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Nuclear power and the public

M. V. Ramana

Abstract

Opinion polls show that public support for nuclear power has declined since the Fukushima crisis began, not only in Japan but also in other nations around the world. People oppose nuclear power for a variety of reasons, but the predominant concern is the perception that it is a risky technology. Some communities that are closely associated with it even suffer from stigmatization. The nuclear industry has tried a variety of strategies to break down public resistance to nuclear power—including information campaigns, risk comparisons, and efforts to promote nuclear power as a solution to climate change. None of these strategies has worked well, mostly because the public lacks trust in the nuclear industry. Public resistance to nuclear power is likely to continue, making it difficult to site and build new reactors. This resistance may be a major obstacle to the rapid expansion of nuclear power.

Keywords

climate change, dread, NIMBY, nuclear power, public opposition, risk, stigma

On April 10 of this year, nearly a month after a disastrous earthquake and tsunami struck Japan, thousands of protesters took to the streets of Tokyo, calling for an end to nuclear power. In the city's Koenji neighborhood, a large group of mostly younger protesters, many in costume, chanted and banged drums. In Shiba Park, an older and more sober group demanded the closure of the Hamaoka nuclear power plant, located near a fault line about 200 kilometers (125 miles) southwest of Tokyo.[1]

These public protests are symptomatic of a general decline in public support for nuclear power in Japan, a country that derived about 30 percent of its electricity from nuclear power in 2010. Recent polls have suggested that somewhere between 41 and 54 percent of Japanese support scrapping, or reducing the numbers of, nuclear power plants (Kyodo News, 2011; Wallace, 2011; Yamada, 2011). By comparison, a 2005 poll conducted by the International Atomic Energy Agency found that 82 percent of Japanese favored building more plants or maintaining existing ones (GlobeScan, 2005). Partly in response to the recent growing opposition, on May 6, Japanese Prime Minister Naoto Kan instructed the operator of Hamaoka to shut down all three reactors

there. Four days later, Kan called for a new energy policy with less reliance on nuclear power.

Japan is by no means alone. Around the world, nuclear energy has declined in popularity. In the United States, for example, a *Washington Post*-ABC poll conducted in April 2011 found that 64 percent of Americans opposed the construction of new reactors (Craighill and Cohen, 2011). Another poll, conducted by CBS News in March 2011, soon after the Fukushima crisis began, found that only 43 percent of those polled would approve of building new reactors, down from a 57 percent approval rating in 2008 (Cooper and Sussman, 2011). Support for nuclear power was similar or lower in countries as varied as Chile (12 percent), Thailand (16.6 percent), Australia (34 percent), and the United Kingdom (35 percent) (Fowler, 2011; Green, 2011; van der Zee, 2011). Even in France, which relies on nuclear power for about three-quarters of its electricity, one poll found that a majority (57 percent) were in favor of abandoning nuclear energy (Buffery, 2011).

These approval ratings are not strictly comparable because the polls were conducted by different agencies, asking different questions and providing different kinds of information prior to asking the questions.[2] Nevertheless, there is little doubt among those who study public opinion on nuclear power that, by and large, it does not command much support.

Nuclear power wasn't always so unpopular. For example, in the United States in 1977, when CBS News conducted its first poll on nuclear power, 69 percent of those surveyed expressed support for building more nuclear plants. Just two years later, after the Three Mile Island accident, public support had plummeted to 46 percent, and it dropped further to 34 percent after the 1986 Chernobyl accident. Since the 1980s, a majority of the US population has consistently opposed the construction of new nuclear reactors (Rosa and Dunlap, 1994; Bolsen and Cook, 2008). Not coincidentally, there has been practically no nuclear construction in the United States since Three Mile Island.

The public perceives nuclear power as a very risky technology. In some cases, association with nuclear facilities is even subject to stigma. The nuclear industry has tried a variety of strategies to break down public resistance to nuclear power, but they haven't worked well. With growing public concern about global warming, the industry is experimenting with a new strategy—playing up the climate mitigation potential of nuclear power. While this has increased the benefit side of the equation for nuclear power, it hasn't decreased the risk perception associated with the technology, and nuclear power remains a reluctant choice at best. Renewable energy technologies offer the same benefits, making it unlikely that a large-scale "nuclear renaissance" will materialize.

A dreaded technology

What explains public opposition to nuclear power? Proponents of nuclear power often dismiss opposition as a "not in my backyard" (NIMBY) phenomenon. There is some evidence for this assertion: In polls, people typically express less opposition to nuclear power in general than to a nuclear plant that would be constructed in their own vicinity. But this is only part of the story—the

majority of those opposing a project are opposed regardless of whether the project is to be located in their vicinity or not. Therefore, the NIMBY phenomenon does not really explain opposition to nuclear power.

