Nuclear Energy
Beliefs, Values and Acceptability

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The last decade has seen a dramatic increase in public concern about nuclear energy. As a consequence, it has become recognised that the future of nuclear energy will not only depend on technical and economic factors, but that public acceptability of this technology will play a crucial role in the long-term future of nuclear energy. Research has shown a considerable divergence in public and expert assessment of the risks associated with nuclear energy. Qualitative aspects of risks play a dominant role in the public's perception of risks, and it seems necessary for experts to recognise this in order to improve relations with the general public. It is also clear, however, that differences in the perception of risks do not embrace all the relevant aspects of the public's assessment of nuclear energy. Public reaction is also related to more general beliefs and values, and the issue of nuclear energy is embedded in a much wider moral and political domain.

Before the mid-1970s, survey data showed consistently high levels of support for nuclear power. The place of nuclear energy as a source of electrical power seemed assured both in the United States and Western Europe. However, since the mid-1970s, support has gradually been eroded. This opposition to nuclear energy was accompanied by the growth of the environmental movement. Since 1975 the environmental movement has matured in organisation and has broadened its membership. Numerous large-scale demonstrations have taken place in both the USA and a number of European countries. Media interest has increased, and the polls show a consistently high level of public concern about potential catastrophic accidents and about radioactive wastes.

Public Concern and Opposition

The accident at Three Mile Island, TMI, has further accelerated public opposition to nuclear power. Immediately following the TMI accident, support in the USA decreased, uncertainty about taking a stand on nuclear power decreased, and opposition to nuclear power increased. Although there has been some rebound towards pre-TMI levels of support and opposition, the return has not been complete. Recent figures show that the percentage of the USA public that supports the continued building of nuclear power plants in the United States is, on average, 10% more than the percentage of the public that opposes such construction. This small majority is composed of a strong majority of men and a minority of women. Furthermore, a majority of the public believes that more such accidents are likely to happen.[1] Finally, a large majority of the public, about 80%, is now concerned about waste management issues.[2]

The above trends are also apparent in Western Europe. Recent referenda in Switzerland, Sweden and Austria were all decided by very narrow margins. Public opinion in the Netherlands has shown an anti-nuclear-power majority since the late 1970s. Opinion poll data for the United Kingdom show a steady increase in public opposition to nuclear energy since the mid-1970s. Whereas in 1980 there was hardly any difference between the number of opponents and supporters of nuclear energy, a National Opinion Poll survey conducted in October 1981 showed that 33% of the public was in favour of expanding the number of nuclear power stations in the UK, while 53% were opposed.

Results of public opinion surveys in both the US and Europe show that people are less willing to approve construction of a new reactor close to their community than they are to approve the construction of these energy facilities in general. Support for local nuclear power plants has been in decline since the mid-1970s. In the USA support decreased from 47% in 1977 to 28% in 1980.[1] Our own surveys[3] in three small communities in the Southwest of England, confronted with the possible construction of a nuclear power station in their locality, also showed a considerable majority - 75% - opposing the plans.

These changes in public awareness and involvement have led to the recognition that the future of nuclear energy will not only depend on technical and

economic factors, but that public acceptability of nuclear energy will play an important role in future energy decisions. The increase in public opposition has resulted in the entrance of 'the public' into the once-exclusive domain of energy policy-making. An important component of public concern over nuclear energy is the public's perception of risks. Recognition of this led to the emergence of risk research with the aim of helping to formulate policy decisions on risk regulation and the acceptability of risk-bearing technologies.

Risk perception

Although expert assessment of the risks of nuclear energy indicate that these are no greater than the risks associated with other generally accepted technologies - and, indeed, they may be less - the public distrust of nuclear energy is substantial. Opinion polls consistently report qualms about the release of radioactivity, potential catastrophic accidents, and the disposal of nuclear waste. Both safety and possible adverse environmental impact are seen as major risks of nuclear energy. A variety of concerns underlie these safety fears. Reactor operation risks, fear of explosions, and waste disposal questions dominate public concern over nuclear energy.

The reasons for this are not well understood, but it is clear that the lay public defines risks in much broader terms than the expert. Early research aimed to discover the basis of the public's distrust given the extremely low probability of serious accidents and the then unknown consequences of routine emission to health and the environment. The experts' risk assessment was regarded as objective and quantifiable, and public fears were interpreted as biased and irrational.

Public disagreement among scientists over the risks of nuclear energy led to the realisation that even the experts' assessments are less objective than previously assumed. As a consequence, more attention was paid to the study of how people think about risks. A number of studies have revealed that nuclear power, as compared with other technologies, elicits an extraordinary level of concern, particularly because of the characteristics of the hazards that it poses.[4,5] Most prominent among these are the catastrophic and involuntary nature of the possible hazard, and the fact that is is an unknown hazard. Compared to other technologies, nuclear energy emerges as the most extreme in terms of the size and seriousness of a potential accident.

The public's concept of risk therefore, seems to be heavily influenced by the characteristics and seriousness of the possible negative consequences of nuclear energy. These factors play a more important role than the assumed probability of the possible negative consequences. In other words, the difference between a probability of one in ten thousand and one in a million seems relatively meaningless to the general public.

