ERIA Research Project Report 2015, No. 19

Building a Collaboration Network towards the Social Acceptance of Nuclear and Coal Power in East Asia

Edited by

Tomoko Murakami

Economic Research Institute for ASEAN and East Asia

ERIA Research Project FY2015 No.19

Published in March 2017

The findings, interpretations, conclusions, and views expressed herein do not necessarily reflect the views and policies of the Economic Research Institute for ASEAN and East Asia, its Governing Board, Academic Advisory Council, or the institutions and governments they represent.

CONTENTS

List of Figures

List of Project Members

Ms Tomoko Murakami (Leader), Senior Economist, Manager, Nuclear Energy Group, Strategy Research Unit, The Institute of Energy Economics, Japan (IEEJ), Japan

Mr Shimpei Yamamoto (Organiser), Managing Director for Research Affairs, Research Department, Economic Research Institute for ASEAN and East Asia (ERIA)

Mr Shigeru Kimura (Organiser), Special Advisor to President on Energy Affairs, Energy Unit, Research Department, Economic Research Institute for ASEAN and East Asia (ERIA)

Dr Yanfei Li (Organiser), Energy Economist, Energy Unit, Research Department, Economic Research Institute for ASEAN and East Asia (ERIA)

Dr Anbumozhi Venkatachalam (Organiser), Senior Energy Economist, Energy Unit, Research Department, Economic Research Institute for ASEAN and East Asia (ERIA)

Dr Han Phoumin (Organiser), Energy Economist, Energy Unit, Research Department, Economic Research Institute for ASEAN and East Asia (ERIA)

Mr Fumihiko Ochi, Researcher, Nuclear Energy Group, Strategy Research Unit, The Institute of Energy Economics, Japan (IEEJ), Japan

Mr Atsuhiko Suzuki, Researcher, Nuclear Energy Group, Strategy Research Unit, The Institute of Energy Economics, Japan (IEEJ), Japan

List of Abbreviations

2DS	Two Degrees Scenario
ACE	ASEAN Centre for Energy
APS	Alternative Policy Scenario
ASEAN	Association of Southeast Asian Nations
BAU	Business as Usual Scenario
CCT	clean coal technology
GDA	generic design assessment
GW	gigawatts
EAS	East Asian Summit
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
IGCC	integrated gasification combined cycle
NEA	Nuclear Energy Agency
OECD	Organisation for Economic Co-operation and Development
SKB	Svensk Kärnbränslehantering AB
TEPCO	Tokyo Electric Power Company

Executive Summary

This project aims to build a collaboration network towards the social acceptance of nuclear and coal power in East Asia.

1.1. Main Argument

Some ASEAN countries are introducing or planning to introduce nuclear / coal power plants due to high growth in energy demand. However, public concern on the safety and environmental impacts of these plants makes it difficult for these countries to proceed with development plans. Based on recognition of such issues, two separate international symposiums were held in Japan (focused on nuclear) and in Thailand (focused on coal). In the symposiums, the role of nuclear / coal power in the world and in East Asia, and the way to promote social acceptance on nuclear and coal power were discussed.

The major findings are:

- Both nuclear and coal power have advantages such as economic efficiency, reliability of electricity, energy security, climate change solution, and so on. Based on such advantages, these power sources have their own roles in each country's energy mix.
- The necessity of these power sources, however, is not fully acknowledged by the public and it should be excluded by the government and power companies.
- It is especially important to communicate on the safety and environmental impacts of these power plants to the public via simple explanation and transparency. A patient dialogue with the people is needed.

1.2. Policy Implications

- Dialogues should be designed such that opinions of the public are truly incorporated with the decision of the government, hence reflecting many layers of dialogue between policymakers and the public. To achieve this as well as the public's trust in the government and experts, the understanding of the public should be indispensable.
- Another important thing is to understand what the public needs. In order for a proposal to be acceptable, it must provide the end-user with considerable benefits. In this regard, the policymaker must clearly present to the public the economic and social benefits of the policy, both local and nationwide, as well as its disadvantages.

Chapter 1

Introduction

The radioactive disaster at Fukushima Daiichi Nuclear Power Station on 11 March 2011 caused a serious impact on regional society. More than 100,000 local residents were forced to leave their home for a long time. The general public in emerging economies in Asia was greatly shocked not only because the disaster was one of the three most severe nuclear accidents so far, but also because it happened in Japan, which has been well-known as one of the most advanced countries in terms of technology and infrastructure.

Meanwhile, economic efficiency is an inevitable element that should be considered in developing power stations in Asia. In this light, coal-fired power stations appear as an option as they have advantages in terms of stability of supply and economic efficiency. However, although there are technologies that utilise coal at lower environmental burdens, concern over carbon emission sometimes harms the adoption of coal-fired power generation.

Therefore, cultivating mutual reliance and agreement between institutional stakeholders such as the government, the licensee, and the local municipalities, would be crucial to the establishment and operation of a nuclear and coal facility. Intense and practical research on issues such as the specific feature of nuclear and coal power, their roles in energy security and climate change, social influence, and disclosure of risk information would be highly appreciated from a socio-scientific point of view. Raising a proposal for collaboration towards the social acceptance of nuclear and coal power in East Asia and taking practical action are of immediate necessity and would greatly contribute to the smooth development and utilisation of this energy in East Asia.

In this context, this project aims to build a network on collaborating towards the social acceptance of nuclear and coal power in East Asia.

This project has three methodologies. They are as follows.

First, we reviewed the activities for social acceptance and consensus taken in more advanced countries, and found facts from national debates and communications between local residents and licensees in advanced countries using nuclear and coal energy, such as the United Kingdom

(UK), Sweden, and Finland. These countries are the focus of this study. We also discussed and analysed how public discussions have influenced nuclear and coal power policies in these countries.

Second, we identified issues to be discussed and implications for a possible approach on risk communication. Based on reviews, we extracted issues on the social acceptance of nuclear and coal power in East Asian countries from the perspectives of energy security and environmental aspects as well as social science and risk science. Comments by experts on these areas from the United States, Europe, and Asia were introduced as inputs on how the risk from nuclear and coal power should be assessed by the public. This will pave the way to suggest an appropriate approach towards building a consensus on energy sources in East Asia.

Third, we held a workshop and open symposium. We discussed what conditions are crucial to improve the social acceptance of nuclear / coal power from the public's point of view aside from the viewpoints of engineers and policymakers. We also held an open symposium aimed for a better public understanding of the effects of nuclear and coal power.

Two major policy recommendations were suggested in this project.

One is that Southeast Asian countries should share a certain practical and useful approach towards having a better social acceptance in countries where the introduction of nuclear and coal power is still under consideration.

Another is that the methods for transparent and public debates in policymaking process are not developed yet in most Asian countries compared to advanced European countries. The study results provide a case model for establishing social consensus on certain public issues.

Chapter 2

Social Acceptance of Nuclear Power

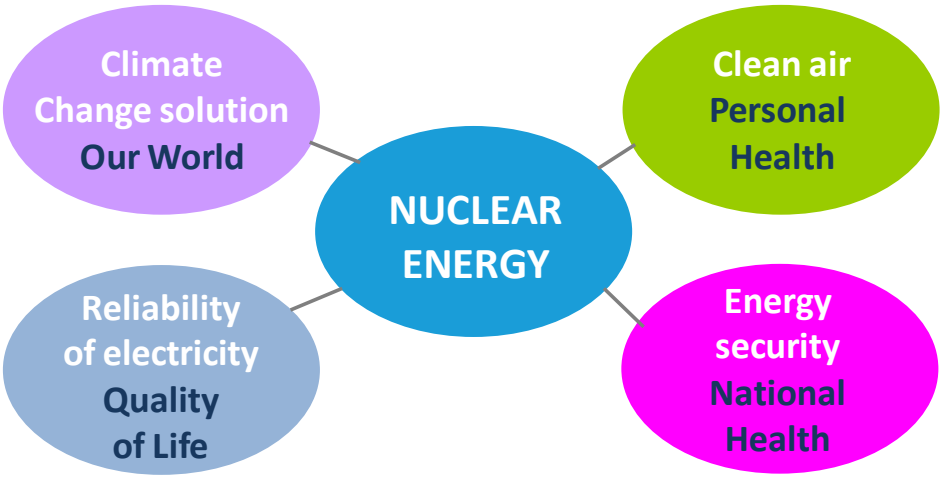
2.1. The Necessity of Nuclear Power

Through the International Nuclear Energy Symposium held in May 2015 in Japan and the research on European countries, some key elements in gaining social acceptance of nuclear power were revealed. First of all, it is important to recognize the necessity of nuclear energy as a stable and economic power source, and to promote people's understanding about it. In particular, nuclear power now expands its role as a low carbon electricity source in terms of greenhouse gas emission reduction. Regarding the safety of nuclear power plants and radiation risks of nuclear power – considered as one of the main issues in gaining social acceptance – it is crucial to provide people with correct information through transparent and simple explanation. A patient dialogue with people is needed.

Based on these findings, we will first describe the necessity of nuclear power (2-1) especially in terms of tackling climate change (2-2). After discussing the approach to communicating the safety of nuclear power plants and radiation risks of nuclear power to the public (2-3), we will introduce a few successful examples of pubic dialogues from the UK, Sweden, and Finland (2-4) then present a conclusion for this chapter (2-5).

According to Ms Agneta Rising, director general of the World Nuclear Association and co-founder / former president of Women in Nuclear, nuclear energy makes four key contributions to the global energy supply: climate change solution; reliability of electricity; clean air; and energy security.

Figure 2-1. Four Key Contributions of Nuclear Energy



Source: World Nuclear Association, presentation in the workshop

1) Climate change solution

The international climate negotiations in Paris held in November and December 2015 produced a global agreement to limit global average temperature increases to below 2 degrees Celsius by the year 2100 compared to the pre-industrial period. The Two Degrees Scenario (2DS) of the International Energy Agency (IEA) requires a major shift to low carbon generation by the middle of this century to prevent a dangerous climate change. This scenario includes 18 percent of global electricity being supplied by nuclear energy by 2050, the largest contribution from any low carbon option. According to Director General Rising, the nuclear industry is ready to deliver more to help tackle climate change and nuclear generation could provide 25 percent of the world's electricity with low carbon generation by having 1,000 gigawatts (GW) of new build by 2050. (This aspect will be detailed in the following section.)

2) Reliability of electricity

Reliability of electricity is crucial for improving and maintaining quality of life. It is especially true in countries expecting high economic growth. Taking China as an example, it is estimated that electricity demand in the country will almost double by 2030. To meet this rapid growth of electricity demand, China has to dramatically expand its capacity of energy sources. China depends mostly on coal, but the country can no longer rely on it considering issues of

environment and climate change. It is important to promote low carbon energy sources such as renewables and hydro, and the country has already made substantial effort towards their adoption. However, these energy sources have inherent constraints; intermittent renewables cannot meet the base load energy demand while hydro has geographical limit. These are one of the main reasons why China and many other developing countries are introducing or trying to introduce nuclear energy. As countries with long histories of using nuclear energy such as Finland, Switzerland, and the US can show, nuclear energy can supply reliable electricity and contribute to their economic growth, thereby improving quality of life.

3) Clean air

Around 3 million people worldwide die from respiratory illnesses alone as a result of burning fossil fuels for energy. This is more than 8,000 people every day. This kind of fact escapes most people while the risk of radiation when nuclear accidents occur tends to be emphasised. Nevertheless, it is worth pointing out that nuclear energy contributes to people's health by supplying electricity without polluting air.

4) Energy security

The availability of adequate supplies of reliable and moderately priced electricity is essential for the competitiveness of industries and sustainable economic growth. France is known as the country with the largest nuclear share in its electricity supply. What led the country to choose nuclear energy was the oil crisis that occurred in the 1970s. Supply interruptions and fluctuations in the price of fossil fuels in world markets at that time urged the country to improve its energy self-sufficiency rate. It was also the case in Japan, which has little natural energy sources. Since the Fukushima accident, the country has been experiencing a historically low energy self-sufficiency rate (6 percent) and is trying to improve it by restarting nuclear energy use. Nuclear energy is expected to strengthen the energy security as a quasi-domestic power source.

2.2. Tackling Climate Change

As mentioned in the previous section, the international climate negotiations in Paris held in 2015 produced a global agreement to limit global average temperature increases to below 2 degrees Celsius, and IEA's 2DS requires a major shift to low carbon generation by the middle of this century to prevent dangerous climate change.

The International Atomic Energy Agency (IAEA) has drafted statements regarding the role of nuclear energy in terms of climate change mitigation in light of the Paris Agreement. It states as follows:

> Currently, nuclear is second only to hydro in avoiding carbon emissions to the atmosphere, by avoiding approximately 2 billion tonnes of carbon annually. The IAEA's latest projections for nuclear power in 2030 show an increase in global nuclear power capacity of 2% in the low case and 68% in the high case scenario. The high case assumes changes in country policies towards climate change and continued economic and electricity demand growth, especially in Asia. The contribution toward mitigation from nuclear would need to double from today's level over the next 25 years in order to support the 2˚C scenario. This would require the addition of 20 GW of nuclear power capacity a year, the rate achieved during 1970s–80s. The Paris Agreement calls for climate action that at the same time supports sustainable development. There is strong agreement that nuclear power is a low carbon technology. However, nuclear power is also favorable across many sustainability indicators, an argument that should potentially receive greater attention in the future.

