Chapter 5

Conclusion

Study on the Strategic Usage of Coal in the EAS Region Working Group

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CHAPTER 5

Conclusion

Summary of Importance of Coal and CCT Benefits

From chapter 2 to 4, the importance of coal and benefits of CCT have been discussed. They can be summarized in 5 points as follows:

(1) Coal is least dependent on imports from outside the EAS region

Among fossil fuels, coal is least dependent on import from outside the EAS region, namely the Middle East. About 31% of natural gas imports, and 68% of oil import from the Middle East.

(2) Coal has always been more affordable than natural gas and oil on heating value basis

Historically, coal has always been around 1.5 – 3.5 times less expensive than natural gas. Furthermore, coal prices are less volatile than natural gas or oil prices.

(3) Strategic use of low rank coal creates opportunities to access half of coal reserves in Asia

About half (123.3 billion tons) of Asia's coal reserves are low rank coals. These reserves are largely undeveloped, but have high potential to increase coal supply in Asia.

(4) Investment possibilities in coal-fired power plants and coal mines are estimated USD 2,629 billion and USD 300 billion respectively

An estimated 1,460 GW of coal-fired power generation capacity worth USD 2,629 billion, and 3,159 MT coal per year, worth around USD 300 billion in development cost will provide ample investment opportunity.

(5) About 550,000 jobs are estimated to be created in power stations and coal mines

Operation of power stations and coal mines increase employment by an estimated 400,000 and 150,000 respectively. Additionally, construction jobs and jobs in other sectors not quantified in this study will be created.

Policy Recommendation for the Strategic Usage of Coal

CCT for Strategic Usage of Coal

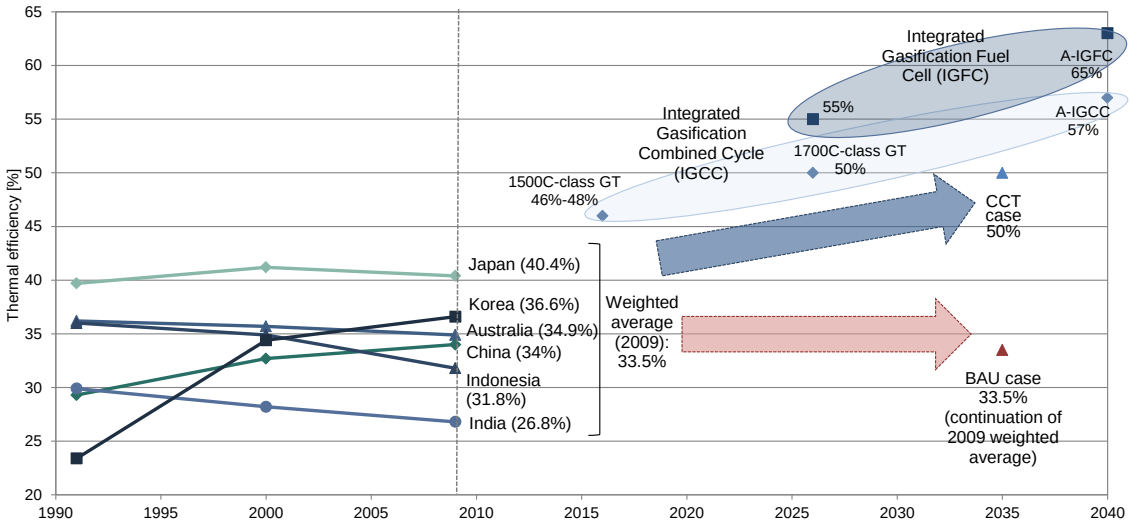
Efficiency

As discussed in section 2.3, thermal efficiency of coal-fired power stations varies greatly across Asia, leaving room for improvement in some Asian countries. Some EAS countries, such as Japan and Korea, have incentives to adopt efficient technologies from an investment point of view (in order to decrease coal imports), as well as from a social and environmental point of view. A policy package in other countries to increase the investment benefits would accelerate the adoption of more efficient technologies, and close the thermal efficiency gap.

