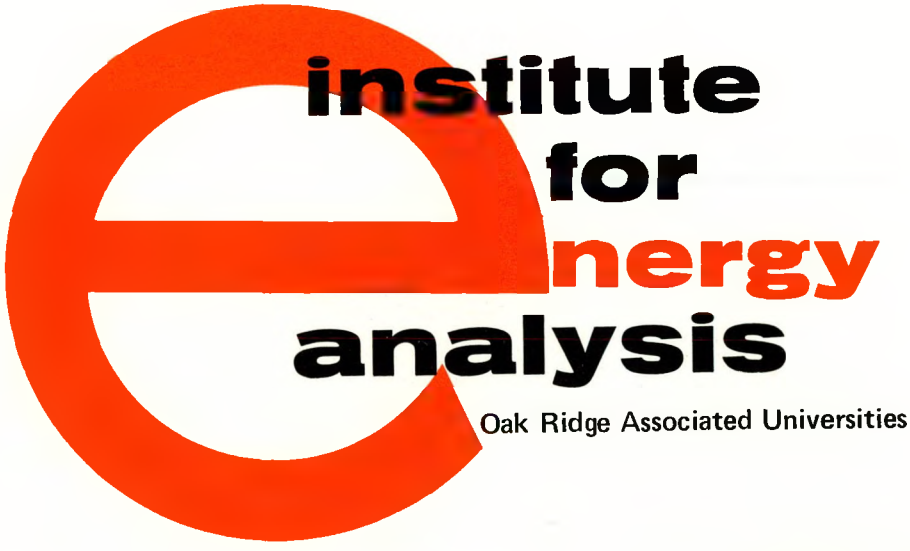
ORAU/IEA-80-6(M)
Research Memorandum

PUBLIC ATTITUDES AND INFORMATION ON THE NUCLEAR OPTION

Morris W. Firebaugh



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May 1980

Institute for Energy Analysis
Oak Ridge Associated Universities
Oak Ridge, Tennessee 37830

Research memorandums document substantive work in progress and receive internal review.

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ABSTRACT

A summary of the principal findings of public opinion surveys on nuclear energy is presented. Attitudes polled include those on building more plants, a nuclear moratorium, options for reducing risks, questions of safety and cost advantage, and the most trusted sources of information about nuclear energy. Next, some less empirical observations for interpreting these results are presented. These address the inertia of beliefs, nature of risk perception, symbolic aspects of nuclear energy, and feasibility of nuclear education programs.

Finally, several suggestions for public information programs based on the previously noted findings and observations are made. These include a safety program analogous to fire drills, itemized electrical bills, nuclear site media workshops, and suggestions for improved communication on nuclear issues. These relatively low-cost, focused efforts may be more effective than mass media information programs.

INTRODUCTION

In this paper I describe some of the salient features of public attitudes toward nuclear energy, some analyses of these attitudes in terms of risk perception and symbolism, and finally suggestions for nuclear information programs based on these findings. The basic assumptions are (1) the future of the nuclear option is a highly political issue, (2) public attitudes will eventually determine the future of nuclear energy, and (3) information programs responsive to public concerns are essential for responsible public consideration of this important energy alternative.

RESULTS OF PUBLIC ATTITUDE SURVEYS

Public attitudes on energy have been recorded and described extensively. An excellent review of 115 general energy surveys taken between 1973 and 1978 is presented in a Solar Energy Research Institute publication.[1] A more historical, comprehensive review of over 100 surveys concerned specifically with nuclear energy is summarized in a Battelle Memorial Institute report.[2] More than 40 opinion polls conducted subsequent to the Three Mile Island (TMI) accident give a fairly consistent picture of its effect on public attitudes toward nuclear energy.[3]

Note: A slightly expanded version of the findings of this paper were presented at the Gatlinburg II Workshop on an Acceptable Future Nuclear Energy System, Gatlinburg, Tennessee, December 10-12, 1979. Limited copies of the workshop proceedings are available from the Institute for Energy Analysis, Oak Ridge Associated Universities, Oak Ridge, Tennessee 37830.

Instead of summarizing these authors' detailed analyses of public attitudes by age, sex, education, income, and so on, I have identified below some of the survey results that I believe bear most directly on attempts to design an appropriate nuclear information program responsive to public concerns on nuclear issues.