The role of nuclear energy in achieving IEA's 2DS is detailed in the paper '2015 Technology Roadmap: Nuclear Energy' jointly prepared by IEA, the Organisation for Economic Co-operation and Development (OECD) / Nuclear Energy Agency (NEA). Firstly, the Roadmap states in its foreword as follows:

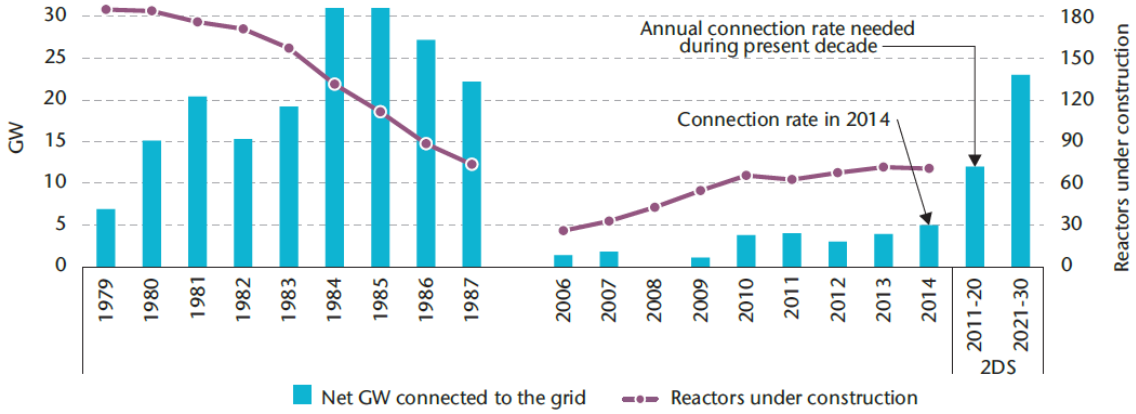
> Current trends in energy supply and use are unsustainable. Without decisive action, energy-related emissions of carbon dioxide will nearly double by 2050 and increased fossil energy demand will heighten concerns over the security of supplies. We can change our current path, but this will take an energy revolution in which low-carbon energy technologies will have a crucial role to play. Energy efficiency, many types of renewable energy, carbon capture and storage, nuclear power and new transport technologies will all require widespread deployment if we are to sharply reduce greenhouse gas (GHG) emissions. Every major country and sector of the economy would need to be involved. The task is urgent if we are to make sure that investment decisions taken now do not saddle us with sub-optimal technologies in the long term.

Then, with regard to the expansion of nuclear capacity, the Roadmap projects as follows:

> In the 2D scenario, global installed capacity would need to more than double from current levels of 396 gigawatts (GW) to reach 930 GW in 2050, with nuclear power representing 17% of global electricity production. Although lower than the 2010 Roadmap vision of 1, 200 GW and 25% share of generation, this increase still represents a formidable growth for the nuclear industry.
>
> The near-term outlook for nuclear energy has been impacted in many countries by the Fukushima Daiichi nuclear power plant accident. Although the accident caused no direct radiation-related casualties, it raised concerns over the safety of nuclear power plants and led to a drop in public acceptance, as well as to changes in energy policies in a limited number of countries. This, together with an economic crisis that has lowered demand in many countries, and a financial crisis that is making financing of capital-intensive projects challenging, has led to a decrease in overall construction starts and grid connection rates over the last four years.
>
> However, in the medium to long term, prospects for nuclear energy remain positive. A total of 72 reactors were under construction at the beginning of 2014,

the highest number in 25 years. According to the 2D scenario, China would account for the largest increase in nuclear capacity additions from 17 GW in 2014 to 250 GW in 2050 and, by 2050, would represent 27% of global nuclear capacity and nuclear power generation. Other growing nuclear energy markets include India, the Middle East, and the Russian Federation. According to 2DS projections, nuclear capacity would either decline or remain flat in most OECD countries, with the exception of the Republic of Korea, Poland, Turkey, and the United Kingdom.

Figure 2-2. Grid Connection Rates and Required Rates to Reach the 2DS Target



Source: IEA/NEA, Technology Roadmap, Nuclear Energy, 2015 edition (page 11)

The Roadmap also makes some recommendations over the next 10 years. Key recommendations are as follows:

- Governments should recognise the value of low-carbon capacity.
- Research and development is needed to support long-term operation.
- Industry needs to optimise constructability of Gen III designs.
- Accelerate development of Small Modular Reactors (SMRs).
- Support development of one or two Gen IV reactors.
- Demonstrate nuclear desalination or hydrogen production.
- Invest in environmentally sustainable uranium mining.
- Continue cooperation and discussions on international fuel services.

- Establish policies and sites for long-term storage and disposal.

As mentioned above, nuclear capacity would either decline or remain flat in most OECD countries according to 2DS projections. However, it does not mean that nuclear power in these countries has no room for improvements; there is a lot to do as recommended in the Roadmap including references for and implications on ASEAN countries introducing or planning to introduce nuclear power.

As both IEA and IAEA mention in their reports and statements, each country is free to use any technology including nuclear in mitigating climate change, and has to individually decide which energy mix is optimal for domestic use. However, the fundamental advantages provided by nuclear energy in terms of reduction of greenhouse emissions as well as competitiveness of electricity production and security of supply still apply. As described in the Roadmap: 'The contributions of nuclear energy – providing valuable base-load electricity, supplying important ancillary services to the grid and contributing to the security of energy supply – must be fully acknowledged.'

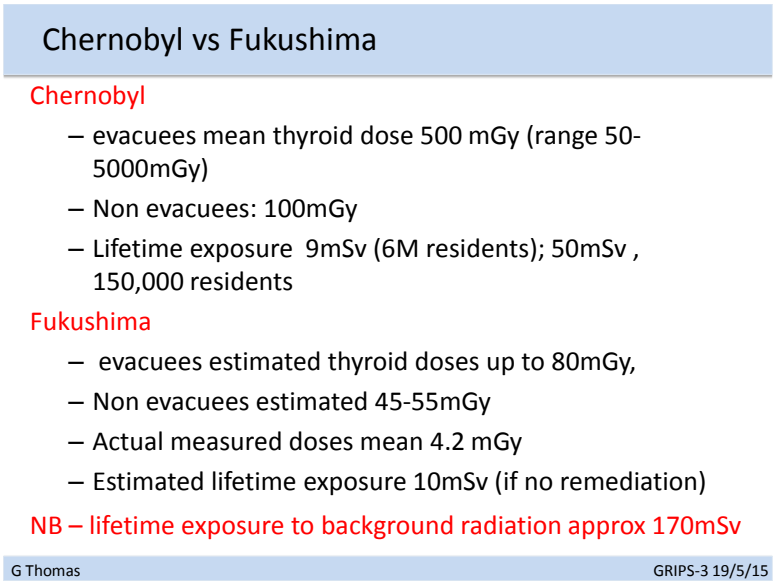
2.3. How Safe is Safe Enough?

Safety of nuclear power plants and the accompanying radiation risks of nuclear power is considered one of the main issues towards social acceptance. The issue sometimes makes it difficult for governments and utilities to introduce or expand nuclear energy. In Japan, public concern on safety of nuclear energy raised by the Fukushima accident is weighing down the reopening of existing nuclear power plants. It becomes apparent that explaining the risks of nuclear power to the public and gaining social acceptance when there is nothing absolutely safe have become the biggest issues in Japan.

In a discussion related to this issue at the International Nuclear Energy Symposium, multiple experts mentioned the Fukushima accident's impact on public health. Professor Gerry Thomas, an expert in molecular pathology at the Imperial College London, announced an analytical

finding that 'the Fukushima accident's impact on thyroid cancer was limited to one-hundredth of the Chernobyl accident's impact' (Figure 2-3).

Figure 2-3. Comparison of Impacts on Thyroid Cancer Between Chernobyl and Fukushima



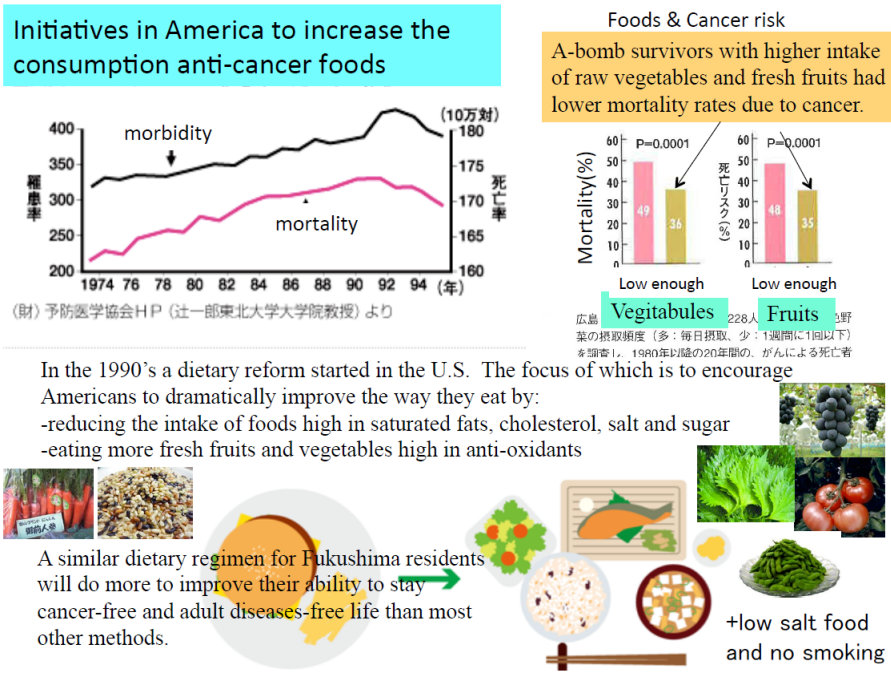
Source: Gerry Thomas, Imperial College London, presentation in the workshop

Dr Kazuko Uno, head of the Interferon and Host Defense Laboratory at the Louis Pasteur Center for Medical Research in Japan, indicated the view that 'the ill fortune of the Fukushima accident was that physicists and biologists were divided over radiation. Problems have emerged from evacuation-related insufficient exercise and stress rather than low-dose radiation.' According to Dr Uno, physicists strongly associate radiation with atomic weapons. Therefore they tend to overreact to the existence of minute amounts of radiation. On the other hand, medical doctors often use radiation in doses exceeding 50 Sv to treat and cure patients. Healthy cells repair themselves on a daily basis. This repair occurs for damages inflicted from all sources including those from radiation exposure.

Dr Uno also introduced an experience when Fukushima residents had been concerned about the risk of radiation in the wake of the accident and explained that lifestyle improvements could mitigate the risk of cancer.. She relayed that she gave a hand massage to a person wanting

healing rather than a difficult lecture during her visit to Fukushima and the patient welcomed the massage. Dr Uno also said, 'When I used a simple experiment to explain about food products that can reduce the risk of cancer, my audience understood my explanation well. For example, A-bomb survivors with higher intake of raw vegetables and fresh fruits had lower mortality rates due to cancer.'

Figure 2-4. Examples of Lifestyle Improvements to Mitigate the Risk of Cancer



Source: Interferon & Hostdefence Res. Lab. , presentation in the workshop

According to experts, the risk of radiation depends on each person's perception. Therefore, transparent and simple explanation by experts is highly required. However, improving people's understanding cannot be achieved by experts alone. As such, education of children and the media is very important.

Dr Uno stated that Japan's education about radiation in high schools or in the universities over the past decades had turned out to be insufficient, noting that many people likened the effects of the Fukushima accident to those of atomic bombing. Relatedly, the connection between the

nuclear industry and journalists was also addressed during the panel discussion in the symposium. Journalist Ann MacLachlan said, 'While some journalists have insufficient knowledge about nuclear energy and send wrong information under time pressure, scientists rather than journalists provide exaggerated information sometimes.' In response, Professor Gerry Thomas introduced a British initiative triggered by the Fukushima accident. Noting that the problem was the unavailability of scientists to respond to journalists, Professor Thomas explained that the Fukushima accident had prompted scientists to send their messages more voluntarily and positively. This was because scientists had feared that those other than real experts would receive interviews instead of experts. She also said that as the independence of academic societies and universities is protected in the UK, journalists are now trusting scientists.

2.4. Public Dialogues in European Countries

1) UK

The symposium brought about a common perception that continuing to provide correct information and communications on the safety of nuclear power plants and on radiation risks are required to gain an understanding on nuclear energy by the public. Then, another question emerges: How to communicate with people effectively and efficiently. With regard to this question, we found successful examples from UK, Sweden, and Finland.

We first introduced UK's example. UK has a long history of using nuclear energy. Though it was not difficult for the government and power companies to gain social acceptance in the early days of introduction of nuclear energy, it became more and more difficult as the access to information became easy and people came to know the risks of nuclear energy. Therefore, the government and power companies considered an effective and efficient way of communication. They now have a system of communication called public dialogue.

