

EVALUATION OF TELEPHONE ENERGY CONSERVATION INFORMATION CENTERS IN MINNESOTA*

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ABSTRACT

Both the Minnesota Energy Agency (MEA) and the Northern States Power Company (NSP, the state's largest utility) operate telephone-energy conservation information centers. Together, the two "hotlines" handled almost forty-five thousand inquiries in 1979. A detailed evaluation of these hotlines was conducted during 1979. The evaluation included four phases, marked by different policy interests and strategies. The first involved review of hotline operating records, to understand the operational dynamics of each program. The second phase involved a telephone survey of 108 August 1979 hotline callers (within two weeks of their hotline contact), to establish caller satisfaction with the service. The third phase involved a telephone survey of 439 people who called the hotlines in 1978 and 270 randomly selected state residents, to determine households' demographic characteristics and the energy conservation actions of hotline callers and non-callers. The final phase involved collection and analysis of fuel use records for 257 households surveyed. Survey results show that the MEA and NSP telephone centers provide useful services to Minnesota residents. Hotline users express satisfaction with the services. Analysis of telephone survey results shows that hotline users took more conservation actions than did non-users. However, analysis of fuel consumption records failed to show any energy saving effects of the hotlines.

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INTRODUCTION

In 1976, the Minnesota Legislature mandated establishment of an energy conservation information center within the Minnesota Energy Agency (MEA), to operate a toll-free telephone information service and disseminate printed materials on energy conservation topics. [1]. In September 1977, Northern States Power Company (NSP) instituted a similar service, called ASK NSP.

The overall objectives of the MEA and NSP centers are to:

1. provide information to Minnesota consumers on energy conservation measures and alternative energy measures;
2. reduce residential energy use in Minnesota;
3. increase the cost-effectiveness of conservation actions taken;
4. handle phone calls in a cost-effective manner.

The MEA information center began operation in June 1976. By 1978, the center was staffed with two full-time energy specialists (increased to three staff in mid-1979), using a toll-free WATS line. About \$90- \$100 thousand was spent for personnel and support (postage, printing, phones, overhead) during fiscal years 1978 and 1979. The total number of calls handled by the MEA center was 12 thousand in 1978 and 21 thousand in 1979; this implies a cost per telephone call of \$5-\$8.

Primary publicity sources for the center include all literature disseminated by MEA, periodic press releases, and a regular 5-minute radio spot on Friday mornings featuring the Agency Director.

Prior to 1977, NSP was receiving several hundred requests for energy information each month. To improve the quality and efficiency of response to those calls, NSP established a service to respond to energy related inquiries only. The service is called ASK NSP and is operated by the Energy Management Department.

The service is currently operated by eight staff members who work part-time on ASK NSP. The service accepts long distance collect calls and is staffed during normal working hours. A tape recorder answering device is used during non-business hours.

Principal sources of publicity for ASK NSP include television, radio, billboard, and newspaper ads. In addition, customer billings frequently mention the ASK NSP hotline.

Figure 1 shows the number of calls handled by the MEA information center for each month in 1978 and 1979. The frequency of calls has increased steadily since Spring 1978. The curves also show substantial variation in frequency from month-to-month. The frequency of calls is lower during the summer than during other seasons, probably because air conditioning is a much smaller contributor to fuel bills than is space heating in Minnesota. In addition, calls to MEA are triggered by a variety of ad hoc events such as Agency press releases and Agency

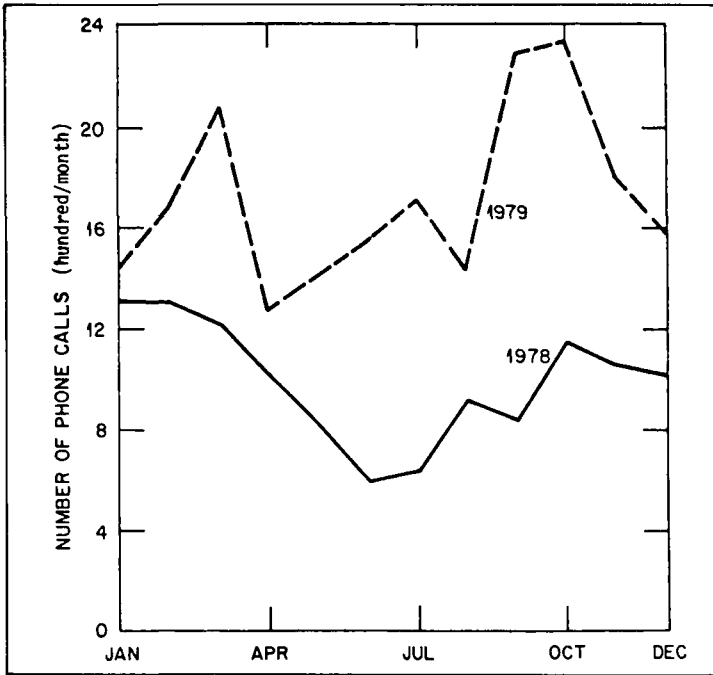


Figure 1. Number of phone calls handled by the MEA information center during 1978 and 1979.

