Chapter 3

Future Threat on Energy Security

November 2015

This chapter should be cited as

Kutani, I., M. Motokura and P. Han (2015), 'Future Threat on Energy Security', in *Scenario Analysis of Energy Security in the East Asia Summit Region*. ERIA Research Project Report 2014-35, Jakarta: ERIA, pp.29-41.

Chapter 3

Future Threat on Energy Security

This chapter presents future energy security risk scenarios for the EAS region that were drawn out through a scenario planning approach.

The Working Group created three scenarios: (i) supply uncertainty in the Middle East and Russia, (ii) low oil price, and (iii) cheap coal utilisation. For each scenario, a scenario in addition to a business-as-usual (BAU) scenario was also created.

3.1. Procedure of the Scenario Planning Method

The following actions were undertaken in the scenario planning:

Item	Action
(a) Raise the issues [Identification of all future risk factors]	• Fill in all the future risk factors in the respective issue cards.
(b) Clustering [Classification of future risk factors]	• Group the issue cards by category. • Pick up a key issue card that acts as a 'driving force'.
(c) Mapping [Prioritising future risk factors]	• Evaluate the driving force of the key issue card based on 'importance' and 'uncertainty'. • Find out what makes it the 'most important' key issue card and/or why it has high uncertainty. Understand the relationships amongst the issue cards.
(d) Structuralise the scenario [Discussing the scenario structure]	• Organise a basic structure of the scenario by using findings through clustering and mapping work.
(e) Scenario building	• Expand the scenario structure by adding issue cards, along with a timeline. • Draw up a scenario.
(f) Implication	• Discuss the implications from this scenario planning, as applicable for each country.

(a) Raise the issues

First, participants will identify all possible future uncertainties. The scope of study will include all fields and regions; events that have a possibility of changing the energy security in the future, both at home and abroad, will be identified. The participants will write the events on cards to create issue cards.

(b) Clustering

This involves classifying future risks. The participants will classify the future risks written on issue cards into related categories and pick up major issues that may be considered ‘driving forces’.

(c) Mapping

This involves ranking the future risks. The participants will assess the major ‘driving forces’ from the viewpoints of ‘importance’ and ‘uncertainty’. Next, they will create an issue card that reflects the most important and/or highly uncertain issue. Finally, they will discuss the relationships amongst the issue cards.

(d) Structuralise the scenario

This involves discussing the structure of a scenario. Through clustering and mapping, the basic structure of a scenario will be drawn up.

(e) Scenario building

This involves creating a scenario. The participants will expand a scenario by adding new issues in accordance with a timeline. Eventually, a final future scenario will be drawn up.

(f) Implication

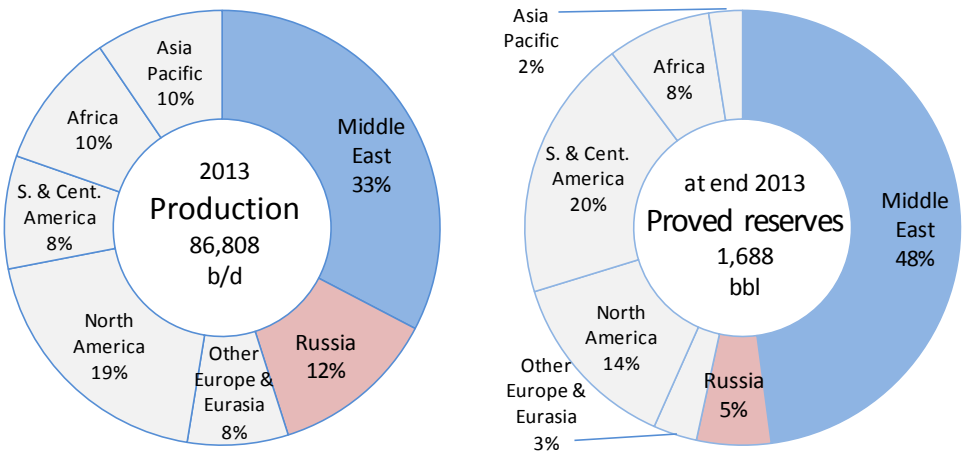
This involves discussing the implications to be drawn out from a future scenario. The participants will discuss implications from the created scenarios, and how these can be applied to their countries.