One example of a public dialogue is Sciencewise. It is funded by the Department for Business, Innovation and Skills, which helps UK policymakers understand and use public dialogue to improve decisions on issues involving science and technology. Since its beginning in 2004, its

projects have delivered measurable and acknowledged impacts and benefits to the UK Government and wider society. Public dialogue supported by Sciencewise brings together members from the public, policymakers, scientists, and other expert stakeholders to deliberate, reflect, and come to conclusions on national public policy issues. The Sciencewise approach to the public dialogue is described in the Government's Approach to Public Dialogue (the Guiding Principles).

Public dialogue allows a diverse mix of public participants with a wide range of views and values to:

- learn from written information and experts;
- listen to each other, and share and develop their views;
- reach to carefully considered conclusions; and
- communicate these conclusions directly to inform the Government's decision-making body.

Good public dialogues can help policymakers and the Government to:

- make better, more robust decisions that reflect public values and societal implications;
- increase legitimacy for tough decisions;
- demonstrate accountability in public investment;
- overcome entrenched positions to enable policies to move forward; and
- gain a rich understanding of public aspirations and concerns that go beyond media headlines or focus groups.

Public dialogue does not:

- remove government responsibility for decision-making;
- rely only on surveys or opinion polls to gather public views;
- seek endorsement of decisions that have already been made; and
- replace other public information or consultation processes.

Sciencewise co-funds and supports a wide range of public dialogue projects to support policymaking in issues involving science and technology.

Figure 2-5. A Wide Range of Public Dialogue Projects

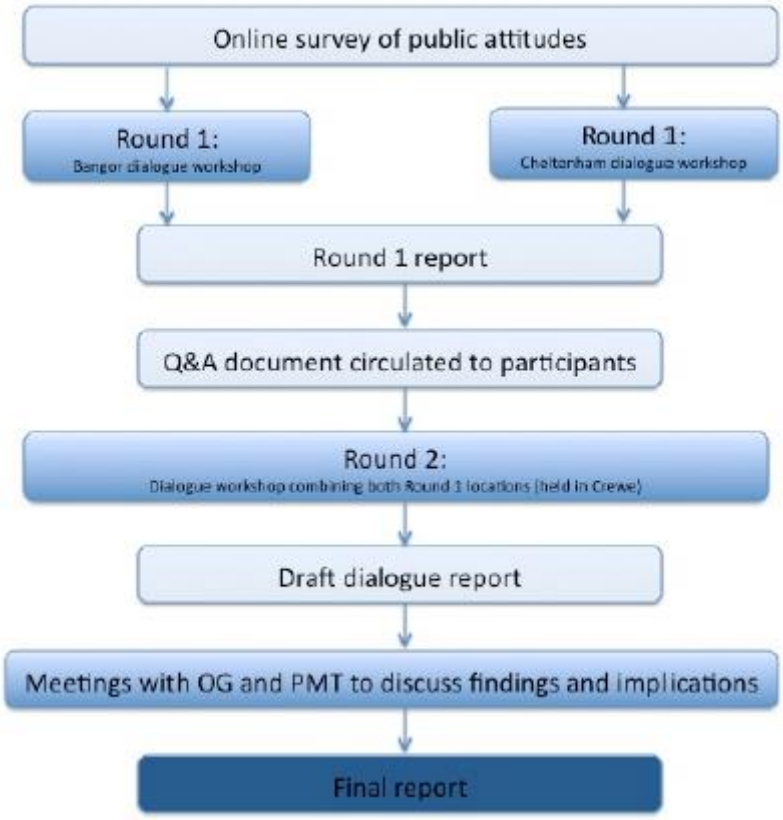
Source: Sciencewise web site.

Public dialogue is conducted even in the highly technical area of nuclear energy such as generic design assessment (GDA). According to records of the dialogue, introduction is as follows:

> The Government has outlined their commitment to a significant expansion in new nuclear in the UK stating that nuclear power, alongside renewable energy sources, will ensure that the UK has enough low-carbon electricity in the future. In 2006, the Government asked the nuclear regulators, Office for Nuclear Regulation (ONR) and Environment Agency (EA), to consider 'pre-authorisation assessments' of new nuclear power stations. The nuclear regulators developed their GDA process in response to this request. GDA enables the regulators to begin assessing the acceptability of safety, security, and environmental aspects of a nuclear power station design, at a generic level, before site-specific applications are made. It provides the regulators with early influence on the design of new nuclear power stations when it is most effective and efficient. It also helps to reduce project cost and time risks for developers as it enables regulatory concerns to be identified and addressed early.

The EA, ONR, and now Natural Resources Wales (NRW), support their GDA process with dedicated communications and engagement staff. This support includes planning and project management, website development, developing communications materials for a range of stakeholders and communities, publishing documents and leaflets, events management, engagement with key stakeholders, graphic design, e-bulletins and advertising, and proactive / reactive media relations. The Environment Agency has consulted previously during GDA of the UK EPR and AP1000. The consultation arrangements included online e-consultation, advertising in local newspapers, posters in libraries around England and Wales and a stakeholder event in Birmingham. The regulators have used the Sciencewise project to explore how they might improve public engagement in GDA.

Figure 2-6. An Example of the Dialogue Process for Generic Design Assessment



Source: Sciencewise, New nuclear power stations, Improving public involvement in reactor design assessments, August 2015

One example of the dialogue process and its key points are as follows:

- Online survey of public attitudes: The survey of 401 people in England and Wales was the first step in the overall dialogue process. Its aim was to inform the design of the local dialogue.
- Round 1 dialogue workshops in two locations: A total of 41 members of the public (unrelated to those taking part in the online survey) took part in Round 1 workshops – 22 in Cheltenham, UK on 17 January and 19 in Bangor, Wales on 31 January. These workshops were designed as introduction to the topic and context of GDA, including the role of the regulators.
- Round 2 dialogue workshop, with participants from both locations: 18 participants (9 from the Bangor workshop and 9 from the Cheltenham workshop) took part in the Round 2 workshop, held in Crewe, UK on 21 March 2015. This workshop was designed to provide opportunities for deeper exploration of key issues, responses to a range of communication and consultation materials, and development of recommendations on future public engagement.
- Meetings with independent Oversight Group and Project Management Team to discuss findings and implications.

To meet dialogue objectives, the process was focused on three key questions:

- How do members of the public want to be involved in the GDA process?
- What do people need to know (what are their concerns/interests?) How can nuclear regulators address their concerns/interests as part of the GDA process?
- What can we do to help improve people's trust in us and confidence in our decisions as nuclear regulators?

Both the framework and the procedure of the dialogue will also be useful when considering the way to gain public acceptance in ASEAN countries.

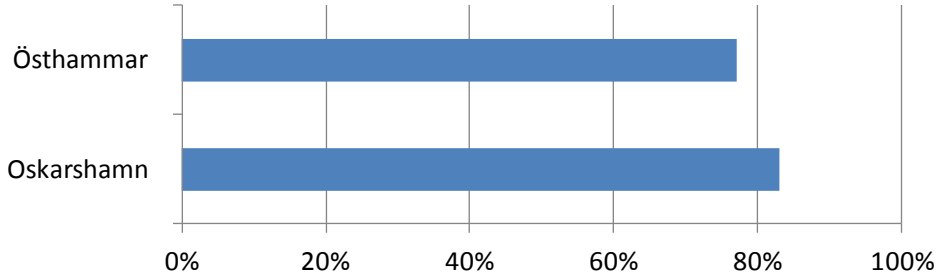
2) Sweden and Finland

Sweden and Finland are successful examples of the public dialogue process especially in the site selection process of the spent fuel repository.

In Sweden, Östhammar was chosen as the site for the spent fuel repository in 2009 although the search began long before that. SKB (Svensk Kärnbränslehantering AB), the organisation responsible for the site selection, had been assembling knowledge about Sweden's bedrock since the middle of the 1970s. Typological surveys of different areas were carried out between 1977 and 1985. During the process, SKB learnt valuable lessons about the importance of a positive response to its plans from the local population. Protests and demonstrations took place many places and against SKB's drills. Therefore, when the site identification process began in 1992, SKB chose to base it on voluntary responses.

Then, pilot studies were made in six municipalities including Östhammar. At the same time, the Geological Survey of Sweden (SGU) was conducting survey studies of the whole of Sweden that showed that there were potentially suitable sites in other municipalities. Finally SKB chose to undertake thorough site investigations with trial drillings in Östhammar and Oskarshamn. The site investigations lasted for 5 years, from 2002 until 2007. They involved studies on the geology, hydrology, ecology, and social impact. In both municipalities, there is strong local support for a future spent fuel repository. Transparent dialogue with local communities and other stakeholders was the key to build support. After Östhammar was chosen, Oskarshamn received funding to compensate for missing out on the opportunities of hosting the repository.

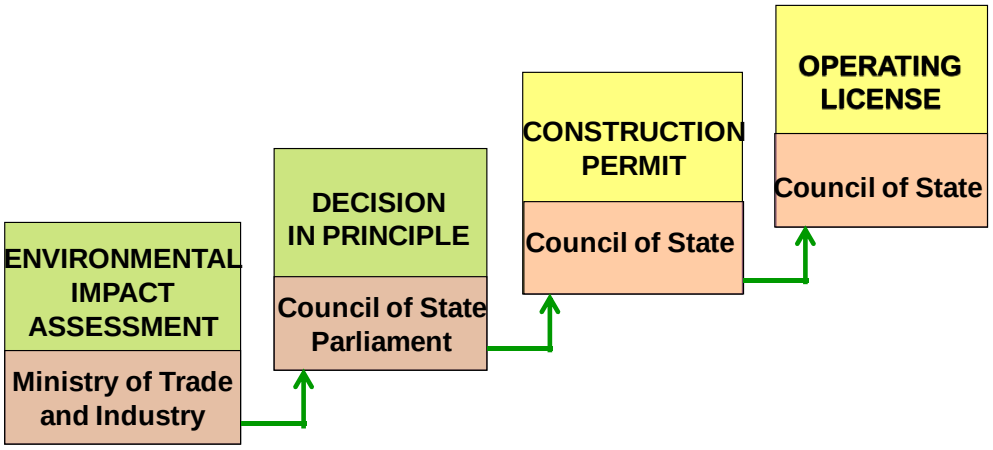
Figure 2-7. Local Community Support for Repository



Source: World Nuclear Association, presentation in the workshop

Similar to Sweden, Finland took a long and step-by-step process in site selection. From 1983 to 1985, a screening study of the entire area of Finland was conducted and from 1986 to 1992, preliminary site investigations were conducted. Then, from 1993 to 2000, detailed site investigations and an environmental impact assessment procedure were carried out for four sites including Olkiluoto in Eurajoki. Throughout the selection, an open and transparent decision-making process was conducted, taking all concerns into account. Simultaneously, continuous participatory processes both at the local and national level were conducted and became important to the success. (In Finland, there is a four-step licensing process [Figure 2-8], namely: environmental impact assessment, decision in principle, construction license, and operation license). Finally, Olkiluoto was chosen as the site and in November 2015, the Finnish government granted a license to Posiva, the operator of the final repository, for the construction of a final disposal facility for spent nuclear fuel, a first time for the world.

Figure 2-8. Four-Step Licensing Process



Source: Kaija Kainurinne, Finland, presentation in the workshop

2.5. What is Necessary to Gain Support from the Public?

Through the chapter, topics such as 'how to gain social acceptance' has been discussed and a few successful cases in public dialogues have been introduced. However, the discussion is not so simple in the sense that a mere introduction of the system of public dialogue that were successful in some countries would necessarily lead to gaining support from the public in other countries. This is pointed out in a research of European countries by a European researcher with a nuclear industry experience of more than 40 years and business development exposures in several Asian countries and European countries such as Turkey, Jordan, and Brazil. According to him, the role of a public communication body is as follows:

> Communication in nuclear project is really an important issue. Developed countries have set up different ways to cope with this issue depending on their cultural and structural ways of doing things. For example, in the USA, public hearings are fully integrated within the country's acceptance process. Will such public communication bodies be efficient? I would argue that except for highly democratic countries such as the USA or UK, public communication done by institutional bodies does not work and ends up with very poor results while costing a lot of money. Even in USA or UK, it can be argued that such processes are significantly extending the construction phase of nuclear projects and

> putting substantial pressure on the operators during the operation phase. In developing countries, it must be said that public communication is viewed as a necessary tool that is sometimes required by the financial community to justify early investment. But fundamentally, most citizens of such countries do not participate and are not using the information for their own benefit.
>
> So in summary, these public communication bodies are failing. Another reason is that people are not part of the decision making process, or that only a very small number of people have hijacked the overall communication, and are trying to impose their main ideology. See for example the green way of handling technical issues. The real importance is for the nuclear community to be accepted by the overall community. You need to bring people with you, to educate them, and to show them the benefits arising from such projects. You have to bring confidence that you know what you are talking about, that you are able to deal with people's concerns, and that you can provide them with the benefits of nuclear technology.

