

Impact Management: Nuclear Power Plant Project in Thailand

Prasit Siritiprussamee¹, Vutthi Bhathumnavin² and Chuvej Chansa-ngavej¹

¹School of Management, Shinawatra University

²School of Management Technology, Shinawatra University

Author to whom correspondence should be addressed: e-mail: prasit_sir@yahoo.com

Abstract: Nuclear power is a promising approach to sustaining energy security and saving the global environment from the global warming crisis. Thailand also considers initiating the first nuclear power plant preparations. Several activities, including policy strategy and action plan development are being carefully processed to handle this challenging project for which several shortcomings, such as public acceptance, nuclear safety, project transparency, policy instability etc., have to be overcome. Public acceptance is the most difficult for project implementation. One of the most interesting solutions is to educate people about the impact as well as the management approaches of the project for mitigating any negative consequences. In this study, the impacts of a nuclear power project are investigated and identified, and impact management approaches are also suggested.

Keywords: Energy Policy, Nuclear energy, Social Impact Management, Nuclear Power Project management

1. Introduction

Currently, high energy costs and environmental concerns force countries around the world to develop suitable and sustainable energy policies, strategies, plans, and management schemes for handling the energy crisis and continuing the national economic growth. Thai government also concerns about these global issues and then revises the national electrical plan (Power Development Plan).

On 19 June 2007, the Thai Cabinet acknowledged and approved Thailand's Power Development Plan 2007-2021 (PDP 2007) [1] which includes a power source development plan up to 2021. The major target challenge in PDP 2007 was not only to encourage the green energy market but also to diversify the fuel types and overcome the risk of over-dependency on natural gas as the main source of supply that has shouldered the growing electricity demand and accounts for about 70% of the current power generation output Figure 1 shows a share of electricity production by fuel types [2]. In order to decrease the portion of natural gas-fired power station, the promising candidate for such diversified sources is clean coal. However, the introduction of coal power have not yet progressed as construction of coal-fired thermal power plants and have tended to suffer serious delays in the face of strong resistance from local communities concerned over the environmental issues such as CO₂, NO_x and SO_x emissions. The PDP 2007 predicts that the introduction of coal-fired thermal power generation will not move forward until 2021, and despite the decreasing natural gas production, its share will remain at a high level as ever. As the national fears, it is not desirable to further increase dependency upon natural gas from a viewpoint of securing a stable power supply together with the mitigation of carbon emission increases. Therefore, with continued increasing of the price of natural gas for the future, it seems there are good grounds to designate of nuclear power generation option to produce 2,000 MW each in 2020 and 2021, totaling to 4,000 MW. This was the first time that the nuclear power generation option was integrated into the national PDP. This plan projects the share of natural gas to go down to 60% by 2021.

In 2009, PDP 2007 was revised to Thailand's Power Development Plan 2008-2021 revision 2 (PDP 2007 rev. 2) because of the global economic recession [3]. PDP 2007 rev. 2, approved by the Thai Cabinet on 24 March 2009, also provides a power generation forecast by fuel types up to 2021 as can be seen in Figure 2. The nuclear power generation option in PDP 2007 rev. 2 was reduced to a half of the first revision.

Recently, a new version of Thailand's Power Development Plan has been introduced. Power Development Plan 2010 (PDP

2010) [4] was approved by the Thai Cabinet on 23 March 2010. PDP 2010 is based on three major assumptions: energy securities, sustainable energy and energy efficiency policies, and load forecast. This latest PDP also integrated nuclear power option in the future plan up to 5,000 MW in 2030. Figure 3 provides a power generation forecast by fuel type up to 2030 based on the PDP 2010.

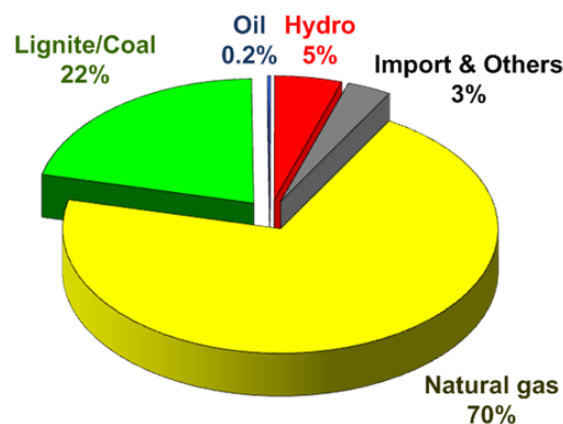


Figure 1. Power generation shared by fuel types, July 2008 [2].