1. Public sentiment in favor of building more nuclear power plants has gradually declined. In answer to the question, "In general, do you favor or oppose the building of more nuclear power plants in the United States?" a Harris poll conducted in January 1980 found 50 percent in favor and 38 percent opposed. (Figure 1 demonstrates the trend of responses to this question from 1975 to January 1980.) This does not mean that the public wants to abandon the nuclear option, however. In a May 1979 poll, Roper found 71 percent opposed to closing all nuclear plants permanently and 14 percent favoring this option.[4] Two other post-TMI surveys confirm this finding: an ABC/Harris poll (April 6-9, 1979) found 80 percent opposed a "permanent shutdown" of all nuclear plants (15 percent favored), and Cambridge Reports, Inc., found only 13 percent in agreement with the statement: ". . . we should close all of the nuclear power plants in the country."

2. Three Mile Island increased the polarization of the nuclear question. As the Harris polls indicate, the decline of the 2-to-1 majority favoring new plant construction derives roughly equally from loss in supporters and the undecided. This decline in the undecided category can be interpreted as an increased polarization over nuclear power. Further evidence for growth in polarization is apparent in the

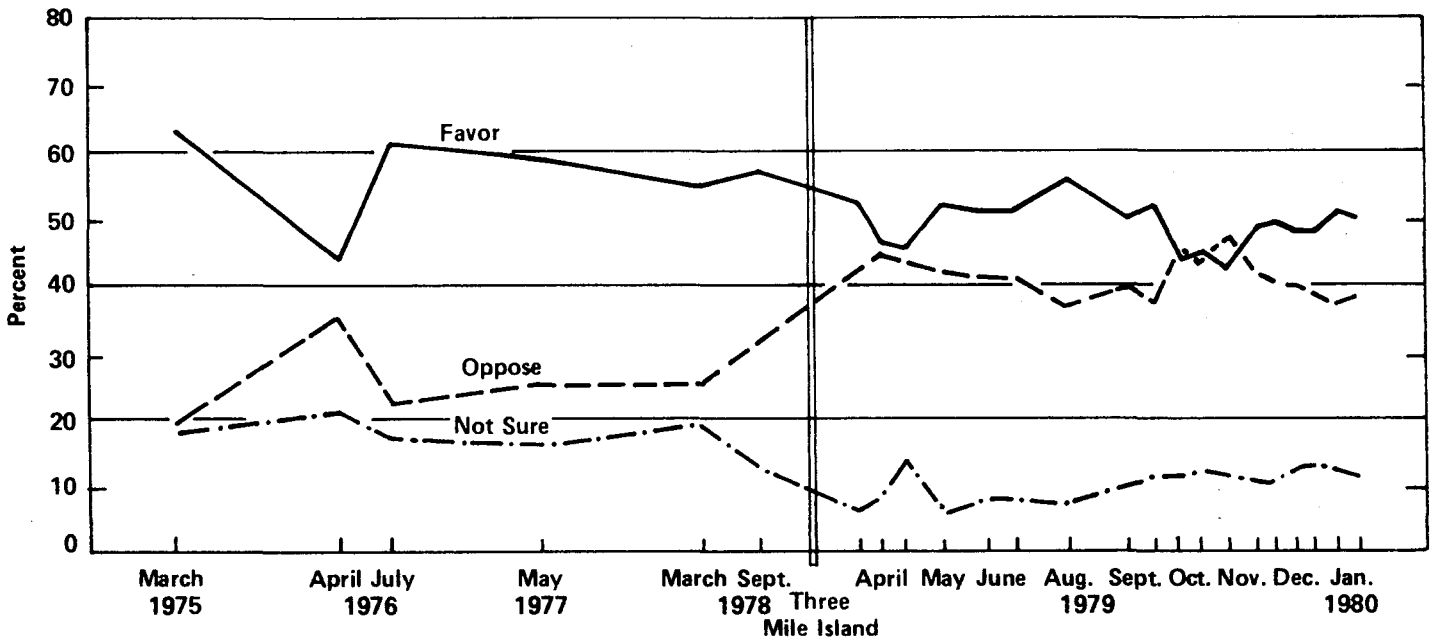

FIGURE 1

"In general, do you favor or oppose the building of more nuclear power plants in the United States?" Harris polls.[3]

phenomenon of nationally organized antinuclear demonstrations. The Washington, D.C., demonstration in May 1979 attracted 100,000 people; five months later the New York City demonstration attracted 200,000. The Seabrook, New Hampshire, demonstration in October 1979 indicates the movement is resuming direct action methods reminiscent of the Vietnam period.