Based on such recognition, he answered the question 'how to significantly improve the public acceptance of nuclear energy' as follows:

> It is somehow difficult to provide a single, simple, and generic answer applicable to every country either developed or under development. Obviously, each country has its own cultural process and solution which can be applied to one country, which cannot be used in another country due to its background. One major element is to use a bottom-up approach rather than a top-down one, which is currently the application method used in all countries nowadays.
>
> What does that mean? It means that any solution for increasing the public acceptance level should be designed to meet the public expectations, and not be imposed from the top to the public. This is particularly true in democratic

developed countries. For developing countries, the main impulse shall be given from government agencies in a rather autocratic way. This is the way nuclear energy is implemented in Turkey or in Viet Nam.

Therefore, it is considered that implementing structures such as CLI as only a very preliminary step and totally insufficient. It is fundamental that implementing a nuclear plant on any site should directly benefit local people in bringing jobs, income, local economy growth, education, etc. This means that the vendor, the operator, the utility, and local administration agencies have to be assigned the responsibility of setting a strong partnership with the local population to make the nuclear plant the key factor for developing local economy and education. It is thus suggested that this partnership be managed by the local population in order to make sure that local constraints and objectives are fully met.

Without such local economic development, there will be no definite public acceptance at the local level, at the regional level, or obviously at the national level. Getting public acceptance at the local level does not automatically imply getting public acceptance at either regional or national levels, but it is a good starting point. It should not be forgotten that people care about jobs, job security, and improving their wealth fare. So meeting these objectives should be much better than relying on administrative structures such as CLI.

In conclusion, these three key points to gain social acceptance were crafted based on the International Nuclear Symposium and the research on European countries:

- To promote understanding on the necessity of nuclear energy as an economically efficient energy source that is effective in preventing climate change;

- To continue to provide correct information and communications on radiation risks and the safety of nuclear power plants; and
- To conduct patient dialogues with people, making sure they understand that nuclear facilities will develop the local economy.

Chapter 3

Social Acceptance of Coal Power

In Chapter 2, we will focus on the social acceptance of coal power generation in the viewpoint of energy security, technological development status and the environmental concerns of its specific feature. The international conference held in Bangkok in November 2015 has significantly contributed to the research. The speakers in this conference were all related parties in coal power generation business in East and Southeast Asian countries and some important implications have been pointed out.

3.1. Energy Security and the Role of Coal Power in East Asia

1) The importance of power supply mix on energy security and sustainable development

There are some countries which consume a substantial amount of energy in East Asia and the Association of Southeast Asian Nations (ASEAN) area where coal is originally a main energy source. In Alternative Policy Scenario (APS) by ERIA (2015), it is estimated that fossil fuel consumption is considerably suppressed by the large expansion of renewable and nuclear energy while in the electricity sector, the share of coal will increase along with renewables and nuclear energy in the ASEAN.

On pushing forward the development of power resources in East Asia, the power supply infrastructure – particularly the expansion of the international grid – needs to be efficiently maintained and that some kind of mechanism for investment promotion be built. Since there is no absolutely reliable source, it is important to gradually push forward energy situation improvement by developing clean coal technology (CCT), renewable energy, and various energy technologies on a multilateral arrangement.

Figure 3-1. Power Supply Mix in the East Asian Summit Countries

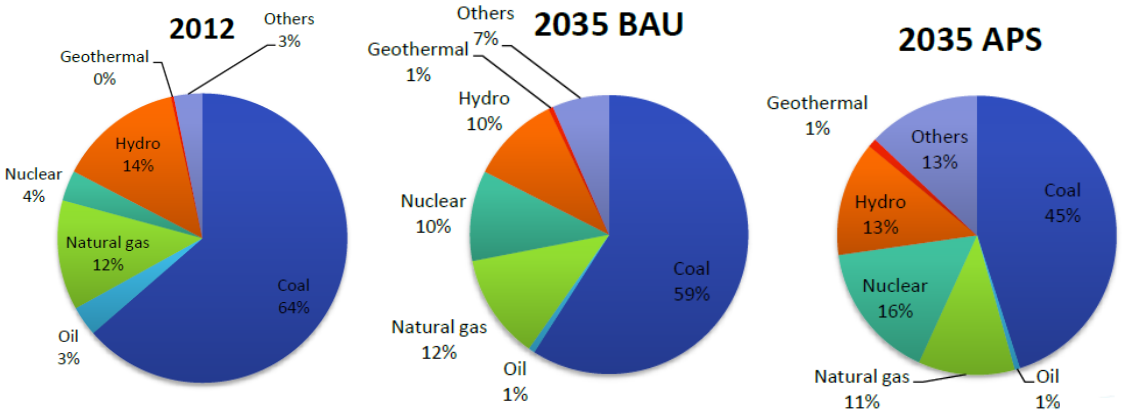
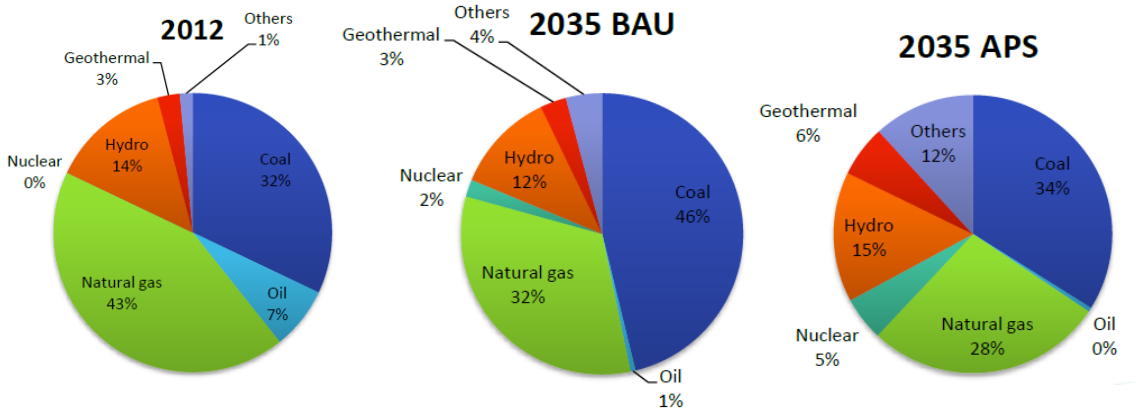


Figure 3-2. Power Supply Mix in ASEAN



ASEAN = Association of Southeast Asian Nations; APS — Alternative Policy Scenario; BAU = Business as Usual Scenario.

Source: ERIA (2015）.

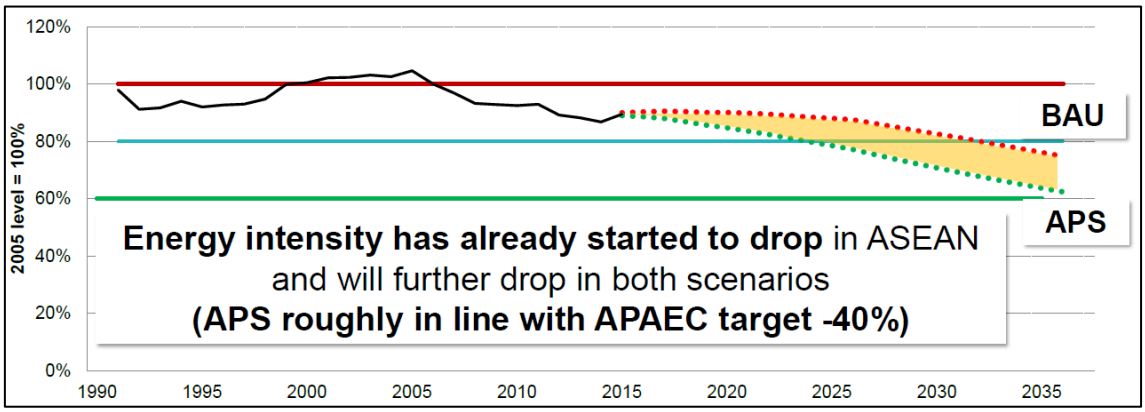
2) The 4th ASEAN Energy Outlook

The 4th ASEAN energy outlook published by ASEAN Centre for Energy (ACE) is comprised of two scenarios: Business as Usual Scenario (BAU) and Advanced Policy Scenario (APS). Apparently, APS is desirable from the viewpoint of energy supply, power consumption, coal demand, and trade in the area. As a result of energy efficiency examinations according to each scenario, APS can achieve -40 percent of the regional target. It is estimated that an industrial sector powered by the advanced use of coal, and energy saving measures in the transportation sector through the

introduction of bio-fuels have proven effective in terms of final energy consumption by sector according to each scenario.

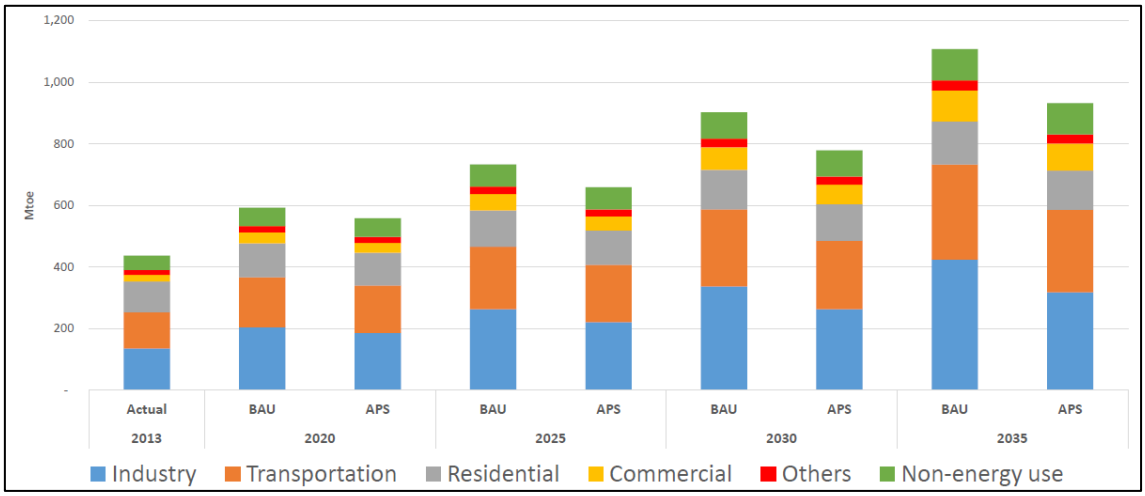
There are many challenges. For instance, restraining coal consumption due to environmental concerns will lead to an inevitable increase in consumption of oil and gas. How will the capital investment adequately be implemented in response to rapidly increasing electricity demand? No one has the correct answer now.

Figure 3-3. Energy Intensity in the 4th ASEAN Energy Outlook



Source: 4th ASEAN Energy Outlook.

Figure 3-4. Final Energy Consumption in the 4th ASEAN Energy Outlook



Source: 4th ASEAN Energy Outlook.

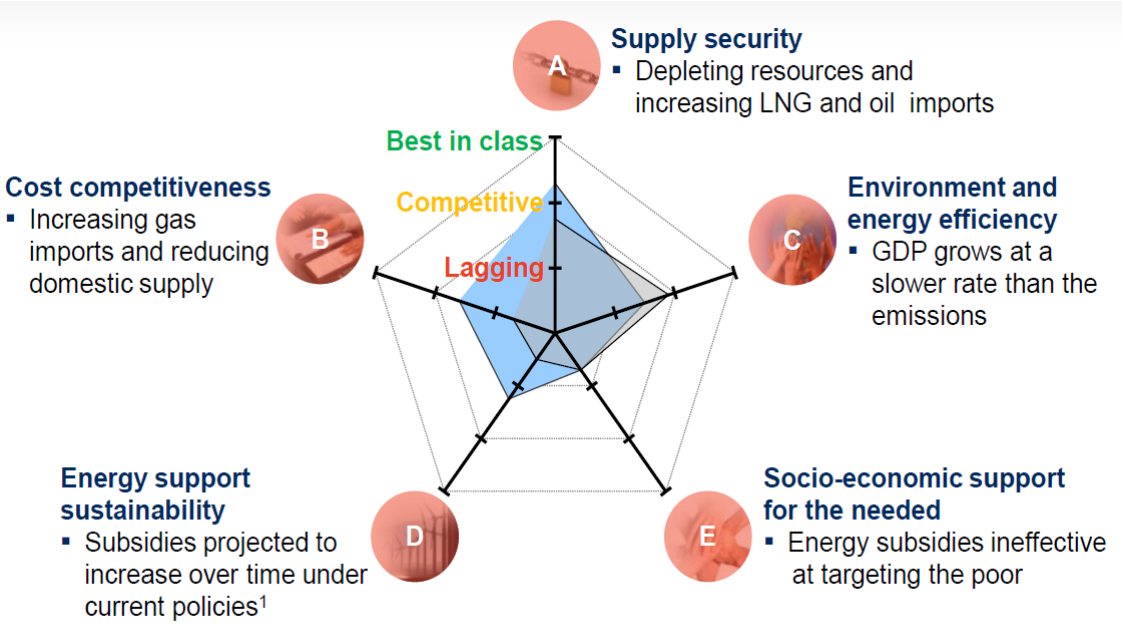
3) Overview of Thailand Integrated Energy Blueprint

The energy policy of Thailand consisted of three pillars: power development; energy efficiency; and alternative energy. Recently, the gas and oil roadmap to develop resources has been added to the policies. They are now the five pillars supporting three major policy targets: energy security; economic efficiency; and environment.

