# Chapter 4

## Key Findings and Policy Recommendation

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# Chapter 4

# Key Findings and Policy Recommendation

## 1. Possible Future Electricity Supply Mix in the ASEAN Region

It is not possible to satisfy all electricity demand with a single energy source. Each energy source has its own advantages and disadvantages (Table 4-1) and effort is required to make full use of the advantages and minimise the disadvantages. Therefore, creating a system featuring a mixture of electricity sources is crucial for ensuring stable supply.

**Table 4-1: Comparison of Fuel Types**

| | **Resource Availability** | **Stability Electricity Output** | **Generating Cost** | **Environmental Friendliness** | **Necessary Action** |
|---|---|---|---|---|---|
| Coal | good | good | good | bad | Improve efficiency |
| Natural gas | good | good | medium | medium | Reduce price |
| Hydro | medium | good | good | good | Develop potential capacity |
| Biomass<br>Geothermal | medium | good | medium | good | Financial support |
| Wind<br>Solar | good | bad | bad | good | R&D for smart grid<br>Financial support |

* Score may differ depending on unique condition in each country.

Source: Study team.

While increasing demand for electricity is a widespread trend in the ASEAN region, the availability of fuel resources for use in electricity generation such as coal, natural gas, and hydropower differs in each country. While some countries have resources that are more than adequate to meet their own needs, others have insufficient resources and therefore have no choice but to rely on importation. If a country has an adversarial relationship with its

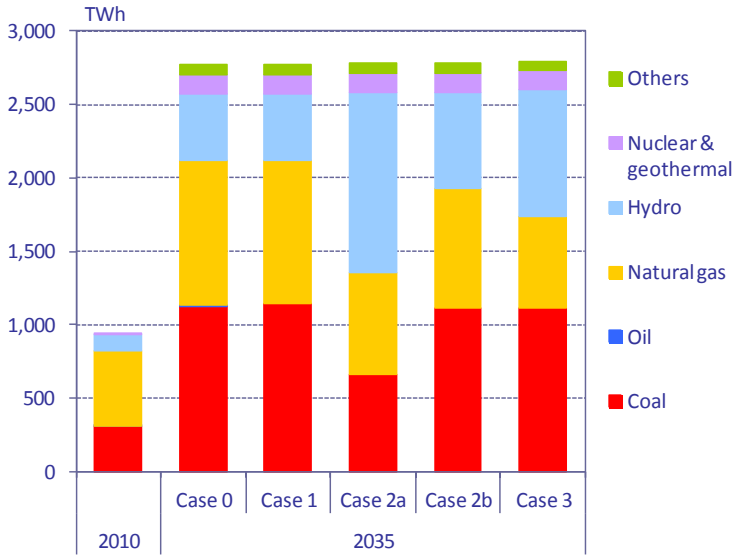
neighbours, it will have to deal with electricity supply and demand within its own borders. However, as there are moves towards increasing regional economic integration, balancing supply and demand across the entire region rather than within each individual country is more economically rational.

More specifically, in the ASEAN region, the Lao PDR, Cambodia, and Myanmar in particular and, outside the region, China's Yunnan Province have considerable hydropower generation potential. Although hydropower generation costs vary significantly according to location, in many cases it is competitive against natural gas- and coal-fired electricity generation. In response to climate change, there is a need to use low-carbon energy as much as possible. In this sense as well, the use of hydropower is an appropriate choice. In order to make full use of the potential of such resources, it is necessary to have power transmission lines to supply electricity from resource-rich areas to areas that require it. This is achieved using international grid interconnections.

Sharing electricity using international interconnected electricity transmission lines changes the electricity mix of each country and of the entire region. It makes it possible to make full use of the low-cost electricity sources available within the region. That is to say, increasing the electricity sharing capacity of international interconnected electricity transmission lines makes it possible to reduce overall electricity generating costs. Maximising the use of hydropower and other renewable energy also makes it possible to curb the emission of air pollutants including $CO_2$.

Through analysis based on this perspective, possible electricity mixes are projected for the ASEAN region in 2035 in the following figures.

