

Prevention and control on urban NIMBY caused by nuclear facilities in China

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Abstract. In order to improve the energy structure and the air quality, China has made every effort to develop civil nuclear industry and establish some nuclear facilities. Due to the potential radioactivity of nuclear facilities, the location and construction of the facilities will cause dissatisfaction and panic of the surrounding residents, resulting in "Not in My Backyard (NIMBY)" incidents. This paper will analyze the reasons for the NIMBY incidents, which are inadequate and not timely disclosure of information for residents, the lack of relevant education and compensation mechanism with legal analytical methods. Therefore, the prevention and control methods of such NIMBY incidents should be put forward: Governmental departments and operators of nuclear facilities should adhere to scientific and democratic decision of location selection and construction, and establish proper compensation mechanism for the residents nearby.

1. Introduction

The civil nuclear industry in China started in the early 1980s. So far, China has been one of the few countries with a complete system of civil nuclear industry and nuclear industry in China has been ranked the fourth in the world. By 2020, the scale of the civil nuclear industry of China will have been ranked second in the world [1]. Nuclear industry has played an important role in economic and social development in China and still keeps a good record of nuclear safety and security. However, it cannot be neglected that nuclear facilities and materials have potential radiological hazards. The nuclear accidents happened in Three Mile Island of the United States, Chernobyl of the Soviet Union and Fukushima of Japan made it quite difficult to decrease people's anxiety and increase people's acceptance for nuclear facilities. Therefore, the residents living near the nuclear facilities always worry about the influences on their health, environmental conditions and property values. So, when the nuclear facility may be constructed nearby, the residents will carry on highly emotional boycotts and even fight against the construction decisions, which always cause the NIMBY incidents.

The NIMBY (Not in My Backyard) movement or incident was initially raised by O'Hare, an American scholar, who defined "NIMBY" that "the establishment and operation of some facilities would benefit the citizens across wide areas but the citizens near the facilities will suffer from relevant negative influences [2]. Therefore, they will be sick of the facilities. When they change their resenting attitude into boycotts, it will be a collective conflict and lead to NIMBY." In the simple words, NIMBY means the citizens near the facilities insist that "we need this facility, but not in my backyard". The occurrence of concept was relevant to the incident that the residents nearby boycotted the decision of the setting of facilities like garbage furnace and nuclear facilities of the developed countries in the 1970s. The event that citizens of Lianyungang boycotted the construction of spent fuel reprocessing



factory in 2016 is typical NIMBY.

In China, it is common for the government to make a compromise and abandon the candidate location of NIMBY nuclear facilities to temporarily solve the confliction. Actually, this method will waste much social and economic cost, still fail to reduce people's fear of nuclear, and quite bad to improve people's acceptance of nuclear facilities.

This paper proposes the following research questions: Why do the NIMBY incidents caused by nuclear facilities happen? And how can the government prevent and control such NIMBY incidents by nuclear facilities? In order to solve the NIMBY problems in China, this paper adopts qualitative and case methodologies to summarize and analyse the current legislation and cases pertaining to nuclear facilities and environmental pollution in China and put forward the reasons of such incidents and solutions to prevent the incidents and increase people's psychological acceptance of nuclear facilities.

2. The reasons of NIMBY incidents by nuclear facilities

In the profound investigation on reasons for Nuclear-fear NIMBY Events with the incident of Lianyungang citizens boycotted the irradiated fuel reprocessing factory, it was learned that the citizens nearby insisted that the use of facility would lead to potential radiological hazards and threat or harm their own interests. From the legal perspective, the insufficient publicity of setting decision made by the operator of nuclear facilities and local governments, to the greatest extent, neglected people's rights of knowing the details. In addition, they failed to conduct the popularization of science for local citizens and haven't collected the suggestions and opinions from local people. Moreover, they haven't promised to provide relevant payment for local people. All the elements led to the occurrence and conflicts in such events.

Table 1. The reasons of NIMBY incidents by nuclear facilities.