According to an assessment of Thailand's current energy status compared to international benchmarks, Thailand is superior in terms of economic rationality and subsidies, but needs improvement in environmental suitability and social acceptability. It is necessary to achieve a balanced energy system in these fields. Thailand needs to develop an alternative energy and establish an efficient energy market as well as develop international collaboration with neighbour countries. Thailand considers innovative coal fired technologies as alternatives and will learn a lot from the experiences of Malaysia, Indonesia, and Japan.

The specific energy target is as follows: achieve 30 percent energy intensity reduction; reach 30 percent coal in power mix and 20 percent clean coal; use biofuels for 20 percent substitution in transport; and so on. In the Power Development Plan 2015 (PDP, 2015), Thailand aims at a large reduction of energy demand versus BAU by saving energy. On the other hand, Thailand plans a lower gas dependency and large expansion of renewable energy for diversity of energy sources. Keeping energy cost at current levels (or slight increase) needs efforts towards technology development. It is expected that the carbon emission is held in check to a considerable degree from BAU by energy saving progress.

Figure 3-5. Assessment of Thailand's Current Energy Status and Evolution Trajectory Relative to International Benchmarks



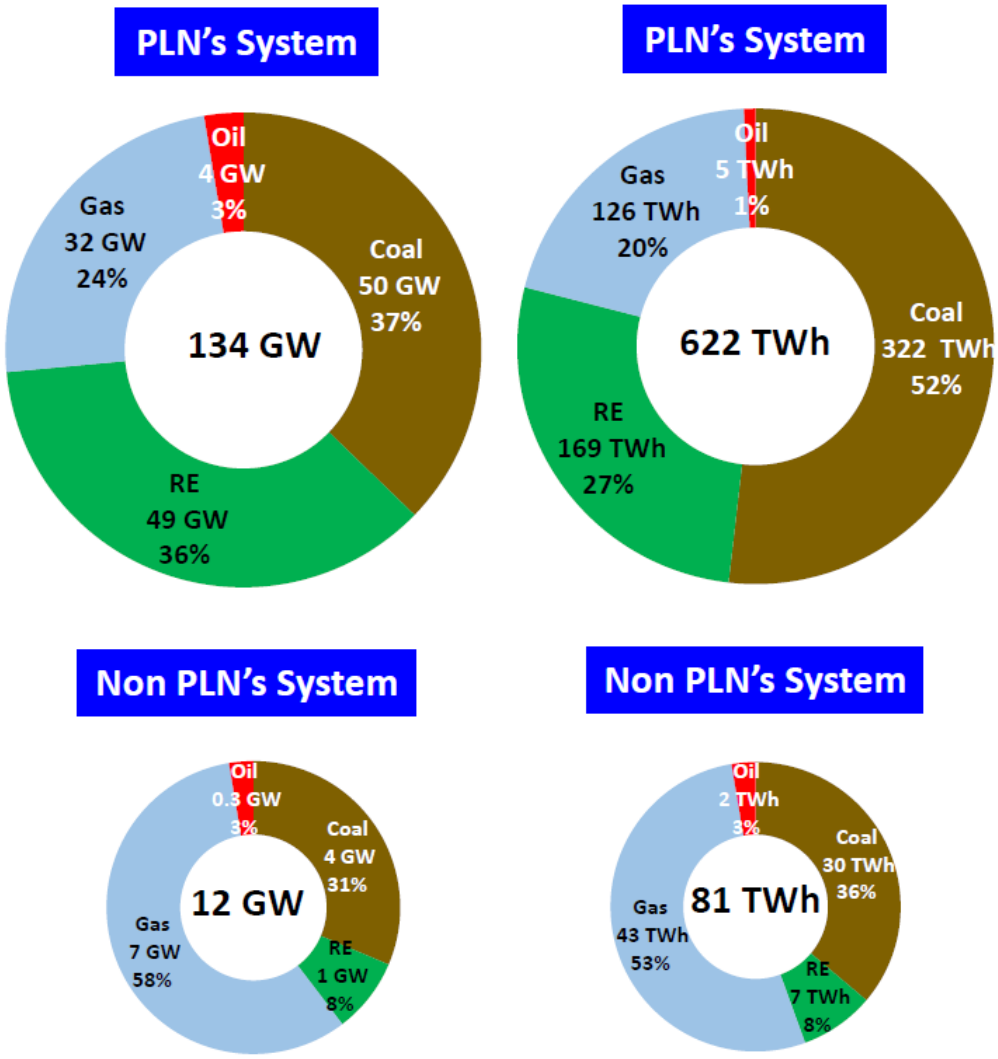
Source: Energy Policy and Planning Office, Ministry of Energy, presentation in the workshop

4) Power Policy and National Development Plan in Indonesia

In Indonesia, the '35,000MW Program' is being pushed forward to achieve an electrification ratio of 97.35 percent and electricity demand growth of 8.7 percent over the next 5 years. In the long term, Indonesia aims to reduce the ratio of Perusahaan Listrik Negara (PLN), utilise independent power producers, reduce coal dependence, and increase the ratio of alternative energies. In case it is difficult to accomplish the electrification target through renewable energy by 2025, nuclear energy will substitute as part of renewable energy, and Indonesia will also achieve the carbon emission abatement.

The aim of CCT in Indonesia is to reduce carbon emission. In addition to existing supercritical steam generation, Indonesia will introduce ultra-supercritical steam generation in 2020 and integrated coal gasification combined cycle in 2025.

Figure 3-6. Projection of Power Generation Capacity and Energy Mix 2025 in Thailand



Source: Ministry of Energy and Mineral Resources, Republic of Indonesia, presentation in the workshop

Since coal power is base load electricity in Indonesia, technology development of highly efficient coal power generation is crucial, and public acceptance of coal power is important as well.

5) Power Policy and National Development Plan in Malaysia

Malaysia is a country consisting of the Malay Peninsula and Borneo Island, and 90 percent of the electricity demand concentrates on the peninsula, occupying 40 percent of the area. There are

oil and gas resources in the country, however, Malaysia aims to keep these domestic resources and instead promoted renewable energy since 2001 and introduced FIT (Feed-in Tariff System) since 2010.

Malaysia's goal is economic rationality while it aims at the import of coal and the expansion of nuclear and renewables in preparation for stoppage of gas. With many problems that include reinforcement of industrial structure, governance, and the tolerance of price fluctuations, Malaysia introduced unbundling and competition in the generation section as a business structure switch from the first quarter in 2016. It is also aiming at the construction of the ASEAN Power Grid in the long term. The 11th Malaysia Plan, which is led by the prime minister, encourages sustainable energy use and steady supply of effective and cheap electricity, and aims at mutual cooperation between players in the energy sector and at energy-saving realisation involving end users.

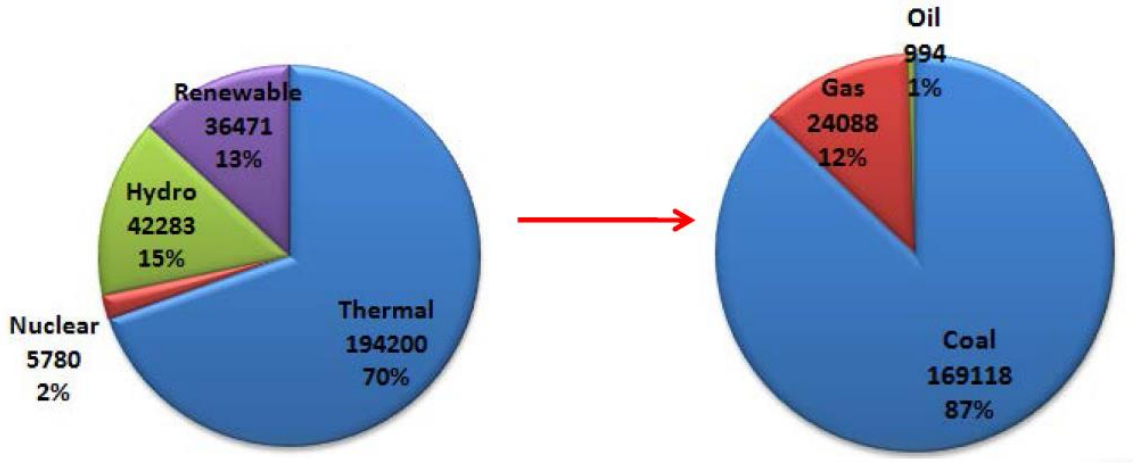
Today, coal is not largely consumed in Malaysia, but remains an open option as one of the alternatives. It would be necessary to watch the technological development and the international cooperation on CCT and public concern on coal power.

6) Coal Power Generation in India and its Role in Economic Efficiency

In India, thermal based power accounts for 70 percent of total generation and coal accounts for more than 80 percent of thermal mix. Because electricity consumption per person is still low, the potential for an increase in electricity in the future is high. India pushes forward the Ultra Mega Power Projects to cope with an increase in electricity demand. Sixteen plans were proposed so far, but only four were awarded by 2006 due to delays in land acquisition and foreseen policy changes.

Coal will continue to have maximum share towards installed capacity for power generation in India. CCTs such as supercritical, ultra-supercritical, and advanced ultra-supercritical system will be the focus in future power projects. More suitable to handle Indian coal are 800-1000MW unit plants, but technology cooperation with international manufacturers will be highly appreciated.

Figure 3-7. Potential Investment Benefits in India



Source: Prosanto Pal, The Energy and Resources Institute, India, presentation in the workshop.

3.2. Clean Coal Technology Development Status

1) Economic benefits of introducing CCT in the East Asian Summit (EAS) region

The use of coal is strictly limited by environmental factors in Europe, US, and other developed countries, but effective utilisation of coal is required in Asia. It is necessary to maintain and promote technologies with high efficiency, low emissions, yet competitive and low cost.

Future increases in energy consumption and electricity generation by fuel are calculated based on assumptions for economic growth, population, and crude oil price using the coal demand prediction model operated by ERIA (2015) for the EAS area.

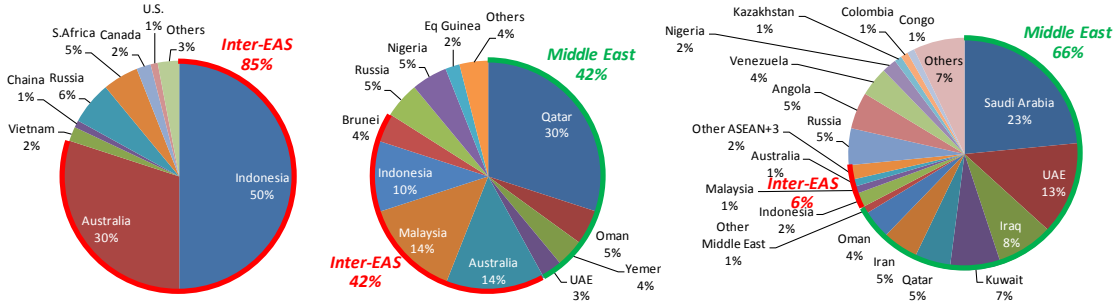
While the total electricity demand in 2035 will be twice that of 2012, coal demand will increase due to its cost competitiveness while its share in the power sector will be around 60 percent in 2035. Particularly, the increase in China is remarkable, and approximately 60 percent of coal consumption in the EAS area is by China.

Most gas is imported from the offshore areas of the Middle East whereas coal is almost always

locally produced for local consumption. The main coal supplier in the area is Indonesia, and the main offshore supplier is Australia.

Installation of facilities for environmental protection such as desulphurisation plants in conventional coal fired power plants is essential although it accounts for more than 20 percent of total construction costs. The efficiency is improved in integrated gasification combined cycle (IGCC) which is state-of-the-art and it releases little toxic substance. Furthermore, it can save considerable coal resources by improving thermal efficiency. CCT is high-cost, but it is desirable to invest in it positively because it is an appealing technology.