**Figure 4-1: Power Supply Mix by Case in 2035 (total of the region)**




Case 0: Reference case (no grid connection)

Case 1: Grid connection, no additional hydro-potential

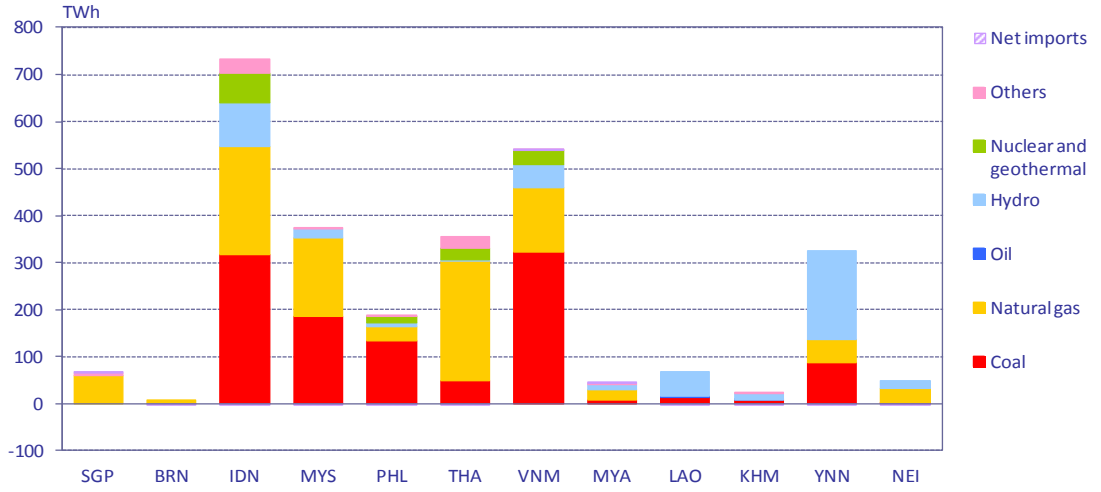
Case 2a: Grid connection, additional hydro-potential

Case 2b: Grid connection, additional hydro-potential (only utilised for export)

Case 3: Same as Case 2b, with no upper limit for the grid connection capacity

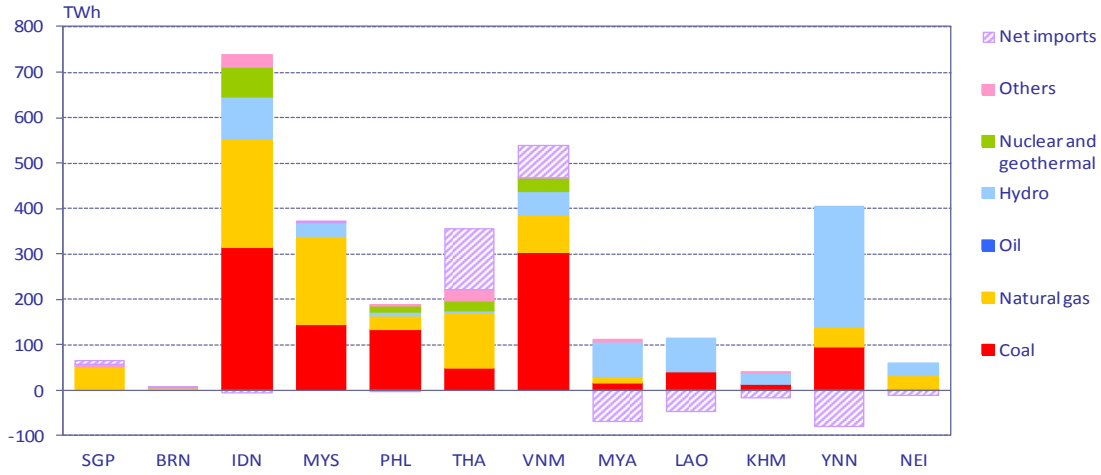
Source: Economic Research Institute for ASEAN and East Asia (2014).

**Figure 4-2: Power Supply Mix in 2035 (Case 0)**




IDN = Indonesia, KHM = Cambodia, LAO = Lao People's Democratic Republic, NEI = Northeast India, MYA = Myanmar, MYS = Malaysia, SGP = Singapore, THA = Thailand, VNM = Viet Nam, YNN = Yunnan Province (China).
Source: Economic Research Institute for ASEAN and East Asia (2014).