3. The threat to personal safety is perceived as the main disadvantage of nuclear energy. Survey analysts are unanimous on this finding. Public attitudes on nuclear power are sensitive functions of the perceived threat to personal safety. One analysis indicated that the level of opposition toward nuclear power can be shifted 40 percent by varying the assurance of safety. Mitchell concluded that "most people are willing to believe that nuclear plants can be made safe."[3]

When the public was asked in May 1979 what options would assure the safe operation of the nuclear enterprise, Roper found the following:[4]

Option	Favor	Oppose	Don't Know
Remote siting: 50 miles from population center	79%	15%	6%
Give local residents vote on having plant	75	18	7
Federal safety inspectors in plants 24 hours per day	69	23	8
Close existing plants until all systems are reviewed and improved	50	40	9
Construct no new nuclear plants	29	57	14
Close all nuclear plants permanently	14	71	15

Keeping nuclear plants at least 50 miles from population centers (i.e., remote siting) is the preferred option for reducing nuclear risks.

4. Support for nuclear energy is stronger in nuclear site host communities than it is in the public at large. This interesting result

identified in earlier polls[1,5] has apparently remained relatively unchanged in post-TMI surveys.[6] Residents in proximity to reactors have more confidence in the safety of the reactor than does the general public. They value the economic benefits (through tax advantages in most nuclear plant communities), and they frequently cite the plant as a symbol of growth and progress.

5. Acceptance of nuclear energy depends strongly on relative cost advantages. When Harris[5] asked people whether it would be worthwhile to have a nuclear plant in their own community as a function of the cost differential of nuclear electricity, he found the response curve shown in Figure 2. By changing the cost advantage of nuclear over other types of power from -20 percent to +50 percent, Harris could swing the positive response of the general public by +60 percent. Figure 2 also indicates how various segments of the public respond to the perceived cost advantage.

6. The public trusts scientists on nuclear matters. In response to the question, "How much confidence do you have in what various people or groups say on matters concerning nuclear energy development?" 58 percent of the public responded "a great deal" to scientists. Scientists were followed by the Nuclear Regulatory Commission (39 percent), the Energy Research and Development Administration (subsequently Department of Energy) (36 percent), leading environmentalists (34 percent), the President (24 percent), TV news commentators (22 percent), and Ralph Nader (22 percent). Presidential candidates and labor union leaders were tied for last place with 5 percent each. Harris concluded in 1976,

