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CHOICES: RESULTS OF A PILOT STUDY

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The Role of Liability Preferences in Societal Technology
Choices: Results of a Pilot Study

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ABSTRACT

At the 1984 Annual Meeting of the Society for Risk Analysis, Steve Rayner presented a paper that challenged the conventional wisdom of risk management research. In that paper, he argued that resolving the question, "How safe is safe enough?" is less important in making societal technology choices than "How fair is safe enough?" Adopting the fairness question as the concern of risk management would imply that the process of technology choice explicitly recognize the preferred principles different parties hold with respect to obtaining consent from those affected by the risks, distributing the liabilities, and justifying trust in the relevant institutions. This paper discusses a recent empirical pilot study which explored the fairness hypothesis in the context of nuclear power.

Individual interviews and focus groups were conducted to examine whether or not preferred principles for liability distributions were consistent with those suggested by the cultural characteristics of the constituency. The results suggest that for this type of societal technology choice, violation of these preferred principles may be a major source of the conflict between different constituencies. Additionally, the study contributes towards the development of a new approach in risk management that combines the cultural model of risk perceptions with the decision-theoretic approaches found in economics and psychology.

KEY WORDS: Risk management, Technology choice, Fairness hypothesis,
Liability preferences.

I. INTRODUCTION

In a recent article, Shafer and Tversky argue that the analytical design used by a researcher to examine probability judgements should reflect such seemingly exogenous considerations as the problem of interest, the body of evidence, and psychological aspects of the individuals being studied (Shafer and Tversky, 1985). A major point of their argument is that in all types of measurement, the analytical

design selected will ultimately affect the measurement and the quality of the design will depend on its ability to provide "accurate answers to questions of central interest" (p. 310).

We believe that their arguments are equally relevant for the current debates regarding analytical approaches in risk analysis and risk management. Last year, during the SRA meeting, Steve Rayner presented a paper that criticized the conventional approaches in risk perception and management on the grounds that they all too often treat the social considerations of the problem as a tedious exercise tacked on to the end of the formal analytical work (Rayner, 1985). This practice has biased much of the work to concentrate on answering the question, "How safe is safe enough?" and thus, argue about estimates of probabilities and the magnitude of consequences from unlikely events. Instead, Rayner argues, because risk is a way of classifying a whole series of complex interactions and relationships between people, as well as between man and nature, societal technology choice problems should be debated on the basis of issues of trust and equity. The appropriate question to be answered by research in these problems is "How fair is safe enough?"

This challenge to the conventional wisdom of risk management research reflects the observation that designs based on the definition of risk as a matter of probabilities and magnitudes do not provide satisfactory answers to questions of central interest. However, challenging the conventional wisdom is itself a challenge to construct an alternative design based on the fairness hypothesis that can be used for problems of societal technology choice.

This paper presents a pilot study which used such a design and explored the fairness hypothesis in the context of nuclear power technologies. The next section discusses the study and the problem of constructing a framework for analysis which could address questions consistent with our hypothesis. This is followed by a section describing the design in greater detail. The fourth section presents some major results of the case studies used in the research and the last section suggests how our framework could be used in the development of a new approach to risk management problems.

II. THE PROBLEM

The problem we selected to use in this exploratory research was the issue of the market acceptability of new nuclear-power reactor technologies with so-called passive safety features. These included for example, the PIUS and the modular high-temperature gas cooled reactor. This analysis was part of a larger program of evaluating these concepts on engineering, economic, and regulatory criteria (Trauger et al., 1985). As only one segment of the program, we were responsible for the analysis of the market viability of these technologies within the 2000-2010 time period.

There are several aspects of the problem that made it a good candidate for an approach based on the fairness hypothesis. First, the experience of the current generation of nuclear technology would suggest strongly that the viability of the future concepts will not depend solely upon their technical plausibility and projected economic feasibility. If this experience has taught us anything, it has taught us that large public and private expenditures on research, demonstration and manufacture of new reactors cannot be justified on technical

criteria alone. Second, nuclear power has been engulfed in a long list of social and technical issues that are likely to haunt any concept that is part of the nuclear family. Finally, because the primary use imagined for these technologies is base-load electricity supply, without evidence to the contrary, we can expect that their attributes and shortcomings will be debated in a regulatory and political environment similar to what we know today.