Director comments on his Friday morning radio show, announcements from the federal government, and international events that affect the supply and cost of fuels in Minnesota.

The number of calls received by NSP shows similar trends. In 1978 NSP handled fewer calls than did MEA; in 1979 the two centers handled approximately the same number of calls.

Although the two centers appear to offer similar services to similar clients, substantial differences exist. For example, analysis of the subject of calls to the two centers shows that about 16 per cent of the MEA callers asked about alternative energy sources (passive and active solar, wood-burning, wind), while only 5 per cent of the NSP calls related to alternatives. On the other hand, 37 per cent of the NSP calls dealt with insulation and ventilation; only 15 per cent of the MEA calls related to these subjects.

The two centers also differ in terms of the geographic origin of the phone calls. Although the MEA center services the entire state, only 17 per cent of its calls were from Outstate¹ (approximately half of Minnesota's four million

¹"Outstate" refers to the parts of Minnesota outside the Minneapolis/St. Paul SMSA.

people live Outstate). About 4 per cent of NSP's calls were from Outstate (approximately 20 per cent of NSP's customers live Outstate).

In early 1979, MEA and NSP agreed to co-fund an evaluation of the two hotlines for several reasons. First, both hotlines are well-established, stable, and sizeable activities in the two organizations. They therefore warrant a close look to see if they succeed in meeting their objectives. Second, neither organization had previously evaluated any of their conservation programs; the perception was growing that evaluation must be an important part of the program planning, implementation, evaluation, and improvement process. (Careful evaluations of conservation programs are rare in most state energy offices, electric and gas utilities, and the U.S. Department of Energy.) Finally, the two services appeared, at first glance, to be duplicative.

EVALUATION DESIGN

The evaluation of program outcomes included several phases. The first involved review of hotline records to understand the operational dynamics of each program. The second phase involved a telephone survey of hotline callers, within two weeks of their hotline contact in summer 1979, to establish caller satisfaction with the service. The third phase involved a telephone survey of hotline callers who had called MEA or NSP in mid-1978 and randomly selected state residents, to compare household characteristics and energy conservation behaviors of hotline callers and non-callers. The fourth (final) phase of the evaluation involved collection and analysis of fuel records for some of those households included in the telephone surveys.

Details of the sampling and measurement strategies used in the evaluation and the survey questionnaires are in the appendix of ref. [2]. Figure 2 shows the different groups with whom telephone interviews were conducted and the number in each group. Interviews were conducted during the summer of 1979 with people who called one of the hotlines between April and October 1978, with those who called one of the hotlines in August or September 1979, and with a random sample of Minnesota residents.

A key element of this evaluation project involved collection and analysis of fuel consumption records for samples of both users and non-users. Figure 3 shows the reasons that complete fuel use records were obtained for only 31 per cent of those interviewed.

Evaluation of the MEA and NSP telephone hotlines deals mainly with program objectives defined in terms of desired effects as shown in Table 1.

Outcomes evaluation of the hotlines seeks to establish the attitudinal and behavioral effects of the services on the client population (hotline callers). The basis for interpreting these effects involves comparison with a random sample of the state population. In comparisons of this type there exists an interaction of client characteristics with desired program outcomes. A general phenomenon

