# Chapter 6

## Key Findings and Policy Implications

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# CHAPTER 6
# Key Findings and Policy Implications

## 6.1. Key Findings

This study aims to quantitatively grasp and analyse how a macroeconomy is influenced when multilateral development banks (MDBs) and export credit agencies (ECAs) of advanced countries discontinue financing new development of coal-fired power generation.

This report first organised the financing situation for coal-fired power generation (Chapter 1), followed by a comparison of thermal power generation technologies (Chapter 2), and trends of financing for coal-fired power generation in the US (Chapter 3). The report then quantitatively analysed the influence of discontinued financing for coal-fired power generation on the macroeconomies of user countries and coal-importing countries (Chapters 4 and 5).

A. Chapter 1

The existing coal-fired power generation capacity of the study's target ASEAN countries and India totals 751 GW. Of this, only 57 GW capacity has been confirmed to have been financed by public financial institutions in the database used for this study. This accounted for 7.6 percent of total power-generation capacity.

There is a limit to studying the financing information of public financial institutions. For instance, the power plants constructed in the 1970s and 1980s are still running, but the financing situations of such old power plants have not been fully grasped. Many public financial institutions in China have not published their financing information. As a result, the financially supported coal-fired power generation capacity does not cover all events; a ratio of 7.6 percent is estimated to be the minimum. It is safe to presume that more coal-fired power plants (CPPs) are financed in reality.

**Table 6.1: Financially Supported CPP Capacity by Public Financial Institutions (Total of Study Target Countries)**

| Institution | MW |
|---|---|
| IBRD/IDA | 16,807 |
| IFC | 1,320 |
| ADB | 4,534 |
| ADB/IFC/Kexim | 4,150 |
| ADB/Kexim | 3,060 |
| ADB/JBIC | 735 |
| JBIC | 5,350 |
| JBIC/NEXI | 12,892 |
| JBIC/NEXI/Kexim | 700 |
| JBIC/NEXI/US Eximbank/OPIC | 1,340 |
| Kexim | 1,240 |
| US Eximbank | 4,731 |
| Total | 56,859 |

ADB = Asian Development Bank, CPP = coal-fired power plant, IBRD = International Bank for Reconstruction and Development, IDA = International Development Association, IFC = International Finance Corporation, JBIC = Japan Bank for International Cooperation, Kexim = Export–Import Bank of Korea, MW = megawatt, NEXI = Nippon Export and Investment Insurance, OPIC = Overseas Private Insurance Corporation, US Eximbank = Export-Import Bank of the United States.
Sources: Websites of institutions.

B. Chapter 2

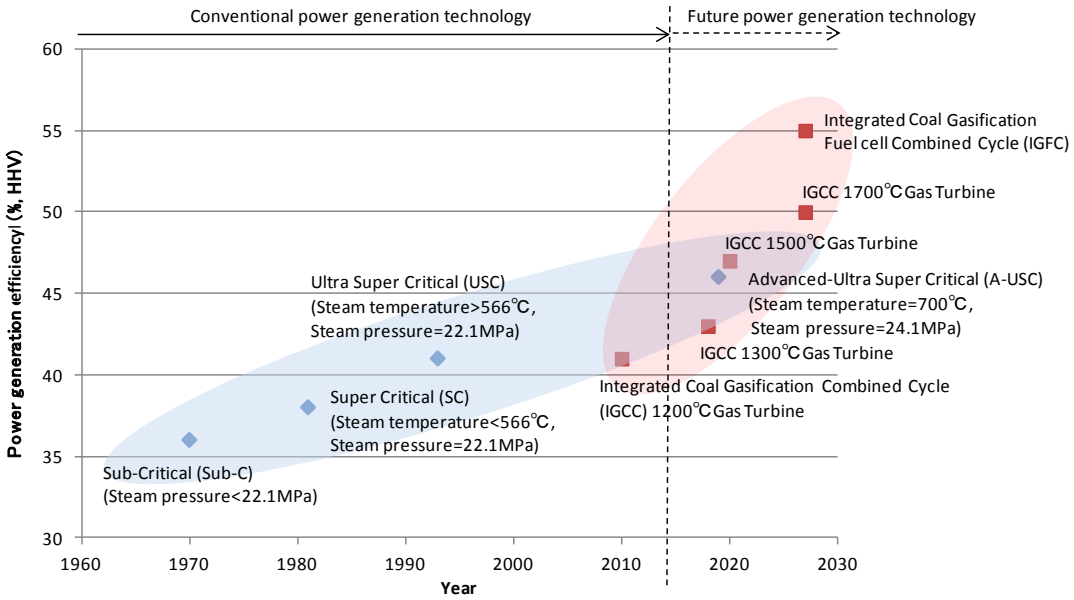
Pulverised-coal-fired power plants have evolved from subcritical pressure (Sub-C) to supercritical pressure (SC) and to ultra supercritical pressure (USC) power plants. All pulverised-coal-fired power plants in advanced countries are supercritical pressure (SC) power plants or above and those to be constructed will be USC pressure power plants. In China, old CPPs have been replaced after 2000 with SC and USC power plants. As a result, the $CO_2$ emission factor of CPPs in China has been improved to almost the same level as that of the Republic of Korea and Italy.