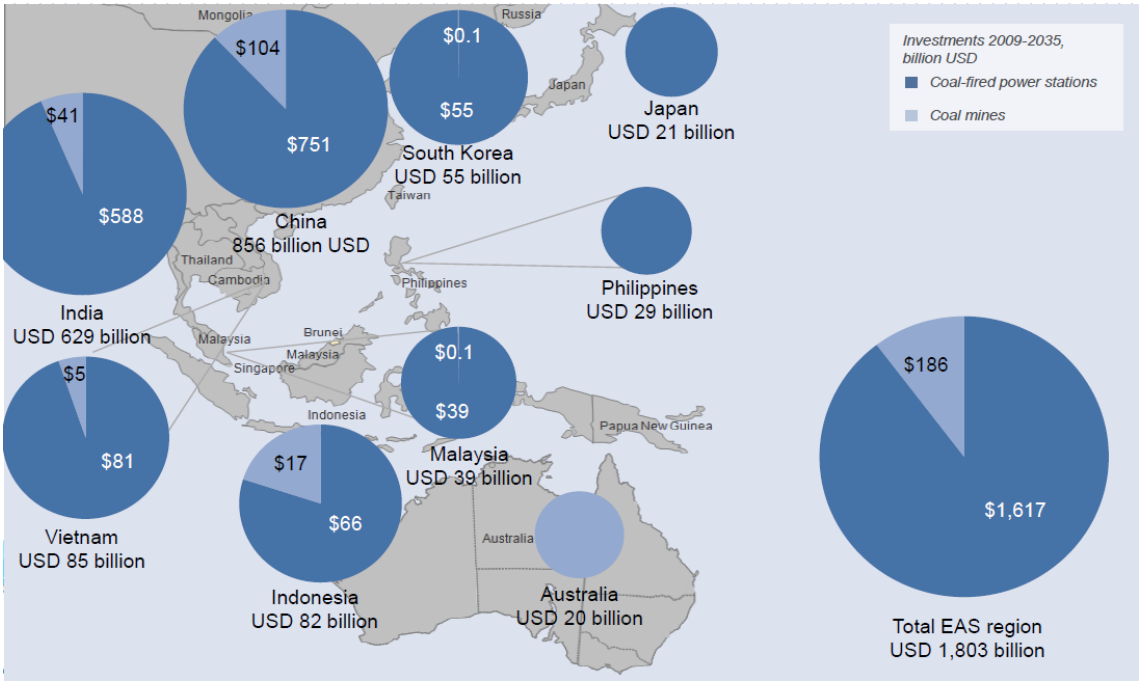
Figure 3-8. Origin of Primary Energy Imports



Coal import origins EAS (2013) LNG import origins ASEAN+3 (2013) Crude oil import origins EAS (2013)

Source: ERIA (2015）.

Figure 3-9. Potential Investment Benefits



Source: ERIA (2015).

2) Clean technology and Thailand's coal-fired power plant pollution control policy

The government of Thailand has carried out the environmental assessment of the thermal power plant through the Environmental Impact Assessment and the Environmental Health Impact Assessment. It also required detailed measures to prevent large scale pollution due to coal-fired power plants and coal mine utilities. For example, release of NOX from a newly built coal fired power plant is limited to less than 200ppm. Other than the official regulation, the industry introduced their voluntary standard and the effort along the industrial standard is required mainly for small coal-fired power plants.

Recommendations by the Government of Thailand include: 1) disposing coal combustion residuals by effective management and utilisation of coal ash as raw material for other industries; 2) value-added products and applications of fly ash and bottom ash; 3) applying green supply chain management for coal transportation; and 4) applying the best available technique for all industries using coal as fuels.

Figure 3-10. Emission Standards for New Power Plants in Thailand

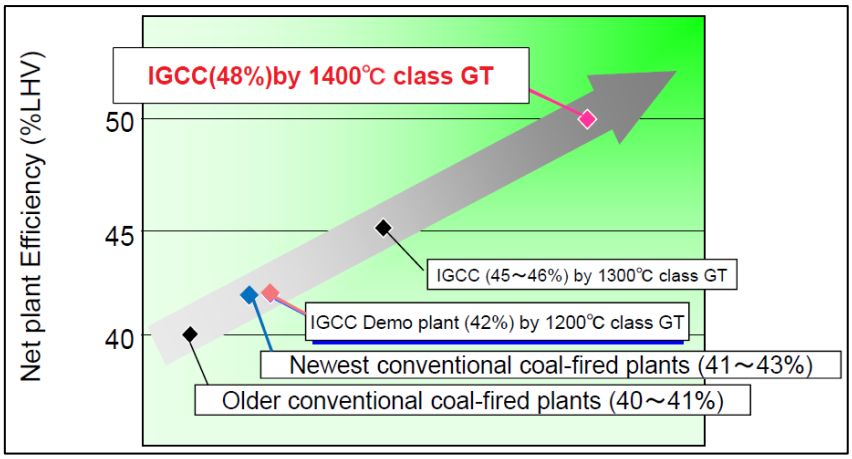
Power Plant type (size and fuel type)	TSP (mg/m^3)	SO_2 (ppm)	NO_x (ppm)
Coal			
❑ Power Plant Size ≤ 50 MW	80	360	200
❑ Power Plant Size > 50 MW	80	180	200
Oil	120	260	180
Natural gas	60	20	120
Biomass	120	60	200

Source: Thailand's Pollution Control Department, presentation in the workshop

3) Achievements and future activities in operation of clean coal technology

Aside from technology development of high efficiency coal-fired power plants and IGCC, efforts such as clearing a severe environmental standard, providing the environment data, and taking communication has been done by Tokyo Electric Power Company (TEPCO). The state-of-the-art IGCC can achieve 48 percent of thermal efficiency, and further improvement by reduction of coal ash and oxygen-blown technology is pushed forward. TEPCO achieved target performance over the longest time in the world at the IGCC proof plant of Nakoso with air-blown technology. TEPCO's CCT will make electricity infrastructure in Asia more efficient.

Figure 3-11. Efficiency Improvement with Increase in Gas Turbine Temperature



Source: Tokyo Electric Power Company, presentation in the workshop

3.3. Social Aspects of Coal Power

Though the role of coal power has been recognised by governmental officials and related business parties, this question still remains: How can we tell people the importance of base load power? Asian countries could learn something from the experience and the intelligence of European countries with a long history of coal and nuclear power utilisation, and of dialogues between government officials and the public.

1) Public acceptability on nuclear and coal power in European countries

Some cases in European countries would be of some help for Asian countries which are planning to introduce or expand the use of coal power plants.

Sweden thinks that crucial conditions for a power portfolio in the future are acceptability including safety, profitability, and capability in terms of technological readiness. Liberalisation in Nordic areas has led the countries to the ‘unified’ market. In Sweden, people accept nuclear power due to its low generation cost.

Germany has developed nuclear power since 1960s, but there are differences about coal resources between the northern and southern areas. There are political hurdles and business risks for power plant projects. Furthermore, Germany aims for very challenging targets in ‘Energiewende. It may lead to exporting volatile generation with low prices.

In Switzerland, renewables with zero marginal costs such as wind and solar, have pushed coal and gas out of the competitive market. The public generally accepts nuclear power and puts reliance on nuclear safety, and highly educated people are more pro-nuclear. Switzerland suggests that real merits (low electricity tariff and emissions) should be most effective in getting the public accept nuclear power.

France had developed and commercialised nuclear power since the 1950s. In the early stage, people were not ‘educated’ enough about the risks of atomic energy and merely believed that nuclear energy can solve every problem. After the Chernobyl accident in the former Union of Soviet Socialist Republics (USSR), the public lost their trust on the officials and the operators. Soon after, a ‘la commission locale d'information’ (CLI), an independent communication body, was established. The law ‘energy transition’ places the obligation on operators to disclose information to local residents through CLIs. Today, all kinds of information can be accessed via the web – a crucial platform that provides accurate and timely information whenever necessary.

As described in the previous chapter, the UK has projects led by Sciencewise, which is the national centre in the UK for public dialogues in policymaking involving science and technology issues. For example, a public dialogue on the GDA of new reactor designs are ongoing in the UK. Cost effectiveness as well as safety should also be reviewed in the UK.

Figure 3-12. Energy and Nuclear/Coal Policy in Major Countries

Country	Energy policy	Nuclear Development	Coal Development
Sweden 	Sustainability/ Carbon neutral	Suspending / decreasing (43% -> ?)	Little (2% -> ?)
Germany 	Zero Emission/ Anti-nuclear	Phasing out (16% -> 0%@2022)	None (without CCS) (45% -> ?)
Switzerland 	Ecology/ Environment compatibility	Transient (38% -> 0%@?)	None (without CCS) (- -> ?)
France 	Security / Sufficiency	Decreasing (78% -> 50%)	Little (2% -> ?)
UK 	Security / Low carbon economy	New builds for replacement (19% -> ?)	None (without CCS) (30% -> ?)

Source: The Institute of Energy Economics, Japan, presentation in the workshop.

Public communication by institutional bodies has faced big struggles during these decades. Even in USA or UK, it can be argued that such processes are extending the construction phase of nuclear projects significantly and putting substantial pressure on the operators during the operation phase. In developing countries, it must be said that public communication is viewed as a necessary tool and sometimes required by the financial community to justify the early investment. But fundamentally, most of the citizens of such countries do not participate and are not using the information for their own benefit. So in summary, these public communication bodies are failing.

Prompt and correct information sharing is a top priority. Independent communicating organisations with professional communication officers would be important. Providing benefits being brought by nuclear energy would be effective in increasing acceptability of nuclear power, rather than arguing about risks. It is really important for the nuclear industry to be accepted by the community and would allow penetration of coal power in East Asian countries.

2) Public concerns on coal/nuclear power and risk communications

Thailand has experienced growing public protests against largescale generation technologies. Although they are still to be strengthened, provisions in their laws and Constitution have established provisions for environmental impact assessments and health impact assessments, and increased the opportunity for public participation.

The ‘public’ means one or more natural or legal persons, a collection of numerous and continually shifting interests and alliances, which may be in conflict with each other. It may also be a catch-all to describe those with an interest in a decision other than a proponent, operator, or responsible authority. The individuals making up a public may be involved as individuals or as members of organisations. They may become involved due to their proximity, economics, social, or environmental issues, values, etc. A person doesn’t have to be a citizen to be a member of the public.

Studies indicate a serious gap in understanding and trust between stakeholders. Existing decision-making structures are often based on either the traditional DAD (Decide, Announce, and Defend) or DEAD (Decide, Educate, Announce, and Defend) methods, and can be seen as one source of gap in trust.

3) Public communication and public acceptance on coal power plant

Most hot issues come from the accusation of nongovernment organisations or academics who want to build their reputations by creating panic in the community and society by raising environmental and health issues. The resolution is to answer all the accusations by using scientific data, hence the need for it.

Accusation topics include contamination of heavy metals from coal burning, acid rain, respiratory impact to communities, coal dust dispersion, ash dispersion, and cooling water problems.

The major causes of the projects' failure are as follows:

- The community has not received the disclosed information on the project.
- The communities do not have any decisive participation from the beginning.
- There exist bad impressions from coal fire power plants in the past.
- NGOs oppose the project.
- The communities do not get any benefits from the project.

Developing large projects requires acceptance from the community surrounding the plant. Recognition by communities consists of two parts. One is that the communities trust that the plant will take care of the environment as a commitment. The other is how the communities will receive the benefits when the project starts. It takes time to create trust and acceptance from communities.

Chapter 4.

Conclusions and Policy Implications

Stable supply of energy is an important factor for the sustainable development of a nation. Securing it should consider various aspects, including energy efficiency, environmental protection, energy security, and safety. As made clear in this study, nuclear power should be regarded as one of the most reliable options for future energy mix, taking into account all of these factors.

It should be noted that in East Asian countries where energy demand will grow rapidly in the future, and where oil and natural gas resources are relatively scarce, energy security will emerge as an especially important issue, resulting in the necessity of continuous use of coal. Taking into consideration both global and regional environmental issues, the wide diffusion of CCTs would be indispensable at the same time.

One of the most important issues for both nuclear and coal power is the perception gap between policymakers and the public. First, in contrast to the policymakers who make decisions considering the interests of the whole nation, the public usually makes decisions taking into account their own interests. For example, global warming is considered an important issue by most people as it would cause various types of damage to anyone anywhere in the world. On the contrary, one usually does not care for the future of the coal industry of one's own country, unless one is a direct stakeholder.

Second, in many cases, relevant information is not fully transmitted to the public in a proper manner. Even if a piece of information is correct as a piece, it cannot be regarded as a proper one if it is fragmented, and decisions based on it cannot be optimal from the viewpoint of the whole nation. For these reasons, there is usually a wide gap between the policymakers and the public, which the government must make maximum efforts to connect.

In this regard, the most crucial factor for obtaining public acceptance is to transmit proper information to the public. The 'information' here includes not only the scientific knowledge on the risk and safety of nuclear or coal-fired power generation, but also the reason why they are regarded as necessary as well as their disadvantages. For this purpose, the government must make policymaking as transparent as possible, paving the way for open and free discussions. As the media plays the crucial role for public understanding, it is always required of the media to make fair and unbiased reports. At the same time, the government must always be conscious of how media reports the policies.

It must also be noted that the transmission of the information must not be a unilateral relationship such as 'DEAD' (Decide, Educate, Announce and Defend). European examples suggest that the dialogues should be designed to allow the opinions of the public truly incorporated with the decision of the government, reflecting many layers of dialogue between the policymakers and the public. In order to achieve this as well as raise the public trust in the government, consideration by the government and the experts in understanding the public would be indispensable.

Another crucial factor is to understand what the public needs. In order for a proposal to be accepted, it must provide the recipient with considerable benefits. In this regard, the policymaker must clearly present to the public the economic and social benefits of the policy, both local and nationwide, as well as its disadvantages.

The government must also continue the policy without frequent changes. From the viewpoint of the power industry and investors, the continuity of policies is as important as the power development need for long-term investments. At the same time, it is also important from the public's viewpoint as the public would not trust the government if it doesn't have a clear perspective of future energy policies.

This study referred to the examples of public dialogues in Europe and sought their implications on East Asian countries. Here, the situations are different between nuclear and coal power. The distrust in nuclear has been caused by the Chernobyl accident in the case of Europe decades ago, and by the Fukushima accident in the case of Asia now. Both cases, however, share the same concern over the safety of operating nuclear power plants and radioactivity.