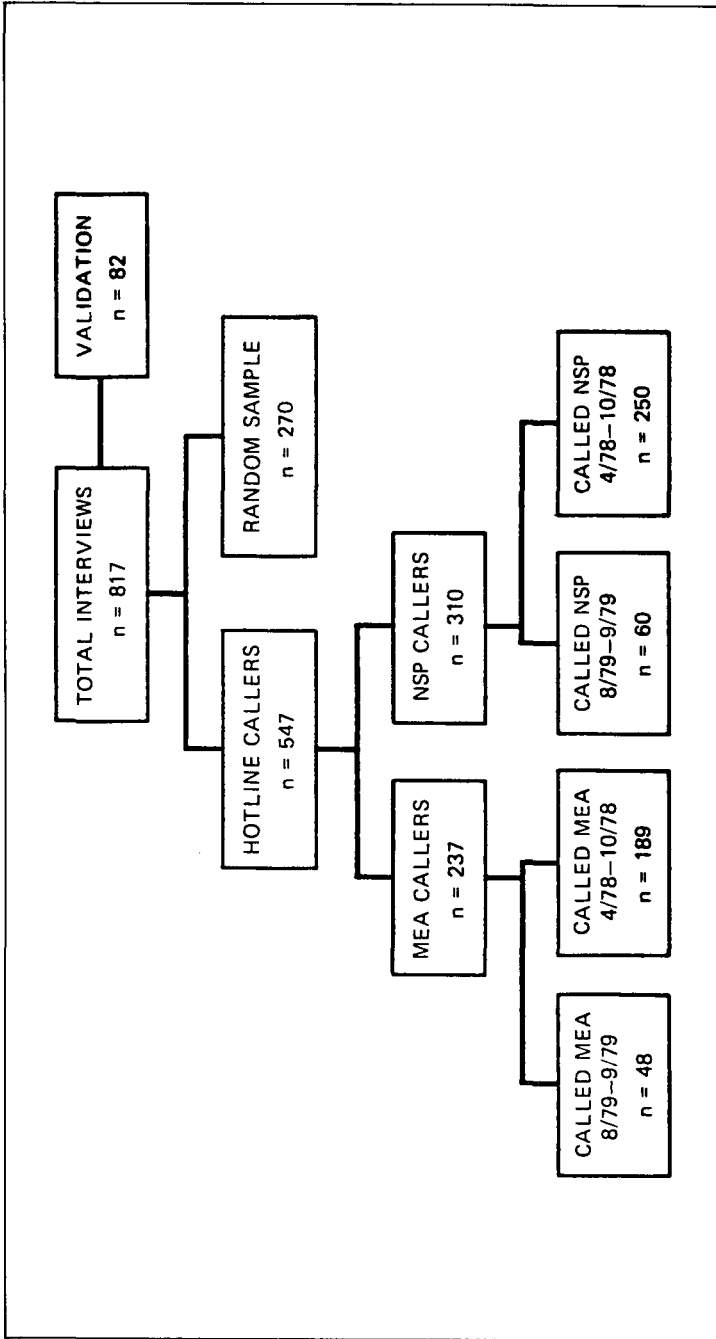


Figure 2. Distribution of telephone interviews conducted during the summer of 1979 to evaluate the MEA and NSP information centers.

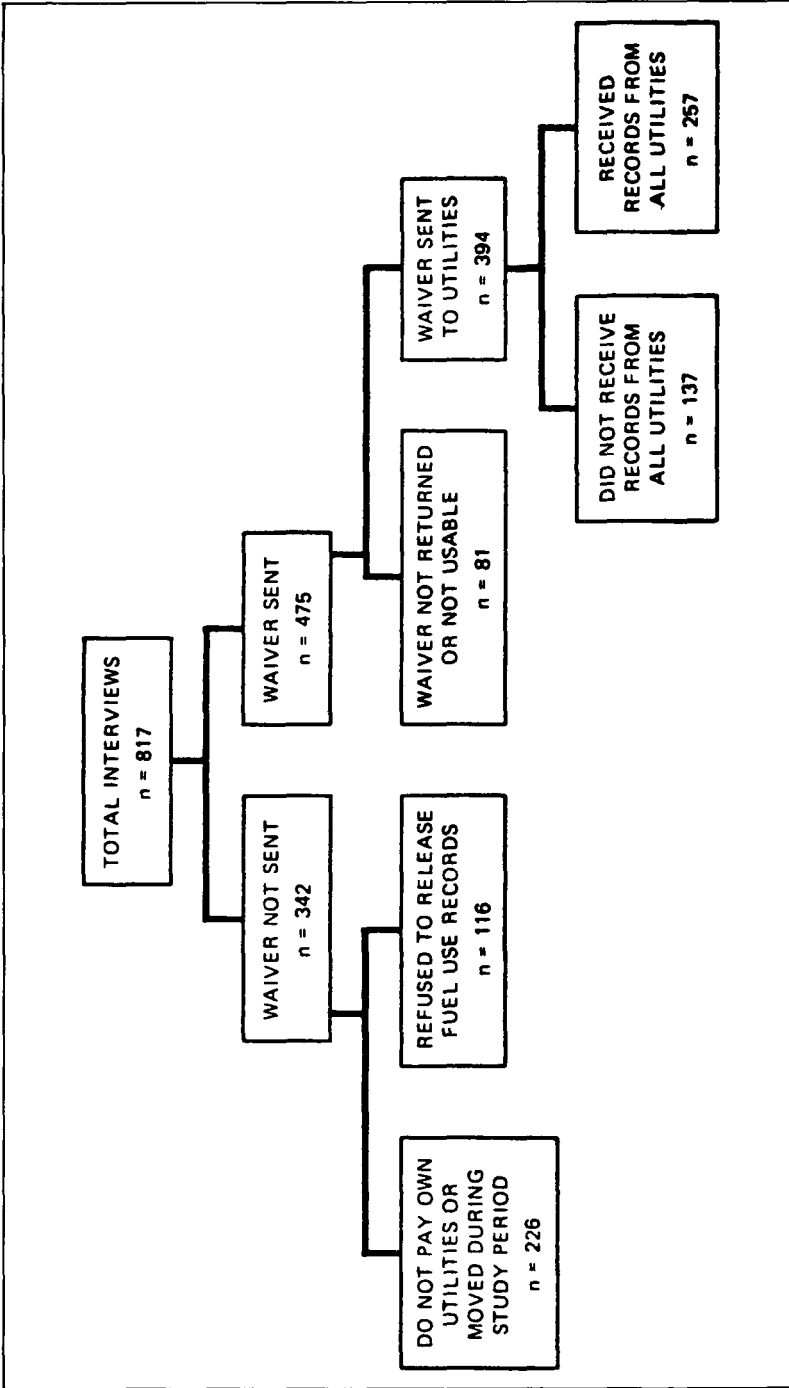


Figure 3. Factors accounting for attrition in obtaining complete fuel consumption records for households interviewed.

