance the expense of electric utility capacity expansion against the consumer expense of conservation investment to reduce consumption. State public utility commissions have encouraged most electric utilities and even some gas utilities to organize these programs. DSM programs differ markedly by utility, but in general include: audit programs designed to improve the thermal efficiency of the home; appliance rebate programs designed to encourage choice of higher efficiency components; and household load controllers designed to limit peak energy demand.

The availability of a variety of utility-sponsored programs to reduce electricity demand grew rapidly during the decade. However in 1990, only 5 percent of U.S. households reported that they participated in these programs.

Of the households involved in DSM programs, about 24 percent had received home audits, 26 percent participated in rebate programs, 35 percent participated in load control programs, and 35 percent had participated in some related conservation activity.

Participants in DSM programs tend to be owners rather than renters, more affluent, better educated, and older. Among DSM households, 50 percent had annual incomes of \$35,000 or more, compared to 41 percent for non-participants. Only 11 percent of DSM households had less than a high school education, compared to 21 percent for non-participants.

## Introduction

Future demand for electricity can be satisfied either by building new generating capacity or by reducing demand through use of conservation, load control, more efficient technology, and other such programs for consumers of electricity. At least 31 States, through a process referred to as Integrated Resource Planning (IRP), look not only at the supply side but also at the demand side when planning for the future provision of electricity. Regulatory commissions in many of the States are requiring utilities to implement programs to reduce electricity demand. In 1988, approximately 485 electric utilities conducted at least 1,022 separate residential programs categorized as Demand-Side Management (DSM) programs.<sup>2</sup> In 1990, an estimated \$2 billion was spent on DSM programs in the United States.<sup>3</sup>

The 1990 Residential Energy Consumption Survey (RECS) (for the first time) asked householders if they had participated in any utility-sponsored DSM programs in the past year and, if so, the type of program (audit, rebate, load control, conservation, or other DSM program) with participation in more than one possible.

Participation by the household in DSM is voluntary; therefore, the utilities must undertake marketing approaches to obtain willing participants. The customary dependence on voluntary participants makes analyses of the results of DSM programs difficult, since those who are sufficiently motivated to participate may also be better motivated to conserve energy than are nonparticipants. A second issue in DSM program analyses is whether the participant would have undertaken the conservation activity (e.g., purchasing a high-efficiency furnace) had the DSM program incentive not been offered at all. This "free rider" issue is of major concern to those promoting and evaluating DSM programs. A third issue is whether participants in DSM programs view their participation as sufficient fulfillment of their socially desirable charge to conserve energy; that is, having insulated their attic, do they then feel that it is acceptable to raise their thermostat settings?

A portrait of DSM-participant households from the 1990 RECS may provide insight into the impact of DSM in the residential sector.

More analysis of the DSM data is forthcoming in *Household Energy Consumption and Expenditures 1990*.

This paper is extracted from a recently published report (Energy Information Administration 1992).

## Technical Approach

The data reported here were collected by the Energy Information Administration (EIA) from a sample of 5,095 households on the 1990 RECS Forms EIA-457A through C. EIA conducts this national sample survey of residential housing units and their energy suppliers on a triennial basis. The RECS is the only comprehensive source of national-level data on energy-related information for the residential sector. The 1990 RECS is the eighth residential energy consumption survey conducted by EIA. Previous RECS were conducted annually from 1978 to 1982, and in 1984 and 1987.

The RECS is a national multistage probability sample survey. Housing unit and household characteristics data are collected via a personal interview with the householder. Householders are asked to sign authorization forms allowing their suppliers of energy to release billing information about their household. A mail survey is used to collect household energy consumption and expenditure information from the energy suppliers.

The statistics are based on a sample from the population of all primary, occupied residential housing units in the United States as of November 1990. As a result, all the statistics are estimates rather than exact measures for the population. The 1990 RECS represents 94.0 million households in the 50 States and the District of Columbia.

## DSM Participation Rates

Approximately 4.6 million (5 percent) of the 94 million households responded that they had participated (Table 1). In these households, 1.2 million households reported obtaining rebates, 1.6 million reported participation in load control, 1.1 million reported having energy audits, and 1.3 million reported involvement in some type of conservation activity.

