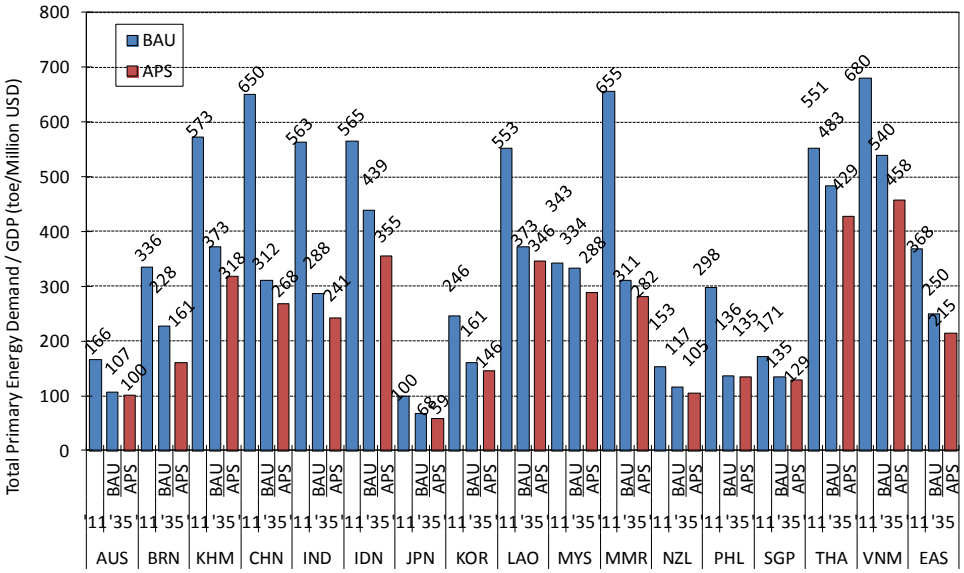
Chapter 5

Conclusions and Recommendations

September 2014

This chapter should be cited as
ERIA (2014), 'Conclusions and Recommendations', in Kimura, S. (ed.), *Energy Outlook and Analysis of Energy Saving Potential in East Asia*, ERIA Research Project Report FY2013, No.19.Jakarta: ERIA, pp.43-48.

Figure 33: Primary Energy Demand per Unit of GDP, BAU and APS



iii) Working against these declines in emissions per unit of primary energy and primary energy per unit of GDP is the projected significant increase in GDP per person in the EAS region, from around US$3,900/person in 2011 to US$9,000/person in 2035, an increase of 129.7 percent. Looking at (i), (ii), and (iii) in combination, emissions per person are projected to increase from 1.09 t-C/person in 2011 to 1.65 t-C/person in 2035 under the BAU case, or by 51.6 percent. Under the APS, emissions rise to only 1.23 t-C/person in 2035, or 13.4 percent higher than 2011. However, the rising emissions per capita are associated with increase in GDP/person and improvement in living standards.

iv) Finally, population in the EAS Region is expected to grow from 3,391 million in 2011 to 3,943 million in 2035, or by 16.3 percent. Combined, all these drivers lead to growth in emissions from 3,683 Mt-C in 2011 to 6,449 Mt C in 2035 under the BAU case, or 76.3 percent. Under the APS, emissions grow to 4,845 Mt-C in 2035, or 31.8 percent.

5. Conclusions and Recommendations

The working group members discussed the key findings and implications of the analysis based on the two energy outlook scenarios, BAU and APS.

5.1. Key Findings

Based on the projected changes in socio-economic factors, energy consumption, and carbon dioxide emissions in the BAU scenario and the APS, the working group members identified a number of key findings which are outlined below:

1. Sustained population and economic growth in the EAS region will lead to significant increases in energy demand. TPES in 2035 will increase 1.8 times from 2011. However, even in the BAU, the EAS region's energy elasticity, which is defined as the growth rate of primary energy demand divided by the growth rate of GDP from 2011 to 2030, is projected to improve to 0.60 (2.5/4.2) as compared to 1.10 (4.2/3.9) from 1990 to 2011.

