INVESTMENT REQUIREMENTS FOR ENERGY SAVINGS AND LOW-CARBON EMITTING TECHNOLOGIES IN EAST ASIA – BENEFITS AND COSTS

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Overview

This paper tries to assess the future potential for energy savings and CO_2 emissions reduction of 16 countries in Asia (Australia, Brunei Darussalam, Cambodia, China, India, Indonesia, Japan, Korea, Lao PDR, Malaysia, Myanmar, New Zealand, the Philippines, Singapore, Thailand and Viet Nam) and analyze the corresponding investment requirements for the time period until 2035 (2010 as the base year). Two cases (Business as Usual:BAU and Alternative Technology Scenario:ATS) are developed to estimate the potential for energy savings and CO_2 emissions reduction. Additional investment requirements are calculated to save energy and reduce CO_2, and consider its monetary benefits from energy savings. Understanding over how much energy savings and CO_2 emissions reduction potential these countries have, which sector can generate the biggest savings, and how much additional investment is required will be useful for the long-term planning. Comparison among the 16 countries in Asia will identify the cost difference in energy savings and CO_2 emissions reduction by technology and by country, and this may serve as the useful basis for regional cooperation.

Methods

Building on the energy demand and supply outlook for Asia under the BAU and ATS scenarios, investment analysis is conducted for both cases. The BAU case tries to analyze the investment needs concentrating on the supply side (to consider infrastructure requirements for meeting the energy demand across the country), while the ATS case analysis covers both supply side analysis and additional investment needs for the deployment of advanced technologies at the final energy demand sectors. This section describes the methods for estimating the investment needs for (1) the supply side (applicable to both BAU and ATS cases), and (2) the additional investment requirements for the demand side of ATS case.

Results

The 16 analyzed countries as a whole will require more than US$ 12.3 trillion over the period between 2010 and 2035. The generation sector presents the biggest share of entire investment needs at 47.8%, followed by the transportation/distribution at 34.1%. The share of extraction sector accounts for the smallest at 8.5%.
High income countries (Japan, Singapore, Korea and New Zealand): The ratio of investment per GDP in these countries represents relatively low level at around 1%. These countries have already developed their infrastructure required for meeting the demand, and the future investment needs relative to the size of GDP tends to be small.

High income resource rich countries (Australia and Brunei Darussalam): These countries' investment per GDP ratio exceeds above 2%, which are high compared with the relative size of their income level. Aside from the investment needs for meeting the domestic energy demand, these countries require investments for the upstream development and production for natural gas.

Emerging countries with industrialization (China, India, Indonesia, Malaysia, Philippines, Thailand and Viet Nam): These countries represent relatively high level of energy investment per GDP at above 2%. As their economies industrialize, larger investment relatively to the size of GDP is required in these countries.

Countries with high energy investments (Cambodia, Lao PDR, and Myanmar): These countries' share of investment per GDP represents the high level, exceeding 3%. At the early stage of economic development, their needs for infrastructure development relative to the size of economy are high in these countries. Lao PDR's case represents a high level at 16%, which results from the electricity capacity expansion for hydro power to meet both domestic demand and export requirements.

The ATS case requires additional investment of US$ 12.6 trillion, for low-carbon emitting technologies (renewables and nuclear), and energy saving technologies (for power, industry, res/com, and transport), compared with the BAU case. Altogether, the cumulative investment for ATS represents US$ 25 trillion between 2010 and 2035. China, India, Japan, Indonesia, Korea, and Australia account for 87% of the total investment requirements of US$ 25 trillion.

Of the total additional investments, the residential/commercial sectors represent the biggest at US$ 5.9 trillion, followed by the transport sector at US$ 3.7 trillion, and the industry sector at US$ 1.0 trillion. As a result of the shifts from the fossil fuels, new and renewable energy generation will require the additional investment of US$ 1.5 trillion, and the nuclear additional investment would be US$ 0.5 trillion. The upgrades to the higher thermal efficiency fossil fuel power generation will result in the additional investment of US$ 0.6 trillion.

The comparison of payout time by sector clearly shows that the assumed technology options in the industry sector can provide the shortest years of recovery at 6.8 years, which is followed by nuclear power generation at 11 years, commercial sector at 17.8 years. The residential sector technologies, excluding insulation, can provide relatively short years of payout time at 25.6 years, compared with the total payout years of the residential sector, including insulation, at 58.9 years.

The analysis results show that cost of CO_2 emissions reduction differs by country. This reflects the diversity in the choice of energy savings technologies and low-carbon energy sources among the analyzed 16 member countries. Those countries such as India and China of which cost of CO_2 emissions reduction represent the lower end among the analyzed countries, are assumed to rely mostly on the industry sector energy saving options – which are the most cost effective among the analyzed technologies. By contrast, Japan has already implemented the great efforts in the deployment of energy efficient technologies in the industry sector; therefore, it is assumed to deploy technologies in the high cost options such as in the residential/commercial sectors as well as the transport sectors. These result in the high cost of CO_2 emissions reduction for Japan among the analyzed countries.

Conclusions

Substantial energy savings and CO_2 emissions reduction can be expected in the analyzed 16 countries of Asia with the introduction of advanced technologies across the sector, and shifts toward the low-carbon emitting sources. Nevertheless, in order to achieve these savings and CO_2 emissions reduction, the Asia region as a while will require substantial investment at US$ 25 trillion over the time period between 2010 and 2035. In fact, this is nearly doubling the investment requirements for meeting the energy demand and supply under the business as usual case. It is also important to note that monetary benefits from the energy savings could reach US$ 6.4 trillion over the time period between 2010 and 2035.

Understanding those benefits from fossil fuel savings as well as the required investment for fossil fuel savings by sector and by technology option would be the important basis for the countries in Asia to consider priority areas for the policy-making purpose. Prioritized approach should be taken by each country starting from the cost-effective options with faster payout period.

The burden of investment required for the energy supply infrastructure as well as technologies for energy saving and CO_2 emissions reduction differ by country. The investment requirements for developing the energy supply infrastructure tend to be large in the countries at the early stage of economic development relative to the size of economic activities.

Aside from this, technology options differ by country as they depend on economic structure, resources availability, and economic development level of each country. The analysis result shows that these differences by technology options result in difference in the effectiveness of CO_2 emissions reduction. For example, some emerging countries can offer lower cost of CO_2 emissions reduction per ton of CO_2, compared with those of developed countries which have already exploited the available options.

These findings would suggest that cooperation among the countries in Asia is essential. Cooperation in terms of financial assistance from the developed countries to the emerging countries is important to lay the basic infrastructure necessary to meet the demand growth. Also, technology cooperation is required from the developed ones. In addition, those countries with high cost option for energy savings and CO_2 emissions reduction could work together with the countries that have lower cost options.