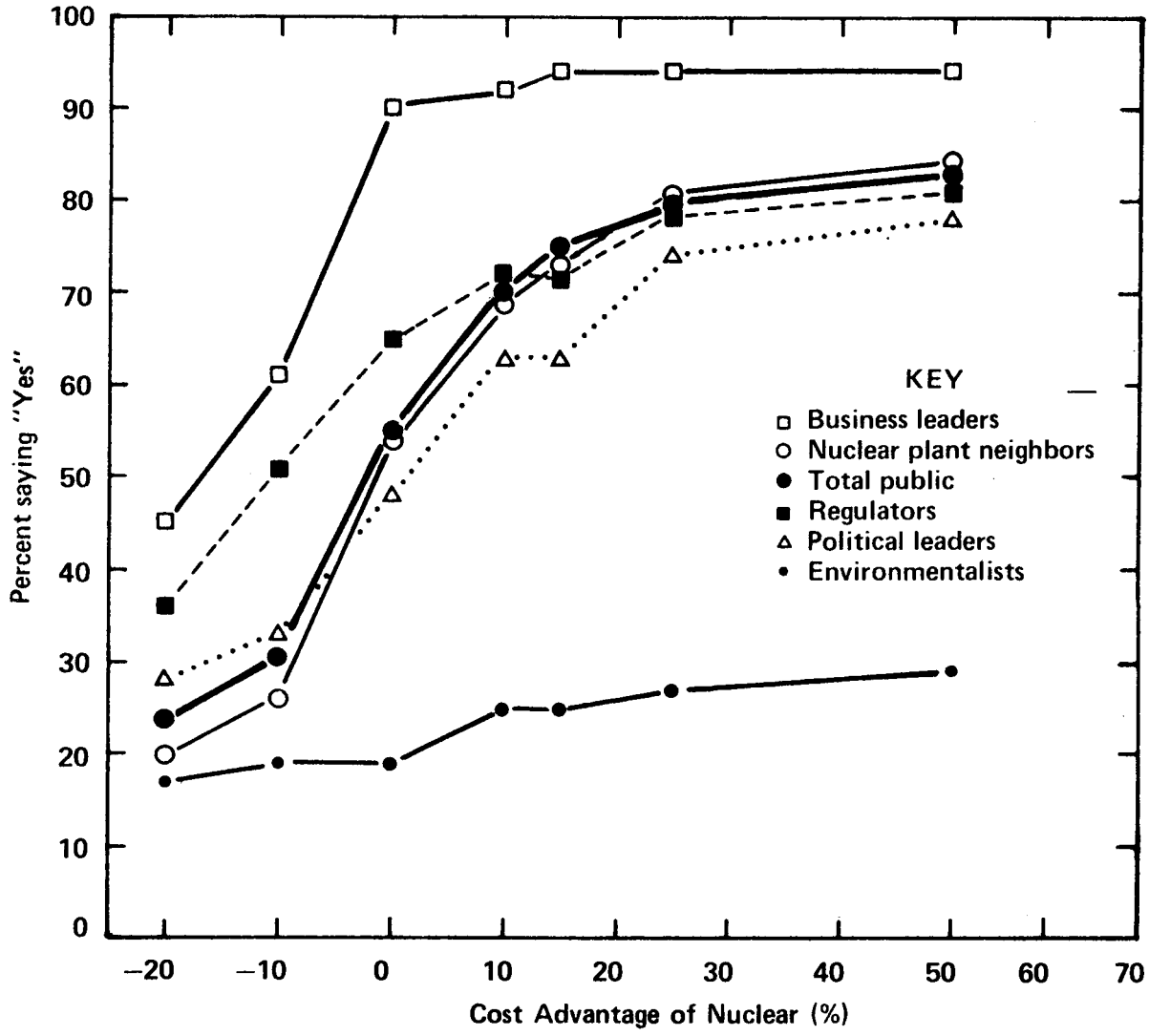

FIGURE 2

"Is it worthwhile to have a nuclear power plant in the community?"

"Public confidence in the scientists as the key spokesmen on nuclear power development remains high."[5]

ANALYSIS AND INTERPRETATION

Several additional observations are useful in interpreting apparent ambiguities in opinion surveys and in improving the effectiveness of any nuclear information program. These observations are less empirical and more speculative than the previously cited findings, but they provide a useful, conceptual framework for understanding the source of the nuclear energy controversy.

1. Personal beliefs on nuclear energy have considerable inertia. A number of analysts have made this observation after interpreting their data. Harris states: "The public does not admit to being easily swayed in its opinions on nuclear energy."[5] The effect of the Three Mile Island accident on the public perception of safety illustrates this observation. In response to the question, "How safe are nuclear power plants?" Harris found,

Public Response	Before TMI, October 1978	After TMI, April 1979	Percent Change
Very safe	26%	21%	-5%
Somewhat safe	38	46	+8
Not so safe or dangerous	28	30	+2
Not sure	8	3	-5

Slovic et al. state: "A great deal of research indicated that peoples' beliefs change slowly and are extraordinarily persistent in the face of contrary evidence."[7] This inertia is maintained by a very effective

filtering mechanism through which each person interprets his or her experience. It also raises questions about the value of a large-scale public education program on nuclear acceptability.

2. For nuclear power, the perception of danger (actuarial risk) plays little role in the perception of risk. This observation was verified in an interesting study in which four groups (the League of Women Voters, college students, business/professional club, and risk analysis experts) were asked to "consider the risk of dying (across all U.S. society as a whole) as a consequence of this activity or technology."[7] Respondents were asked to rank, in order of decreasing risk, some 30 sources of risk including nuclear power, motor vehicles, handguns, smoking, motorcycles, and alcoholic beverages. The noteworthy result is that the League of Women Voters rated these sources in precisely that order, with nuclear power as the most risky activity or technology. College students also rated nuclear power as having the highest risk, while the professional club rated it eighth and the experts twentieth.