These aspects of the problem imply that, like the current generation of the nuclear technology, future concepts will be characterized by social conflicts over their use and management of their risks. To answer the viability question, we need an understanding of these conflicts, their implications, and possible resolutions. Societal technology choices of this type are typically examined by concentrating on conflicts over the safety issues, and thus, perceived probabilities and magnitudes. An analytical framework consistent with this view might focus on questions about probability judgements, alternative risks, and feelings regarding catastrophic consequences.

In contrast to this approach, our concept of risk management requires that the analysis explicitly recognize the social issues of trust and equity, and thus, incorporate ethical, political, legal, cultural and economic comparisons of various constituencies and their liability preferences. Consequently, our framework focused on questions about the preferred principles different parties hold with respect to obtaining consent from those affected by the risks, distributing the liabilities, and justifying trust in the relevant institutions. For the purposes of this pilot study, we limited the scope of the analysis to

three constituencies: the utilities, state public utility commissions (PUCs), and public interest groups critical of nuclear power.

III. Research Design

Given the focus outlined above, an important aspect of the analytical framework is to explicitly recognize sources and channels of social conflict that arise over the equity and trust issues when societal technology choices are made. The first step in this process is to identify the constituency that provides the occasion for conflict by being the primary user of the technology. In this case, this constituency corresponds to the electrical utilities.

In order to analyze the utility demand for new reactor technologies, we examined the preferences for different reactor characteristics on the basis of information about a utility's decision-making process for new capacity. Because of the nature of the problem, we decided that the best way to project what the systems planners might recommend in the year 2010 is to look at the process rather than to conduct an attitude survey of the present incumbents of systems planning departments. A method was designed to investigate the criteria used to select new capacity, the types of employees participating in capacity decisions, the data sources and modelling techniques applied, and the alternatives considered in a particular utility's process of capacity choice. Concentrating on these factors allowed a long term view of how preferences for specific technical characteristics would be formed. The underlying premise of the method is that the process of decision making ultimately influences how alternative technologies are valued by the utility. If the process differs among utilities, presumably their preferred choices will also differ.

To obtain the information about the decision-making processes, extensive interviews were conducted with a cross section of systems planning personnel and executives of five utilities. These utilities control generating systems that range from medium to large and operate in the southeast, mid-atlantic, southwest, and west. One utility was not investor-owned. All of them currently own a nuclear power plant. Finally, in addition to these five, limited interviews were conducted at two large municipal utilities.

The decision-making research established the criteria that each utility would generally prefer to use in decisions to build power plants. However, this represents only one part of our problem. The other equally important part is concerned with the potential social conflicts arising from these decisions. The sources of conflict are grounded in the constraints exercised by PUCs and interest groups on utility decision making. The channels through which these conflicts are routed are the regulatory and legal processes established for such purposes as power plant construction approval, technology licensing, and electricity rate determination.

One approach to examine the fairness hypothesis is to observe the public display of the arguments about risk from each constituency and then relate the arguments to specific preferences regarding the trust and equity issues. However, because risk arguments are carefully framed so as to be successful in the particular public forum in which they are made and the adversarial nature of these confrontations often forces the arguments to the extreme, it is difficult to extract a meaningful translation.

We sought to avoid these biases by conducting direct interviews with members of the PUCs and public staffs about their roles in the capacity choice decision. The PUC's role in the market place is generally to approve the need, site, technological option, and apportionment of financial responsibilities for building a plant. Depending on state legislation, PUCs may have a number of subsidiary responsibilities that affect plant certification and that give them considerable flexibility in fulfilling their primary responsibilities. Because of these regulatory powers, these state agencies effectively hold a potential veto over the commercialization of any nuclear technology. Thus, to appreciate their perspective on the trust and equity aspects of risk, PUCs must be thoroughly understood regarding their legislative mandate, regulatory philosophy and procedures, analytical skills, and the degree of access of all parties to the state regulatory process.