Table 1. Hotline Program Objectives and Outcomes Measures

<i>Objectives</i>	<i>Outcomes and measures</i>
Provide information on energy conservation	Tabulation of calls handled; client satisfaction with service; client activities attributable to hotline
Reduce energy use	Changes in fuel use attributable to hotline
Increase cost-effectiveness of conservation actions	Ratio of conservation activity to changes in fuel use attributable to hotline
Handle phone calls in a cost-manner	Program costs per client

in social programming is that program clients participate in programs that interest them (self-selection) thus making comparisons with a random group of people difficult. Hotline callers, for example, may represent a group involved in energy conservation activity to a greater extent than the population as a whole.

Comparisons between 1978 hotline users and the random samples show significant differences. Hotline users have higher education levels and higher incomes than does the population in general. For example, 75 per cent of the hotline users have at least some college education while only 53 per cent of the random sample interviewees have some college education. Similarly, 83 per cent of the hotline users reported a household income of \$15,000 or more; only 65 per cent of the random sample reported such high incomes. There are also differences in housing tenure. About 91 per cent of the hotline users are owner-occupants of single-family homes, compared with 71 per cent for the random sample.

These statistically significant differences [2] between users and nonusers are important both with respect to program evaluation and program operation. These prior differences complicate comparisons between the two groups and support the notion that hotline users are a self-selected group. In terms of program operation, these results suggest that the hotlines are not widely used among low-income tenants of multi-family dwellings.

USER ASSESSMENT OF THE HOTLINES

Telephone interviews were conducted with 108 users of the two hotlines in September 1979, roughly two weeks after they had called either MEA or NSP. These immediate follow-up interviews were designed to learn how clients view the hotlines in terms of relevance and detail of information provided; and courtesy, knowledge and helpfulness of hotline staff. Interviews conducted

with mid-1978 hotline users, discussed in the following section, were designed to determine what conservation actions were taken by hotline users (and by the control group). People interviewed eighteen months after contacting a hotline could not remember details on the information provided or the hotline staff; hence the immediate surveys were conducted.

Client assessment of the hotlines was generally quite positive. Table 2 shows that more than three-fourths of the MEA and NSP callers rated the information they received as useful.

When asked, "How well-informed was the person you talked with?," 52 per cent of the MEA sample and 65 per cent of the NSP sample indicated that the staff person was "very well-informed." An additional 21 per cent of MEA callers and 18 per cent of NSP respondents said the person they talked with was "somewhat well-informed."

When asked how helpful the hotline operator had been, 75 per cent of the MEA sample and 72 per cent of the NSP sample said "very helpful." An overwhelming proportion of the samples indicated that hotline operators were "very courteous" (88 per cent MEA and 87 per cent NSP).

Another dimension of user assessment concerns the extent to which callers felt they received sufficient information. When asked if they had questions which the hotline could not answer, 22 per cent of the MEA and NSP samples answered affirmatively. Unanswered questions covered a range of issues: insulation, heating, and cooling. Also, 35 per cent of the MEA and 44 per cent of the NSP callers said that more information was needed after hotline contact.

To determine the extent of consumer and taxpayer support for the hotlines, interviewees were asked whether they would be willing to pay \$1 per year for the hotline service. A majority of those in both hotline samples expressed a willingness to make such a payment: 64 per cent of the hotline users who answered this question would be willing to pay \$1 to support an energy hotline service.

Interviewees were also asked to rate the importance of the hotlines as a consumer service. Table 3 shows that hotline callers attach more importance to these services than do people in the comparison sample. Moreover, hotline callers interviewed soon after their call rated the hotlines much more highly (77 per cent very important) than those interviewed nine to sixteen months after their call (48 per cent very important), suggesting either that time influences judgment or that the services have improved over time.

In response to the question, "How did you find out about the telephone information service?" most of the August-September 1979 users were unable to trace recollection to any single *primary* publicity source. Many cited the phonebook as their source. Without actual knowledge of the hotlines' existence, these people expected MEA and NSP to have someone available to answer questions.

Table 2. User Assessment of the MEA and NSP hotlines^a

	<i>MEA callers (n=48)</i>	<i>NSP callers (n=60)</i>
How useful was the information you received from the telephone information service?		
very useful	56%	58%
somewhat useful	21	27
not too useful	2	9
not at all useful	10	7
no opinion	10	—
	<u>99%</u>	<u>101%</u>
How well-informed was the person you talked with?		
very well-informed	52%	65%
somewhat well-informed	21	18
not too well-informed	6	7
not at all well-informed	10	3
no opinion	10	7
	<u>99%</u>	<u>100%</u>
How helpful was the person you talked with?		
very helpful	75%	72%
somewhat helpful	19	20
not too helpful	—	2
not at all helpful	6	2
no opinion	—	4
	<u>100%</u>	<u>100%</u>
How courteous was the person you talked with?		
very courteous	88%	87%
somewhat courteous	6	8
not too courteous	—	2
not at all courteous	4	2
no opinion	2	1
	<u>100%</u>	<u>100%</u>

^aThese responses were obtained during telephone interviews conducted with people who had contacted MEA or NSP in August or September 1979; interviews took place about two weeks after hotline contact.