·NIMBY citizens are lack of rights of disclosure and knowing details
·NIMBY citizens do not have sufficient relevant promotional education
·Government is unable to develop relevant compensation mechanism for NIMBY citizens

2.1. Unable to provide NIMBY citizens rights of knowing details

The construction of nuclear facilities leads to great benefits but they also bring out regional hazards. So, in some sense, the cost will be only paid by citizens near the plants and not shared by the beneficiaries, which is unfair for the citizens nearby. Therefore, it will cause complains and boycotts from citizens who take the risks. Besides, the imbalanced information and failure of delivering opinions will aggravate the existing confliction. In selection and construction of the nuclear facilities, the intensification of public learning the details and participation may increase the cost and influence the efficiency. However, fear is usually from something unknown and understanding is from general publicity. In many similar events, as the relevant information is not revealed from mainstream channels, there is no chance for people to deliver their own opinions and safeguard their own benefits, which are the main reasons for citizens to boycott the setting of NIMBY facilities.

In China, there are legal requirements to provide people sufficient rights to be informed and rights of discourse in legislation and regulation. According to Article 53 and 56 in The Environmental Protection Law as well as Article 21 and 23 in Evaluation Law of Environmental Influence, firstly, the operators involved in special projects like nuclear facilities shall submit the documents relevant to environmental influences of construction projects. Before approving the documents, it is necessary to give the explanation for citizens who may be influenced and collect the views from relevant operators, experts and citizens by holding public hearings or other ways of announcement. Secondly, chief environmental protection departments of governments at all levels shall release environmental information to the public according to the law and establish sound mechanism of people's participation. Thirdly, the citizens, according to the law, have the rights to obtain environmental information and participate in and oversee environmental protection. Meanwhile, according to Article 11 and 15 in Regulations on the Administration of Construction Project Environmental Protection issued by State Council, construction operators of nuclear facilities should compile the environmental

impact reports and demand the examination and approval from the competent department of environmental protection administration under the State Council, in addition, the report compiling should solicit the views of the operators and residents concerned of the locality. As for the laws and regulations relevant to nuclear facilities and radiation, according to The Prevention and Control of Radioactive Pollution Law, Chinese safety supervision of nuclear facilities and radioactivity, prevention and control of radioactive pollution should be mainly administrated and supervised by governments and relevant departments, in the meantime, relevant operators and individuals have rights of reporting and accusing the conducts of radioactive pollution. Therefore, according to the laws and regulations mentioned above, governmental institutions like the operators of nuclear projects and environmental protection departments have obligation of issuing relevant information and solicit the opinions from the public who also have the rights of gaining information and put forward their views relevant to their own direct interests and participate in reporting, supervising and accusing the conducts of radioactive pollution. Only when the residents concerned of the locality gain sufficient information may they escape from exaggeration and panic of the hazards and reduce the impulse of opposing the NIMBY facilities.

However, in NIMBY Events like the incident of Lianyungang citizens boycotted the irradiated fuel reprocessing factory, as the final locality hasn't been selected, relevant operators neglected the aforementioned laws and regulations and simply revealed in some enterprise news with a few words to explain the reason for selecting Lianyungang as the locality of the plant. In addition, they never let local residents know the details of the news, which restricted the local residents from knowing the details and participation. However, according to Environmental Protection Law, local environmental protection departments, for all the time, have the obligation of "disclosing environmental information with the accordance of law and completing the procedure of people's participation." As it was in selecting the locality of spent fuel reprocessing factory, the relevant selections haven't made real impact on the local residents and then the government neglected local residents' rights to know and disclose. Therefore, without gaining real and correct information and candidate locality, local residents were misunderstood by We-media and then became panic, which led to NIMBY phenomenon.