To launch the preparatory work for the first nuclear power plant project in Thailand, the NEPC appointed the Nuclear Power Infrastructure Preparation Committee (NPIPC) which is responsible for developing the Preliminary Nuclear Power Infrastructure Establishment Plan (NPIEP) in April 2007. On 30 October 2007, the Thai Cabinet [5-6] approved The Preliminary Nuclear Power Infrastructure Establishment Plan (NPIEP) and the establishment of the Nuclear Power Program Development Office (NPPDO), which was launched officially in January 2008, under the Ministry of Energy to coordinate the NPIEP implementation, and the work plan for NPPDO and the NPIEP implementation during 2008-2010 (3 years). Then on 18 December 2007, the Cabinet further approved the Final Nuclear Power Infrastructure Establishment Plan (NPIEP) and the appointment of the Nuclear Power Infrastructure Establishment Coordination Committee (NPIECC).

NPIEP is composed of five phases: Phase 0.1 Preliminary phase, Phase 1 Pre-project activity phase, Phase 2 Program implementation phase, Phase 3 Construction phase, Phase 4 Operation phase. Figure 4 shows NPIEP Milestones for Nuclear Power Program Implementation [7].

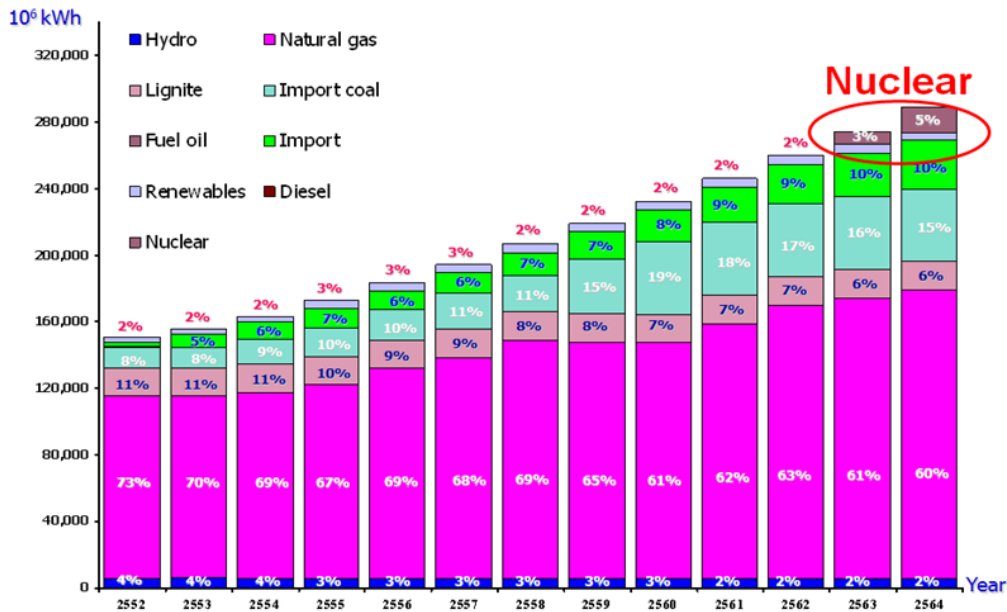


Figure 2. Power generation forecast by fuel types up to 2021 based on the PDP 2007 rev. 2.