Table 3. Importance of Hotline Services to Users and Non-users

	<i>MEA callers</i> (<i>n</i> =189) ^a (<i>n</i> =48) ^b		<i>NSP callers</i> (<i>n</i> =248) ^a (<i>n</i> =60) ^b		<i>Comparison sample</i> (<i>n</i> =270)
How important do you think the hotlines are as a consumer service?					
very important	52%	79%	45%	75%	28%
somewhat important	32	19	38	17	40
not too important	5	—	7	2	8
not at all important	2	—	2	2	5
no opinion	9	2	8	4	19
	100%	100%	100%	100%	100%

^aCalled hotlines between April and October 1978.

^bCalled hotlines in August or September 1979.

A large majority (85 per cent) of interviewees who contacted the hotlines in August-September 1979 were first-time callers. Most interviewees cited at least one, and often more than one, source of information used in addition to the hotline: utilities, contractors, media, publications, and retailers.

These (and other) findings suggest that people expect their state energy agency and public utilities to offer energy conservation information services. Although they use these services, they also obtain information from several other sources. It seems likely that many people call the hotlines with specific requests, having already decided to undertake some conservation actions. Thus, the hotlines operate primarily in a response-mode rather than as a consciousness-raising mechanism. This suggests that the hotlines provide information to people who are already motivated to conserve energy.

REPORTED CONSERVATION ACTIONS OF HOTLINE USERS AND NON-USERS

Interviews conducted with hotline users two weeks after they called the hotline cannot yield information on the conservation actions taken because of hotline contact; people generally do not respond that rapidly. Therefore, the evaluation included telephone interviews with people who called the MEA or NSP hotlines during mid-1978 (April through October); in addition, interviews were also conducted with a random sample of Minnesota households.

These interviews dealt primarily with conservation actions taken by these households during the past two years and when each action was taken, Hotline

users were also asked about the influence of their hotline contact on actions subsequently taken and on the way they implemented these actions.

Approximately two-thirds of the hotline users interviewed nine to sixteen months after their contact remembered contacting the hotline service. Most of these people also remembered the subject of their call.

Table 4 shows the reported conservation actions taken by the samples of MEA callers, NSP callers, and the comparison group. For all three groups energy conservation activity is generally the rule, with few households reporting none of the conservation measures. Seventy-six per cent of all households lowered thermostat settings in winter. Fifty-one per cent had installed weatherstripping and/or caulking, and 44 per cent had installed attic insulation in the past two years. Forty-one per cent had lowered the temperature setting of their hot-water heaters. In addition, a variety of other conservation measures had been adopted including wall insulation (20 per cent), fireplace modification (21 per cent), and water heater insulation (6 per cent).

One of the major areas of evaluation interest concerns differences between hotline callers and non-callers in terms of steps they took to conserve energy. Table 4 shows that hotline callers are generally more likely to have reported conservation actions. The major exceptions are keeping the thermostat lower in winter and having the furnace tuned.² There is considerable similarity between NSP and MEA hotline callers in the frequency of actions, with neither group significantly more active in an overall sense.

In contrast to the comparison sample, hotline callers are significantly more likely to have weatherstripped or caulked (58 per cent versus 40 per cent), installed attic insulation (51 per cent versus 32 per cent), installed attic ventilation (36 per cent versus 20 per cent), installed wall insulation (24 per cent versus 13 per cent), installed new storm windows and/or doors (35 per cent versus 20 per cent), installed a wood-burning stove or furnace (11 per cent versus 6 per cent), installed a new furnace (13 per cent versus 7 per cent), purchased a new energy-efficient appliance (30 per cent versus 22 per cent), modified the fireplace to save heat (25 per cent versus 14 per cent), and lowered hot water thermostat setting (44 per cent versus 36 per cent). The biggest difference between the comparison group and hotline callers is in weatherstripping and installing attic insulation with about 18 per cent more activity among hotline callers.

After establishing the extent of conservation activity, interviewees were asked whether contact influenced the way in which actions were taken. In response to the question, "Did the hotline influence your decision to do any of the things you mentioned as far as energy conservation . . . ?," 17 per cent of the MEA sample and 30 per cent of the NSP sample said yes.

²Those actions taken more often by non-users tend to be no- or low-cost and to require little technical advice to implement.