The role of public interest groups in relation to the construction and operation of nuclear plants was analyzed through focus group discussions which were held in each state. Public interest groups were selected for study because of their ability to place major hurdles in nuclear licensing activities. Opinions were sought from members of a variety of environmentalist and anti-nuclear organizations on matters relating to confidence in institutions associated with nuclear power, the manner in which liabilities from potentially hazardous technologies are distributed within society, and the problems associated with obtaining legitimate societal consent for such technologies. Preferences for specific principles to be followed in societal technology choices regarding consent, liability, and trust were obtained

by presenting realistic examples of technology choice problems. We directed the group to discuss alternative solutions for each example which generally led to a related discussion of the safety risks of nuclear power. We found using the examples to initiate a number of such discussions rather than a single one about the risks of nuclear power a helpful tool to discourage group from simply reiterating the arguments they would normally use in a public debate.

IV. RESULTS OF THE ANALYSIS

Several important results emerge from the analysis that we believe have implications for the current state of risk management research as well as the future market for new nuclear technologies. To be brief, we will present only the results that are more relevant for evaluating the fairness hypothesis approach.

Examining the perspectives of the major constituencies on the basis of the technology choice and not the technological risks, indicated that their predominant concerns about risks were fundamentally different. For the utilities, the risk from the decision is investment risk, i.e., the risk that the costs of plants will not be fully recovered from ratepayers. This is not to say that utilities are not concerned with health and safety risks, however, they view them as part of the technical design which is licensed by regulators. State PUCs are concerned with economic risks that might arise either because costs are incurred that were not anticipated, utilities fail to perform as expected, or demand fails to grow at a rate that warrants new capacity. Their concern for health and safety risks is incorporated into their general concern that from the public's point of view, the plant's costs will outweigh the benefits. In contrast, the public interest groups

focus almost entirely on health and safety risks, pointing out that because these risks are imposed by one group and inevitably fall unevenly on others, they cannot be treated as acceptable under any circumstances. For them, a risk that threatens an individual's health is a risk that cannot be spread equitably. Such incompatibilities in the type of risk being addressed by each constituency make the search for solutions considerably more difficult.

The analysis of the PUCs and public interest groups revealed that these constituencies conceptualize basic nuclear issues differently. We contend that the ways in which they differ suggest implicit agendas of interest for the constituencies that make it difficult for them to understand the fears or objections of others. The different ways of conceptualizing problems are indicated in three critical regulatory concerns, as shown in Table 1.

Table 1. Different emphases of PUCs and Interest Groups on parallel problems of utility capacity additions

Problem	PUC Emphasis	Interest Group Emphasis
need for the plant	need for power	consent of affected parties
who pays for plant	allocation of costs	distribution of liabilities
management of the technology	management prudence	institutional trust

In regard to the basic question of the need for the plant, the PUCs frame the issue as primarily a forecasting problem that simply requires

the utility to present adequate data and justification that the power will be needed when the plant becomes operational. Many PUCs have also become involved in judging whether the utility has selected the correct technological option to meet the demand forecast. While intervenor groups must contest the issues on these terms, the more important philosophical question in intervenors' minds is the need to secure consent of the parties affected by construction and operation of a nuclear plant. Rather than delegating responsibility to regulatory bodies to decide if the plant is needed, intervenors would prefer to decide, perhaps by popular referendum, if people want the plant.

The second important concern is that of who pays the costs of the plant. PUCs view this concern as primarily a financing one with some overtones of equity frequently intervening in the decision. If the utility can demonstrate that its construction costs were reasonably incurred and not the result of poor management, then costs of the plant will be allowed in the rate base and consumers will pay for the plant. If some construction costs are found by the PUC to be unwarranted, then the normal procedure is to pass those costs along to stockholders rather than ratepayers.