**Figure 4-3: Power Supply Mix in 2035 (Case 2b)**




IDN = Indonesia, KHM = Cambodia, LAO = Lao People's Democratic Republic, NEI = Northeast India, MYA = Myanmar, MYS = Malaysia, SGP = Singapore, THA = Thailand, VNM = Viet Nam, YNN = Yunnan Province (China).
Source: Economic Research Institute for ASEAN and East Asia (2014).

Then, what needs to be done to attain these electricity mixes?

Electricity markets have up to now been regulated, meaning that governments have been able to directly reflect their policies on markets through legislation and a variety of review procedures. Now, however, although conditions differ in each country, some ASEAN member states are moving to liberalise their electricity markets. Market liberalisation means that the strength of government involvement in markets is weakened. It therefore becomes more difficult for governments to reflect their policies, including those relating to electricity mixes, on markets. If a large number of ASEAN member states were to liberalise their electricity markets, how should their governments implement their policies?

Fortunately, there are cases of electricity market liberalisation around the world and it is possible to learn from these. What can be learned from the experiences in Europe?

## 2. Lessons from Experiences in Europe

Electricity liberalisation in Europe began in the UK. After the Second World War, the Labour government placed the UK's major industries under the monopoly of state-run companies. As a result, there was insufficient competition and investment in modern facilities among others lagged behind, causing the UK to lose its global competitiveness. After taking office in 1979, Prime Minister Thatcher carried out structural reforms including the easing of regulations and by the time of the change of government in 1990 her administration had succeeded in resuscitating the UK economy.

As part of the shift towards unifying the European market from the latter half of the 1990s, the trend towards liberalisation that began in the UK spread through Europe in the form of energy market reforms aimed at creating a single pan-Europe energy market, encouraging competition and streamlining, and enhancing supply security. At the time, enhancing the fluidity of energy transactions through market liberalisation was thought to contribute to supply security.

Here we would like to touch upon the fact that when this liberalisation began in the 1990s, the electricity infrastructure that we see today was already in place. Similarly, electricity was

also available to all residents and industries, and each country already had sufficient electricity generation plants and transmission/distribution grids. It goes without saying that without this foundation it would not have been possible for competition to arise.

An electricity liberalisation directive issued in 1996 called for a third of the retail market to be liberalised and for account separation and fundamental separation in the electricity transmission sector. A second liberalisation directive was later issued in 2003, which called for liberalisation of all sectors other than domestic electricity by July 2004 and complete liberalisation including the domestic electricity sector by July 2007. The directive also called for implementation of legal separation in the electricity transmission sector. In 2009, a third liberalisation directive called for further unbundling in the electricity transmission sector.

As a result, new companies entered the electricity business in Europe creating competition and a wide range of new types of transactions began to take place. Market liberalisation was successfully carried out and competition was facilitated.

On the other hand, the liberalised electricity markets face a wide range of difficulties. The most significant effect was changes in investment in electricity generation plants. Free competition led to pressure to cut costs and the fact that it was difficult for companies to forecast their own long-term prospects hindered investment in electricity generation plants. In some countries, this led to problems such as reduced supply capacity.

Investment also tended to excessively favour more profitable low-cost coal-fired power plants leading to an imbalance in electricity mixes. As a result of policies that placed excessive emphasis on renewable energy, a large amount of renewable energy flowed into the wholesale market fuelling market distortions. As a result, the profitability of gas-fired power plants – which from the perspective of environmental load reduction ought to be prioritised over coal-fired power plants – began to worsen and they began to be decommissioned. Give that gas-fired power plants are easy to use for the purpose of adjusting the balance between supply and demand, the spate of plants being decommissioned resulted in insufficient adjustment capabilities.

With the introduction of market competition, electricity generation companies were forced to manage their businesses with a short-term perspective and the types of electricity

generation susceptible to fuel price fluctuations increased. In addition, there were concerns about medium- to long-term electricity generation supply deficiencies.

Hence, a large number of thermal power plants, particularly those degraded due to age, were decommissioned in Europe as a result of the introduction of competition through liberalisation and the promotion of climate change countermeasures. There are even electricity generation plants that have just come into operation that are at risk of being decommissioned.