Table 4. Conservation Actions Taken By Mid-1978 Hotline Users and The Comparison Group

<i>Action taken</i>	<i>Hotline users</i>		
	<i>MEA (n=189)</i>	<i>NSP (n=248)</i>	<i>Comparison (n=270)</i>
Lowered thermostat setting in winter	75%	78%	76%
Weatherstripped or caulked	57	59	40 ^b
Installed attic insulation	52	50	32 ^b
Installed wall insulation	27	22	13 ^b
Installed new storm windows and/or doors	36	34	20 ^b
Installed wood-burning stove or furnace	14	10	6 ^b
Had furnace tuned	41	50	46
Installed new furnace	12	13	7 ^b
Installed solar space or hot water heating	0.5	2	0.4
Purchased new energy-efficient appliance(s)	24 ^a	34 ^a	22 ^b
Modified fireplace to save heat	25	25	14 ^b
Insulated water heater	6	7	4
Lowered thermostat setting on water heater	42	46	36 ^b

^aSignificant difference at 5% level between MEA and NSP hotline users.

^bSignificant difference at 5% level between the comparison sample and one or both samples of hotline users.

Content analysis of answers to the follow-up question, "What things did it influence?," reveals that about half of those who responded believe that the hotline encouraged them to take action, a small fraction believe that the hotline discouraged them from taking an action that was not feasible or economical, while the remainder did not specify how they were influenced.

In response to the question,

Did the hotline influence the *way* you did these things?

Did you do anything differently as a result of the information you received from the hotline . . . ?

16 per cent of MEA callers answered yes with the majority of these indicating that the type of product or installation procedure was influenced. Of the NSP callers, 19 per cent answered affirmatively, again with a majority indicating that choice of product or installation procedure was influenced.

Two major limitations on the findings reported above are in order. First, we noted earlier that the hotline samples contained a significantly larger proportion of owner-occupied single-family dwellings than the comparison sample. This introduces a possible bias because such households are more likely

to take conservation actions than those in rental dwellings. Second, it is impossible to tell from Table 4 if the conservation actions of hotline callers were greater than the comparison sample *before* hotline contact; if so, the differences could not be attributed to the hotlines.

To refine our understanding of conservation activity the three samples were compared again. In this second comparison, only owner-occupied single-family dwellings were included, and a distinction was made between conservation actions taken before hotline contact and actions taken afterwards.³ (See Appendix B of ref. [2] for details.)

In this comparison the average level of conservation activity did not differ significantly between hotline callers and the comparison sample *before* hotline contact. However, in comparing the two groups *after* hotline contact, hotline users' conservation activities were significantly greater than those of the comparison sample. This suggests that the hotlines did, indeed, play a role in contributing to the higher level of conservation activity among callers.

To estimate the effectiveness of conservation activity per household in each of the samples, it was necessary to make assumptions about the individual and aggregate effectiveness of conservation actions. Estimates from MEA staff and from a computerized home energy audit were used [3]; see Table 5.

The assumption was made that the effectiveness of individual actions is additive—that a 15 per cent savings due to attic insulation adds directly to an 8 per cent savings from lowering the thermostat, for example. While this assumption is wrong, it probably has only a slight effect on the results reported here (primarily because the interaction effects influence results for all three groups).

Under these assumptions, the average effectiveness per household in each sample was calculated for each type of action and for the total of all actions. These figures are shown in Table 6. The results show that overall energy savings for the two hotline samples are larger than for the comparison sample (14 per cent versus 12 per cent).

ACTUAL ENERGY USE

The preceding section discussed energy conservation actions taken by hotline callers. This section deals with the extent to which hotline callers actually reduce energy consumption as measured by utility records.

The appendix of ref. [2] details the sampling techniques and methods used to obtain utility records. In brief, interviewees who paid their own utilities and who had lived at their current address during the past two winters were asked to sign consent forms giving access to their utility records. The data presented in this section are based on analysis of those records, obtained from the 1978

³The telephone surveys included questions both on what conservation actions were taken and when they were implemented.

Table 5. Estimated Percentage Energy Savings of Individual Household Conservation Actions

Lowered thermostat setting in winter	8%
Weatherstripped or caulked	5
Installed attic insulation	10
Installed wall insulation	10
Installed new storm windows and/or doors	7
Installed wood-burning stove or furnace	7
Had furnace tuned	5
Installed new furnace	10
Installed solar space or hot water heating	30
Purchased new energy-efficient appliance(s)	2
Modified fireplace to save heat	1
Insulated water heater	2
Lowered thermostat setting on water heater	2

Source: MEA staff and ref. [3].

Table 6. Estimated Percentage Energy Savings of Household Conservation Actions Taken After Hotline Contact^a

<i>Action taken</i>	<i>Hotline users</i>		<i>Comparison (n=205) Comparison</i>
	<i>MEA (n=156)</i>	<i>NSP (n=199)</i>	
Lowered thermostat setting in winter	2.1	2.1	2.5
Weatherstripped or caulked	1.7	1.9	1.4
Installed attic insulation	3.0	2.6	2.4
Installed wall insulation	1.8	1.4	1.1
Installed new storm windows and/or doors	1.7	1.6	1.0
Installed wood-burning stove or furnace	0.5	0.5	0.4
Had furnace tuned	1.4	1.8	1.6
Installed new furnace	0.6	0.6	0.4
Installed solar space or hot water heating	0.2	0.5	0.0
Purchased new energy-efficient appliances(s)	0.3	0.5	0.3
Modified fireplace to save heat	0.2	0.2	0.1
Insulated water heater	0.1	0.1	0.1
Lowered thermostat setting on water heater	0.5	0.5	0.5
Totals ^b	14.1%	14.3%	11.8%

^aThese aggregate energy saving estimates are based on household responses during telephone interviews with mid-1978 hotline users and the comparison group. Responses are shown above only for owner-occupied households in single-family homes for the post-hotline contact period.

