



Post-Fukushima public acceptance on resuming the nuclear power program in China



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ABSTRACT

This study investigates social perceptions, electricity preference, management instruments towards nuclear power in China, and evaluates the extent of opposing nuclear power by estimating public Willingness-To-Pay (WTP) to prevent a nuclear power plant from being constructed in their local cities and the neighboring cities. It is pretty important to understand the public sentiment towards commencement of nuclear programs, since public acceptance of nuclear energy is one of the determinants for government establishment of a new nuclear project. Especially, the Chinese government has resumed the approval of new nuclear power plants and planned to expand this industry in the post-Fukushima world. The findings show that most of the respondents care about the development of nuclear power in China. The publics are a bit skeptical about the security of nuclear power, since they are worried about nuclear accidents. In addition, the government is requested to improve policy transparency, which is seen as an essential way of alleviating the public nuclear anxieties in China.

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Contents

1. Introduction	686
2. Description of the survey	686
3. Analysis of the public attitudes	687
3.1. The brief public opinions on the nuclear power	687
3.2. Public opinions on nuclear power security	689
3.2.1. Opinions of different types of responders on the risks of nuclear power	689
3.2.2. Opinions of different types of responders on measures to improve the security of nuclear power	689
4. Discussion about the WTP	690
4.1. Methodology	690
4.2. Estimates of WTP for not constructing nuclear power plants nearby or locally	691
5. Main findings	692
5.1. Risk perception and concerns about nuclear energy	692
5.2. Degree of public opposition to nuclear power	692
5.3. Dependable regulation mechanism	692
5.4. Beliefs in electricity generation	692
6. Conclusions and policy recommendations	692
Acknowledgments	693

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Appendix	693
References	693

1. Introduction

The Chinese government announced the recommencement of nuclear power programs to reduce environmental pollution and replace coal-burning power generation after the Fukushima nuclear accident. As the choking smog which blankets most areas of the country is becoming a serious environmental problem [31], the new administration has declared to fight against the air pollution and pledged to fight it with a strong determination since March 2014. The haze is primarily caused by coal-burning power generation plants and has enveloped a large swathe of eastern and central China. The low cost of fossil energy facilitates the rapid development of China's industrial sector. However, the high energy consumption not only results in the problem of unsustainability but also makes the public suffer from the environmental disaster [22]. As a result, to mitigate the pollution threats and meet the economic targets, non-fossil resources are considered as the major solution to meet the country's future expectation [13]. However, there are several practical constraints associated with the cost and technique for hydropower, solar energy and wind power in China [32]. Considering its notable economic and environmental advantages compared to other clean energy resources [20], the Chinese new administration has given priority to the development of nuclear power.

However, the Fukushima nuclear accident has led to serious economic, environmental and political impacts all over the world [24]. Triggered by the anxiety about nuclear accidents, anti-nuclear protests have broken out in many places, especially Fukushima where experienced Japan's worst nuclear meltdown. For instance, some anti-nuclear protesters marched on the streets in Taiwan and declared that they would hold the anti-nuclear activities every Friday to boycott the Fourth Nuclear Power Plant. Many countries have to suspend nuclear power construction and pay more attention to nuclear security management [6,9,35]. For example, some European countries such as Germany and Switzerland have accelerated the closure of nuclear power plants [33]. Global electricity generation from nuclear power has declined after the Fukushima nuclear accident, 93.8% for Japan, 29% for Germany, 4.7% for America and 0.7% for France. In contrast, only China showed an increase of about 31.8% in nuclear electricity generation compared to other countries.

In fact, considering the national conditions, nuclear power means much profounder to China than other countries. China is rich in coal resource, while the uneven distribution of coal resource makes the eastern region with huge demand for electricity highly dependent on the resource from western region. This situation not only increases energy supply cost but also poses a challenge to transportation [37]. Meanwhile, the lag of power grid construction further results in the unbalanced development among regions [36]. In addition, the current fossil fuel combustion accounts for most of carbon dioxide emissions, which has held China back on its commitment of global emission reduction targets [16]. When the cost and the environmental benefits are considered, nuclear power that can achieve the aims of sufficient energy supply and improvement of energy structure is found to be a promising alternative in China. Currently, Mainland China has 17 nuclear power reactors in operation and 30 under construction.

For a short period of suspension after the Fukushima nuclear accident, the Chinese government has resumed the approval of

constructing new nuclear power plants and planned to achieve the goal of a four-fold increase in nuclear power installed capacity to at least 58 GWe by 2020, possibly 200 GWe by 2030, and 400 GWe by 2050. China has the most ambitious nuclear expansion plan in the world and is sure to play a vital part to the future of the world's nuclear industry [15,29,33].

However, the Fukushima nuclear accident has profoundly affected the public perception of the nuclear power [4,7,24,26–28]. Since the radiation would increase the probability of cancer and endanger the ecosystem, residents have begun to pay much more attention to the development of nuclear power and utilized their rights of being informed and participating in policy design [1,2,12,38]. Moreover, the negative attitude from the public would have a significant impact on nuclear policy decisions and may even postpone the process of nuclear development. For example, a designed uranium plant, located in Jiangmen, Guangdong province in the southeast of China, had to be canceled because of public opposition. All in all, in the post-Fukushima world, it is urgent to investigate public trust in nuclear power and public opinions on the recommencement of nuclear power programs in China.

Based on the face-to-face survey of China's Public Perception of Nuclear Power (CPPNP),¹ this paper analyzes social attitude, perception and concerns about nuclear power. We also evaluate China's public Willingness-To-Pay (WTP) to prevent a nuclear power plant from being constructed in their cities and the neighboring cities by using the Contingent Valuation Method (CVM) [3,10,11,17,19–21,23]. Our study puts forward several practical measures and feasible ways to pacify the public and promote stable development of nuclear power respectively.

The contributions of this study to previous research are as follows. (1) We investigate public opinions in China towards nuclear power on re-launching nuclear power programs after the Fukushima nuclear accident, which is significantly important and informative for the development of nuclear power in China. (2) We evaluate the WTP of different groups that respectively consider nuclear power as safe, risky or uncertain power generation technology for the suspension of building nuclear power plants in their cities and neighboring cities. (3) Based on the analysis of public attitude towards nuclear power, recommendations are submitted to government to reinforce the security management.

The remainder of this study is structured as follows. Section 2 provides a description of the questionnaires. Section 3 presents an analysis on the CPPNP data and discusses public opinions on re-launching nuclear power programs. Section 4 uses the Double-Bounded-Dichotomous-Choice (DBDC) model to estimate the public Willingness-To-Pay (WTP) for preventing the construction of nuclear power plants. Section 5 reports the main findings with regard to the analysis. The final section is conclusions and policy recommendations.

2. Description of the survey

The main goal of the investigation is to gather information regarding perception, concerns and opinions of residents related

¹ CPPNP, supported by China Center for Energy Economics Research at Xiamen University, is a nationwide face-to-face survey which focuses on the public perception of nuclear power.

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