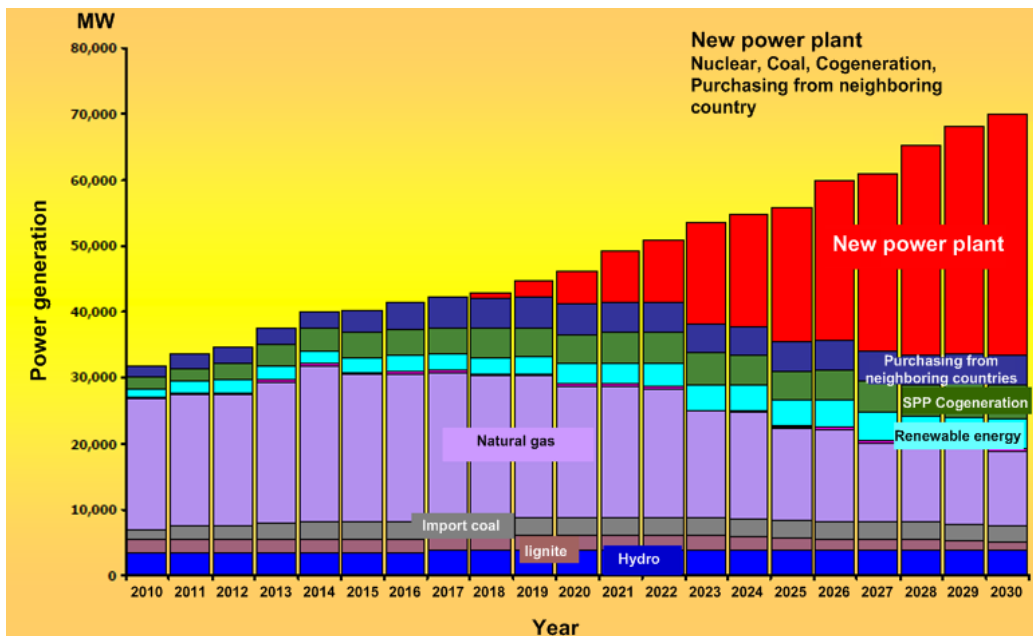


Figure 3. Power generation forecast by fuel types up to 2030 based on the PDP 2010.

After the 0.1 Preliminary phase, when the NPIEP was developed, nuclear power infrastructure preparation work such as Legislation and Organizational Structure Framework development, National Infrastructure Survey, Feasibility Study, Potential Sites Survey, Manpower Survey, Power System Planning etc. have been started in phase 1 for supporting policy decision “GO NUCLEAR” (Nuclear power project go ahead). All the preparation in phase 1 will follow through the 3S concept; Safety, Security, and Safeguard (non-proliferation). If the decision is “GO NUCLEAR”, National Regulatory Body (RGB) will be fully established and, the construction site, qualified technology and bidding process will be chosen during phase 2. The construction in phase 3, which will be starting from 2014, is preferred to utilize the local content as much as possible. When the commissioning process is complete, Scheduled Commercial Operation Date (SCOD), phase 4, can be in 2020 and 2021 for the first 1000-MW class and the second 1000-MW class nuclear power plant, respectively.

Although the nuclear power is clean, sustainable and

useful, to realize that the nuclear power project is very difficult as most people fear it because they do not understand the truth about nuclear technology. In order to deal with people, one proper approach is to inform about impacts [8] from the nuclear power project. This study identifies the impacts of the nuclear power project. In 2008, P. Satangput [9] identified consequences from the first nuclear power plant project focusing on three time-frames of the nuclear power plant lifespan: the planning stage (0-3 years), construction stage (3-15 years), and operation stage (15-50 years). However, the Inter-organizational Committee on Guidelines and Principles for Social Impact Assessment suggest that the impact study should cover five policy stages; Project settings, Project planning, Construction, Operation and Maintenance (O&M), and Decommission. This project period is corresponded to International Atomic Energy Agency (IAEA)’s suggestion [10]; Pre-project, Project decision making, Plant construction, Plant operation and Plant decommissioning. This study examines each stage of the activities of the impact management.