2. The continued reliance on fossil fuels to meet increased energy demand will also be associated with significant increases in CO_2 emissions. However, even in the BAU, CO_2 elasticity, which is defined as the growth rate of CO_2 emissions divided by the growth rate of GDP from 2010 to 2035, will be 0.57 lower than the energy elasticity. There are two reasons for this. The first is diversification among fossil energy from coal to gas. Coal share of the total primary energy mix will decline from 51.1 percent in 2010 to 46.6 percent in 2035. On the other hand, gas share will increase to 14.0 percent from 9.0 percent during the same period. The second reason is the increased use of carbon neutral energy, such as nuclear power, hydro power, geothermal power and NRE. The share of carbon neutral energy in 2011 was 16.0 percent but it will increase to 16.2 percent in 2035.

3. The EAS energy mix in the BAU will change from 2011 to 2035. Coal and oil will decrease their share from 75.0 percent to 69.8 percent. The diversification of the regional energy mix, which increases the share of low and carbon neutral energy, will contribute to improvements in carbon intensity.

4. Industry remains as a major consumer of energy but the transport sector continues to increase rapidly. These two sectors are challenging sectors in terms of improving energy efficiency and reducing CO_2 emissions. In this regard, appropriate energy efficiency and conservation programs and low emission technologies are needed in these sectors.

5. Throughout the region, there is strong potential to increase energy efficiency to reduce growth in energy consumption and CO_2 emissions. The results of this analysis indicate that by 2035, the implementation of currently proposed energy efficiency goals, action plans and policies across the EAS region could lead to the following reductions:

    - 14.1 percent in primary energy demand
    - 14.1 percent in energy intensity
    - 24.9 percent in energy derived CO_2 emissions.

5.2. Policy Implications

Based on the above key findings, the working group members identified a number of policy implications which were aggregated into five major categories. The identified policy implications are based on a shared desire to enhance action plans in specific sectors, prepare appropriate energy efficiency policies, shift from fossil energy to non-fossil energy, rationalise energy pricing mechanisms, and address the need for accurate energy consumption statistics. The implications identified by the working group are listed below. It should be noted that appropriate policies will differ between countries based on differences in country circumstances, policy objectives, and market structures and that not all WG members necessarily agreed to all recommendations.

a. *Energy Efficiency Action Plans in Final Consumption Sectors*

The industry sector would be a major source of energy savings because it will still remain the largest energy consuming sector by 2035. There are several EEC action plans to be implemented, which include replacement to more efficient facilities and equipment. In addition, the working group suggested the following points:

- Changing the industrial structure from heavy to light industries - Shifting of industries from energy intensive industry to less energy intensive industries would surely reduce energy consumption per unit of GDP output.

In the road transport sector, the following are measures that are considered

to definitely reduce energy consumption per unit of transport activities:

- Improvement of fuel economy
- Shift from personal to mass transportation mode
- Shift to more efficient and clean alternative fuels

In other sectors, the following are the measures identified to improve energy efficiency:

- Application of demand management systems such as household energy management systems (HEMS) and building energy management systems (BEMS)
- Improvement of the thermal efficiency in the power generation sector by constructing or replacing existing facilities with new and more efficient generation technologies.

b. *Need for Consistent EEC Policies*

To further promote energy efficiency, effective and consistent energy efficiency policies will be needed:

- Demand side
  - Establishment of energy management system
  - Promotion of energy efficiency in small and medium enterprises (SMEs)
- Supply side
  - Strong support to energy technology development such as smart grids
  - Planning of best energy mix in both power generation and primary energy supply
  - Use of more efficient thermal power generation technologies
- Financial side
  - Provision of financial incentives on EEC such as soft loans, tax credits and other incentives that would support energy efficiency and conservation.

c. *Shift from Fossil to Non-fossil Fuels to Curb CO_2 Emissions*

To curb the increasing CO_2 emissions, there is a need to shift from fossil to non-fossil fuels. This could be attained by increasing the share of new and renewable energy as well as nuclear energy in the energy mix of each country. Joint research amongst industries, governments and the academe should be carried out in order to determine the economic potential of NRE and the safe use of nuclear energy.