## Comparisons of DSM Participants to Nonparticipants

Since 89 percent of the DSM participants lived in single-family or mobile homes, this analysis is focused on only those types of households.

## Household Characteristics

The 1990 RECS data show that participants in DSM programs tend to be owners rather than renters, more affluent, better educated, and older (Table 2). Among DSM households in the 1990 RECS, 50 percent had family incomes of \$35,000 or more, as compared to 41 percent of nonparticipants. Additionally, fewer DSM participants were below poverty level (11 percent versus 17 percent for nonparticipants). Only 11 percent of the DSM-participant households had less than a high school education, compared with 21 percent of the nonparticipants.

## Housing Unit Characteristics

Analyses of the RECS data show that housing units built since 1980 tend to be better insulated than older housing units and thus in principle are less in need of electricity savings. Given this finding, it is interesting that a higher percentage of DSM than nonparticipant households were built in 1980 or later (29 percent of DSM participants versus 17 percent of nonparticipants), possibly because households with a higher income tend to occupy new housing. The explanation may be that DSM housing units were, on average, larger (1,935 heated square feet versus 1,786 heated square feet for nonparticipants); larger housing units tend to have higher fuel bills and greater incentive to participate in such programs. Higher fuel bills also offer a greater target of opportunity for electric utility savings.

## Heating and Cooling Equipment and Fuels

Central air conditioning was more common in DSM households than in nonparticipant households (Table 3). Central air conditioning was present in 57 percent of the DSM households and in only 39 percent of the nonparticipant households. Of all single-family households and mobile homes, 40 percent had central air conditioning.

Electricity is used more often as the main space-heating fuel in DSM households than in nonparticipant households (30 percent versus 19 percent), most likely because electricity is more expensive than alternative fuels. DSM households are also more likely than nonparticipant households to use a secondary space-heating fuel in addition to their main space-heating fuel. Use of secondary space-heating fuels can be motivated by a desire to reduce total space-heating cost, increase comfort levels at the same cost, or to provide heat, in case of the loss of the main space-heating source. Participation in DSM programs may

**Table 1. Demand-Side Management Program Participation, 1990 (Million U.S. Households)**

Geographic Area	Households Participated in DSM Program						
	No/Don't Know	Yes					
		Total	Rebate	Load Control	Energy Audit	Conservation	Other
United States	89.4 (±.9)	4.6 (±.9)	1.2 (±.5)	1.6 (±.6)	1.1 (±.4)	1.3 (±.4)	.1 (±.05)
Census Region							
Northeast	18.2 (±.3)	1.0 (±.3)	.2 (±.1)	Q	.4 (±.2)	.5 (±.2)	NC
Midwest	22.1 (±.3)	1.0 (±.3)	.2 (±.1)	.2 (±.1)	.4 (±.2)	.3 (±.2)	Q
South	30.7 (±.6)	1.6 (±.6)	.6 (±.4)	1.0 (±.5)	Q	.2 (±.15)	NC
West	18.4 (±.4)	1.0 (±.4)	.2 (±.15)	.3 (±.2)	.2 (±.17)	.3 (±.2)	Q

NC = No cases in sample.

Q = Data withheld either because the Relative Standard Error (RSE) was greater than 50 percent or fewer than 10 households were sampled. The RSE is a percentage derived from dividing one standard error by the estimate.

Note: The "±" is two standard errors of the estimate indicating the precision at the 95 percent confidence level.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-457 A, B, and C of the 1990 Residential Energy Consumption Survey. Table 41 in *Housing Characteristics 1990*.

be, at least in part, motivated by dissatisfaction with space-heating cost and/or comfort.

Comparisons of DSM participation by main water-heating fuels are similar to those by space-heating fuels. In 45 percent of the DSM households, compared with 38 percent of the nonparticipant households, electricity is the water-heating fuel.