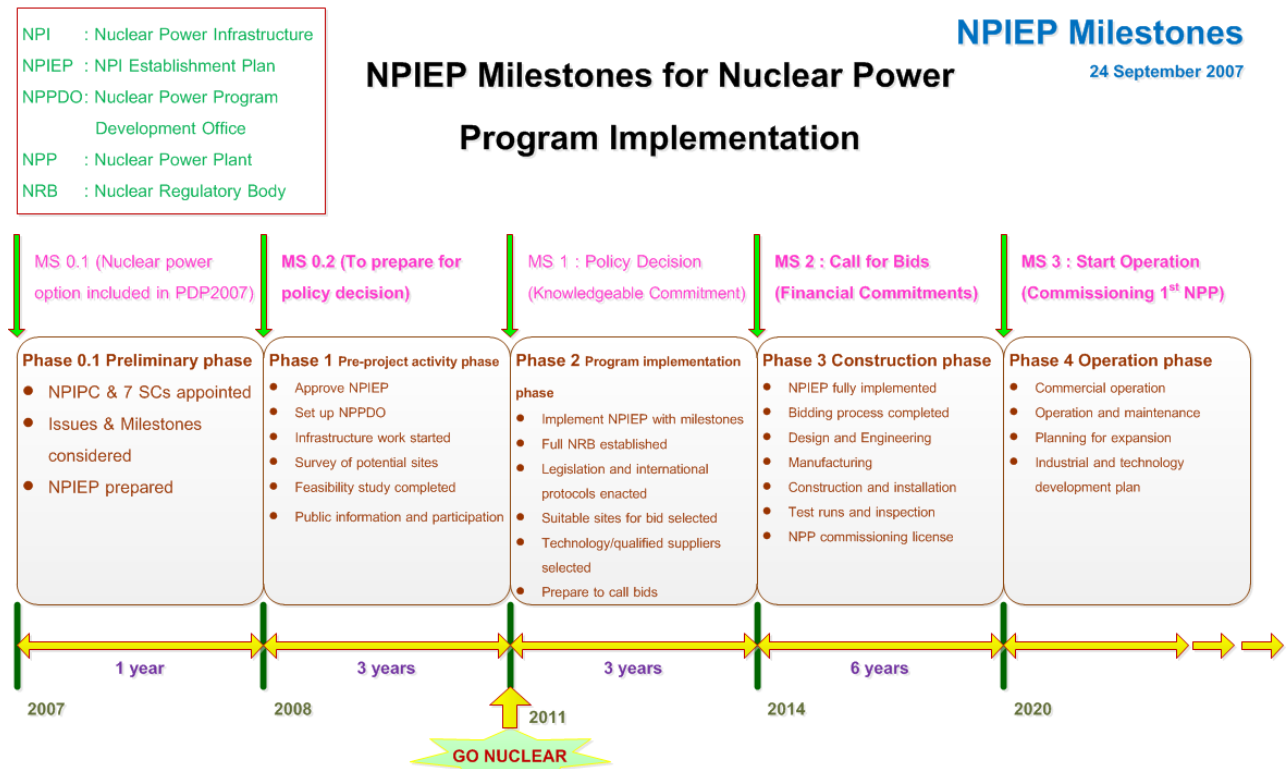


Figure 4. NPIEP Milestones for Nuclear Power Program Implementation.

2. Experimental

Individual depth (In-depth) interview, which involves conducting intensive individual interviews with a focus group to explore their perspectives on a particular idea [11], was applied to explore expert’s idea on the impact management at each stage of the activities of the NPP project. The focus group is composed of 25 interviewees including national and international experts, for instance, policy makers who involve in the NPIEP, power regulators, nuclear power technology experts, environmental experts, representatives from power utility, power plant developers. The findings, impacts and impact management are systematically analyzed and reviewed. In addition, the in-depth interview was conducted during December 2009 to February 2010.

Stage 1 Pre-Project

Stage 1 Pre-Project is defined as the conceptual and preparation activities during starting period with the decision to consider nuclear power related to Power system planning, Legislation and organization framework, National Infrastructure survey, National participation plan, Site survey and environmental assessment, and Human resource survey and development program.

Impacts of the nuclear power project during stage 1 Pre-Project, displayed in Figure 5, are social and political impacts.

1. Social impacts:

a. Public awareness is concerned about the safety of the nuclear power project because of fear of nuclear accident and leaking of radioactive materials and nuclear wastes. To increase the public awareness, one good solution is to increase trust in nuclear safety technology and understanding of basic nuclear knowledge by introducing a new educational technology for promotion of nuclear power innovation in Thailand [12].

b. Public awareness is concerned about transparency of the nuclear power project implementation. The public monitoring committee should be set up to monitor and investigate the project activity.

c. Public protest issues are usually found during potential site surveys [13]. Public should be informed and explained both positive and, negative aspects and consequences of the nuclear power project. Moreover, an information centre should be established to collect data and to report the situation to the public, especially, when there is any nuclear incident. Furthermore, the alliance network should be established for educate the public regarding nuclear impact.

2. Political impact: political instability is a major difficulty of the nuclear power project in Thailand that could directly affect to reliability of the nuclear power project. All political decisions should be widely accepted by public participation and based on reasonable principles and strong government leadership.

