



Why have some people changed their attitudes toward nuclear power after the accident in Fukushima?



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HIGHLIGHTS

- Changes in benefit perception after the Fukushima accident strongly influenced acceptance of nuclear power.
- Proponents changed into opponents of nuclear power when they perceived fewer benefits.
- Proponents did not change into opponents of nuclear power due to higher risk perceptions.

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ABSTRACT

The nuclear accident in Fukushima and the subsequent discussions about nuclear power influenced public acceptance of this technology. The aim of the present study was to examine why after the Fukushima accident some people converted from supporting nuclear power to opposing it or became undecided. Data from a longitudinal telephone survey with two measurement points were used. The first survey was conducted about 15 months before the accident in Fukushima and the second survey was conducted about 20 months after. The sample consisted of 561 respondents from the German- and French-speaking regions of Switzerland. Results suggest that changes in benefits perception were mainly responsible for people's changes in attitude toward nuclear power. People perceived somewhat more risks related to nuclear power after the accident in Fukushima. This change in risk perception did not explain the attitudinal changes of proponents into opponents of nuclear power, however.

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1. Introduction

The accident at the Fukushima Daiichi nuclear power plant in Japan, which happened March 11, 2011, affected the public acceptance of nuclear power. Various studies have shown that the public in most countries perceived somewhat more risks and fewer benefits of nuclear power after the accident (Kim et al., 2013; Siegrist and Visschers, 2013; Visschers and Siegrist, 2013). Results of these studies suggest that the accident in Fukushima had only a limited effect on public perception and acceptance of nuclear power. Nevertheless, some people have changed their attitudes toward nuclear power after the accident. The question why they changed their attitudes is difficult to answer based on the existing literature. In the present article, we present data from a longitudinal telephone survey in which we examined why some proponents of nuclear power became opponents of this technology or undecided in the aftermath of the Fukushima accident.

1.1. Factors influencing acceptance of nuclear power

Acceptance of a new technology is strongly driven by the perceived benefits and perceived risks (Siegrist, 2000, 2008). Results of many studies suggest that perceived benefits are more important than perceived risks for explaining the acceptance of a technology. Studies examining the acceptance of nuclear power also suggest that economic benefits are the main reason proponents support nuclear power (Visschers et al., 2011). Opponents of the technology value the economic benefits of this technology much less, and, therefore, are not willing to accept the risks associated with it (Eiser and Van der Pligt, 1979). In a study conducted in Switzerland, the influence of perceived benefits and perceived risk on acceptance of nuclear power was examined (Visschers et al., 2011). Results suggest that the economic benefit perception (i.e., secure energy supply) is an important driver for acceptance compared with risk perception. Nuclear power does not emit CO₂ when producing electricity; this is another benefit. Recent research suggests, however, that climate change concerns have had only a limited impact on acceptance of nuclear power plants (Corner et al., 2011; Visschers et al., 2011). If nuclear power

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was framed as contributing to climate change mitigation, then acceptance of the technology increased a bit, but even then, the impact was small (Pidgeon et al., 2008).

Assessing the non-tangible benefits and risks of new technologies requires knowledge most laypeople lack. To assess risks and benefits, participants may rely on social trust (Siegrist and Cvetkovich, 2000) or affective information (Finucane et al., 2000). According to the affect heuristic images associated with, and the associations evoked by, nuclear power determine people's perception of this technology (Finucane et al., 2000; Slovic et al., 2004). Several studies found strong associations between people's perception and the affect evoked by a nuclear power plant (Dohle et al., 2010; Keller et al., 2012; Siegrist et al., 2006). Opponents and proponents of nuclear power differ not only in the affect evoked by this technology but also in the concrete images and associations (Keller et al., 2012). Results of this study indicated that risk and dread are more often expressed by people who oppose replacing nuclear power plants than by people who are in favor of nuclear power plants. People who support the replacement of nuclear power plants often associate nuclear power plants with neutral and positive concepts such as energy, and to a smaller extent, with necessity. Furthermore, people in favor of replacing nuclear power plants perceive nuclear power plants as a viable and safe technology that ensures the future energy supply.

In other studies, not affect but trust was used to explain the risk and benefit perceptions of technologies (Siegrist et al., 2000). These studies suggest that people who trust the industry and government agencies perceive more benefits and fewer risks associated with a technology. Few studies have examined simultaneously the influence of affect and trust on perception of nuclear power (Visschers et al., 2011). Results of this latter study suggest that trust was more important for explaining the risk perception of nuclear power and affect was more important for explaining the benefit perceptions of nuclear power.