In the case of coal, the main concern in Europe is focused on global warming issues, in contrast to Asia, especially Thailand, where the concern is on regional air pollution. The efforts in Europe to obtain public acceptance for nuclear would be a good reference not only for nuclear, but also for coal power, in East Asia. At the same time, the issues which do not seem to be relevant in Europe anymore, such as the necessity of coal from the viewpoint of energy security and the crucial role of CCTs for the continuous use of coal, should be taken as one of the most relevant issues in East Asia. As such, discussions taking into account specific situations would be necessary when considering energy issues in East Asia.

Appendix 1.
Summary of the International Nuclear Energy Symposium in Tokyo

Date and Time: 09:00 – 17:30, 19 May 2015

Venue: Sokairo Hall, National Graduate Institute for Policy Studies, Tokyo, Japan

8:30	Doors open, Registration
9:00- 9:10	Opening Address Masakazu Toyoda, President & CEO, The Institute of Energy Economics, Japan
9:10- 9:25	Special Lectures：Yosuke Takagi, State Minister of Economy, Trade and Industry, Japan
9:25- 9:40	Keynote Speech：Hidetoshi Nishimura, Executive Director, ERIA
9:40- 9:55	Keynote Speech：Agneta Rising, Director General of World Nuclear Association, Co-founder and Former President of Women In Nuclear
Session 1 :	*"Why is nuclear energy necessary?"* (Moderator: Ann MacLachlan, journalist)
9:55-10:25 (Talk to order from each invited speakers （Each 7 min. ×4 speakers）)	1) Anne-Marie Choho, AREVA Executive Committee Member, France
	2) Ana Raffo-Caiado, Director, Division of Programme Support and Coordination, IAEA
	3) Xudan Song, CEO of China Division, EDF, China
	4) Reiko Fujita, President of Atomic Energy Society of Japan, Program Manager of ImPACT R&D program, Japan Science and Technology Agency, Japan
10:25-11:10	Panel Discussion
11:10-11:25	Coffee Break
Session 2 :	*"Can we cope with the climate change without nuclear energy? "* (Moderator: Sumiko Takeuchi, Senior Fellow, IEEI)
11:25-11:55 (Talk to order from each invited speakers （Each 7 min. ×4 speakers）))	1) Jessica Lovering, Senior Analyst, The Breakthrough Institute, USA
	2) Ximena Vásquez-Maignan, Senior Legal Adviser, Organisation for Economic Co-operation and Development/Nuclear Energy Agency
	3) Cecilia Tam, Deputy Vice President, Asia Pacific Energy Research Centre, Former Head of the Energy Demand Technology Unit, International Energy Agency
	4) Siriratana Biramontri, Former Deputy Secretary General of Office of Atoms for Peace, Thailand
11:55-12:40	Panel Discussion
12:40-14:00	Lunch Break
14:00-14:10	Keynote Speech：Takashi Shiraishi, President, National Graduate Institute for Policy Studies

Session 3 :	*"How safe is safe enough when there is nothing absolutely safe?"* (Moderator: Ann MacLachlan, journalist)
14:10-14:40 (Talk to order from each invited speakers （Each 7 min. ×4 speakers）))	1) Kaija Kainurinne, Former Head of TVO Brussels Office , Finland
	2) Gerry Thomas, Professor of Molecular Pathology at Imperial College London, UK
	3) Monamie Bhadra, Arizona State University, USA
	4) Kazuko Uno, Department Head, Interferon & Host Defense Laboratory, Louis Pasteur Center for Medical Research, Japan
14:40-15:25	Panel Discussion
15:25-15:40	Coffee Break
Session 4 :	*"What is necessary to gain support for nuclear energy from the public, especially from women?"* (Moderator: Yukari Yamashita, Director, IEEJ)
15:40-17:10 (Talk to order from each invited speakers （Each 7 min. ×12 speakers）))	1) Anne-Marie Choho, AREVA Executive Committee Member, France
	2) Ms Ana Raffo-Caiado, Director, Division of Programme Support and Coordination, IAEA
	3) Xudan Song, CEO of China Division, EDF, China
	4) Reiko Fujita, President of AESJ, Program Manager of ImPACT R&D program, JST, Japan
	5) Jessica Lovering, Senior Analyst, The Breakthrough Institute, USA
	6) Ximena Vásquez-Maignan, Senior Legal Adviser, OECD/NEA
	7) Cecilia Tam, Deputy Vice President, APERC, Former Head of the Energy Demand Technology Unit, International Energy Agency
	8) Siriratana Biramontri, Former Deputy Secretary General of Office of Atoms for Peace, Thailand
	9) Kaija Kainurinne, Former Head of TVO Brussels Office , Finland
	10) Gerry Thomas, Professor of Molecular Pathology at Imperial College London, UK
	11) Monamie Bhadra, Arizona State University, USA
	12) Kazuko Uno, Department Head, Interferon & Host Defense Laboratory, Louis Pasteur Center for Medical Research, Japan
17:10-17:25	Closing Address : Rachel Pritzker, Chair of Advisory Board, Breakthrough Institute, USA
17:25-17:30	Closing Address : Masakazu Toyoda, President & CEO, the Institute of Energy Economics, Japan

Minutes of the Symposium

(1) On May 19, the Institute of Energy Economics, Japan (IEEJ), the US environment think tank the Breakthrough Institute, the Economic Research Institute for ASEAN and East Asia (ERIA) and the National Graduate Institute for Policy Studies (GRIPS) cosponsored the International Nuclear Energy Symposium at GRIPS.

(2) Seventeen female experts in nuclear, energy and environment issues from Japan and other countries met at the symposium to discuss how best to secure nuclear safety, the necessity and roles of nuclear energy, measures against climate change, how to communicate with the public on nuclear energy and other matters from a wide range of female viewpoints under the theme 'Discussions on Nuclear Energy from the Female Point of View – Why is it necessary? Why is it safe enough? Why is it irreplaceable?' This is a tough theme over which Japanese people are divided.

(3) Ms Agneta Rising, director general of the World Nuclear Association, delivered a keynote speech introducing the present situation where 'nuclear energy serves as a base load power source in most countries that have achieved a low-carbon power generation sector.' Quoting a report by the International Energy Agency (IEA), she said, 'Nuclear power generation will make the greatest contribution to solving global warming in the future.' Reviewing the past process in which public confidence in nuclear energy was restored gradually after the Three Mile Island and Chernobyl nuclear power plant accidents, she assured Japan that nuclear energy promoters 'will be able to restore public support' for nuclear energy through their tenacious dialogue with all layers of citizens.

Session 1: 'Why is nuclear energy necessary?'

(1) Four panellists from France, the International Atomic Energy Agency (IAEA), China and Japan gave presentations.

(2) First, Ms Anne-Marie Choho, a member of the AREVA Executive Committee, France, explained the process in which the oil crisis in the 1970s led France to choose nuclear energy for improving its energy self-sufficiency rate. She pointed out that public understanding about nuclear energy would be required first for its promotion and that transparency of nuclear energy must be enhanced to secure such understanding. Ms Choho noted that the present French administration's policy of reducing nuclear energy's

share of power generation reflects its coalition with Europe Ecology, or the Greens. The administration, though planning to promote renewable energy development, would have to maintain a certain level of nuclear power generation from the viewpoint of competitiveness, she said.

(3) From the viewpoint that a growing number of countries in Southeast Asia and Africa are considering introducing nuclear energy for the first time, Ms Ana Raffo-Caiado, director of the IAEA Division of Program Support and Coordination, explained a framework for the IAEA's support for the countries planning to introduce nuclear energy for the first time. She said, 'If IAEA member countries request support from IAEA, IAEA has prepared resources (safety analysis systems and technical cooperation projects) to sufficiently meet their requests.' 'IAEA also hopes member countries to promote nuclear energy with safe ways, though refraining from forcing them to introduce it,' she added.

(4) Ms Xudan Song, CEO of the China Division of French power utility EDF, said that this year was an important year for China to resume its nuclear power plant construction projects suspended since the Fukushima accident. For China that has already developed hydro resources as a low carbon power source almost to the maximum extent and depends heavily on coal power generation, nuclear energy "is an environment-friendly power source that can respond to fast-growing electricity demand," she said, emphasising the necessity of nuclear energy. With China's plan to raise nuclear energy's share of power generation output to 3 percent by 2020 and to 6 percent by 2030, she explained that China was planning efforts to build nuclear reactors in inland zones as well as coastal zones while promoting public understanding about nuclear energy.

(5) Ms Reiko Fujita, president of the Atomic Energy Society of Japan (AESJ), said nuclear energy was one of solutions to the global warming problems and a stable base load power source. She also said: 'Irrespective of whether to support or oppose nuclear, no one can get around the challenge of high-level radioactive wastes. Wastes should be minimised and recycled as much as possible.' As nuclear energy has an advantage of being conservable or usable over a long term, it is important to establish a fuel cycle including fast breeder reactors in the future, Ms Fujita said, citing the present postponement of the nuclear fuel cycle project as a problem.

(6) Panel discussions focused on whether female viewpoints are different from male viewpoints. Ms Anne-Marie Choho said that while female and male viewpoints are not so

different, women spend more time on childcare and contacts with neighbours than men so female viewpoints might reflect home life to a greater extent than male viewpoints. Ms Ana Claudia Raffo-Caiado said women tended to take reasonable approaches and do business enthusiastically. Ms Xudan Song explained that due to the limited number of women majoring in nuclear reactor engineering, she could be viewed as representing female viewpoints and could attract more attention. She also said her opinions could gain more attention as female views when talking about new projects for nuclear power generation. Ms Reiko Fujita said women, though becoming emotional sometimes in private situations, were as logical as men in public situations.

Session 2

(1) Four panellists from the United States, the Nuclear Energy Agency of the Organisation for Economic Cooperation and Development (OECD/NEA), the Asia Pacific Energy Research Center (APERC) and Thailand took the rostrum to give presentations.

(2) First, Ms Jessica Lovering, senior analyst at the U.S. Breakthrough Institute, said, 'Japan actually increased energy-sector CO_2 emissions despite its target of cutting such emissions by 6 percent by 2012 under the Kyoto Protocol.' 'Low-carbon power sources' share of total power generation output has failed to increase since the late 1990s while the share has remained around 5 percent for hydro and rose rapidly for nuclear energy in the 1980s and for renewable energy recently.' She also said: 'The risk of CO_2 emissions through oil, natural gas and coal combustion is greater than that of nuclear power generation from the viewpoint of the global environment. In Japan, the economic risk of the shutdown of all nuclear reactors is also great.'

(3) OECD/NEA Senior Legal Adviser Ms Ximena Vasquez-Maignan said: 'The IEA's Technology Roadmap released in 2015 makes 10 proposals to overcome major obstacles to the introduction of nuclear energy. In the 2 degrees C scenario, nuclear energy will play a key role in cutting emissions in the power generation sector. The roadmap predicts that the development of small modular nuclear reactors will expand the nuclear market and allow even isolated markets to get nuclear reactors.' She also said: 'Key actions should to be taken in the next decade to keep the nuclear option open. Not only governments but also all other stakeholders should take actions to allow nuclear generating and other countries to promote nuclear reactors that are safe, acceptable for the public and cheap.'

(4) APERC Deputy Vice President Ms Cecilia Tam, as an author of the IEA Technology Roadmap 2010-2015, introduced a prediction that 'OECD countries, which have diversified energy sources, will increase nuclear energy consumption while reducing coal and oil consumption, while non-OECD countries will expand consumption of all energy sources.' She also said: 'Various areas should be decarbonised to limit the temperature rise to 2 degrees C or less. Given that nuclear energy is required to account for some 17 percent of power generation output in 2050, achieving the limitation without using nuclear energy would cost more.' 'While there would be various challenges to be solved for Southeast Asian countries' introduction of nuclear energy, a globally united organisation would be required to promote nuclear energy as a key option to develop countries. The next APEC (Asia-Pacific Economic Cooperation) meeting is planned to indicate that the stability as a feature of nuclear energy would become necessary'."

(5) Ms Siriratana Biramontri, a former deputy secretary general of the Thai Office of Atoms for Peace, said: 'In Thailand as well, the energy sector emits massive CO_2. Thai power generation is mostly covered by natural gas, emitting massive CO_2. Furthermore, Thailand imports natural gas from neighbouring countries.' 'Thailand decided to construct a nuclear power plant more than 30 years ago. But the project was suspended as offshore natural gas resources were discovered. I hope that the government will make a decision to use nuclear from the viewpoint of energy security.'

(6) In panel discussions, moderator Ms Sumiko Takeuchi, a senior fellow at the International Environment and Economy Institute, first asked a question about the Obama administration's attitude on nuclear energy. In response, Ms Jessica Lovering indicated her hopes on U.S. nuclear energy policy, saying: 'President Obama has made no specific remarks on nuclear energy. In respect to Climate Action Plan being drafted by the Environmental Protection Agency, however, momentum for nuclear is growing in the political world.'