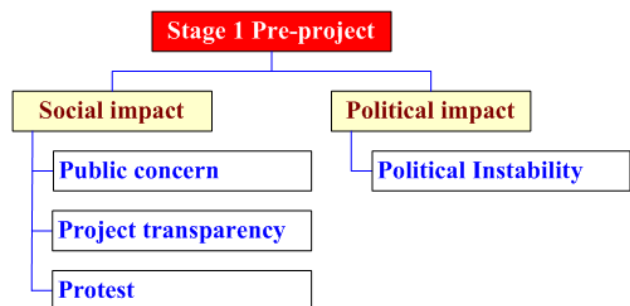


Figure 5. Impact identification of the nuclear power project during stage 1.

Stage 2 Project Decision Making

Stage 2 Project Decision Making is defined as Preparation activities to create the necessary infrastructures and facilities to support the launch of a nuclear power plant related to Pre-investment (feasibility) study, site selection and evaluation, Bid specifications/Reception offers, Bid evaluation, Contract

negotiation and closure, and Initiation long lead procurement item. Stage 2 can start if the project decision is “GO NUCLEAR”.

Impacts of the nuclear power project during Stage 2 Project Decision-Making, which are displayed in Figure 6, are social and political impacts.

1. Social impacts: Most impacts of Stage 2 are similar to the impacts of Stage 1 except the risk perception.

a. Public awareness is still concerned about safety of the nuclear power project. Thus, nuclear safety and basic nuclear knowledge should be continuously and widely educated to Thai people.

b. Public awareness is concerned about transparency of the nuclear power project implementation. The public monitoring committee should be continuously monitoring and investigating the project activities.

c. Public demonstration can be found during this phase. An information centre should be further reporting the project situation to the public clearly and also enhancing the public participation such as developing several public forums on nuclear project.

d. Indeed, local people who live in the selected nuclear site have to perceive the risks of the project implementation. Government should develop specific measures for the local people to compensate the risks.

2. Political impact: political instability still remains the major difficulty of the nuclear power project in Thailand that could directly affect to reliability of the nuclear power project. Thus, if the government decides to “go nuclear”, the nuclear power project should be set as a national policy.

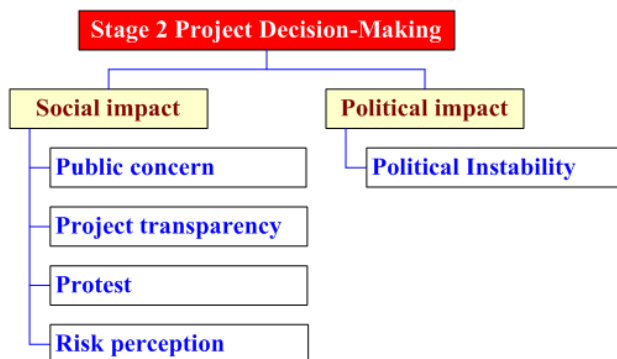


Figure 6. Impact identification of the nuclear power project during stage 2.

Stage 3 Plant Construction

Stage 3 Plant Construction is defined as project-oriented activities related to the Preparation of site infrastructure, detailed design engineering, Equipment and components manufacture, Construction, Erection and installation, and Commissioning and plant acceptance. Furthermore, the power development fund (PDF) [14], which is collected from power utility and given to the local community to minimize the project impact since the beginning of project construction phase, can be used to mitigate and/or heal local community impacts.

Impacts of the nuclear power project during Stage 3 Plant Construction, displayed in Figure 7, are social, economic, health, environmental and political impacts.

1. Social impacts: Project transparency, protest and risk perception are similar to the impacts of previous stage.

a. Public awareness is concerned about transparency of the nuclear power project implementation. The public monitoring committee should be continuously monitoring and investigating the project and PDF activity.

b. Public demonstration can be found during this phase. An information centre should be further reporting the

project situation and also affects such as dust emission etc. to the public clearly.

c. The risk to the local community should be monitored, managed and minimized. In addition, the stakeholder’s risk should be analyzed, managed and minimized.

d. Crime could be increasing since many construction workers, who have different backgrounds, come to work at the site. The government should establish defense measures for crime control.

e. Local people may be concerned about the uncertainty of the future of their living. Government and electrical utility should communicate and help local people to manage the change.

f. Immigrants and newcomer population will be increasing quickly during plant construction that brings about the local culture change. Government may develop a law measures to preserve the local culture for the local community.

g. Increasing the local population enhances the local demand of basic needs. Therefore, the basic needs for instance infrastructure, public transportation and housing, social services and public facilities should be well prepared.