A more fundamental reason that the term NIMBY is inappropriate is that it overlooks the ethical objections that many people have to a variety of hazardous facilities—including waste incinerators, oil refineries, and chemical plants, as well as nuclear power plants. Opposition to these facilities arises not only from a desire to avoid personal harm but also from the feeling that no community should be subjected to the risks that come with such facilities. Many researchers have suggested that the term NIMBY be avoided, if not entirely discarded (Burningham, 2000; Freudenburg and Pastor, 1992; Heiman, 1990; Kraft and Clary, 1991; Wolsink, 2006).

The question, then, is why so many people see nuclear facilities as unacceptable, not just in their own backyard but in anyone's backyard. The public is not homogeneous, and different individuals oppose nuclear power for different reasons.[3] But for the majority, opposition to nuclear power seems to be tied to perceptions of the risk of nuclear accidents, concerns about the disposal of nuclear waste, and low levels of trust in the nuclear establishment (Whitfield et al., 2009).

Of particular importance is the public's perception that nuclear power is a risky technology. To someone who evaluates risk using metrics such as the number of major accidents, or the number of deaths on a day-to-day basis, this might seem inexplicable. But studies of risk perception have revealed that most people have a much more comprehensive conception of risk that is based on characteristics such as the familiarity of the hazard; whether exposure to the hazard is undertaken voluntarily; features of the technology such as the magnitude of accidents it could potentially give rise to; inequities in risks and benefits; and the long-term implications of exposure to the hazard (Slovic et al., 1982).

For decades now, psychometric studies based on detailed opinion surveys have examined how nuclear power fares in the public mind. Paul Slovic, a leading practitioner of this methodology and a pioneer in studying risk perception, has summarized the results of this research: "nuclear power had the dubious distinction of scoring at or near the extreme negative end for most of the [above-mentioned] characteristics. Its risks were seen as involuntary, unknown to those exposed or to science, uncontrollable, unfamiliar, catastrophic, severe (fatal), and dreaded.... These results have since been replicated with many different populations in numerous countries" (Slovic, 1994). Given these problematic perceptions of nuclear power, opposition to nuclear facilities is not surprising.

Severe stigma

Studies also find that some aspects of the technology, especially those involving radiation, are "subject to severe stigmatization," where the term stigma is used to denote "something that is to be shunned or avoided not just because it is dangerous but because it overturns or destroys a positive condition" (Gregory et al., 1995). In stigmatized communities, what may be more dreadful to residents is not the direct experience of risk but rather the experience of how they are

viewed by others (Gregory and Satterfield, 2002).

A current example is how people from Fukushima are treated: Some people who have left the area since the disaster have been turned away from hotels, and their children have been called "baikin" (vermin) and have been bullied (McNeill, 2011). One young woman was reported as saying, "As a single woman . . . I'm worried about groundless rumors that women from Fukushima should not be chosen as wives" (Ito, 2011).

The stigmatization even extends to vegetables. Cucumbers from the Fukushima region had enjoyed a favorable "brand image" for decades. Now, even vegetables grown in areas that are not subject to government bans are not saleable. Many farmers have reportedly not even bothered planting a cucumber crop this season (Ito, 2011).

Such stigmatized perceptions of produce from areas near nuclear power plants are not confined to Fukushima or Chernobyl. People who live near the Kalpakkam nuclear facility in India reportedly never buy fish caught from the sea near the facility; local fishermen are forced to travel about 80 kilometers (50 miles) to sell their catch in the city of Chennai, taking advantage of urban anonymity (Chugoku Newspaper, 1992; Shivakumar, 2008). Whether or not the fish are indeed contaminated, the perception that they are unsafe to eat has very real impacts on the livelihoods of local people.

Nuclear waste disposal facilities can also stigmatize a community. During the years when the United States was considering Nevada's Yucca Mountain as a disposal site for high-level radioactive waste, nationwide surveys showed that a majority of people felt that a repository would reduce the desirability of Nevada as a state to move to, and could deter them from visiting for a vacation or a convention (Flynn and Slovic, 1995). Thus, regardless of whether there would be any harm to the health of the people of Nevada, they would suffer real economic damage from having a repository in their state.

Information or propaganda?