2.2. Lack of relevant promotional education

In dealing with NIMBY, besides making public a variety of information, American government also organized and trained professional staffs to help local residents learn professional standards and data relevant to NIMBY facilities in order to improve people's reasonable judgement and eliminate panic emotions. In China, The Prevention and Control of Radioactive Pollution Law also regulates that "the people's government at the county level or above shall arrange for and carry out the pertinent publicity and education on the prevention and control of radioactive pollution, and make the public know about the relevant information and scientific knowledge on the prevention and control of radioactive pollution." However, in Lianyungang NIMBY Incident, as it was in the period of site selection, the governments and enterprises neglected sufficient promotion and education and never revealed relevant information timely making the local residents lack relevant knowledge and information. In addition to the characteristics of Network Era, some fake information spread through various We-media rapidly, which made the people misunderstood and become panic.

As for the construction of a spent fuel processing plant, from scientific and legal perspective, it is suitable to implement popularization of science on the knowledge of "spent fuel" and "spent fuel processing". For example, in science, "spent fuel" refers to the used nuclear fuel generally produced in the reactors of nuclear plants. In nuclear reactors, nuclear fuel has nuclear reactions with neutron bombardment. After a period of time, it is removed from the reactors. Meanwhile, the fuel contains many unused proliferating materials including Uranium 238 or Thorium 232. As the Uranium contents of fuel are reduced, it cannot continue with nuclear reactivity. Therefore, the fuel is called the spent fuel. From the perspectives of laws and international conventions, according to Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radiation Waste Management, "spent fuel" means nuclear fuel that has been irradiated in and permanently removed from a reactor core. Therefore, according to Article 2 in Regulations for Radioactive Waste Management issued by State Council, there is the definition of radioactive waste that the spent fuel is not nuclear waste. And, it can deal

with the resource limits of nuclear fuel and reduce nuclear waste and optimize the management of waste after processing of the spent fuel. In addition, if such conducts are in line with Article 40 in Environmental Protection Law, “The state shall promote cleaner production and resource recycling” and relevant regulations in Promotional Law of Recycling Economy, the residents won’t believe the fake information and consider it as processing of nuclear rubbishes. They just think it is harmful and dangerous and refuse to agree on the construction of establishing the local spent fuel plant for fear of hurting their own health and economic interests. However, in this incident, nuclear facility operator CNFR (CNNC Nuclear Fuel Reprocessing Co., Ltd) hasn’t carried out the aforementioned science popularization for the citizens of Lianyungang, who lives in the possible site of the spent fuel plant. When responding the relevant issues, they just focus on the importance of project instead of answering the people’s puzzles directly and reply people’s needs, which lead to more misunderstandings and resentful emotions.

2.3. Unable to develop relevant compensation mechanism for NIMBY citizens

According to the research of O'Hare Michael, an important failing of current practice in sitting locally noxious facilities is the strategic problem which results from failure to pay compensation to neighbors who suffer costs (loss on property values or less measurable amenity costs) not found to be a taking under law. If the residents in nuclear facility areas can be provided with relevant financial compensation for their loss from potential risks and great reduction in possible added value of permanent assets like houses, it will bring out relevant economic interests and improve the enthusiasm of construction for the residents in nuclear facility areas. In addition, it is also good for reducing people’s hostility and improving their recognition and acceptance of nuclear risks. However, there are no relevant systems in the fields of nuclear law in China. Take the relevant spent fuel processing system as an example, there are regulations in Temporary Measures for the Use and Management of the Spent Fuel Treatment and Disposal Fund for Nuclear Power Plants Issued by MOF (the Ministry of Finance), NDRC and MIIT (Ministry of Industry and Information Technology) and Management Measures for the Spent Fuel Treatment and Disposal Fund for Nuclear Power Plants issued by SASTIND that the spent fuel processing fund can be used for of spent fuel’s transportation, storage, later processing and the processing of highly radiation waste from later processing of spent fuel, spent fuel processing plant’s construction, operation, reconstruction and retirement as well as other outcomes of spent fuel processing. Meanwhile, they haven’t regulated clearly that local residents can be provided with financial compensation. Local governments usually provide relevant land compensation for the residents of NIMBY areas rather than the residents whose lands haven’t been requisitioned. For example, in construction of high-speed railroad, people with relevant interests in relocation can be provided with compensation but other people in the project are the exception of the compensation. Therefore, it has been one of the reasons for NIMBY phenomenon in site selection and construction of nuclear facilities.

