Energy Policy 104 (2017) 134–143

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Close or renew? Factors affecting local community support for rebuilding nuclear power plants in the Czech Republic

Bohumil Frantál*, Jiří Malý

Department of Environmental Geography, Institute of Geonics, The Czech Academy of Sciences, Brno, Czech Republic

ARTICLE INFO

Keywords:
Nuclear power plants
Rebuilding
Community acceptance
Nuclear risk perceptions
Czech Republic

ABSTRACT

Rebuilding and upgrading of existing nuclear power plants represent a great energy policy challenge today. In this paper, factors that affect local community support for the rebuilding of an existing nuclear power plant are explored using a regression analysis model. It is based on a survey involving nearly 600 residents of twelve municipalities located in the vicinity of the Dukovany power plant in the Czech Republic. Nearly two thirds of local population support the rebuilding of the plant. The support for rebuilding is not directly affected by distance of residence from the power plant or perceptions of its local economic impacts, but is more influenced by general perceptions of pros of nuclear power. Work in the power plant, perception of nuclear power as a clean energy contributing to climate change mitigation and negative attitude to the renewable energy development are strongest predictors of the support. In terms of energy policy implications, it seems that the education of the public and awareness of nuclear power plants as a clean, safe and landscape compatible system of energy production are more important for increasing acceptance of rebuilding projects than spatial distribution of economic benefits to local communities.

1. Introduction

In recent years we have been facing a distinct energy transition (Bridge et al., 2013). Reaping the benefits of renewable sources has become a global ambition for several reasons, ranging from concerns about climate change and energy security to the dangers of the atom. Following the nuclear meltdown in Fukushima Daiichi in 2011, some countries (e.g., Germany or Switzerland) decided to phase-out their nuclear power plants. In other countries, such as the Czech Republic, however, governments plan to further develop their nuclear programmes, regardless of the rising costs and doubts (Cooper, 2010; Černoch and Zapletalová, 2015).

The issue of rebuilding and upgrading of existing nuclear power plants represents a big energy policy challenge and substantial potential for the renaissance and further development of the nuclear energy sector. For example, the average age of reactors in the US is 35 years and many are coming to the end of their licensing period (EIA, 2016). The socioeconomic aspects of rebuilding have been, however, relatively neglected in academic research, although it is not anticipated that rebuilding programmes will be unconditionally accepted by host communities.

While politicians usually support their pro-nuclear arguments through surveys of general public opinion, complex studies focusing on the perceptions of impacts of existing power plants by host communities and their acceptance of rebuilding projects are scarce (Visschers and Siegrist, 2012). The attitude of communities living near nuclear power plants is considered a key factor in nuclear policy decision making in Japan (Kato et al., 2013), also due to the fact that some recent studies found that perceived impacts of nuclear power plants on the economic welfare and life quality of host communities have not always been positive (Yamane et al., 2011; Těšitel et al., 2005).

In this paper, factors that affect local community support for the decision to rebuild and upgrade existing nuclear power plants are explored and classified using a regression analysis model. The analyzed factors include people´s perceptions of general pros and cons of nuclear power, the assessment of specific local socioeconomic impacts of the existing power plant, attitudes to the promotion of renewable energy development, demographics, and the geographical distance of the place of residence from the power plant. The study is based on a data from the survey involving nearly 600 residents of twelve municipalities located in the vicinity of the Dukovany nuclear power plant in the Czech Republic. It is suggested that the findings of this research can offer useful insights for the future planning and design of rebuilding and upgrading programmes of nuclear power plants. Moreover, it is maybe the first study that complexly investigates the issue in the context of post-communist East-Central Europe.

* Corresponding author.
E-mail address: frantal@geonika.cz (B. Frantál).

http://dx.doi.org/10.1016/j.enpol.2017.01.048
Received 19 August 2016; Received in revised form 22 January 2017; Accepted 25 January 2017

2. Social acceptance of nuclear power plants: literature overview

The rise of nuclear technologies in the 1960s has revealed a marked discrepancy between the enthusiasm for a new, powerful, clean and safe energy shown by scientific experts and the fears of immediate disasters and unknown long-term health and environmental effects on the part of the general public (Fischhoff et al., 1983). This discrepancy has been behind the boom in research on risk perceptions (Starr, 1969; Slovic et al., 1979; Fischhoff et al., 1978, etc.), which has revealed that people perceive and accept hazardous technologies and activities less on the statistical probability of the realization of risks, than on the basis of qualitative attributes of these risks, such as novelty or familiarity, controllability, predictability and others. The qualitative aspects of risks have played a crucial role in the public's perception of nuclear energy, and reactions such as fear and anxiety seemed to be the major determinants of attitudes to the building of nuclear power plants (Van der Pligt, 1985, 1986).

The differences in the perception of risks from nuclear power, however, do not embrace all the relevant aspects of public acceptance of projects for the construction of nuclear power plants. The local acceptance of projects appears to be determined by personal values and beliefs, pragmatic (rational) assessments of the usefulness of projects for an individual and a community as well as by immediate emotions Acceptance can be motivated by different goals, including the overall evaluation of costs and benefits, moral evaluations (e.g., whether the technology has a more positive or negative effect on the environment or society), subjective feelings and previous experiences (Goodfellow et al., 2011; Visschers et al., 2011). The acceptance is also dependent on socioeconomic status, education and knowledge of energy matters (Bazile, 2012; Pampel, 2011). Apart from the perception of the technology, the acceptance is also significantly affected by the way that the technology is implemented and how the costs and benefits of projects are distributed; i.e., the factors of procedural fairness and distributional (outcome) fairness (Venables et al., 2012; Visschers and Siegrist, 2012).