Faced with public antipathy, the nuclear industry has tried a variety of strategies to persuade the public to accept nuclear power. None of these have been very successful. One of the most common strategies is to publish numerous "fact sheets" that discuss issues of public concern. For example, Unistar Nuclear Energy, which seeks to build new nuclear reactors in the United States, has published Issue Briefs on its website with titles such as "Nuclear Energy Facilities: Safe and Secure," "Ionizing Radiation and Public Health," and even one claiming that "Strong Public Support of Nuclear Energy Continues its Positive Trend" (Unistar, 2011).

A constant theme in such publications is that risk from nuclear power is low in quantitative terms. Unistar's Issue Brief on radiation, for example, has a highlighted box informing the reader: "Compared to your risk of dying from cancer caused by living near a nuclear generating facility, you are 630,000 times more likely to die from an auto accident . . . 50,000 times more likely to die from drowning . . . 450 times more likely to die from overexertion," and so on (UniStar, 2011). The implicit assumption is that since most people do not shy away from buying an automobile or

working hard on occasion, they should not be wary of Unistar's proposed nuclear reactors. Such comparisons, however, do not address the many qualities that people believe to be important to an evaluation of risk, such as familiarity and control. For example, most people are familiar with the risks of driving and can substantially control their own chances of dying in an auto accident.[4] Simplistic numerical risk comparisons, therefore, are not entirely appropriate and are more likely to produce anger than enlightenment (Slovic, 1996). Indeed, many members of the public see the information provided by the nuclear industry as propaganda.

The implicit assumption behind many efforts to provide "factual information" about nuclear power is that public opposition results from ignorance, often termed the knowledge-deficit model. Although this assumption is widely asserted, evidence for it is weak, and several studies have found no significant relationship between levels of knowledge about nuclear issues and support for nuclear power (OTA, 1984). This is true not just of nuclear power. In a wide variety of arenas, it has been observed that local resistance is often greatest where education levels and access to information are highest, and many project opponents are well-armed with facts and figures (Heiman, 1990).

The importance of trust

A number of studies have found that knowledge is a less important factor than trust in determining people's attitudes toward nuclear power. For example, two psychologists at the California Polytechnic State University who studied how students at the university felt about the nearby Diablo Canyon nuclear power plant found no significant relationship between the students' nuclear power knowledge and their attitudes or behavior (Levi and Holder, 1988). However, the psychologists found that "those who supported nuclear energy expressed more trust in the credibility of information received from government and industry officials and were more trusting that the officials would protect the public" (Levi and Holder, 1988: 445).

Distrust of the social institutions that manage nuclear energy is widespread. A 2001 survey by the European Commission, for example, found that only 10.1 percent of Europeans trusted the nuclear industry (EC, 2002). In another survey, 68 percent of Americans disagreed with this statement: "The US Department of Energy can be trusted to provide prompt and full disclosure of any accidents or serious problems with their nuclear-waste management programs" (Slovic et al., 1991). Even when it comes to local government officials, 62 percent of Americans surveyed in one poll were unlikely to trust the opinion of a local government official (Johnson and Scicchitano, 2000).[5]

There are many reasons for this absence of trust. In the case of nuclear waste disposal at the Yucca Mountain site, for example, the reasons included a site selection process that was perceived as unfair, attempts to coerce the state of Nevada, manipulation of regulatory criteria to make them fit the chosen site, and treating the public as if its concerns were irrational (Tuler and Kasperson, 2010).

The major challenge for the nuclear industry today is regaining trust. Once lost, trust is extremely difficult to

regain—a characteristic that has been termed the "asymmetry principle" (Slovic, 1993). This can be seen even in everyday life: Just because someone acts in a trustworthy manner today, there is no reason to believe that he or she will always do so. However, if a person has betrayed someone even once, there is clear proof that this person can (at least in some circumstances) be untrustworthy (Poortinga and Pidgeon, 2004). It would likely take a long time for this person to re-establish her or his trustworthiness.

Unfortunately for the nuclear industry, distrust is periodically reinforced by evidence of safety violations by nuclear companies, or of ineffectiveness or corruption on the part of regulatory authorities. After the Fukushima crisis began, for example, newspapers reminded readers that the Tokyo Electric Power Company had continued to operate the Daiichi plant for two years after a safety inspector discovered in 2000 that a piece of equipment had become cracked (Onishi and Belson, 2011). Worse, the regulatory authorities knew about the safety issue but did not force the company to shut down the plant and fix the problem.

In the United States, the Nuclear Regulatory Commission responded to the Fukushima accidents by assuring members of the public that US reactors were safe. "US nuclear power plants are built to withstand environmental hazards, including earthquakes and tsunamis," said a statement released by the Commission on March 12 (NRC, 2011). But subsequent checks at all 104 nuclear reactors in the country revealed that, at a significant number of those reactors, there were problems that would have made some emergency equipment unusable in the event of an accident (Wald, 2011). This discrepancy between reassuring statements and reality does not make for greater trust.