3. Prevention and control of NIMBY caused by nuclear facilities

Law is the most efficient solution in dealing with NIMBY incidents caused by nuclear facilities. As the stable and predictable rules, law can make all sides with relevant interests participate in construction and policy-making equally and fairly. And, it will make the people with loss of personal interests gain the compensation so as to prevent the frequent happening of NIMBY events and solve such events properly. Then, it may reduce the economic loss from the events and safeguard social harmony and stability and win the people’s confidence. As a result, our relevant governmental departments and enterprises should make good use of law to prevent and solve the NIMBY phenomenon in the frame of laws and regulations.

For maintaining social stability and making Chinese nuclear industry with smooth and sustainable development, the government’s security departments, and environmental protection department, local governments of candidate areas, relevant enterprises and institutions must make site selection of nuclear facilities and construction policy-making scientific and democratic. Science refers to the evaluation of various safety issues related to the selection of such great nuclear facilities. In addition, it is also needed to implement sustainable supervision and examination of the construction and the later

processing to prevent from the risks. As for being democratic, it means to establish public participation mechanism and conduct profound communication with the residents and provide popularization for residents and collect the public opinions and focus on public rights to know and supervise.

Table 2. Methods of prevention and control of NIMBY caused by nuclear facilities.

·Government and operators of nuclear facilities should adhere to scientific location selection and construction
·Government and operators of nuclear facilities should adhere to democratic site selection and policy-making of construction
·Legislature should establish financial compensation mechanism for residents nearby the nuclear facilities

3.1. Adhere to scientific nuclear facilities' decision of location selection and construction

In order to make scientific location selection of nuclear projects, Prevention and Control of Radioactive Pollution Law in China provides that "The competent department for nuclear facilities under the State Council, together with the competent environmental protection administrative department under the State Council, shall draw up, based on the environmental impact assessment, a solid radioactive waste disposal siting plan on the basis of geological factors and solid radioactive waste disposal needs. The plan shall be implemented after being reported to and approved by the State Council." [3] Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management issued by IAEA also stipulate that Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed spent fuel management facility: to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime; to evaluate the likely safety impact of such a facility on individuals, society and the environment; to make information on the safety of such a facility available to members of the public; to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory, meanwhile Each Contracting Party shall take the appropriate steps to ensure that: the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases; at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account; the technologies incorporated in the design and construction of a spent fuel management facility are supported by experience, testing or analysis [4].

For making site selection more scientific, procedural and systematic, according to Nuclear Safety Law, the top legislative law in nuclear field in China, which officially implemented at the beginning of 2018, it regulates: "The state shall develop a nuclear facility safety licensing system. A nuclear facility operating entity that conducts such activities as siting, construction, operation and decommissioning of a nuclear facility shall apply for licensing to the nuclear safety supervision and administration department of the State Council... A nuclear facility operating entity shall make scientific assessment of geology, earthquake, weather, hydrology, environment, population distribution and other factors, submit a nuclear facility site safety analysis report to the nuclear safety supervision and administration department of the State Council on the premise of conforming to the requirements of nuclear safety technical appraisal, and obtain the nuclear facility site selection review opinions after the review finds it conform to the requirements for nuclear safety." [5] It is believed that with the aforementioned scientific site selection, the operating party of nuclear facilities and relevant departments of local governments will do well in prevention of risks and accidents to safeguard the safety and interests of local residents.