With higher efficiency as target, advanced USC pressure (advanced-USC) technology is being developed in pulverised-coal-fired power generation. On the other hand, combined cycle power generation with gas turbines or fuel cells (IGCC, IGFC) is being studied, with focus on the advanced countries, so as to greatly improve power-generation efficiency.

Improvement of coal-fired power-generation efficiency not only enhances economic superiority over other power generation systems but controls environmental

load, a weakness in coal-fired power generation.

**Figure 6.1: History of Efficiency Improvement in CPPs**




HHV = higher heat value, MPa = megapascal, CPP = coal-fired power plant.
Source: Ministry of Economy, Trade and Industry, Agency for Natural Resources and Energy, 13th Fundamental Issues Committee Materials.

C. Chapter 3

The Barack Obama administration, in intensifying its voice on the global warming issue, has positioned diffusion of clean energy as one of the main pillars of its energy policy.

In January 2010, the US submitted to the United Nations Framework Convention on Climate Change (UNFCCC) a national-goal plan to reduce greenhouse gas by 17 percent by 2020, which includes enactment of relevant domestic law.

The Climate Action Plan, announced by President Obama in June 2013, emphasises promotion of the spread of renewable energy technology, and shows a policy that puts the introduction of advanced CCS technology as a precondition for financial support for overseas coal-fired power generation.

In December 2013, the Export-Import Bank of the United States (US Eximbank) introduced major regulations on financing CPPs and technology export. With future consequences of such financing regulations in mind, however, it is necessary to study and analyse in a multifaceted and comprehensive manner the following: 1) environmental regulations on domestic coal-fired power generation, 2) price competitiveness of coal-fired

power generation, 3) global framework for climate-change countermeasures, 4) trends of coal-fired power plants and technology export in other countries, and 5) domestic political dynamics.

D. Chapters 4 and 5

This analysis assumes the following two scenarios.

**Table 6.2: Description of Scenarios**

| | |
|---|---|
| Efficiency Downgrade Scenario | Despite discontinued financing by MDBs and ECAs, construction of coal-fired power plants is continued by using alternative funds. Because there will be no more efficiency standards and environmental protection regulations imposed by MDBs and ECAs, improvement of coal-fired power generation efficiency is delayed. |
| Gas Conversion Scenario | A project, assuming financing from MDBs and ECAs, is partly deadlocked. Needs for new electric power development are satisfied by a gas-fired power generation project entitled to financing. |

ECA = export credit agency, MDB = multilateral development bank.
Source: Author.

(1) Influence on the User Country of Coal-fired Power Generation

This study analyses how India and Indonesia are influenced when financing for construction of CPPs in them is discontinued. The following are the results.

- When scenario becomes a reality, the macroeconomies of both countries are influenced negatively depending on a combination of events.
- Delayed improvement of coal-fired power generation efficiency badly affects the GDP, current account balance, and electricity charge of the country as a result of increased coal import volume or decreased coal export volume.
- A shift to gas-fired power generation badly affects the GDP, current account balance, and electricity charge as a result of increased natural gas import volume.