(7) Next, asked "why nuclear failed to be recognised as a low-carbon technology under the Kyoto Mechanism and if the situation would change in the future," Ms Ximena Vasquez-Maignan said, 'Nuclear failed to be put into the Clean Development Mechanism due to the radioactivity and other problems.' But she said: 'Excluding nuclear means limiting options and is not positive. Discussions should be continued on nuclear energy's contribution, which is important from the viewpoint of climate change.'

(8) Asked 'if Japan, which spends funds on diffusing existing technologies, should invest more in development,' Ms Cecilia Tam said: 'Most emerging countries are considering the nuclear option. Various technologies must be considered for satisfying future energy demand.' She also said: 'Japan, which has no international grid network linked to neighbouring countries, must consider flexibility and energy storage. As energy storage technology may be developed over a long term, it is important to support the development.'

(9) Asked 'what contributions Japan's nuclear technology would make,' Ms Siriratana Biramontri said: 'Japan has experienced various natural disasters and can become a model for the Thai people. Despite the Fukushima accident, most Thai people support Japan. Thailand, though having yet to introduce nuclear energy, is looking to Japan in preparation for the introduction.'

Session 4

(1) In the fourth and last session, a total of 12 panelists from the first to third sessions took the rostrum. All were asked what is necessary to gain support for nuclear energy from the public, especially from women, and made the following comments:

(2) Ms Monamie Bhadra: 'Without having a preconception that ordinary people are irrational and full of fears, we should make discussions under the conception that they are intelligent.'

(3) Ms Siriratana Biramontri: 'Women may be in an advantageous position in talking with people. We should have dialogue with ordinary citizens to win their confidence in nuclear energy.'

(4) Ms Ana Raffo-Caiado: 'We should involve young generations who are free from any specific views. It is also important to use easy-to-understand words for explanations.'

(5) Ms Reiko Fujita: 'AESJ members have been visiting Fukushima. Initially, Fukushima residents questioned why we were visiting Fukushima. As we have won their confidence through the continuation of such visits, experts should continue such activities to maintain connections with many people.

(6) Ms Kaija Kainurinne: 'Patience is a key factor. While winning public confidence in nuclear energy is indispensable, citizens' participation only in one meeting would be insufficient.

Women should take advantage of their patience for continuing the communication process.'

(7) Ms Jessica Lovering: 'Women are apt to have interests in solving actual problems rather than in science or engineering. Nuclear energy should be emphasised as "a means to provide cheap, clean energy' rather than as 'one of the power generation means."'

(8) Ms Ximena Vasquez-Maignan: 'In order to gain confidence in nuclear energy from the public, a legal framework is required for operators' safe use of nuclear energy and regulator's oversight. Preparations for accidents are also necessary.'

(9) Ms Xudan Song: 'China has started initiatives to increase the public acceptance of nuclear energy. Since the Fukushima accident, citizens have become willing to get involved in decision-making processes for nuclear plant construction projects and locating such plants. It is important to provide information to the public in early stages.'

(10) Ms Cecilia Tam: 'We should identify matters of concern to our conversation partners before talking with them. It is important for us to explain and get conversation partners' understanding about the advantages of nuclear energy.'

(11) Ms Gerry Thomas: 'We must discuss various matters. Explaining only puts us at the starting point. As for differences between women and men, some may point out that women tend to refrain from making comments. But all people should be allowed to participate in discussions and make comments, irrespective of whether they are men or women.'

(12) Panelists also introduced interesting episodes based on their actual experiences. Ms Anne-Marie Choho quoted one of her neighbours as telling her: 'I had been opposed to nuclear energy until several years ago. After seeing you (Ms Choho) living as an ordinary citizen while working in the nuclear industry, however, I have begun to believe nuclear energy is reliable.' 'People working in the nuclear industry should become reliable to win public confidence in nuclear energy,' Ms Choho said.

(13) Ms Kazuko Uno introduced an episode where she gave a hand massage to a person wanting healing rather than a difficult lecture during her visit to Fukushima and found the massage very welcomed. Ms Uno also said, 'When I used a simple experiment to explain about food products that can reduce the risk of cancer, my audience understood my explanation well.' Then, she repeated a part of the experiments.

(14) Following comments by panelists, the audience was invited to ask questions. A GRIPS

student said: ‘There were comments that emphasised transparency. What does transparency mean? Does it mean an explanation about a process or a detailed scientific explanation to the public?’ In response, Ms Gerry Thomas said: ‘We must first find what kind of detailed explanations the public wants. It is not easy to explain about radiation or doses.’ ‘It is not appropriate to provide only a mountain of facts,’ she said. Ms Ana Raffo-Caiado said, ‘IAEA staff members are ready to provide answers for various cases in preparation for being asked why nuclear energy can be used for peaceful purposes.’ She also said: ‘We must consider who our conversation partners are, what we want to communicate to our conversation partners and what words we should use for such communication. Messages should be clear.’ Finally, the session ended with a concluding remark by moderator Ms Yukari Yamashita, IEEJ director in charge of the Energy Data and Modeling Center: ‘I thank you for your very significant discussions. I would like you to refer to the discussions here after returning to your businesses.’

(15) After all the sessions ended, Ms Rachel Pritzker, chair of the Advisory Board of the Breakthrough Institute, delivered a closing address. The Breakthrough Institute, which had doubted the safety or economic efficiency of nuclear energy 5 to 6 years ago, has recognised nuclear energy as indispensable for satisfying energy demand in the world through its past researches, according to Ms Pritzker. In the research process, she said, she had paid attention to the fact that no one had died from radiation in the Fukushima accident while fossil fuel combustion for energy supply had led 30,000 people to die of respiratory diseases annually in the world. She then emphasised nuclear energy as one of the safest and cleanest energy sources. When asked if she would allow her daughter to live near a nuclear power plant, she said powerfully: ‘Yes.’

(16) As for challenges regarding nuclear energy, Ms Pritzker said Japan had faced difficulties in gaining public understanding about nuclear energy after the Fukushima accident. While noting it would not be easy to overcome the difficulties, she expressed expectations that Japan, attracting global attention now, could develop a new model for dialogue with the public about nuclear energy.

(17) The symposium brought about a common perception that (1) promoting understanding about the necessity of nuclear energy as an energy source that is effective for preventing climate change and economical, (2) continuing to provide correct information and communications on safety of nuclear power plants and radiation risks, and (3) patient dialogue with people taking advantage of female viewpoints, particularly ‘transparent’ and

‘easy-to-understand’ explanations, are required for gaining understanding about nuclear energy from the public, particularly women.

Appendix 2.
Summary of the Symposium on Sustainable Power Mix in the Future

Date & Time: 09:00 – 17:20, 20 November 2015

Meeting Venue: The Library, Novotel Bangkok on Siam Square, Bangkok, Thailand

Agenda:

08:00-09:00 *Registration and Refreshment*

09:00-09:10 **Welcoming and Opening Remarks**

***Dr Dawan Wiwattanadate**, Director, CU-ERI, Thailand*

09:10-09:20 **Keynote Address**

***Mr Akihiko Uchikawa**, Minister – Economic Section, Embassy of Japan in Thailand, Japan*

09:20-09:50 **Special Lecture 1**

Thailand's Energy Policy and Power Development Plan

***Dr Twarath Sutabutr**, Director-General, Energy Policy and Planning Office (EPPO), Ministry of Energy (MOEN), Thailand*

09:50-10:20 **Introductory Lecture**

The Importance of Power Supply Mix on Energy Security and Sustainable Development

***Dr Yanfei Li**, Energy Economist, Energy Unit, Economic Research Institute for* ASEAN and East Asia (ERIA)

10:20-10:40 *Photo Session and Coffee Break*

10:40-12:40 **Session 1: Current Situation of Power Policy and Coal Power Generation and Perspectives in ASEAN and East Asia**

*Moderator: **Dr Weerin Wangjiraniran**, Researcher, CU-ERI, Thailand*

20 minutes presentation + 5 minutes Q&A

10:40-11:10 Coal Power Generation in ASEAN Countries and its Role in Energy Security

***Dr Joni Jupesta**, Manager of Policy Research and Analytics Programme, ASEAN Centre for Energy (ACE)*

11:10-11:40 Power Policy and National Development Plan in Indonesia

***Mr Jarman**, SOE Leader of Indonesia, Director General for Electricity, Ministry of Energy and Mineral Resources (MEMR), Indonesia*

11:40-12:10 Power Policy and National Development Plan in Malaysia

***Mr Somasundram Ramasamy**, Senior Undersecretary, Energy Division, Ministry of Energy, Green Technology and Water (KeTTHA), Malaysia*

12:10-12:40 Coal Power Generation in India and its Role in Economic Efficiency

***Mr Prosanto Pal**, Senior Fellow, The Energy and Resources Institute (TERI), India*

12:40-14:00 Lunch Break

14:00-14:30 Special Lecture 2

Clean Technology and Thailand's Coal-fired Power Plant Pollution Control Policy

***Dr Wijarn Simachaya**, Director General, Pollution Control Department, Ministry of Natural Resources and Environment (MNRE), Thailand*

14:30-15:10 Session 2: Clean Coal Technology – Current Status and Perspectives

20 minutes presentation +5 minutes Q&A

*Moderator: **Dr Viboon Sricharoenchaikul**, Deputy Director, CU-ERI, Thailand*

Issues to be Discussed: Technology, Project Management, and Finance

14:30-15:00 Economic Benefits of Introduction of CCT in the EAS Region

***Dr Phoumin Han**, Energy Economist, Energy Unit, ERIA*

15:00-15:30 Achievements and Future Activities in Operation of Clean Coal Technology

***Mr Atsushi Kimura**, Manager of Mechanical Engineering Group, Fukushima IGCC Design Center, Thermal Power Department, Fuel & Power Company, Tokyo Electric Power Company, Inc. (TEPCO), Japan*

15:30-15:50 Coffee Break

15:50-17:30 Session 3: Social Prospects of Power Generation Business

20 minutes presentation +5 minutes Q&A

*Moderator: **Dr Sopitsuda Tongsopit**, Researcher, CU-ERI, Thailand*

Issues to be Discussed: Environmental Aspects, and Social Acceptance

15:50-16:20 Public Acceptance on Nuclear and Coal Power in European Countries

***Ms Tomoko Murakami**, Senior Economist, Manager of Nuclear Energy Group, Strategy Research Unit, IEEJ, Japan*

16:20-16:50 Public Concerns on Coal/Nuclear and Risk Communications

Prof Surichai Wun'geao, Former Director, CU-SRI, Thailand

16:50-17:20 Public Communication and Public Acceptance on Coal Power Plant

***Mr Veerapon Puangpitayavut**, External Relations Director, BLCP Power Station, Thailand*

17:20 Closing Remarks

***Mr Ichiro Kutani**, Assistant to Managing Director, Senior Economist, Manager of Global Energy Group 1, Strategy Research Unit, IEEJ, Japan*

Minutes of the Symposium:

(1) On November 20, 2015, the Symposium on Sustainable Power Supply Mix in the Future was supported by Economic Research Institute for ASEAN and East Asia (ERIA) and co-organised by The Institute of Energy Economics, Japan (IEEJ) and Energy Research Institute of Chulalongkorn University (CU-ERI) at Novotel Bangkok on Siam Square in Bangkok, Thailand.

(2) The purpose of the symposium was to share information and to discuss policies necessary to enable sustainable power supply mix in ASEAN and East Asian countries, focusing on coal power generation. The symposium was broken into an introductory lecture session and three sectoral sessions followed by Q&A.

(3) In the Introductory Lecture Session, experts from Ministry of Energy (MOEN), Thailand and ERIA gave a lecture on the current status and the outlook of energy policies and energy mix in Thailand and EAS region.

(4) In Session 1, panellists from ASEAN Centre for Energy (ACE), Ministry of Energy and Mineral Resources (MEMR), Indonesia, Ministry of Energy, Green Technology and Water (KeTTHA), Malaysia, and The Energy and Resources Institute (TERI), India introduced the outlook of energy mix in ASEAN region and explained the importance of coal resource utilisation. After the presentation, based on the questions from participants, issues such as a financial support for the development of high-efficient coal power plants (e.g. IGCC) and international electricity trades among ASEAN countries were discussed.

(5) In Session 2, an expert from Ministry of Natural Resources and Environment (MNRE), Thailand explained that in Thailand, development of coal power generation is getting more and more difficult due to environmental regulation. Then, Tokyo Electric Power Company, Inc. (TEPCO), Japan introduced the current status of implementation of coal power plants using clean coal technology (CCT) in their supply area in Japan. Some participants commented that they are eagerly hoping for an introduction of the CCT from Japan.

(6) In Session 3, three panellists from IEEJ, Japan, Rotary Peace Center, CU, Thailand, and BLCP Power Station, Thailand introduced the methods and actual efforts to improve public acceptance of coal power in European countries and in Thailand. Through discussion, participants found that it is necessary for local communities to be convinced of not only the environmental adaptability of the coal power plants, but also the benefits gained for them to go ahead with the construction projects.

(7) Through the symposium, the importance of high-efficient coal power generation to achieve the sustainable power supply mix was commonly recognised by the participants and the way to resolve issues such as finance support, technology development and public acceptance were actively discussed.