3.2. Scenario 1: Supply Uncertainty in the Middle East and Russia

3.2.1. Background of the scenario

In this scenario, a possibility that crude oil prices will surge around 2020, triggered by uncertainties in the Middle East and Russia, which are major oil-producing regions of the world, is assumed as a turning point in the future. As of 2013, the two regions account for 45 percent of the world's oil production and 53 percent of proved oil reserves of the world. If these regions are unstable, the crude oil supply will be unstable, substantially affecting oil supply and demand in the world. Should the oil supply from these regions decrease for some reason, it can be easy to imagine that the market will immediately react and oil prices will surge.

Figure 3-1. Share of Middle East and Russia in Global Oil Supply



Source: BP Statistical Review of World Energy, June 2014.

Chapter 2 has cited geopolitical issues, natural disasters, lack of infrastructure, quota agreement amongst the OPEC nations, and uncertainty in demand as the possible backgrounds of uncertainties in the Middle East and Russia, and of crude oil prices going

up again. Over the medium to long term, there are concerns that depletion of resources might occur. It is also highly possible that prices of oil and natural gas will go up around 2020. These factors are taken into account in the BAU scenario.

3.2.2. Business-As-Usual scenario

The following scenario was drawn up for the supply uncertainty in the Middle East and Russia:

Outcomes of crude oil price hike:

- Development of renewable energy will increase its price competitiveness and climate change policy will be globally reinforced in 2020 and onwards. Development of renewable energy will proceed in the years following 2025.
- Development of new resources will be encouraged as oil and natural gas prices rise.
- Use of coal will be promoted because its price attractiveness will heighten. At the same time, use of nuclear power will also be promoted by strong climate change policies, with an eye to curbing the carbon dioxide (CO_2) emitted by coal.
- In the transport sector, the introduction of new energy, such as hydrogen, will be accelerated in 2030 and onwards.
-

As a result of these, oil and natural gas demand will diminish over the long term. Declining oil and gas demand will harm these industries both in exporting and importing countries, with less earning and less employment in the sector. In the meantime, jobs will be created by the promotion of development of renewable energy, introduction of new energy, and development of new technologies, and the economy will be revitalised after 2030.

3.2.3. Scenario other than Business As Usual

What will be happen if crude oil prices do not rise and remain at about US$80 per barrel?[1] Reinforcement of the climate change policy will be the driver of development of renewable energy and new technologies. The reinforcement of the climate change policy

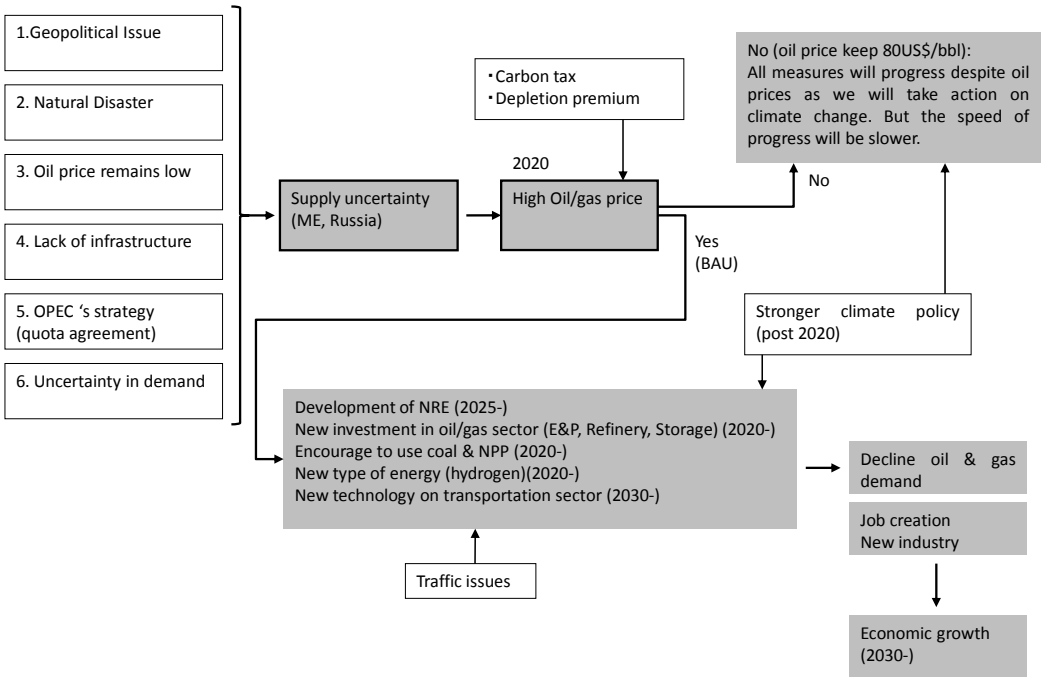
[1] The crude oil price was about US$80 per barrel when this scenario was created. Before that, US$80 per barrel was considered to be at low level because the oil price was at a range higher than US$100–US$120 per barrel.