^bNo correction is made for interaction among items. Thus these totals overstate total energy savings. Also columns may not add because of rounding.

hotline callers and the comparison group who lived in owner-occupied single-family homes heated with natural gas;⁴ see Figure 3.

Measured from July through June, average household energy use in the combined sample (MEA callers, NSP callers, comparison group) was 212 billion joules in both 1977-78 and 1978-79. However, the 1978-79 heating season was 2 per cent colder (as measured by heating degree days) than the previous year. Adjusting for this difference, there is a conservation trend, showing a 2 per cent reduction in energy use.

In all three samples, increases in electricity use offset decreases in natural gas use. Between 1977-78 and 1978-79, the decrease in gas use lowered total energy use by a fraction of a per cent (unadjusted for temperature), while the increase in electricity use boosted total energy use by a fraction of a per cent. Table 7 summarizes the data on actual energy use for the three groups.

Energy use for the two hotline samples was 8 per cent lower than for the comparison group in both the first and second years. This suggests that hotline callers used less energy than non-users with similar household characteristics—both before and after hotline use. Although hotline callers consumed less energy, they did not save more energy between the first and second years than did the comparison group. Holding first year (before hotline contact) energy use constant, second year energy use did not differ significantly between users and non-users.

These findings, based on analysis of fuel consumption records, differ from those presented in the preceding section, based on household responses during telephone interviews. Answers to questions on conservation actions taken before hotline contact showed that hotline users and non-users had similar patterns. Answers to questions on conservation actions taken after hotline contact showed that hotline users saved more energy than did non-users.

Although we are not sure what accounts for the differences in conclusions from analysis of fuel use records and analysis of telephone interview responses, we offer a few possible explanations. First, telephone interviewees may feel a social pressure to respond positively to questions about their energy conservation actions; in particular, partial actions may be reported as full-scale. Second, the energy savings engineering estimates for each household action may be too large; also our inability to incorporate interactions among items leads to an overestimate of the energy saving effects of a combination of actions. Third, as shown in Figure 3, fuel consumption records could be obtained from only 31 per cent of the households interviewed; this high attrition rate may introduce bias into subsequent analysis of fuel consumption. Fourth, technical fixes alone do not assure energy savings. For example, installation of attic insulation might lead the occupants to raise winter thermostat settings (an

⁴The most commonly used fuel for space heating among the sample households is natural gas (77%). Fuel oil accounts for 14 per cent of the households, electricity for 4 per cent, wood for 3 per cent, and propane for 1 per cent. This distribution of households by heating fuel is similar to that shown in other surveys [3].

Table 7. Energy Use Per Household As Determined From Actual Fuel Consumption Records^a

	<i>MEA</i> (<i>n</i> =54)	<i>NSP</i> (<i>n</i> =77)	<i>Comparison</i> (<i>n</i> =56)
First year average energy use ^{b,c,d} (billion joules)	206.4	205.9	224.1
Second year average energy use ^{b,c,d} (billion joules)	204.8	208.2	224.2
% Change	-0.8%	+1.1%	0.0%
% Change, adjusted for heating degree days	-2.4%	-0.3%	-1.4%

^aNone of the differences between samples was statistically significant at a 5% confidence level, using either parametric or non-parametric tests.

^bThese figures include natural gas and electricity, with electricity converted at 3.6 million joules/kwhr. Oil-heated homes are not included. Only households in owner-occupied single-family dwellings are included in this analysis.

^cThe coefficient of variation (ratio of standard deviation to mean) for all three groups for both years ranges from 24% to 29%.

^dTo convert from billion joules to million Btu, multiply by 0.948.

offsetting behavioral change). Fifth, a single phone call to a hotline cannot be expected to have a large effect on household energy use. These small effects may be masked by other factors that influence household energy use such as fuel prices, incomes, weather, and other conservation programs. Finally, collection, validation, and analysis of fuel consumption records is exceedingly difficult [4,5]. These records may contain errors due to estimated bills, incorrect meter readings, cancelled bills, and missing bills (see Appendix D of ref. [2].⁵

CONCLUSIONS AND RECOMMENDATIONS

Both the Minnesota Energy Agency and Northern States Power Company operate telephone energy conservation information centers. In 1979, the two centers handled about 45 thousand telephone calls. (By comparison, the

⁵The initial evaluation plan called for detailed regression analysis of energy use, conservation actions, and attitudes towards the hotlines (dependent variables) as functions of various socio-economic factors (independent variables). In addition, various non-parametric tests with the fuel consumption data were planned to more carefully examine changes in fuel use that might be attributable to the hotlines. However, lack of time prevented more than an initial stab at these analyses; see ref. 2 for additional details.