The decisions about whether or not costs are warranted require detailed analyses and are highly technical. Intervenors tend to view concerns associated with costs of the plant in broader ethical terms. While intervenors will address the issue of paying for the plant on the PUC's terms because the regulatory process requires it, intervenors would prefer to focus on the more basic issue of who bears the various safety, economic, and managerial costs in society resulting from the

plant and who enjoys the benefits and how can the costs and benefits be shared equitably.

The last important concern is that of management of the nuclear enterprise. PUCs focus on issues associated with management prudence. Management prudence admittedly lends itself to vagueness and regulatory expansiveness and has evolved in recent years into a catch-all category of issues that facilitates greater regulatory intervention into utility management. PUCs frequently appear to approach management prudence issues from technical bases in the sense that technical problems may have been created or made worse by mismanagement. Also implied is the belief that use of the correct data and analytical techniques will produce the appropriate response if management is carrying out its responsibilities and that inappropriate responses may well indicate management imprudence.

Intervenors conceive the management concern to be not merely a judgement of the utility's qualifications but, also, a questioning of the regulators' qualifications as well. Ultimately, there is the question of whether nuclear technology can, indeed, be managed safely. Intervenors demonstrate a strong consensus that the technology is simply too complex to oversee and that nothing can be done to alter this inherent flaw. Their view of the regulators is that such agencies are too sympathetic to the industry and are not to be trusted.

Thus, in respect to the concern of managing the nuclear enterprise, PUCs tend to view the issues in narrower terms that allow regulators to address specific management problems frequently in technical contexts. Intervenors expand the scope of management beyond the utilities to include any institutions that are responsible for nuclear technology.

Their trust in these institutions is nil -- managers, regulators and the technology itself are parts of the nuclear problem.

These results support the propositions regarding implicit agenda of Rayner's model of institutional cultures of risk management (Rayner 1984). We see that process is the domain of the regulators, and their objective is the adherence to that process, regardless of the outcome it produces. This objective suggests an implicit agenda for system maintenance. On the other hand, intervenors are concerned with achieving an outcome that is consistent with their anti-nuclear goals. Adherence to process is irrelevant. Their concerns are broad and directed at policy level questions for which regulatory environments are not well-suited. Their implicit agenda calls for a new social and political order that would make the current distribution of resources more equitable. Indeed, intervenors in a very real sense are fighting legislative battles in regulatory proceedings.

V. SUMMARY

We have presented the design and results of a pilot study which explores the question "How fair is safe enough?" The results of this study are intended to help evaluate whether or not this is a meaningful question for risk managers to ask. We believe that the approach uncovers the risk conflicts between constituencies that are rooted in disagreements over principles for consent, liability, and trust and thus, provides unique and valuable information to the decision makers.

As our example illustrates, the problem of finding a risk-management solution to satisfy all constituencies is a difficult one. However, both greater understanding of the liability issues and the processes of policy debates could be enhanced by this kind of approach.

Further research into the trust and equity aspects of risk can benefit from using the approach for other examples of societal technology choice and risk management. As examples of relevant problems, we are exploring conservation investments, hazardous waste management, and innovative medical practices.

Further research in this area could also provide important contributions to the decision-theoretic approaches of economics and psychology that are often used in problems of risk management. We see these contributions occurring at both the micro- and macro-levels of analyses where models of decision making are applied. At the micro-level, as an alternative to using directly preferences regarding the probabilistic concept of risk, we suggest using the decision maker's preferences for principles of consent, liability, and trust as underlying determinants of derived risk perceptions.

Finally, for a broader level of analysis which must mesh together the preferences of several constituencies, exploring each constituency's preferences for these principles would help risk managers construct meaningful possible solutions to be offered in public forums. Such a practice might enhance the negotiations between constituencies in these open debates by avoiding the insults to strongly held principles that occur because offered solutions fail to reflect these considerations.

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