2. Economic impacts:

a. Construction and other skilled workers will be massively employed. In this case, local worker should be primary employed to increase the local community’s income.

b. The price of local goods and services and the price of housing will increase because of increasing local income. The government should monitor, regulate and/or control the prices fairly.

c. Local economy can be rapidly changed if the atmosphere and culture are changed. The government may develop laws to preserve the local occupation for the local and/or measures to consult and/or to help local people manage the change. From this stage, the power development fund can be used to heal and/or to develop the local area and community.

d. Project delays can seriously affect the project costs. Thus, several factors, which cause risk, should be foreseen from international lesson learnt, and a reactivity plan should be prepared.

3. Health impacts:

a. The pollution emissions during the construction process have to be avoided as best as possible. The local community should closely monitor and report to the national regulatory body.

b. Noise pollution can be found in this stage. The construction contractors will have to minimize the impact by selecting the appropriate working hours and construction technology if the local community requests.

c. Accidents can happen anytime. However, the consequences of the accident have to be systematically stopped and minimized. Thus, the emergency plans have to be developed as a guide for the worker and the local people.

4. Environmental impact: Pollution emissions can damage the environment or kill animals and insects. Therefore, the pollution emissions have to be controlled and the reliable monitoring system should be properly installed.

5. Political impact: political instability still remains the major difficulty of the nuclear power project in Thailand that could directly affect the reliability of the project. The PDF’s criteria should be developed clearly and strictly.

Stage 4 Plant Operation

Decommissioning funds should be established to collect funds for decommissioning.

Stage 4 Plant Operation is defined as performance oriented activities leading to the safe and reliable operation and maintenance.

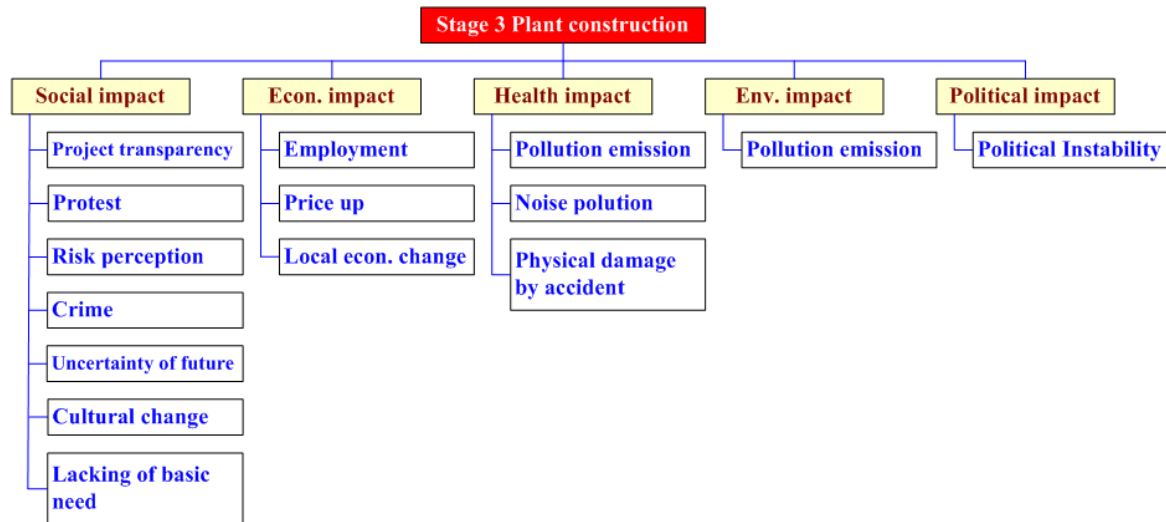


Figure 7. Impact identification of the nuclear power project during stage 3.