3.2. *Adhere to democratic nuclear facilities' site selection and policy-making of construction*

As for democratic nuclear facilities' site selection and policy-making of construction, International Atomic Energy Agency (IAEA) suggests, with the development of the peaceful uses of nuclear energy, public understanding of and confidence in the technology have required that the public, the media, legislatures and other interested bodies be provided with the fullest possible information concerning the risks and benefits of using various nuclear related techniques for economic and social development. Therefore, the transparency principle requires that bodies involved in the development, use and regulation of nuclear energy make available all relevant information concerning how nuclear energy is being used, particularly concerning incidents and abnormal occurrences that could have an impact on public health, safety and the environment [6].

Relevant French legislation and regulations also require nuclear operators to popularize the public with knowledge of nuclear power and open to the public with nuclear facilities on construction or operation in order to strengthen people's safety confidence of nuclear projects. In administrative permission of project approval and site selection, Japan has taken consideration of national safety, nuclear development plan and regional economy. In addition, it has also considered the rights of public expression in system and procedure. The operator should try to make the information public and ensure transparency of business activities and establish the platform to strengthen the communication with regional society. For example, at Kashiwazaki and East Sea Village, together with local residents, Tokyo Electric Power established Transparency Organization of Kashiwazaki Kariwa Nuclear Power Plant and Proposal Organization of East Sea Village's Environment and Nuclear Energy Safety [7].

In order to improve the democracy of decision-making and prevent the NIMBY Events, China has always focused on the cultivation of public rights of knowing the details and awareness of participation. Since 1996, State Council has issued Decision on Some Issue of Environmental Protection and initially put forward public participation mechanism. In 2004, Administrative Permission Law stipulated the public participation's procedures, methods and conditions. As for nuclear projects and safety, Statement of Nuclear Safety Culture Policy issued by National Nuclear Safety Administration, National Energy Administration put forward to establish harmonious public relations. "Through ways of public communication like information opening, public participation, science popularization, it is needed to ensure the public rights to know, participate and supervise. The departments of decision and administration should learn different opinions in different ways and with open mind. In addition, they should try to deal properly with various demands of relevant people." [8] According to 12th Five-year Plan and 2020 Long-rang Objective of Nuclear Safety and Protection of Nuclear Radioactive Pollution, China will "Establish an open and transparent platform of communication to improve transparency of industry; establish the system to open information of nuclear facilities and make clear governmental departments and operational sections' scope, duty and procedure in releasing the information; improve the public participation in site selection, construction, operation and retirement. In basic education, it is needed to add the popularization knowledge of nuclear and radioactive security. In addition, the effective educational and promotional system of nuclear security must be established to meet the public demands of relevant nuclear security information so as to improve people's confidence and understanding in the safe application of nuclear and technology [9].

The Chapter Five of Nuclear Safety Law has also provided "Information Disclosure and Public Participate" for nuclear facilities. Firstly, the relevant departments of the State Council and the departments designated by the people's governments of provinces, autonomous regions and municipalities directly under the Central Government where nuclear facilities are located shall publicly disclose the information relating to nuclear safety within their respective functions and responsibilities in accordance with the law. The nuclear safety supervision and administration department of the State Council shall publicly disclose under the law administrative licensing relating to nuclear safety and such information as reports on safety supervision and inspection of activities regarding nuclear safety, overall safety situation, radiation environment quality, and nuclear accidents. The State Council shall regularly report nuclear safety situation to the Standing Committee of the