Power is produced by various technologies in different countries. The available alternatives to nuclear power influence people's perception and acceptance of this technology, of course (Kim et al., 2013). Discussions about renewable power generation may result in a more positive perception of these new technologies and in a more negative perception of nuclear power, and coal-produced power, for example. Support for these thoughts comes from an U.S. study that showed residents wanted more reliance on solar, wind, and hydroelectric energy sources (Greenberg, 2009). About half of the respondents favored a decrease in electricity produced by nuclear power, and the other half of the respondents were in favor of the status quo or an increase in nuclear power production. Public discussions about energy systems shape acceptance of specific power technologies.

1.2. Studies examining attitudes before and after a nuclear accident

Compared with other hazards, nuclear power is perceived as a dreadful and unknown risk (Slovic, 1987). For accidents in nuclear power plants, therefore, social amplification effects are often observed (Kasperson et al., 1988). Accidents in nuclear power plants have a larger societal impact compared with other accidents that cause a similar level of harm. Therefore, it is not surprising that immediately after the accident at Chernobyl, people had more negative attitudes toward nuclear power, and perceived more risks compared to before the accident (Renn, 1990). The more a country or region was affected by fallout caused by the accident, the stronger the attitudinal change (Drottz-Sjöberg and Sjöberg, 1990; Renn, 1990). However, the accident had only short-term effects (i.e., after the event, opposition toward nuclear power decreased again) (Renn, 1990; Verplanken, 1989).

Most of the studies that examined the impact of a nuclear accident on people's attitudes and risk perceptions used cross-sectional data. Cross-sectional studies provide only limited information about changes in risk perception, however. Even if the percentage of people who are in favor of nuclear power has not changed after a nuclear power accident, this does not necessarily imply that individuals have not changed their attitudes. It cannot be ruled out that people interpreted the accident in different ways. For some people, the accident in Fukushima may have shown that even after a severe accident, the hazard had only a limited impact. People against nuclear power may, therefore, have turned into proponents of the technology. The reverse change may also be possible of course. Some people may have perceived the accident as a sign that severe accidents involving the technology cannot be ruled out, and therefore, these people may have changed from proponents into opponents of nuclear power. Only longitudinal studies help examine which factors cause people's changes in accepting nuclear power. Despite the clear disadvantages of cross-sectional studies, only a few longitudinal studies have examined the stability of attitudes toward nuclear power within individuals (Eiser et al., 1990; Lindell and Perry, 1990; Midden and Verplanken, 1990; Siegrist and Visschers, 2013; Verplanken, 1989; Visschers and Siegrist, 2013).

A longitudinal study conducted in the UK showed that after the accident in Chernobyl, the opposition to existing and planned nuclear power plants increased (Eiser et al., 1989). No such effect was observed for new chemical plants or oil wells, however. In a Dutch study, data collected before and after the Chernobyl accident were used to compare within-subject analysis and between-subject analysis of attitudes toward nuclear power (Midden and Verplanken, 1990). Results of this study suggest that attitudes toward nuclear power are much less stable over time than one would expect based on cross-sectional study designs. Correlations between pre-Chernobyl and post-Chernobyl measures were reported in only one study (Lindell and Perry, 1990). All of the correlation coefficients were below .05. This suggests that attitudes toward and perceptions of nuclear power measured before and after an accident may be only moderately correlated.

In a Swiss longitudinal study, several mail surveys in the German-speaking region of Switzerland were conducted (Siegrist and Visschers, 2013; Visschers and Siegrist, 2013). The first survey took place before the accident in Fukushima (Autumn 2010), the second survey immediately after the accident (March 2011), and the third survey half a year after the accident (October 2011). Results of this study suggest that the accident in Fukushima had a negative impact on the acceptance of nuclear power in Switzerland (Siegrist and Visschers, 2013). The overall changes were relatively modest, however, and high correlations between attitudes before and after the Fukushima accident were observed. Results of this study suggest that participants had stable attitudes toward nuclear power across the three measurement waves. The interpretation of the accident in Fukushima and its implications for the energy system in Switzerland were strongly influenced by people's pre-Fukushima attitudes toward nuclear power. Acceptance of nuclear power was strongly influenced by perceived benefits and perceived risks, before and after the accident in Fukushima (Visschers and Siegrist, 2013). Trust was a good predictor of perceived benefits and perceived risks, before and after Fukushima. Furthermore, people's trust in the nuclear power industry and the regulatory bodies before Fukushima strongly influenced the level of trust after the accident. Results suggest that the nuclear accident in Fukushima did not change the determinants of acceptance of nuclear power. Even after a severe accident, perceived benefits are the main driver for acceptance of nuclear power, and trust strongly influences risk and benefit perception.

In a recent study, public attitudes toward nuclear power in Britain and Japan before and after the Fukushima accident were

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