is considered highly probable and it is forecast that its speed is slower than the BAU scenario, or a similar change to occur as the oil price is low.

3.2.4. Summary of the scenario

The above supply uncertainty in the Middle East and Russia scenario is summarised in Figure 3-2.

Figure 3-2. Scenario of Supply Uncertainty in the Middle East and Russia



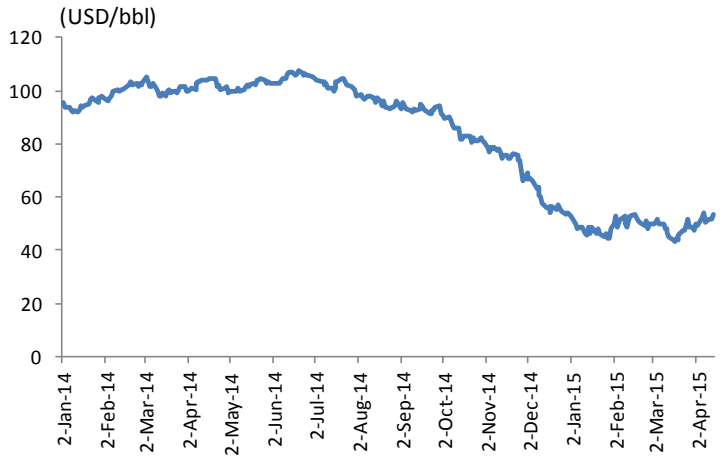
Source: Author's scenario assumption.

3.3. Scenario 2: Low Oil Price

3.3.1. Background of scenario

This scenario was added at the second Working Group meeting. Crude oil prices, which were at around US$100 per barrel until July 2014, started falling in August. As of October, when the first Working Group meeting was held, they were still at US$80 per barrel, and it was still not actually felt that the oil prices were low. However, the crude oil prices kept declining after that, and fell below US$50 per barrel in January 2015, and there is a dominant perspective that the low oil price would continue.

Figure 3-3. West Texas Intermediate Crude Oil Futures Price (2014–2015)



Sources: United States Department of Energy (DOE) and US Energy Information Administration (EIA).

Both oil-producing and oil-importing countries coexist in the EAS region. Some nations in this region export or import liquefied natural gas (LNG) at oil index price; the influence of the low oil price is not limited to oil. Hence, the Working Group created a BAU scenario where crude oil prices will remain at US$50 per barrel until 2020.

3.3.2. Business-As-Usual scenario

The following scenario was drawn up for the BAU low oil price scenario:

Against the background of low oil prices, the demand for oil and natural gas will increase.

- It will have a favourable influence on the economy of oil-importing countries so they will continue their growth.
- Europe, where the economy is slowing down, and China, whose economic growth is decelerating, will be revitalised.
- China will increase its oil stockpile to improve energy security, and refrain from the use of coal but increasingly rely on the use of natural gas as a countermeasure against air pollution.

On the other hand, the supply of oil and natural gas will drop because of the low oil price.

- Existing oilfields will be depleted.
- Production of unconventional resources will decrease in the US.
- Investment in the upstream sector will decline.
- Exploration and production and the research and development (R&D) of oil and natural gas in the unconventional and frontier areas will be delayed and investment in R&D of renewable energy will also be delayed.