### Conservation Activities

As Figure 1 shows, DSM households were more likely than nonparticipant households to have taken active conservation measures such as furnace tune-up, weather stripping and caulking, and thermostat setbacks. The DSM program may not be a cause of the conservation behavior; DSM participation and conservation behavior may both be a result of concern about household energy consumption, for economic or environmental reasons. For whatever reasons, DSM households undertook (at statistically significant percentage levels) more of the easier and less expensive conservation activities. Of the DSM households, 55 percent had their furnaces tuned, 41 percent had their water heater insulated, 69 percent had weather stripping, and 78 percent had caulking. Incidence of all of these activities was lower for nonparticipant households.

### Summary

The availability of a variety of utility-sponsored programs to reduce electricity demand grew rapidly during the decade. However in 1990, only 5 percent of U.S. households reported that they participated in these programs.

Of the households involved in DSM programs, about 24 percent had received home audits, 26 percent participated in rebate programs, 35 percent participated in load control programs, and 35 percent had participated in some related conservation activity.

Participants in DSM programs tend to be owners rather than renters, more affluent, better educated, and older. Among DSM households, 50 percent had annual incomes of \$35,000 or more, compared to 41 percent for non-participants. Only 11 percent of DSM households had less than a high school education, compared to 21 percent for non-participants.

### Future Analysis

At this time, 1990 RECS consumption and expenditures data are not yet available. Future analyses could compare consumption and expenditures between DSM participants and nonparticipants, while holding constant characteristics such as size and type of housing units.

**Table 2. Characteristics of Participants as Compared to Nonparticipants in Demand-Side Management Programs in U.S. Single-Family and Mobile Homes, 1990**

<u>Characteristics</u>	Percent of DSM Participants	Percent of DSM Nonparticipants
Homeowner	89	83
At least \$35,000 Family Income	50	41
Below 125 Percent of Poverty Line	11	17
<b>Education of Householder</b>		
More than 16 Years	22	10
13 to 16 Years	38	33
12 Years	30	36
Less Than 12 Years	11	21
<b>Age of Householder</b>		
34 Years or Less	19	24
35 to 44 Years Old	26	23
45 to 64 Years Old	38	31
65 Years or Older	17	22

Note: Because of rounding, data may not sum to 100 percent.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-457 A, B, and C of the 1990 Residential Energy Consumption Survey. Table 8 in *Housing Characteristics 1990*.

The householder's report of having participated in DSM programs can be verified by linking 1990 RECS data to reports filed by electric utilities with EIA. These reports (Form EIA-861) contain information as to whether individual electric utilities do, in fact, have DSM programs. The linkage will increase the accuracy of DSM program participation data and will identify RECS households that could not participate because their electric utility did not offer DSM programs.

## Endnotes

1. The opinions and conclusions expressed herein are solely those of the authors and should not be construed as representing the opinions or policy of any agency of the United States Government.
2. Electric Power Research Institute, *1988 Survey of Residential-Sector Demand-Side Management Programs* (EPRI CU-6548), (Palo Alto, California, 1989), p. III.

3. Eric Hirst, "A Rose by Any Other Name: Defining Key Terms on Utility DSM Programs," *Energy Systems and Policy*, Vol. 14, 1990, pp. 305-318. See also Eric Hirst and Carol Sabo, *Electric-Utility DSM Programs: Terminology and Reporting Formats*, (Oak Ridge, Tennessee: Oak Ridge National Laboratory, October 1991.)