An example of a response to these issues is the FIT/CfD (Feed-in-Tariff/Contract for Difference) scheme introduced in the UK to incorporate market principles into a regulated market. This scheme is an attempt to, on the one hand, guarantee the long-term stability of the prices of electricity generated using nuclear power, CCS, integrated gasification combined cycle, and large-scale offshore wind power to encourage the creation of low-carbon-oriented energy portfolios with a long-term perspective. On the other hand, it also aims to incorporate the Capacity Market concept centred on thermal power generation in order to solve the problem of short- to medium-term tight supply-and-demand situations.

While a diverse energy mix is necessary from the perspective of energy security, the experience in Europe indicates that this objective has not been easily achieved by leaving things up to market forces and that they are still in a trial and error stage. Rather, it would appear that governments in Europe are attempting to solve issues by incorporating a somewhat more regulatory approach.

Thus, unfortunately there are currently no electricity liberalisation models that make it possible to simultaneously achieve the 'three Es' (energy security, economic efficiency, and environmental sustainability). Although there are significant differences in the environment in Europe and the ASEAN region, when ASEAN member states aim to liberalise their electricity markets they should be sufficiently cognizant of such points.

## 3. Pros and Cons of Different Market Model

Many ASEAN member states currently employ a single buyer system which essentially involves a single buyer purchasing all generated electricity and selling this on to distribution companies in a monopolistic fashion. Conversely, Singapore and several other countries have also

introduced market principles into the retail sector. In this way, structural reform of traditional vertically integrated electricity systems is gradually progressing, but since the market structures and energy usage conditions vary widely by country, policies that suit each country need to be introduced.

Although there is a wide range of different market model types to select from, based on market models that exist in the East Asia Summit region we have roughly divided them into four main types: (*a*) The National Monopoly Model, (*b*) The Private Regional Monopoly Model, (*c*) The Liberalised Power Generation Sector + Single Buyer Model, and (*d*) The Fully Liberalised Model.

In this study, we looked at the advantages and disadvantages of each market model based on the following three perspectives:

1. Energy mix implementation
2. Economic efficiency
3. Financial capability

**Table 4-2: Market Structure and Their Characteristics**

| | **National Monopoly Model** | **Private Regional Monopoly Model** | **Liberalised Power Generation Sector + Single Buyer Model** | **Fully Liberalised Model** |
|---|---|---|---|---|
| Energy mix implementation * | very easy | Easy | difficult | difficult |
| Economic efficiency | low | Medium | medium | high |
| Financial capability | high | High | low | low |

*Power station and grid development along with policy direction.

Source: Study team.

### 3.1. Energy Mix Implementation

With the National Monopoly Model and Private Regional Monopoly Model, governments are able to intervene to a certain degree in electricity markets. For this reason, these models have the advantage of making it easy for governments to implement their energy policies and electricity source development plans.

In contrast, since in principle the Liberalised Power Generation Sector plus Single Buyer Model or Fully Liberalised Model leave the electricity generation sector to free competition, they make it difficult for governments to reflect their energy policies and electricity source development plans.

### 3.2. Economic Efficiency

With the Liberalised Power Generation Sector plus Single Buyer Model or Fully Liberalised Model, enhanced economic efficiency can be expected due to competition amongst those engaging in electricity generation and electricity generation plant construction.

With the Private Regional Monopoly Model, although there is no competition, if regulations give governments the ability to carry out price reviews as needed, economic efficiency can presumably be enhanced to a certain degree. Appropriate price reviews could minimise the necessary cost. As a result, the electricity price would not increase or even drop to a lower price range. However, it should be remembered that government officers need to have satisfactory capability to conduct cost assessment.

With the National Monopoly Model, on the other hand, there is no competition and the potential for reduced economic efficiency increases.

### 3.3. Financial Capability

With the National Monopoly Model, it is possible to procure funds based on the creditworthiness of the government. Official development assistance funds can also be utilised.

With regard to the Private Regional Monopoly Model, since it is based on regional monopolies it is possible to achieve a higher level of reliability than with competitive markets. Since it involves private sector companies, however, official development assistance cannot be used.