As a result, the supply–demand balance of oil and natural gas will be tightened and oil prices will rise to a level of US$80–US$100 per barrel in 2020 and onward.

As a risk factor, a situation where the expansion of the region dominated by Islamic States has a significant influence on oil production is conceivable. In addition, it would also be possible that a large amount of speculative fund flows into the oil market. In case such a situation does happen, extremely high oil prices of US$150–US$200 per barrel in 2020 or later are possible.

The scenario in an extremely high oil price scenario is as follows:

- Oil-importing countries will be significantly affected economically.
- Exploration and production of oil and natural gas will be promoted.
- Use of coal will increase and competitiveness of nuclear power generation will rise.
- Price competitiveness of renewable energy will increase and its development will be moved forward.
- Contingency measures, such as stockpiling of oil, will be reinforced.
- Efficiency of energy use will improve.
- R&D of new technology will be promoted.

As a result, the demand and supply of oil and natural gas will be relaxed and oil prices will fall to a level of US$80–US$100 per barrel around 2030. Depending on the degree of the events assumed above, however, oil prices may be somewhere between the low oil price scenario and extremely high oil price scenario.

3.3.3. Scenarios other than Business As Usual

Aside from the BAU scenario, other scenarios are also conceivable, such as one where the demand and supply is relaxed because supply increases while demand is sluggish.

Weak demand:

- China's economic adjustment will continue until 2020.
- China's gross domestic product (GDP) growth rate will drop to 5 percent and oil demand will decline as the nation will increasingly use natural gas as an energy source.
- Retail price will rise and demand will decline as energy subsidy will be abolished sometime between 2015 and 2020.
- In exporting countries, which have seen rapid domestic economic growth due to high oil prices, the economy will be decelerated because of low oil price.
- A climate change policy for 2020 or later will be agreed on at a session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) and a movement towards reduction of oil consumption will be accelerated.

Strong supply:

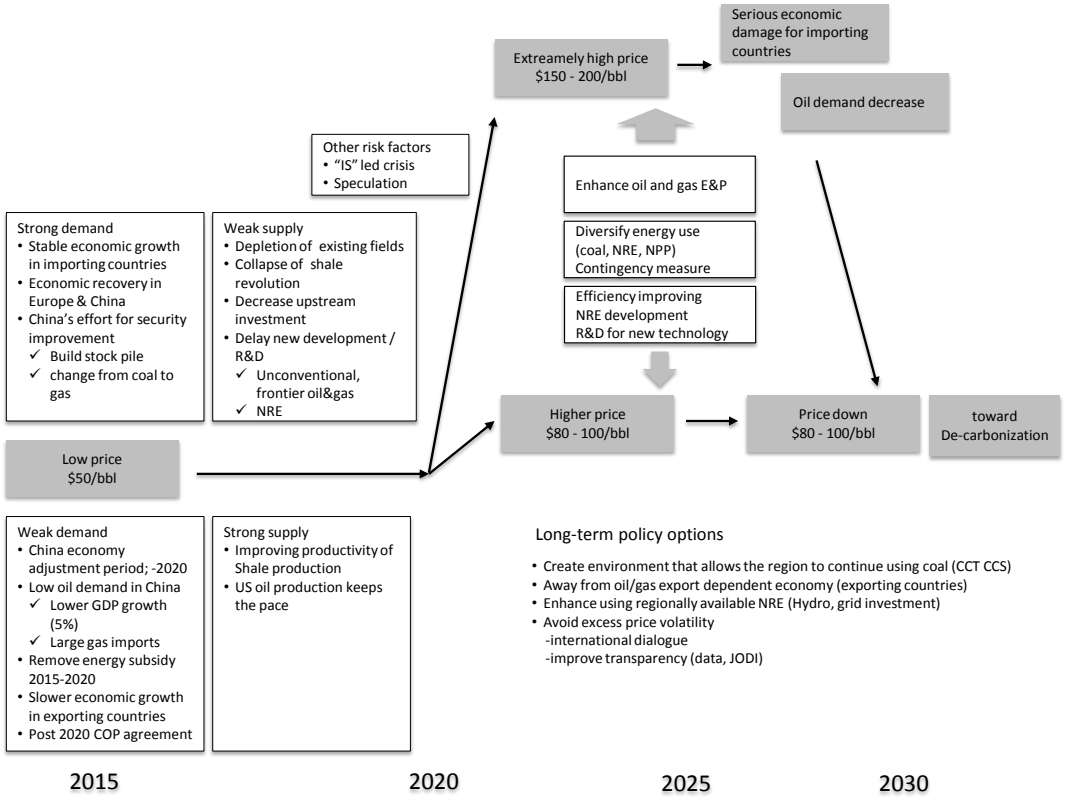
- Production efficiency and thus price competitiveness of shale oil and gas will improve and oil production of the US will not decline even though the price is low.

