

Policy Necessity and Problems for Nuclear Energy Development in the Asia-Pacific Region

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Energy demand, especially electricity demand, will increase in the Asia-Pacific region, and nuclear energy development will be required for the reduction of fossil fuel dependence and the protection of the global environment. In order to realize nuclear energy development, it will be necessary to cope with construction, operation, regulation and nonproliferation problems. Some kind of regional cooperation will be required for solving these problems.

Keywords: Asia-Pacific region, nuclear energy development, regional cooperation

1. Introduction

This report is designed to specify the policy necessity and problems for nuclear energy development in the Asia-Pacific region and explore the direction for solutions to these problems.

2. Asia-Pacific economic growth and energy supply/demand

The “Asia/World Energy Outlook 2009” by the Institute of Energy Economics, Japan(IEEJ), projects economic growth and energy demand up to 2035 in major countries including Asian ones. In the reference case based on the past trend and existing energy and environmental policies, economic growth and energy supply/demand are projected for major Asia-Pacific countries as shown in Table 1.

Among these major countries, developing nations are expected to achieve high growth. Vietnam is projected to achieve the highest annual average growth of 6.3%, followed by 5.6% for China and 4.2-4.3% for the other ASEAN (Association of Southeast Asian Nations) countries. Among developed countries, South Korea is predicted to score an annual average growth rate of 2.8%, followed by 2.7% for Oceania (Australia and New Zealand). Japan’s growth would be limited to 1.1% partly due to the falling population.

Primary energy consumption growth is projected at lower levels than economic growth because of improvements in basic unit for energy. Among Asia-Pacific developing countries, Vietnam is forecast to record the highest average annual primary energy consumption growth of 5.9%, followed by 2-4% for the other ASEAN nations and China. Among developed countries, South Korea is expected to record an annual average growth rate of 1.5%, followed by 0.9% for Oceania. Japan with low economic growth is projected to record an annual average decline of 0.1% in primary energy consumption.

Of energy consumption, electricity demand is expected to be firm. Electricity demand growth is projected as faster than primary energy consumption growth for each country. Among developing countries, Vietnam is projected to record the highest annual average growth of 6.3% in electricity generation, followed by 3-6% for other Asia-Pacific developing countries. Developed countries are forecast to expand electricity demand by an annual average of 1-2%. Japan, though forecasting a primary energy consumption decline, is expected to boost electricity demand by an average 0.7%.

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Table 1 Asia-Pacific Economic Growth and Energy Demand

	Economic growth	Primary energy consumption			Electricity generation		
	(Annual average: %)	(In millions of tons oil equivalent)		(Annual average growth: %)	(TWh)		(Annual average growth: %)
		2007	2035		2007	2035	
Japan	1.1	514	493	-0.1	1123	1359	0.7
China	5.6	1765	3451	2.4	3279	7667	3.1
South Korea	2.8	222	341	1.5	426	658	1.6
Indonesia	4.2	138	378	3.7	142	665	5.7
Malaysia	4.2	70	144	2.6	101	353	4.6
Philippines	4.3	32	112	4.5	60	255	5.3
Thailand	4.3	86	234	3.6	143	485	4.5
Vietnam	6.3	31	154	5.9	69	380	6.3
Oceania	2.7	141	181	0.9	298	521	2.0

Source: "Asia/World Energy Outlook 2009," IEEJ

3. Expanding dependence on energy imports

The Asia-Pacific region is less rich with energy resources, especially oil, than other regions. According to BP statistics, the Asia-Pacific region (excluding India while including other South Asian countries and New Zealand) recorded nearly 740 million tons in net oil imports in 2008. The region is dependent particularly on Middle East oil. Imports from the Middle East account for about 60% of the region's total oil imports (see Table 2).

If energy demand increases by motorization and other economic growth factors in the region, its dependence on Middle East oil may increase further.