- A shift to gas-fired power generation contributes to reduced $CO_2$ emissions. Because of failure to offset increased $CO_2$ emissions due to delay of concurrent improvement of coal-fired power generation efficiency, however, $CO_2$ emissions may become higher than in a business-as-usual scenario.

It should be noted that this analysis does not include evaluation for a change of initial investment cost. When comparing coal-fired and gas-fired power generation, the latter is smaller in initial investment cost. Therefore, to some extent, the negative effects of increased fuel cost will be absorbed by smaller amount of initial investment when using gas-fired instead of coal-fired power generation (see Appendix B).

(2) Influence on the Coal-exporting Country

This study analyses how Australia, Indonesia, and South Africa are influenced when financing coal-fired power generation in India, a coal-importing country, is discontinued. Following are the results.

- In actualised scenario of coal-fired power generation in India, the macroeconomy of the coal-exporting country is influenced both positively and negatively.
- Delayed improvement of coal-fired power generation efficiency in India has a positive effect on its GDP and current account balance through an increased coal import volume.
- Coal demand is decreased by a shift from coal-fired to gas-fired power generation, conceived to concurrently advance in the coal-importing country. The volume of Indian coal import may drop greatly depending on a balance between 'delayed efficiency improvement' and 'shift to gas-fired power generation.' In this case, the GDP and current account balance of the coal-exporting country are lowered.

### 6.2. Policy Implications

Economic efficiency is the biggest reason to favour coal-fired power generation. Such a trend is particularly noticeable in developing countries with weak financial base or where the people have low income/purchasing power. Every country makes efforts to develop its economy. A stable and inexpensive supply of electric power is essential for economic development. In this sense, coal-fired power generation plays an important part.

On the other hand, with global warming now an international issue and the developing countries being asked to respond to pollution problems, there is a demand to utilise energy as cleanly as possible. Given such a situation, the most suitable energy is nuclear power and renewable energy, followed by gas-fired power. The extremely big investment and special skills required for nuclear power generation, however, serve as obstacles to its utilisation in the developing countries. Renewable energy is not only expensive but also has system stabilisation problems at the time of large-scale introduction of wind- and solar-power generation. Gas-fired power generation is more advantageous than nuclear power and renewable energy in terms of cost and investment barriers, but less advantageous than coal-fired power generation in terms of economic efficiency. Given such conditions, utilisation of high-efficiency coal-fired power generation is very meaningful if it can use its economic superiority and stable availability of supply while controlling its weakness This is a strong option capable of simultaneously achieving the three pillars in electric power supply: 'supply stability,' 'economic efficiency', and 'environmental friendliness,' at a high dimension.

The question now is how the ongoing restrictions on financing construction of new coal-fired power plants would figure in all this. As analysed in Chapter 4, the most possible scenario is that construction of coal-fired power plants is continued by using alternative funds. The problem, however, is that alternative fund sources may not be as stringent with environmental standards as MDBs and ECAs. The developing country would obtain satisfactory results in the stable supply and economic efficiency of electric power through coal-fired power generation. However, this will damage the country's 'environmental friendliness,' increase air pollution and $CO_2$ emissions, and drive it away from the world movement towards a low-carbon society.

The restrictions imposed by MDBs and ECAs on financing coal-fired power generation are intended to inhibit construction of CPPs with high environmental load. The results of this study, however, indicate that the restrictions on financing may run counter to the intended purpose.

Why then do the restrictions on financing by MDBs and ECAs not function as intended? It is because the restrictions are only imposed by MDBs and ECAs of advanced countries. ECAs in non-OECD countries, on the other hand, would continue to finance coal-fired power generation. Of those financial institutions, how many would impose stringent

environmental regulations on a debtor? To achieve maximum effects of restrictions on financing, all MDBs and ECAs in the world have to agree to the restrictions. But it is not realistic or it is evident that it would take a considerably long time to realise that. If that is the case, one may think that leaving the existing financing framework and allowing financing CPPs under a stringent environment control would be a shortcut to a low-carbon society.