In follow-up studies with additional groups of students and league members, respondents were asked to "estimate how many people are likely to die in the United States in the next year" as a result of some 30 activities, assuming an average year. In this study, league members estimated that motor vehicles cause 28,000 deaths and nuclear power 20, and the college students gave estimates of 10,500 and 27, respectively. In fact, both the league group and the student group put nuclear power at the bottom of the list in estimated deaths per year. If we assume that the groups sampled were representative, we are left with the

ambiguous conclusion that the public views the least dangerous activity (as measured in attributed deaths, i.e., the actuarial risk) as the most risky.

3. Risk perception is a complex, emotional process. At first glance, it is tempting to dismiss the apparent inconsistency noted above as an irrational fear ("I know there are no hobgoblins in the basement, but I'm still afraid to go down there"). This ambiguity is frequently interpreted to result from the layman's inability to understand the true nature of risk as being the product of the probability of an event multiplied by the severity of its consequences. While these are both natural reactions to the phenomenon of the public's perception of nuclear risks, neither provides any emotional relief to those suffering such fears or much help in designing information programs to reassure them.

There is clearly something more to the public's perception of nuclear risk than the perceived actuarial risk of fatality. Risks from nuclear energy are not, in fact, limited to death and injury but include hard-to-quantify but very real disruptive social effects such as evacuation, loss of income, emotional distress, real estate devaluation, and potential for land despoliation.[8] The TMI incident illustrates this point: The actual effect on human health was essentially zero (<1 expected death due to radiation release), but the social consequences have been considerable (144,000 persons living within 15 miles evacuated an average distance of 100 miles at an economic cost of $18 million).[9] Since the real risk of nuclear power must include all such deleterious effects, the intuitive "folk wisdom" perception of risk may be a more

accurate, operational measure than the actuarial statistics. This is the basis for advocating a "double standard" of safety in setting nuclear policy.[10]

Other characteristics of risk have been suggested to explain the high-risk rating of nuclear energy. These include the nonlinear response to size of accident (i.e., the "catastrophe potential"); the "availability heuristic" (i.e., the ease of recall of an event); and such properties as how voluntary the risk is, immediacy of effect, knowledge about risk, control over risk, and familiarity.[7] By measuring a person's response to these risk characteristics, one can predict accurately how he or she will rank the risk itself. Unfortunately, nuclear energy ranks toward the high-risk end on each of these risk dimensions.

4. Nuclear power has strongly symbolic aspects. This observation is very helpful in understanding the intensity of the present nuclear debate.[11] For advocates, nuclear power symbolizes man's attempt to harness the most awesome force in the universe, to "beat his sword into plowshares," and to lift the poverty stricken masses of the world to a decent standard of living through abundant, cheap energy. That so many of the early Manhattan Project leaders persist in attempting to realize this dream in the face of repeated rebuffs and abuse is evidence of the strength of this symbol in their lives. The idea that nuclear plants are a symbol for growth and progress has been identified as underlying favorable attitudes in host communities.[6]

For opponents, nuclear energy plays an equally important symbolic role--that of everything wrong with society. They strive for a return

to the simple life while nuclear power is the most complex of technologies. They advocate decentralized, labor-intensive "soft technologies," and nuclear power is just the opposite.[12] They call for participatory democracy and "power for the people" while nuclear power requires structured, bureaucratic management and reliance on "experts." Nuclear power symbolizes the growth that opponents view as unwise in a world of finite resources. Nuclear power does, in fact, represent the culmination of a highly specialized, technical, industrial society and, as such, becomes a natural focus for those who want to reverse those trends. Evidence is accumulating that these underlying social and political concerns are stronger determinants in the leadership of the opposition to nuclear power than are the expressed concerns over health and safety.[13]

When this powerful symbolism is combined with the almost total lack of competing, highly visible social causes, we get the hardening in opposition now observed. For example, of the May 6, 1979, antinuclear demonstrators, 67 percent responded that they had been at least "somewhat active" in the anti-Vietnam War movement.[14]

5. Nuclear education may be counterproductive. Since much public opposition to nuclear energy is grounded in ignorance or misinformation, the natural response of supporters is to resolve the issues by getting the facts to the public. However, Slovic et al. have noted that "disagreements about risk should not be expected to evaporate in the presence of 'evidence'."[7] Otway and Thomas have summarized the possibility of counterproductive results: ". . . the communication of information about new and improved safety systems is liable to have more complicated

effects upon attitudes, and might well stimulate the formation of new, inferential beliefs that the technology is dangerous."[13] In describing seven programs to reach consensus on nuclear power abroad, Kasperson et al. state: "Although the specific outcomes of the efforts are quite diverse, all failed to win consensus and increased the politicization of the nuclear issue."[10]