Nuclear power plants have a range of socioeconomic implications for their host regions and localities. Some of them are direct through local employment on the development, others are more indirect resulting from the filtering of income and expenditure through into the local community (McGuire, 1983; Metz, 1994; Glasson, 2005). The effects on employment and tax revenues have been mentioned among the most relevant long-term benefits (Johnson and Bennett, 1979; McGuire, 1983; Horská et al., 1996). The second-order consequences of the direct economic impact may include changes in community land use policies, increase in the salience of growth issues, and alteration of both inter- and intra-community relationships (Peelle, 1976).

Perceptions and attitudes to nuclear power plants are not static but dynamic phenomena which are subject to the influence of space and time. A recent study from Japan (Yamane et al., 2011) reported that the nuclear power neighbourhoods are negatively evaluated by residents in some areas (reporting that their economic welfare has been worsened by living near nuclear power plants), whereas there are positive evaluations for other nuclear power plants at different locations. These differences proved to be affected by contextual factors such as how long the power plant has been in operation, past accidents, population density, change in employment and industrial structure, financial condition and change in social infrastructures in the area. In this sense, both the spatial and social distance significantly affect the perception of positive impacts of power plants (Frantál et al., 2016).

So called proximity hypothesis assumed that those living nearer to energy facilities are likely to have more negative attitudes in comparison to those living further away. Dear (1992:291) suggested that “the closer residents are to an unwanted facility, the more likely they are to oppose it”. Many studies (Maderthaner et al., 1978; Greenberg, 2009a, 2009b; Frantál et al., 2016) reported the opposite, however, that people living closer to existing power plants perceive them more positively than people living further away. Warren et al. (2005) found a strong positive effect of distance on the dislike for proposed wind power plants and a much weaker negative effect of distance on the dislike of existing wind turbines. Cale and Kromer (2015) reported that while geographic proximity to nuclear power plants does lead to increased levels of awareness about them, it does not appear to impact overall attitudes toward the use and perceived safety of nuclear energy. This shows that the time-space dynamics of social acceptance is a complex phenomenon and the role of geographical proximity differs largely with respect to the type of technology, the stage of development and specific local contexts and experiences.

Apart from the spatial scale, also the factor of time plays a significant role in the acceptance of energy facilities. The attitudes of local communities to nuclear power plants usually develop from very critical during the planning and construction phase to more tolerant or even positive after a certain time of operation (Těšitel et al., 2005; Frantál et al., 2016). The acceptance of existing nuclear power plants, which is constructed through the processes of familiarisation and normalization of risks co-exists with a more complex set of contradictions (Parkhill et al., 2010). Experience of having lived near a power plant can affect not only people's perceptions of costs and benefits, but also the importance they attach to various consequences (Van der Pligt et al., 1986). In contrast to familiarisation of risks, attitudes towards the nuclear technology can deteriorate due to external factors (e.g., the effect of accidents in Chernobyl and Fukushima; see Eiser et al., 1989; Siegrist and Visschers, 2013) or because the expectations concerning the distribution of costs and benefits of existing power plants have not been met.

It has been emphasized by one of the few studies concerning the nuclear power plants rebuilding (Visschers and Siegrist, 2012) that in the case of rebuilding of existing power plant, people's own personal experience, perceived economic benefits and outcome fairness are key determinants of acceptance of the decision, while procedural fairness has only a limited impact. Boholm and Löfsted (2004) stressed out that it is much easier to destroy trust than to build it, so that it would appear to be more difficult to gain acceptance of new energy projects (or rebuilding projects) if local community expectations about the distribution of benefits of previous projects have not been met. In this sense, greater attention should be paid to research of the ex-post perceptions of impacts of existing power plants, spatial and social asymmetries of these impacts, and the role of distributional fairness and other external factors in shaping the acceptance of further nuclear energy development and upgrading processes in affected localities. The contribution of this paper to the existing knowledge lies precisely in this area.

3. Geographical context of the study

The current energy policy of the Czech Republic remains highly dependent on conventional resources. Overall electricity generation is based predominantly on thermal power plants burning domestic brown coal [41%], black coal [6%], gas and other fuels [6%], nuclear power [35%], and renewable energy sources [12%] (Energostat, 2014). The State energy conception of the Czech Republic till 2040 deals with a successive decline of coal energy, an increase of energy production from nuclear power, and development of RE, particularly biomass, wind and small scale solar plants.

The Czech Republic with its two nuclear power plants (Dukovany and Temelín) generating over 30 TWh is among the top fifteen world nuclear powers. Nuclear power is expected by the current Czech government to become the main source of electricity generation with its share rising from the present 35% to between 46% and 58% in 2040 (WNA, 2015). Recently a new long-term plan for the nuclear industry was approved in order to be able to decarbonise the economy, involving building at least three new units at existing sites by 2040.