In this section, the benefits of providing a roadmap for CCT technologies are quantified. For this purpose, 2 scenarios were assumed, the CCT case and the BAU case.

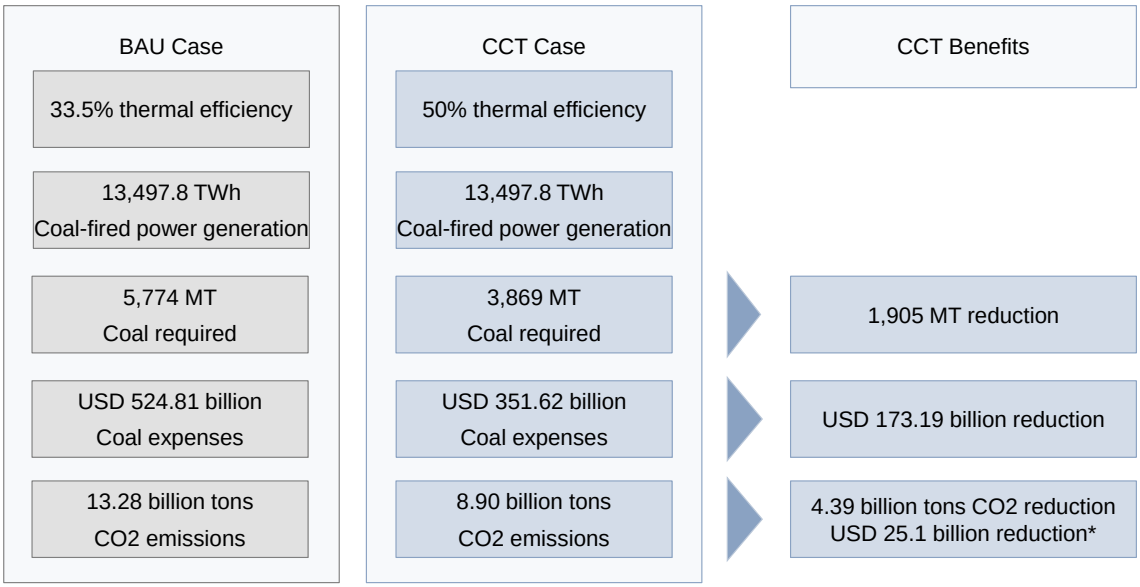
Figure 5-1 illustrates the scenarios, the technology roadmap, as well as the history of thermal efficiency values. In the CCT case, it is assumed that a thermal efficiency of 50% will be reached by 2035, through introduction of CCT. In the BAU case, it is assumed that the weighted average thermal efficiency (based on electricity generation in TWh) in 2009 will remain unchanged at 33.5% up to 2035.

Figure 5-1: Thermal efficiency history and roadmap



Quantification of benefits of the CCT case compared to the BAU case in the year 2035 is illustrated in Figure 5-2. As seen in the ERIA energy savings research project, in 2035 13,497.8 TWh of electricity is assumed to be generated from coal for both cases per year. In the BAU case, this would require around 5,774 MT of coal annually, assuming that the heating value is 6,000 kcal/kg. Under the same assumptions, 3,869 MT coal would be required in the CCT case, which is 1,905 MT less than in the BAU case. Assuming that coal prices are 90.89 USD/ton (Newcastle FOB price for 6,000 kcal/kg coal, January 2013), and that coal prices remain at this price, an estimated USD 173 billion in coal procurement costs are saved per year in the CCT case. Thirdly, the reduction of coal necessary for power generation will reduce CO_2 emissions. Assuming that 2.30 kg-CO_2/kg of coal is emitted, 4.39 billion tons of CO_2 emissions can be avoided annually. In April 2013, EU Emission Trading System (EU ETS) certificate prices were around 5.73 USD/ton (4.40 EUR/ton). Assuming the same price in 2035, around USD 25 billion could be generated from certificates.