6. Public attitudes on nuclear power have not yet been measured as functions of perceived need and convenience. There have been few cases of the public's actually needing electricity and not having it. The most notable, recent instances were the brownouts and accidental blackouts of the 1960s and the shortage of electricity and heavy reliance on nuclear energy in the Midwest during the coal strike of 1977-1978. The example of public attitudes toward gasoline rationing is instructive. Before the gas lines during the summer of 1979, there was strong sentiment against rationing, which is generally conceded to be awkward, bureaucratic, and easily corrupted. However, after a brief experience with gas lines, the political pressure for rationing began to build, with the prime motivation being the avoidance of this inconvenience.

It is entirely possible that circumstances could arise (e.g., a combination of a coal strike and oil cutoff) that would, in fact, cause a serious shortage of electricity. The severe inconvenience caused by rationing electricity or brownouts would "personalize" our electrical dependence in a way that could cause a considerable shift toward public acceptance of nuclear power. As former utility executive Romney Wheeler

has observed, "There is nothing like serious inconvenience to clear the public mind."

SUGGESTIONS ON PUBLIC INFORMATION PROGRAMS

The obligation to provide information to the public on the nuclear option follows from some fairly basic tenets of a democratic society: namely, that an informed citizenry is the best basis for public policy, that the basic issues of nuclear power are amenable to analysis and understanding, and that some understanding and trust in such analyses can be developed in the general public. Even those analysts reporting the failure of previous attempts call for "new ventures in public education and participation."[10]

Outlined here are a number of modest programs that could be implemented at minimal cost and that could prove very effective in building public understanding of nuclear energy because they are directed primarily at the public concerns identified above. By focusing on smaller groups with a personal or professional interest in a safe nuclear enterprise rather than society at large, these programs may prove more productive than previous education programs. These programs may all be implemented independently of the significant and extensive reforms instituted by the nuclear industry and the Nuclear Regulatory Commission in response to TMI.

1. Nuclear site resident safety program. Analogous to fire drills, this program would be designed to provide basic information on emergency procedures to all residents living within 10 miles of a

nuclear reactor site. It would follow Nuclear Regulatory Commission guidelines and would be implemented in cooperation with local governmental agencies responsible for emergency evacuation procedures. The program would emphasize the appropriate safety measures to take in case of a radiation emergency. Background information on the nature of radiation, basic reactor operation, and the risk of nuclear accident in comparison with other typical industrial accidents would be provided.

A successful safety program would accomplish several things. It would indicate concern on the part of government and the nuclear industry for guaranteeing the safety of plant neighbors, the public most at risk due to an accident. It would indicate to the public that the nuclear enterprise recognizes this risk. By interpreting the risk of nuclear power compared with the risks from other energy and industrial sources, the program could help develop the familiarity with nuclear power that is essential if it is to be accepted as an energy option. Most importantly, it would provide a very real, additional margin of safety by helping to avoid in the future the near public panic apparent during the TMI incident.[15]

The primary purpose of this program is to increase both the actual safety and the perceived safety of the community surrounding nuclear power plants. However, if the program is successful, it could also play an important role in implementing the existing-site policy at sites suitably remote from population centers.[16] As I have already noted above, the public sees remote siting as the best option for assuring a safe reactor industry, and the communities in which reactors are presently

located support nuclear energy more strongly than the nation as a whole. When these public preferences are combined with the difficulties of site acquisition and the inertia of the regulatory process, the existing-site policy appears the most likely development.

If actual operating data verify the benefits expected from large, multireactor sites, the community nuclear information program would provide a natural vehicle to explain such advantages to a community that accepts the risks and benefits involved. If existing reactor plants prove to be acceptable through years of safe operation and the community sees itself becoming an important "energy center" with valuable economic advantages, the existing-site community should be much more receptive to new units than a nonnuclear community.