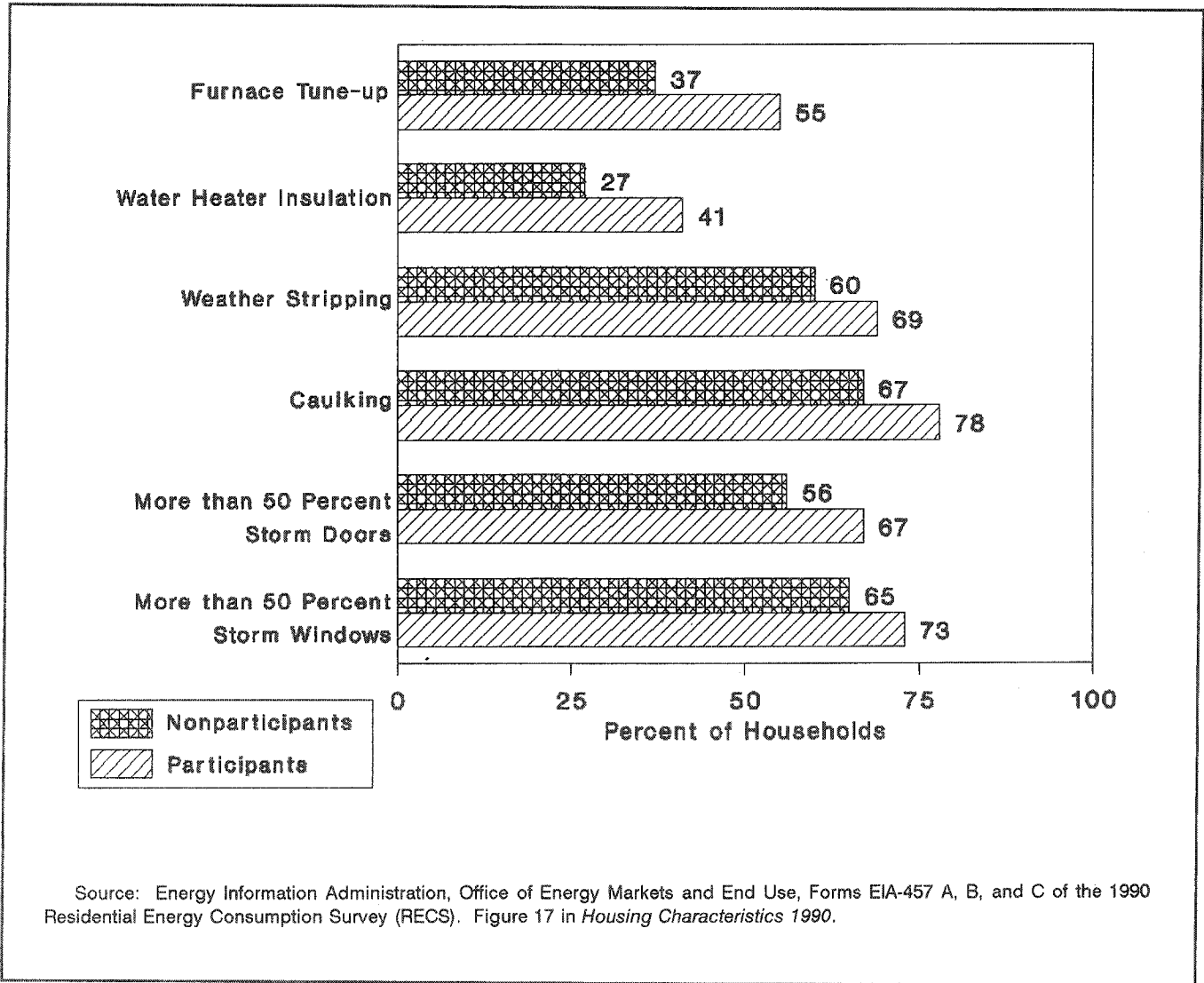
## Reference

Energy Information Administration. 1992. *Housing Characteristics 1990*. DOE/EIA-0314(1990), U.S. Department of Energy, Washington, D.C.

*Table 3. Appliances and Fuels Used by Participants Compared to Nonparticipants in Demand-Side Management Programs in U.S. Single-Family and Mobile Homes, 1990*

<u>Appliances and Fuels</u>	<u>Percent of DSM Participants</u>	<u>Percent of DSM Nonparticipants</u>
<b>Central Air Conditioning</b>	57	39
<b>Room Air Conditioning</b>	23	31
<b>Main Space-Heating Fuel</b>		
Electricity	30	19
Natural Gas	45	56
<b>Main Water-Heating Fuel</b>		
Electricity	45	38
Natural Gas	47	52
<b>Use Secondary Space-Heating Fuel</b>	58	49

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-457 A, B, and C of the 1990 Residential Energy Consumption Survey. Table 9 in *Housing Characteristics 1990*



*Figure 1. Comparison of Participants and Nonparticipants in Demand-Side Management Programs in U.S. Single-Family and Mobile Homes, 1990*