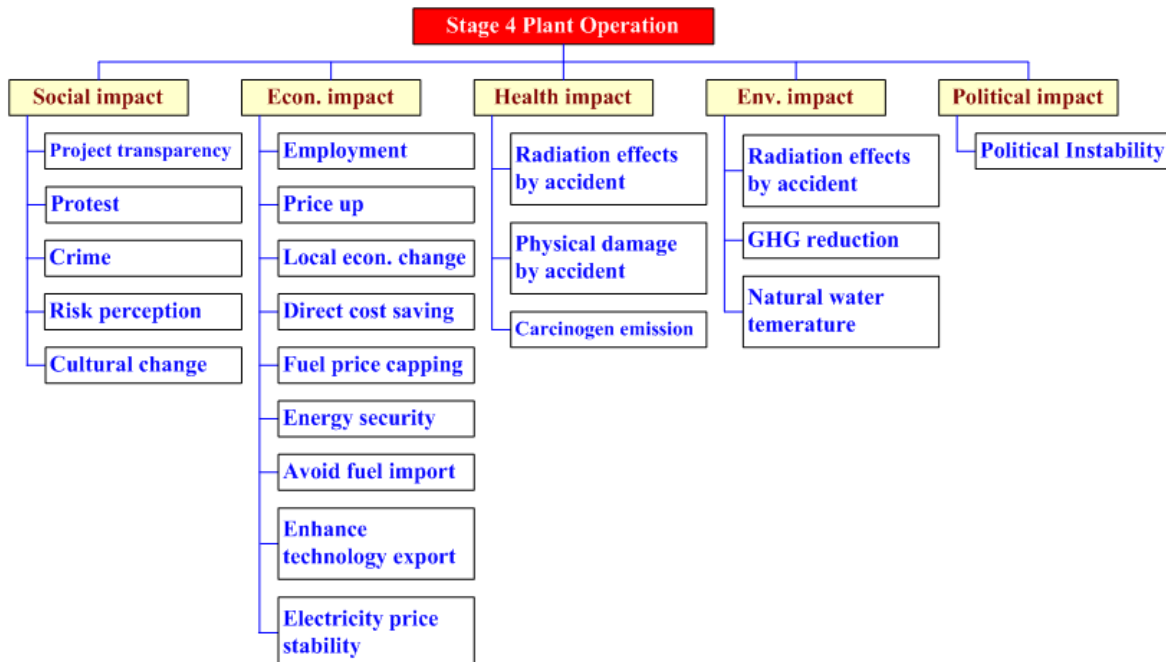


Figure 8. Impact identification of the nuclear power project during stage 4.

Impacts of the nuclear power project during stage 4 Plant Construction, displayed in Figure 8, are social, economic, health, environmental and political impacts.

1. Social impacts: Project transparency, protest, risk perception, crime and cultural change may still appear, so mitigation should be continued.

a. Public awareness is concerned about transparency of the nuclear power project implementation. The public monitoring committee should be continuously and closely monitoring and investigating the project and PDF activity.

b. Public demonstrations may be found during this phase. An information centre should be continuously reporting the plant's operations and other impacts such as radiation near the site, dust emission etc., to the public clearly.

c. Crime should be reduced as many workers, who have different backgrounds, come to work at the site. The government should establish defense measures for crime control.

d. Risk of radiation from the nuclear power plant operation should be focused on. To decrease the risk, normal and emergency plans have to be developed properly by experts.

e. Immigrants and newcomer population will be increasing quickly during plant operation that brings about the local culture change again. The developed measures, local culture preservation measures, should be monitored and managed.

2. Economic impact:

a. Lack of skilled nuclear operators is one concern issue that has to be systematically prepared. The national human capital development plan for nuclear power project should be properly prepared. A national nuclear training center should be established and also international nuclear training cooperation should be continuously and sufficiently implemented before this stage.

b. Employment is changed from the low-level worker to well-trained workers for plant operations. When the operation stage starts, around 1000 skilled-staffs are required for a 1000 MW-class nuclear power plant.

c. The price of local goods, services and housing will increase proportionally to the increase of local income. The government should monitor, regulate and/or control the prices fairly.

d. Local economy can be rapidly changed to facilitate the newcomers. The government may develop law to preserve the local occupation for the local and/or measures to consult and/or to help local people manage the change. The power development fund can play an important role in order to heal and/or to develop the local area and community.

3. Health impacts:

a. Pollution emissions can be lessened for its cleaner energy. However, the risks from the leaking of the radiation materials or accident may occur during the fuel transportation. Thus, a proper fuel transportation plan should be carefully developed. Furthermore, the workers and local people have to monitor their own absorb dose usually for protect the hazard from the radiation. The absorb dose should be keep as low as possible, as and lower than the suggestion in ICRP 60 [15] or its equivalent.

b. Accident can happen anytime. However, the consequences of the accident have to be systematically stopped and minimized. Thus, the emergency plans have to be developed as a guide for the worker and the local people.

c. Carcinogen emissions known as ionizing radiation from nuclear power plant such as tritium, which is radioactive hydrogen, created and released from nuclear reactor into the environment should be routinely observed for preventing the severe consequences.