2. Electrical customer itemized bill. Figure 3 is an example of a typical electric bill with additional itemized information: an estimate

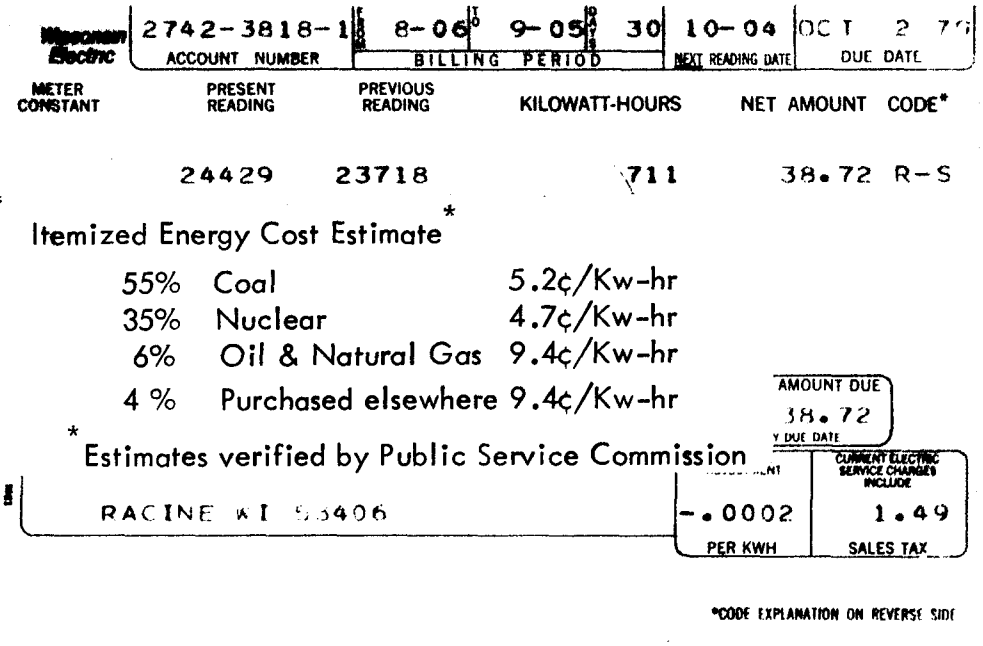

FIGURE 3

Electrical Customer Itemized Bill

of the percentage of electricity from the following sources--coal, nuclear, oil and natural gas, and electricity bought from other utilities--and a hypothetical estimate of the cost (in cents per kilowatt-hour) for each of these sources.

There are obvious problems associated with the simple format presented here, including the cost differential between peak and base load capacity; between the low construction costs of earlier hydro, coal, and nuclear systems and present marginal costs of these systems; and problems of time-of-day pricing. If these problems prevent a clear, honest, and defensible summary on the monthly electric bill, perhaps an annual summary could be distributed to utility customers. This summary could present fuel costs, production costs, fraction of energy, and capacity factors for each fuel system averaged over the preceding year. To help assure public confidence, either analysis could carry a qualification such as the following: "This analysis is certified as valid by the Public Service Commission."

This information program would have numerous educational benefits. It would inform the public, much of which is still unaware of the fact, that a considerable portion of electricity is generated by nuclear power; it would remind the public regularly of the relative cost advantage (or disadvantage) of nuclear energy. (It was noted in survey findings, item 5) that the cost advantage/disadvantage was critically important to the public's evaluation of the acceptability of the nuclear option.) Finally, this itemized bill is completely consistent with societal trends towards truth in packaging, full disclosure, and freedom of information. It would serve a valid public service.

3. Local media nuclear information workshops. Sixty-seven percent of the residents near TMI indicated both local TV and radio provided extremely useful or useful information during the crisis.[9] These information sources were followed by national network TV and newspapers at 55 percent and 50 percent, respectively. All emergency evacuation planning being promulgated by the Nuclear Regulatory Commission relies on local radio and TV for informing the public on appropriate emergency measures. Yet in most cases, the media in smaller communities near reactors cannot afford the science editors and analysts whom the larger, national media can. As a result, the level of competence of science reporting in such communities is frequently not high and, in the case of an emergency, such reporting could even be confusing or detrimental.