Wyoming hotline handled 1,200 calls and the Michigan hotline handled 9,000 calls during 1979 [6]).

In early 1979, MEA and NSP contracted with the Minnesota Center for Social Research to conduct an evaluation of the two hotlines. The evaluation included analysis of agency records on hotline operation, telephone interviews with recent hotline users, telephone interviews with hotline users from the previous year and a random sample of Minnesota households, and collection and analysis of fuel consumption records from some of these households.

Examination of agency records shows that the frequency of calls has been increasing steadily during the past few years (see Figure 1). Because of the increasing load, NSP recently installed an energy conservation tape library. The library currently includes about 60 tapes on different energy conservation subjects; each tape is three to eight minutes in length. NSP expects to handle more than 75 thousand calls per year with the new system, thereby greatly increasing the capacity of their ASK NSP service.

Analysis of agency records and the telephone interviews conducted two weeks after hotline use leads to the following findings:

- Hotline callers represent a strata of the population characterized by higher than average incomes and education levels.
- The vast majority of hotline callers belong to households in owner-occupied, single-family dwellings.
- While small fractions of hotline callers used both hotlines, the vast majority used only the MEA *or* the NSP hotline.
- Clients of the MEA hotline are more likely to call about alternative energy sources than are NSP clients; clients of the NSP hotline are more likely to call about insulation-related subjects.
- Most callers expected an information service to be available as a matter of routine; they did not call in response to any particular advertising or out-reach effort.
- The great majority of hotline callers are first-time users.
- More than 75 percent of the hotline callers said that the information they received from the hotline was useful and that the person they talked with was well-informed, helpful, and courteous.
- Over half the hotline callers were willing to pay \$1 per year for the service.
- Belief in the importance of the hotlines as a consumer service is especially strong soon after hotline contact, diminishing with time. However, even after a year, over 80 percent of hotline callers continue to view the hotlines as important services. Also, over two-thirds of non-callers view the hotlines as important services.
- Almost without exception, hotline callers rely upon other information sources in addition to the hotlines.

- About 25 per cent of callers have questions which the hotlines are unable to answer completely.
- About 40 per cent of the callers require additional information after hotline contact.

A major issue in this evaluation was the extent to which the hotlines contribute to energy conservation actions. Data on energy conservation were compared for MEA callers, NSP callers, and a random comparison sample. The data showed that hotline callers were more likely to have done the following: weatherstripped or caulked, installed attic insulation, installed attic ventilation, installed wall insulation, installed new storm windows or doors, installed a wood-burning stove or furnace, installed a new furnace, and lowered the thermostat on the hot water heater. There was no difference between hotline callers and the comparison sample on lowering the thermostat for home heating, having the furnace tuned, installing solar energy devices, and insulating water heaters.

When specifically asked if the hotline had influenced their decision to do any of the things they had done, 17 per cent of the MEA callers and 30 per cent of the NSP callers said they had been influenced by the hotlines.

Using data supplied by MEA it was possible to convert the actions taken by people interviewed into estimates of energy savings. These estimates suggest that MEA and NSP callers had engaged in activities that reduced their energy consumption by 14 per cent, while the comparison sample reduced consumption by 12 per cent.

In addition to these estimates of energy conservation based on reports from callers, data were gathered on *actual* fuel consumption for some of the hotline users. While certain methodological and statistical problems limit generalizability of the results, our interpretation is that hotline users use less energy than the comparison sample of users; these results were not, however, statistically significant. Also, fuel consumption records contradict the findings obtained from household interviews concerning the energy saving effects of the two hotline services.

The data and analysis conducted as part of this evaluation lead to the following recommendations:

- Representatives of the hotline staffs of MEA, NSP, and other energy hotline services in Minnesota should meet to standardize the categories and forms they use for collecting hotline information. This standardization would permit each hotline to compare its services to other hotlines to understand trends in the types of calls received by the different hotlines.
- Both hotlines appear to be weak in reaching Outstate residents. Plans should be developed for better serving their information needs.
- Based on the types of calls received and information obtained during telephone interviews conducted for this evaluation, it appears that MEA

bears a heavy responsibility in providing information on alternative energy sources. We recommend that MEA pay particular attention to its credibility in this area and make sure that it provides high quality information about alternative energy sources. NSP, on the other hand, may want to examine the possibility that its credibility is low in this area and take steps to increase its credibility on alternative energy sources.

- Because the sample data from the evaluation show that both MEA and NSP callers are predominately single-family home owners (92 per cent) and are of higher income and education than the general population, it is important to find more effective ways to reach renters, occupants of multi-family units, and low-income households with energy conservation information.
- This evaluation was unable to draw meaningful conclusions from the fuel consumption records collected. Because the major purpose of energy conservation outreach programs (such as these hotlines) is to reduce energy use, more effort should be devoted to collection and analysis of fuel consumption records.

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