Lack of trust will also likely render unsuccessful the attempts by nuclear proponents to regain public support by offering newer reactor designs that are claimed to be safer. Examples are designs that incorporate passive safety, and Small Modular Reactors.[6] While these reactor designs are intended to inspire trust, they may have an unintended effect: creating distrust of older reactors that lack the touted safety features.

More fundamentally, the general public cannot be expected to evaluate detailed technical designs and convince themselves that these designs are accident-proof. To the contrary, the public can only decide that the newer designs are safe by trusting "expert" opinions. In a number of cases, however, accidents and safety violations have occurred at reactors deemed safe by "experts." Under such circumstances, there is little reason for the general public to trust statements about safety.

Climate change

The urgent need to reduce carbon dioxide emissions and prevent drastic climate change is possibly the most important argument for expanding nuclear power today. Proponents of nuclear power hope that it can be rebranded as a solution to climate change and thereby gain legitimacy (Stoett, 2003). The empirical evidence from a number of public opinion surveys, however, is that concern about climate change has at best a modest impact on public support for building new nuclear power plants. A survey by Accenture

Corporation in 2009 asked: "What actions should be considered to reduce your country's reliance on fossil-fueled power generation (i.e. coal, oil or gas generated power)?" Of those who responded, only 9 percent called for an increase in nuclear power alone, while 34 percent called for increases in both renewable energy and nuclear power. By contrast, 57 percent called for an increase only in renewable energy, without expanding nuclear power.

Such a predilection for renewable energy has been demonstrated in a wide variety of polls. Several US polls from 2003 to 2008 showed that the public had a clear preference for renewable sources of energy and major reservations about coal and nuclear fuel to generate electricity (Greenberg, 2009). In the United Kingdom—after a sustained campaign by the government, the nuclear industry, and major scientific leaders and professional societies to reframe nuclear power as necessary to reduce carbon emissions—one study, which used a survey and focus groups to evaluate the impact of this attempt, found "reluctant acceptance" at best (Bickerstaff et al., 2008; Pidgeon et al., 2008). The researchers found that people were concerned about climate change, but radioactive waste trumped climate change in dread. There was also great mistrust of the competence of the nuclear-power establishment and the government to manage nuclear power safely. Again, renewable energy came out looking much better than nuclear power.

Conclusion

In 1976, Alvin Weinberg, former director of the Oak Ridge National Laboratory, observed: "The public perception and acceptance of nuclear energy… has emerged as the most critical question concerning the future of nuclear energy" (Weinberg, 1976: 19). This question continues to dog nuclear power, making the technology a problematic choice for electricity generation. The Fukushima accidents reinforce the public's concern about the potential for severe accidents and long-lasting harm to health and the environment. The ongoing revelations about unreported safety problems in Japan, the United States, and other countries offer proof that the nuclear industry and the regulatory authorities cannot be trusted when it comes to assertions of safety. As a result, public opposition to nuclear power is unlikely to disappear anytime soon. If democracy is to be respected, it would take a miracle to effect a "nuclear renaissance."

Notes

1. Short video clips can be seen on YouTube at http://www.youtube.com/watch?v=4biDo_oSoXM and http://www.youtube.com/watch?v=tZW7MoCIbRM.
2. For example, a poll that begins with a reference to the Fukushima disaster would find lower levels of support for nuclear power than a poll that begins by informing participants that nuclear power has no greenhouse gas emissions.
3. There are also striking differences in public preferences when categorized by age, ethnicity, race, gender, and other demographic characteristics (Greenberg, 2009). A widely observed phenomenon is the "white male effect," that is, a preference for nuclear power among educated and relatively affluent white males in part because they tend to have greater levels of trust in authority.

4. Wearing a seat belt, for example, reduces the chances of fatal accidents significantly. In contrast, those living in the vicinity of the Chernobyl reactor had no control over the accident that occurred in 1986.
5. In contrast, about 50 percent of the people were unlikely to trust a university scientist on nuclear power.
6. Passive safety features are those based on natural forces such as convection and gravity, rather than on active systems and components such as pumps and valves.

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Author biography

M. V. Ramana is currently appointed jointly with the Nuclear Futures Laboratory and the Program on Science and Global Security, both at Princeton University, and works on the future of nuclear energy in the context of climate change and nuclear disarmament. He is the author of *The Power of Promise: Examining Nuclear Energy in India*, to be published later this year by Penguin. Ramana is a member of the International Panel on Fissile Materials and the *Bulletin*'s Science and Security Board.