With the Liberalised Power Generation Sector plus Single Buyer Model or Fully Liberalised Model, fund procurement is left up to the private sector. Although domestic private sector companies cannot attain creditworthiness greater than that of government bonds, they may have more of an advantage when procuring funds when attempting to utilise foreign capital.

## 4. Policy Recommendation for ASEAN Member States

Based on consideration of the three perspectives above, we would like to propose that ASEAN member states introduce the market models that are most appropriate in light of their own policy priorities.

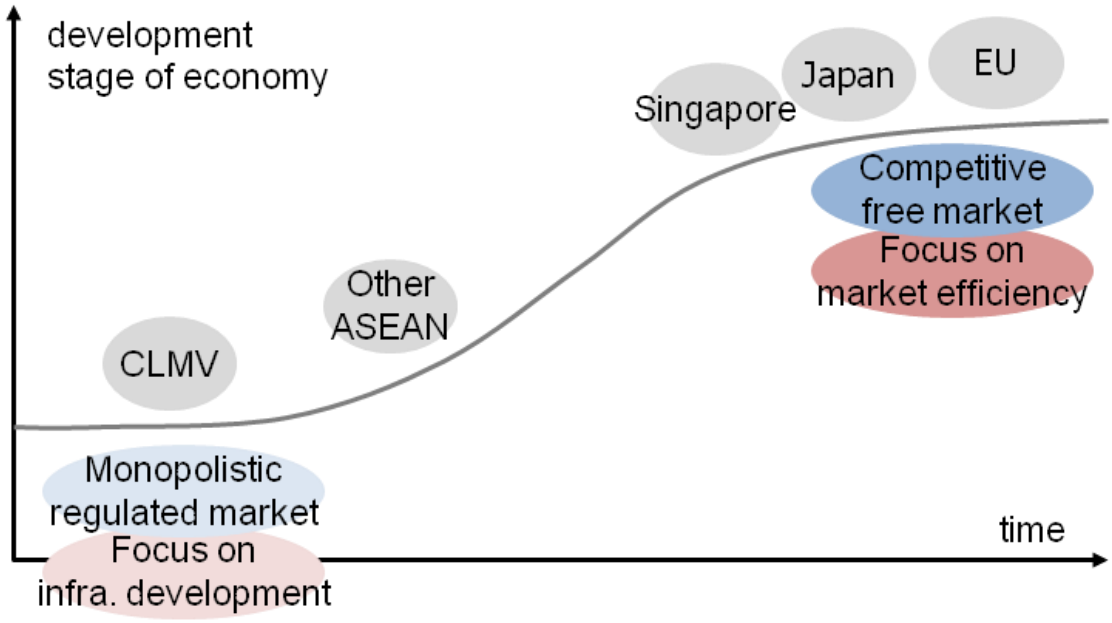
As mentioned, although a free market is highly likely to enhance economic rationality, it is unsuitable from the standpoint of creating electricity infrastructure and balanced electricity mixes. In other words, there are currently no electricity liberalisation models that make it possible to simultaneously achieve energy security, economic efficiency, and environmental sustainability.

As is well-known, apart from a certain number of countries, many ASEAN member states are still working on developing electricity infrastructure such as electricity generation plants and transmission/distribution networks. In addition, many countries are increasingly relying on imported energy, making the creation of balanced electricity portfolios more and more important. Responding to the issues of pollution and climate change has also become a crucial aspect of sustainable economic development.

Related to this, while current liberalisation models bring efficiency to markets, they also have the potential to cause imbalance in infrastructure investment or hinder it. That is to say, they may not be able to satisfy the requirements of the policies of ASEAN member states. Conversely, if infrastructure is fully developed and policies prioritise economic efficiency, electricity market liberalisation is an appropriate option.

Thus, based on the circumstances of ASEAN member states and the advantages and disadvantages of each market model, it could be considered desirable in many cases to first adopt a model such as the National Monopoly Model to prioritise the creation of infrastructure and a balanced electricity mix, and then later move forward incrementally with the creation of systems that emphasise economic efficiency (Figure 4-4).

**Figure 4-4: Development Stage of Economy, Policy,and Appropriate Market Structure**




ASEAN = Association of Southeast Asian Nations; CLMV = Cambodia, Lao PDR, Myanmar, and Viet Nam; EU = European Union.

Source: Study team.