Various analyses show that the intermittent nature of renewable energy

sources poses significant challenge in integrating renewable-energy generation to the electricity grids. Governments should therefore look into this integration problem as this would entail significant costs. Government investments in electricity storage technologies especially for solar and wind power might be needed.

Even in the APS, the carbonisation ratio is still projected to increase in view of the inevitable continuing use of fossil fuels to meet increasing demand in both the final consumption and electricity generation sectors. This implies that the development of carbon capture and storage (CCS) technology will be very important in controlling the release of greenhouse gases to the atmosphere.

Likewise, carbon sinks such as forests should also be increased in order to lessen the impact of emitted CO_2 to the environment.

d. *Rationalizing Energy Pricing Mechanism*

The WG members recognised that distorted energy price is a barrier to the effective implementation of energy efficiency policies. It was therefore suggested that energy prices should be rationalised to reflect the real cost of energy while ensuring that the most vulnerable sectors of the society are still able to use energy. Rationalising energy prices is considered as an important policy that would help to improve more efficient use of energy. Furthermore, government incentives would be necessary for consumers to choose the best energy mix.

e. *End-use Energy Statistics*

The WG also recognised the need for end-use energy statistics in all energy consuming sectors. Currently, only a few countries collect this information and databases containing such information are scarce. End-use energy statistics are important in the formulation and assessment of the effectiveness of energy saving policies and monitoring of actual energy savings.

5.3. Recommendations

The analysis in this report indicates that there is significant potential for countries in the EAS region to reduce growth in energy consumption and CO_2 emissions by implementing policies across all sectors of the economy that encourage improvements in energy efficiency and conservation and increase the use of lower emission technologies and fuels.

It is clear that many EAS countries already have a variety of policies aimed

at achieving energy saving goals. However, it is recommended that detailed action plans which outline in a broad sense how these energy savings will be achieved should also be developed especially in industry and road transport sectors. Energy management is one of the important action plans in the industry sector. On the other hand, improvement of fuel economy and shift from personal to mass transport mode are essential in the road transport sector. Rationalising the current pricing mechanism is a key policy to advance energy efficiency and conservation activities, expand the use of renewable energy, provide consumers the best energy mix and reduce the burden on the national government budgets. However, in parallel, assistance to low income households is required to help them cope up with higher prices.

A lack of reliable end-use energy statistics will impose barriers in monitoring and evaluating the energy saving targets and action plans of EAS countries. The pilot survey on end-use energy consumption in the residential sector implemented in the previous years under this project, which covered both urban and rural areas, has contributed to improving the capability to collect energy consumption statistics. It is recommended that a national energy consumption survey be conducted in all sectors in EAS countries, applying the experience and know-how obtained through the pilot survey.

The projected level of energy savings and reduction in CO_2 emissions will be significant if all of the energy saving and low emission fuel policies proposed at the 6th Energy Ministers Meeting in September 2013 were implemented in EAS countries. Although enhanced energy efficiency and an increase in the share of low emission and renewable fuels in the energy mix may also have other benefits such as increasing energy supply diversity and enhancing energy security, these measures are not enough to mitigate all of the challenges posed by climate change. Therefore, more aggressive saving goals, advanced technologies to reduce CO_2 emissions directly, such as clean coal technologies along with carbon capture and storage, and enhanced uptake of low emission fuels are recommended to further reduce CO_2 emissions.

Concrete action is required to facilitate inter-regional collaboration on technology development, transfer and policy implementation within the EAS and between the EAS and the rest of the world. It was also noted that financial schemes to support the inter-regional collaboration on technology transfer may be associated with implementing more energy efficient technologies and increasing the share of renewable energy sources.