National People's Congress. Secondly, the nuclear facility operating entities shall publicly disclose such information as its nuclear safety management system and relevant documents, safety situations of the nuclear facility, radiation monitoring data of effluents and surrounding environment, and annual nuclear safety reports. The nuclear safety supervision and administration department of the State Council shall develop specific measures. And the nuclear facility operating entities shall solicit the opinions of interested parties on major nuclear safety matters involving public interests through questionnaire survey, hearing, discussion meeting, or symposium or by any other means and provide feedback in an appropriate form. The people's government of the province, autonomous region or municipality directly under the Central Government where the nuclear facility is located shall solicit the opinions of interested parties on major nuclear safety matters impacting public interests by holding hearing, discussion meeting, symposium or any other means and provide feedback in an appropriate form. The entities shall take measures to conduct nuclear safety publicity campaigns, such as opening the nuclear facility to the general public in an orderly manner on the premise of ensuring the safety of the nuclear facility; cooperating with schools to conduct nuclear safety knowledge education campaigns for students; establishing nuclear safety publicity places and printing and issuing nuclear safety publicity materials and etc. Moreover, nuclear safety information required to be publicly disclosed by the law shall be so disclosed in a timely manner by government announcements, websites or any other means facilitating public knowledge. Citizens, legal persons or any other organizations may, in accordance with the law, apply for access to the information relating to nuclear safety to the nuclear safety supervision and administration department of the State Council and the department designated by the people's government of the province, autonomous region or municipality directly under the Central Government where the nuclear facility is located and they have the right to report any act with hidden nuclear safety risks or in violation of nuclear safety laws and administrative regulations to the nuclear safety supervision and administration department or any other relevant department of the State Council [10].

Besides, the upcoming Nuclear Power Management Regulations (draft for approval) drafted by NDRC (National Development and Reform Commission) and National Energy Bureau regulates in general principles that in Article 8, "the state's relevant departments and units shall strengthen nuclear power and its safety, nuclear radioactive protection and popularization and education of nuclear emergency knowledge and gradually make them into national compulsory educational system. Establish the sound system of nuclear power information disclosure and public participation. According to the law, it is needed to disclose relevant information of nuclear plant construction, operation and emergency management of nuclear accidents. In addition, it also leaves a special chapter (Chapter 10) to regulate information disclosure and public participation.

Through issuing and implementing the aforementioned laws, it is believed that China's nuclear information should be released more openly, apparently and instantly, which will reduce the people's doubt and fear. In addition, it will prevent and control the happening of NIMBY incidents.

3.3. Establish financial compensation mechanism for residents nearby the nuclear facilities

Some financial compensation provided for local residents can avoid the happening of NIMBY events. For example, Regulations on Site Setting of Final Disposal Facilities for Low Radioactive Waste issued in Taiwan regulates that the rewarding system for local residents to gain feedback fund directly in order to improve the residents' acceptance of final settlement plant. Mainland China's law has similar regulations. On the basis of such concept, Environmental Protection Law regulates that "the state shall establish and improve an ecological compensation mechanism." [11] The reason why financial compensation is provided for local residents is because NIMBY facilities will do harm to the health of relevant residents. In addition, as for the cost and benefits, it will devalue the building properties surrounding the facilities and reduce the house occupancy as well as the rent. As a result, financial interests of the residents surrounding NIMBY facilities will be damaged.

Therefore, some relevant departments in China should develop some compensation mechanism and make up such procedures, methods and standards to provide the financial compensation for the residents around nuclear facilities. Therefore, it will reduce their rejections for fear of nuclear facilities and reduction of housing prices and foreign income. Then, the residents' recognition and acceptance

of nuclear facilities will be improved to reduce the happening of NIMBY incidents. In the ways of compensation, it's suggested that the government should try many ways, comprehensive benefit compensation modes. Apart from money, they can provide to present the health insurance, the reduction of taxes of small business, the exemption from the expenditure of relevant residents' water, electricity and gas. Therefore, it will relieve NIMBY emotions of residents around the facilities.

4. Conclusion

Due to insufficient and delayed disclosure of information, lack of promotion of knowledge on nuclear facilities safety and failure of establishing relevant compensation mechanism for NIMBY residents, NIMBY incidents happened some time. In order to protect and control the happening and spreading of such NIMBY public events, this thesis has made an analysis based on legislation and regulations in China. It's suggested that China's government departments and operators involved in nuclear facilities should adhere to scientific and democratic decision of location selection and construction and establish proper compensation mechanism for the residents nearby to reduce the possibility of radioactive damage and relieve anxiety and opposition of residents so as to reduce the possible loss.

Acknowledgments

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