Table 2 Asia-Pacific Oil Trade

	Japan	China	Singapore	Other Asia-Pacific	Australia/ New Zealand	Total
Imports	244.2	217.8	130.9	345.7	43.6	982.2
<i>(Imports from Middle East)</i>	<i>196.9</i>	<i>92.0</i>	<i>53.1</i>	<i>238.3</i>	<i>5.4</i>	<i>585.7</i>
<i>(Share for imports from Middle East)</i>	<i>80.6%</i>	<i>42.2%</i>	<i>40.6%</i>	<i>68.9%</i>	<i>12.4%</i>	<i>59.6%</i>
Exports	17.1	18.8	76	116.5	15.5	243.9
Net imports	227.1	199	54.9	229.2	28.1	738.3

(In millions of tons)

Source: BP Statistical Review of World Energy, June 2009

Note: "Other Asia-Pacific" cover Brunei, Cambodia, Hong Kong, Laos, Mongolia, North Korea, Afghanistan, Bangladesh, Myanmar, Nepal, Pakistan, Sri Lanka, Taiwan, Papua New Guinea and Oceania.

4. Constraints of global environment problems

The "Asia/World Energy Outlook 2009" also gives carbon dioxide emission estimates. In the reference case, CO₂ emissions in Asia (including India and other South Asian countries) are projected to increase by 8.4 billion tons from 10.7 billion tons in 2007 to 19.1 billion tons in 2035. China is predicted to expand emissions 1.6-fold from 6 billion tons to 9.8 billion tons. "Other Asian countries" including Southeast Asian nations are forecast to boost emissions 2.3-fold from 2.1 billion tons to 5 billion tons.

No CO₂ emission reduction targets are imposed on China and Southeast Asian countries under the present Kyoto Protocol to the United Nations Framework Convention on Climate Change. But some

restrictions may be imposed on them in the future to prevent their emissions from increasing at the projected paces.

5. Necessity for nuclear energy development

In the face of their growing dependence on energy imports and the constraints of global environmental problems, Asia-Pacific countries are required to take various energy policy measures including nuclear energy development as well as the promotion of energy conservation and cleaner uses of coal thermal power generation.

Table 3 Asia-Pacific nuclear energy development

	Nuclear power generation capacity		Nuclear power generation	
	(Million KW)		(TWh)	
	2007	2035	2007	2035
Japan	50	63	264	470
China	9	81	62	554
South Korea	18	31	147	257
Indonesia	0	0	0	0
Malaysia	0	1	0	9.1
Philippines	0	0	0	0
Thailand	0	1	0	9.1
Vietnam	0	3	0	18
Oceania	0	0	0	0

Source: "Asia/World Energy Outlook 2009," IEEJ

The "Asia/World Energy Outlook 2009" projects major Asia-Pacific countries to proceed with nuclear energy development in the reference case. China is predicted to boost nuclear power generation capacity and real output about nine-fold from 2007 to 2035. South Korea and Japan are also forecast to expand nuclear power generation substantially. Among Southeast Asian nations, Vietnam, Malaysia and Thailand are expected to launch nuclear energy development (see Table 3).

While Asian countries depend heavily on energy imports, particularly oil, their main electricity source is now coal. Oil's weight in electricity generation is low. Given that nuclear power generation is planned as the base electricity source, nuclear energy may replace coal rather than oil in power generation. In the transportation sector, however, electricity demand may replace diesel oil demand through the electrification of railways. In the future, electricity may replace gasoline and diesel oil to power vehicles through the diffusion of electric vehicles.

In connection with the constraints of global environment problems, nuclear power generation will contribute to CO₂ emission reductions in the power generation sector by replacing coal.

6. Problems with nuclear energy development and direction of their solutions

Nuclear energy development entails various problems. Particularly, Vietnam, Malaysia, Thailand and other countries planning to introduce nuclear power generation may have difficult problems. First, they will have to create infrastructure for nuclear energy development. They might have difficulties in creating such infrastructure and will have to get help from developed countries.

The key infrastructure for nuclear energy development includes nuclear power plant construction capacity including planning and fund-raising capacity.

The infrastructure also includes nuclear plant operation capacity for power generators and regulatory capacity for governments. Nuclear regulations cover nuclear security of recent interest, as well as nuclear safety of traditional interest.

Both governments and power generators must also have capacity to make efforts to prevent the

proliferation of nuclear weapons.

Developed countries with advanced nuclear energy technologies and Asia-Pacific countries planning to introduce nuclear energy will have to cooperate in constructing and operating nuclear plants, setting safety/security regulations and preventing the proliferation of nuclear weapons. Given the smooth coordination of interests, lower telecommunications and transportation costs, and progress in regional economic integration, countries planning to introduce nuclear power generation may mainly choose to cooperate with neighboring developed countries rather than with remote developed nations or through international organizations. Such regional cooperation may be desirable for countries planning to introduce nuclear power generation.

Reference

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