A series of workshops could be held for editors and reporters from the media serving nuclear site areas. Topics could include basic background material on reactor operation, nature of radioactivity, elementary risk analysis, and radiological emergency procedures. Again, by limiting the scope of the program to media representatives from nuclear site communities, one would maximize the educational benefits and minimize costs. The workshops could be sponsored by a newspaper such as The Oak Ridger, which has gained a national reputation for informed reporting in the TMI accident and which could use the scientific personnel in the Oak Ridge community for staff support. The expected benefits of upgrading the competence of the media include increased safety for the public resulting from informed and accurate media coverage in the event of an emergency, improved quality of local analysis

and reporting of "abnormal incidents" of a nonemergency nature, and an improved level of communication and understanding between the power plant and local community during normal operation.

4. Interdisciplinary topical conferences on the nuclear option. One effect of the controversy over the nuclear option is the polarization of the intellectual community into the pronuclear side heavily represented by physical scientists and engineers and the antinuclear side heavily represented by social scientists and those from the humanities. Aggravation of the "two cultures" syndrome is bound to result from the continued nuclear debate. Since nuclear policy is based on social and political assumptions involving strong symbolic value judgments, communication between physical scientists on one hand and social scientists and those in the humanities on the other are essential.

A series of topical workshops could be organized in which roughly equal numbers of scientists and social scientists (or scientists and churchmen, or scientists and those from the humanities) would come together to focus on topics such as the social dimensions of risk perception--nuclear power as case study, ethical implications of nuclear energy, and the compatibility of a plutonium economy with a democratic society. The format of the conferences would keep the size small, require position papers from participants, offer substantial opportunity for information exchange in working sessions, and offer numerous opportunities for informal exchange of views. The goals for such a series of conferences would be increased personal contact and understanding across the two-culture boundary, increased understanding of nuclear energy by

nontechnical participants, and increased appreciation of the insights and values of the social sciences and humanities for the technical participants.

5. Improved communication between the nuclear industry and the public. The nuclear industry, working through trade associations such as the Edison Electric Institute and the Atomic Industrial Forum, has established an excellent program for sampling public attitudes toward nuclear energy. The program includes sponsoring the ongoing Harris poll referred to earlier; subscription to general services provided by Roper, Yankelovich, and Gallup; and more indepth studies by Cambridge Reports and personal interviews.[17] The question is, How can this wealth of information be used most effectively in designing nuclear information programs for improving public understanding of the nuclear option? The following suggestions may be useful in answering this question:

a. Expand the distribution of nuclear opinion poll results. While the proprietary nature of these polls must be recognized, the industry and the nation would be well served by a completely open policy on the distribution of results. By making them generally available, the nuclear industry would be stating, in effect, that it recognizes the critical role of public acceptance for a successful nuclear future and is doing its best to measure and understand public concerns. Many university and energy policy researchers would find such information extremely valuable and would contribute significantly to its interpretation and hence its value to public policy decisionmakers.

b. Extend the surveys to identify concerns and acceptable solutions. In both the 1975 and 1976 detailed Harris polls, the greatest

single safety-related concern was the problem of radioactive waste disposal.[5] As noted earlier, Roper found that remote siting as an option for reducing risks was favored by nearly 80 percent of the public.[4] By extending the surveys to explore such public perceptions and probe their strength and duration, information might emerge to help guide public policy on nuclear issues. Again, by making the survey process more open, valuable assistance in survey design could be provided by interested university and policy groups.

c. Continue the "sensitivity training" of nuclear utility personnel. The nuclear industry should continue the excellent programs of summarizing public opinion and communicating it to utility personnel so they can deal with the public more sensitively. By demonstrating that it listens to public concerns, the nuclear industry will enhance trust so essential for public acceptance of its product.

Finally, I offer the following suggestion on the most effective attitude in dealing with opposition to nuclear power. There is a great temptation to members of the nuclear enterprise, particularly those who have dedicated their lives to its development, to become infuriated with nuclear energy opponents and what is seen as their unfair or dishonest tactics. Rather than develop a "siege mentality" toward the public, nuclear energy proponents should simply present the world energy situation as they perceive it and the essential role they see for nuclear energy in it. By citing the parallel history of nuclear energy development in every major industrialized nation, they can demonstrate the evolution of this technology in industrial society. The nuclear in-

dustry should frankly and openly concede the real choice society is facing between the "hard" and "soft" technology paths and the implications of this choice for such human values as freedom, convenience, and standard of living.

By listening to the concerns of the public about nuclear energy and discussing these concerns with the public, the nuclear industry can help reestablish the trust that is essential for rational decisions on our nuclear future. Without this trust, no nuclear information program will be successful.

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