4. Environmental impacts:

a. The emergency response plans for minimizing the radiation accident should be periodically reviewed and practiced. In addition, radiation monitoring system should be routinely monitored and tested in order to prevent the impact on environments.

b. Greenhouse gas (GHG) emissions can be greatly reduced because nuclear power does not release the GHGs.

c. Increasing of surround water temperature may cause the local ecology and life diversity to change. The cooling water has to be measured and the temperature controlled not to exceed the acceptable level.

5. Political impact: political instability still remains the major difficulty of the nuclear power project in Thailand that could directly affect the reliability of the project.

Stage 5 Plant Decommissioning

Stage 5 Plant Decommissioning is defined as post-operation activities related to Decontamination, Dismantling, Asset recovery and Waste processing, storage and disposal.

Impacts of the nuclear power project during Stage 5, displayed in Figure 9, are social, health, environmental and political impacts.

1. Social impacts: Project transparency and risk perception are similar to the impacts of previous stages.

a. The public is concerned about transparency of the nuclear power project implementation. The public monitoring committee should be continuously and closely monitoring and investigating the project and PDF activity.

b. Risk of radiation of nuclear waste should be carefully controlled and managed. Decommissioning strategy, policy and plan should be suitably developed.

c. Ecology around and within the plant will be modified following the decommissioning concept adopted by the national regulatory body.

2. Health impacts:

a. Accidents can happen anytime during decommissioning and waste management activities so that the monitoring system should be properly prepared. Moreover, the suitable emergency plan should be carefully developed. The dose limits should be followed in ICRP 60 or its equivalence.

b. The consequences of an accident have to be systematically controlled and minimized. Thus, the emergency plans have to be developed as a guide for the worker and the local people.

3. Monitoring system is still needed to investigate the environmental impacts, especially for nuclear radiation. Moreover, the decommissioning strategy, plan and policy should be developed properly.

4. Political impact: political instability still remains the major difficulty of the nuclear power project in Thailand that could directly affect the reliability of the project.

3. Discussions

The impacts of the nuclear power project were investigated and impact management was introduced for minimizing the risks of the impact. Therefore, people should be thoroughly informed about the impacts and the impact management of the nuclear power plant project in Thailand for more understanding. Furthermore, the policy makers and regulators should develop and implement the policy and regulation to prevent the impacts that may occur in the future.

4. Conclusions

The first nuclear power in Thailand is one of the most challenging parts in the national electricity generation development plan because of strong public resistance. In order to gain public acceptance, the impacts and managements of the first nuclear power plant project should be explained to people especially for the people in the potential area. In this study, the impacts during the five stages of the nuclear power project implementation in Thailand were identified and the management policies were suggested. It was found that the publics were mainly concerned about the public safety from health and environmental impacts, project transparency, risk management, policy instability, lacking of skilled human resources. To minimize the impact, the management approaches are suggested, for instance, the national human capital development center should be established to train for new nuclear operators, the radiation and pollution monitoring systems should be sufficiently and suitably installed for protecting humans and environments. Finally, the government should clearly inform publics both merits and disadvantages of the project with truth, and also do all impact mitigating activities to gain public acceptance.

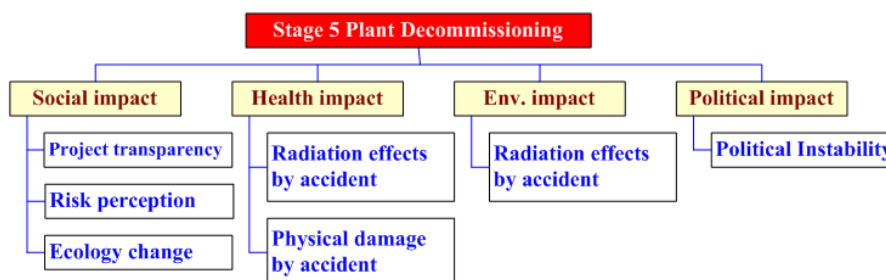


Figure 9. Impact identification of the nuclear power project during stage 5.

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