However, the concept of risk does not embrace all the relevant terms of public acceptance. The public's perceptions of risks are built on values, attitudes and sets of attributes which need not be similar to the representations of risk experts and policy-makers. Research on public attitudes should result in a better understanding of the factors that determine overall acceptability of nuclear energy.

Beliefs and Values

Attempts to analyse the structure of people's attitudes towards nuclear energy are usually based on expectancy-value models of attitude formation, which basically assume that the more a person believes the attitude-object has good, rather than bad, attributes or consequences, the more favourable his or her attitude tends to be. In other words, people's attitudes are assumed to be a function of their beliefs about the attributes and possible consequences of using nuclear energy. Results of this work pointed at a number of dimensions underlying the way people think about nuclear energy.[6] These dimensions can be summarised as follows:

- Beliefs about the economic benefits of nuclear power
- Beliefs about environmental and physical hazards due to routine low-level radiation, and possible accidents

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- Beliefs about the sociopolitical implications of nuclear power - for example restrictions on civil liberties
- Beliefs about psychological risks, such as fear and stress

Our own research showed that opponents and proponents of nuclear energy have very different views on the possible consequences of nuclear energy. In a study conducted in 1978 we found that opponents of the expansion of the nuclear industry did not think that development of the industry would strengthen the UK economy or the UK's ability to meet future energy demands, while those in favour of nuclear energy thought both consequences to be quite probable.[7] Furthermore, opponents thought that a further expansion of nuclear industry would increase the risk of nuclear terrorism, the risk of a serious nuclear accident, the risk of further proliferation of military nuclear capability, and the risk of restrictions on individual civil liberties in the UK. Supporters of the expansion of the nuclear industry did not share these beliefs.

We also considered which possible consequences were chosen as being important by the supporters and opponents of nuclear energy. Results showed striking differences between the two groups, supporters most frequently choosing the strength of the UK economy and the UK's ability to meet future energy demands, and the opponents choosing restrictions on civil liberties and the risk of nuclear terrorism. Finally, the two groups showed remarkable differences in their perception of which factors they felt contributed most to the overall quality of life. The factor most frequently chosen by the supporters was 'advances in technology', whereas 'decreased emphasis on materialistic values' and 'conservation of the natural environment' were chosen by all the respondents opposed to the expansion of the nuclear energy programme. The above findings were obtained in a study on mostly professional people with relatively active interest in the issue, attending a one-day workshop on *The Great Nuclear Debate*. A recent study conducted in the Netherlands on a more general sample of the public ($n = 638$) confirmed these results.[8] It seems, therefore, that individuals approach the issue of nuclear energy in terms of various potential positive and negative consequences. Furthermore, individuals with opposing attitudes tend to see different aspects of the issue as salient and hence will disagree not only over the likelihood of the various consequences but also over their importance. In other words, each group has its own reasons for holding a particular attitude: the supporters see the potential economic benefits as most important, while the opponents attach greater value to environmental and public health aspects.

Results concerning the perception of the importance of more general social issues were in line with the above findings, the major difference between the two attitude groups being that the supporters attached more importance to economic issues and defence spending, while the opponents stressed the importance of the conservation of the natural environment.[8] These results clearly indicate that differences in attitude towards nuclear energy are embedded in a wider context of attitudes towards more general social issues. Public thinking on nuclear energy is not simply a matter of perception of risks but is also related to more generic issues, such as the value of economic growth, high technology and centralisation. It seems impossible, therefore, to detach the issue of nuclear energy from questions of the kind of society in which one wants to live.

What Next?

Public attitudes are relatively stable and are embedded in a wider context of values and attitudes towards more general issues. As a consequence, large-scale attitude conversion is more difficult than is often assumed. However, major dramatic events have been shown to influence nuclear-related beliefs and attitudes, especially of those who have not committed themselves strongly to one of the two sides in the debate. With regard to safety-related aspects of public acceptance of nuclear power, it seems much easier for attitudes to become suddenly more anti-nuclear because of a major accident or a series of smaller accidents - as for example the leaks from the Windscale reprocessing plant in the UK in 1984 - than it would be for nuclear attitudes to become more pro-nuclear as a long-term result of an extended period of safe operations. Sudden changes in a pro-nuclear direction are more likely to result from events related to energy supply, such as, a substantial increase in the price of oil.

Since safety-related issues play a crucial role in public acceptance of this technology, it seems necessary to improve relations between the expert and the lay public. For the lay public this poses an important challenge: to be better informed and to be aware of the qualitative aspects that strongly affect the perception of risks. For experts it seems necessary to recognise the limitations and fallibility of risk assessments. Furthermore, awareness of the fact that important qualitative aspects of risks influence the responses of lay people might improve relations with the public. However, it is also clear that the risk concept in itself is not sufficient to explain public reactions. Risk perception is not the only issue, and probably not even the most important one. Public reaction is also related to more general beliefs and values, and the issue of nuclear energy is firmly embedded in a much wider moral and political domain.

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