In this scenario, the current low oil price will be adjusted as a whole and crude oil prices will gradually go up, though not to the level of the BAU scenario. In this case, changes similar to the BAU scenario will occur but their degree will be less than the BAU scenario.

3.3.4. Summary of scenario

Figure 3-4 summarises the low oil price scenario:

Figure 3-4. Low Oil Price Scenario



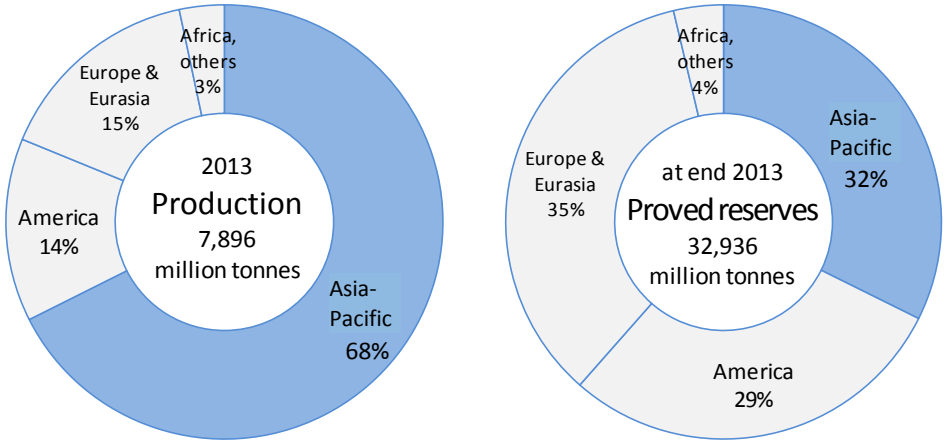
bbl = billion barrels, COP = Conference of Parties, E&P = exploration and production, GDP = gross domestic product, IS = Islamic States, NPP = non-petroleum products, NRE = new renewable energy, R&D = research and development.
Source: Author's scenario assumption.

3.4. Scenario 3: Cheap Coal Utilisation

3.4.1 Background of scenario

The Asia-Pacific region, where the EAS region belongs, accounts for 68 percent of the world's coal production and 32 percent of proved coal reserves of the world, as of 2013. It is also the region where coal is used most in the world. The EAS region can supply coal to itself, unlike oil and natural gas. Therefore, coal is an energy source preferable for the region from the viewpoint of energy security.

Figure 3-5. Share of Asia–Pacific in Global Coal Supply



Source: BP Statistical Review of World Energy, June 2014.

In this scenario, whether an environment where abundant cheap coal reserves in the EAS region can be utilised in large quantity can be created or not is assumed as a turning point in a vision of the future. Considering the importance of coal for the EAS region, the possibility that coal will be continuously used in the future is presumably high. Therefore, such an environment was assumed in creating a BAU scenario.

The following provides the background where coal will be needed in the EAS region:

- The EAS region's economy is growing and living standard is improving. Consequently, demand for electricity is growing, and demand for inexpensive base load power sources is high.
- Inexpensive coal is highly demanded also in industrial sectors, such as iron and

steel, and cement.

- Clean coal technology to cleanly use coal has been put into practical use.
- Demand for natural gas is growing at the same time. But demand for inexpensive coal is outpacing it because natural gas is relatively expensive.
- Energy prices are on the rise because subsidy is abolished, and pushing down the energy supply cost is strongly demanded.