Figure 5-2: CCT case benefits



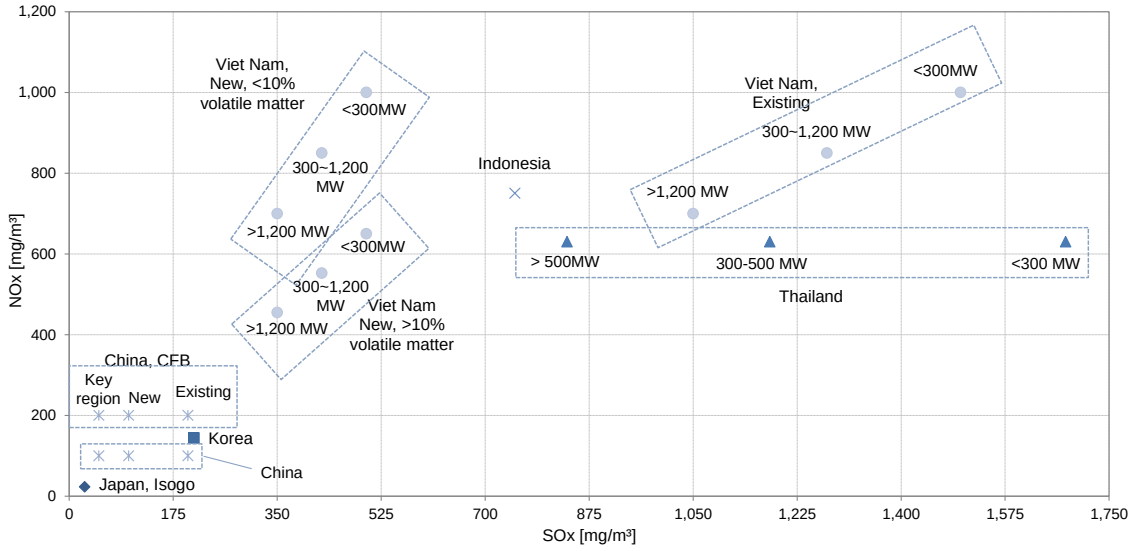
: CO_2 values were calculated using: (1) emissions are 2.30 kg-CO_2/kg, and (2) certificate prices are 4.40 EUR/ton, or 5.73 USD/ton (EU ETS price in April 2013, converted to USD using Federal Reserve average exchange rate for April 2013).

2.2.2. Environment

This section explains NOx, SOx regulations, which are already implemented in many EAS countries, and CO_2 regulations, which have not been introduced yet in most EAS countries.

Figure 5-3 gives an overview of NOx and SOx emissions standards applied in China, Indonesia, Korea, Thailand and Viet Nam, as well as the NOx and SOx emissions of the New Isogo plant in Japan. As can be seen in the figure, standards vary greatly across the countries. Therefore, harmonization of emission standards across Asia is necessary. Furthermore, a roadmap for future emissions standards is necessary.

Figure 5-3: Comparison of SOx and NOx emission standards from coal-fired power stations



Note: A regional factor applies to power stations in Viet Nam, ranging from 0.6 (urban areas) to 1.4 (remote areas). Factor 1 is applied in this figure.

Within the EAS region, Australia is the only country which has implemented a direct regulation on CO_2 emissions. In Japan, CO_2 are indirectly regulated, through a tax on coal and oil. The tax on coal is higher, accounting for the higher CO_2 emissions from coal use. In other EAS countries, CO_2 emissions are not regulated.

If CO_2 emission regulations would be implemented in countries across the EAS

region, deployment of more advanced technologies such as CCS, IGCC or IGFC, in addition to USC and SC, would be incentivized, and commercialization of such technologies could be accelerated.