3.4.2. Business As Usual scenario

Use of cheap coal will be accelerated by economic growth and technological innovation in the EAS region. Over medium and long terms, however, coal prices will rise because demand for coal will increase. In the meantime, demand for natural gas will fall and natural gas prices will drop because coal will be the major energy source in the region. As a result, the difference in price between coal and natural gas will be reduced, lowering the price competitiveness of coal; the role of natural gas will also possibly expand around 2030.

Appropriately financing the investments over the short and medium term is important for this scenario. Because coal emits large amounts of air pollutants, the use of high-efficiency and clean technology is desirable. This means that the initial investment, which is larger than for natural gas, is further driven up. Thus, access to funding by international financial institutions should be secured and lenders should be responsible for introducing appropriate technology.

For the medium and long term, it will be necessary to create a system that encourages the clean use of coal by, for example, (i) setting forth a standard of efficiency; (ii) developing an advanced coal utilisation technology; and (iii) having a mechanism to finance CO_2 emissions reduction, such as a clean development mechanism (CDM).

3.4.3. Scenario other than Business As Usual

A scenario where the use of coal—an inexpensive energy source that can be procured in the region—becomes difficult for some reason is also conceivable.

In this case, more natural gas will be used as an alternative to coal. Altogether, energy prices will rise. Consequently, economic growth will be pushed down, and the shift

to renewable energy will be accelerated with the expensive energy price as the driving force, and energy efficiency will be enhanced. Over the medium and long term, electricity transaction will become faster to fully use the renewable energy that is usable in the region. Although the use of nuclear power generation will be promoted, the share of nuclear power is expected to be minor.

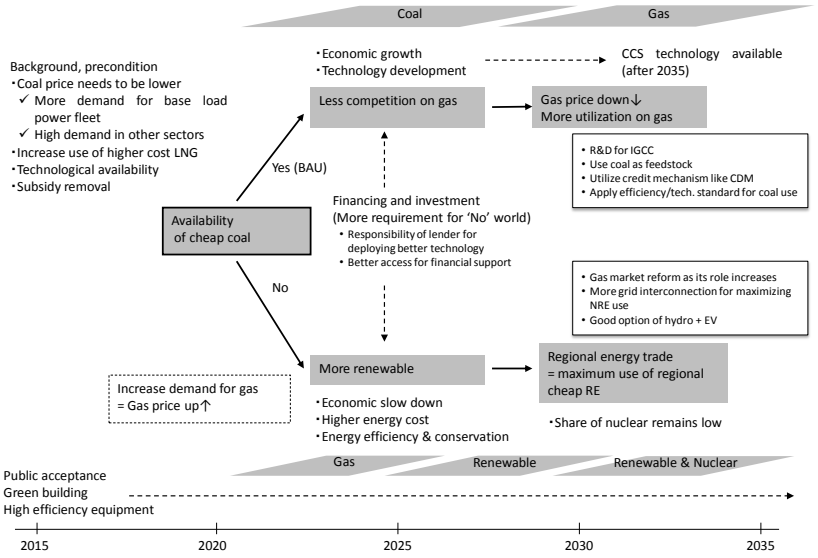
In this scenario, financing is as important as in the BAU scenario. However, much more funds are needed than in the BAU scenario because investment in expensive renewable energy is required. In addition, a reform of the gas market will also be required to use natural gas in place of coal, and this will play an important role in energy supply at as low a price as possible.

To fully utilise the usable renewable energy, a power transmission network that ensures electricity transaction within the region must be reinforced. If the possibility of using renewable energy increases, the spread of electric vehicles that use clean electric power may be an alternative worth considering.

3.4.4. Summary of the scenario

Figure 3-6 summarises the cheap coal utilisation scenario:

Figure 3-6. Cheap Coal Utilisation Scenario



BAU = business-as-usual, CCS = carbon capture and storage, CDM = clean development mechanism, EV = electric vehicle, IGCC = integrated gas combined cycle, LNG = liquefied natural gas, NRE = new renewable energy, RE = renewable energy, R&D = research and development.

Source: Author's scenario assumption.