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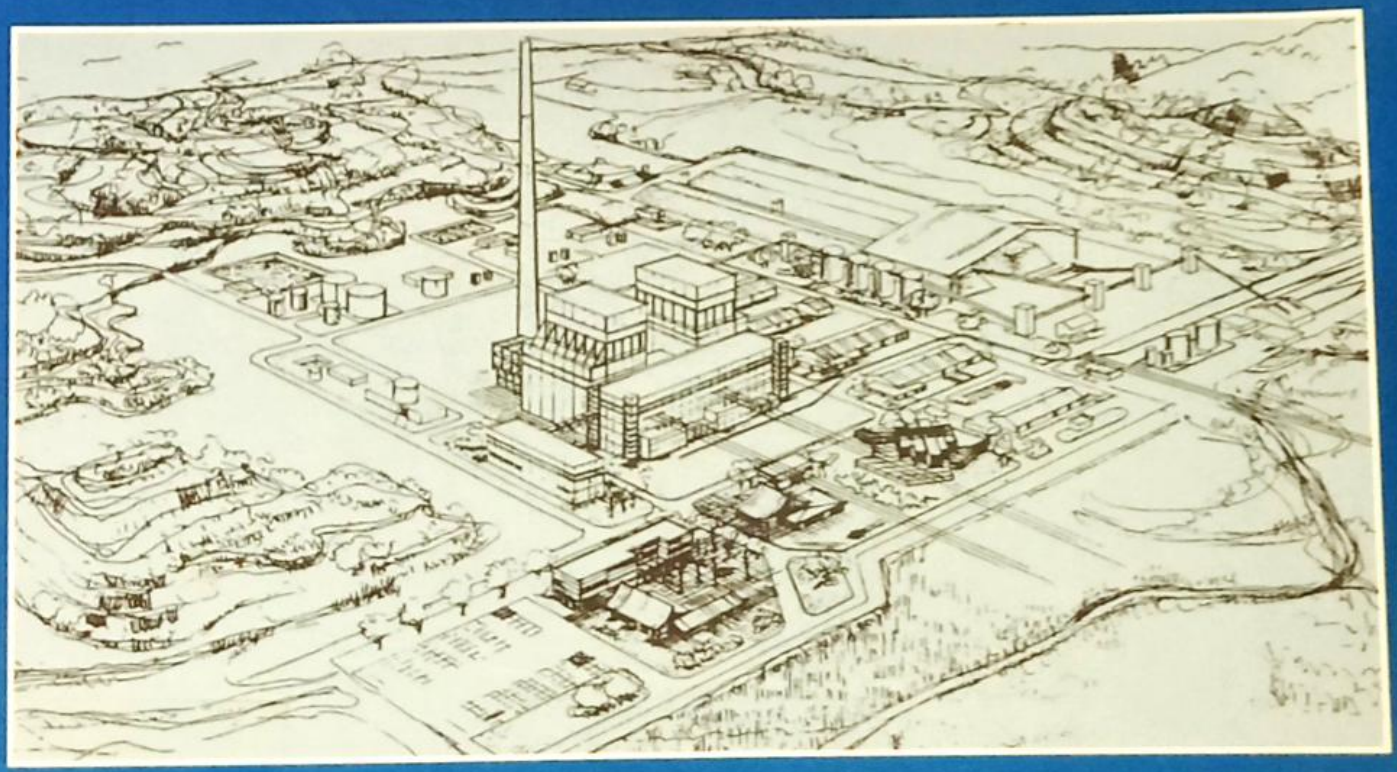
A Planner's Guide for Selecting Clean-Coal Technologies for Power Plants



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FOREWORD

As East and South Asia continue to develop economically, production of electrical energy must keep pace with demands of growing industries and burgeoning populations. Roughly three-fourths of the energy in Asian cities will come from thermal power plants burning indigenous coals. Some of these plants will be modern, state-of-the-art units, owned and operated by private interests, but most will be state owned and operated under less than optimal conditions. Resulting air pollution, creation of greenhouse gases and solid residuals will have ever greater environmental impact. In order to keep emissions at an absolute minimum, new power plants will have to include air pollution control devices. Older plants may have to be shuttered or retrofitted accordingly. Eventually, all new and retrofitted plants must meet the highest efficiency standards so that coal burning can be kept to a minimum.

Unfortunately, for many Asian countries, the costs of high efficiency, state-of-the-art pollution control systems are prohibitive. More often, less costly control systems will have to be employed. Typical decisions to be made by planners and engineers are whether to implement 95 percent sulfur removal at a prohibitive cost, 70 percent sulfur removal at modest cost or no control at all. Important factors in this equation include coal quality, power plant and mine location, local air quality standards, ambient air quality conditions, and waste transport and disposal. Few analytical tools exist to assist power sector planners and engineers in such a complex exercise. To add to the configuration of options, the commercial availability of several new combustion technologies, such as fluidized beds, have made the choice of technology even more challenging.

The World Bank has been involved in the power sector and with the institutional, financial and regulatory issues that affect its environmental performance. The Asia Environment and Natural Resources Division (ASTEN) seeks to assure that investments meet environmental guidelines set out by the Bank's Board of Directors. In this effort, ASTEN initiated the preparation of *A Planner's Guide for Selecting Clean-Coal Technologies for Power Plants*. We hope it will assist planners choosing among competing combustion and pollution control technologies. Several existing reports provide detailed descriptions of these technologies; few incorporate an organized analytical approach to examining the options from the standpoint of cost and performance. The particular value of this guide is to provide a synthesis of available combustion and pollution control technology information developed to date.

This report offers a step-by-step model for selecting the appropriate technology based on the resources and objectives. It is the hope of the authors that it will be widely circulated among power sector planners, engineer and environmental specialists and encourage further work along these lines. The importance of this topic cannot be overstressed since electrical generation will continue to grow rapidly in conjunction with overall economic development in the two regions of Asia.

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ABSTRACT

- Coal will continue to play a role in future energy supply in China and India, where today from 70 to 75 percent of electric power is coal based.

- The negative effects of coal on global environment, eco-systems and public health are well documented; its use must be balanced between the development needs of a country and the welfare of its people and land.

- The most widely used combustion technology in China and India are the subcritical pulverized coal boilers with low efficiencies resulting in the combustion of extra quantities of coal.

- Greater efficiencies will reduce emissions and prevent waste generation, and must be implemented in the short term. Planning should strive for increased utilization of by-products and waste. And if disposal is the only alternative, protection of waterways must be enforced.

- Washed-coal use in power production is the most cost-effective mean to reduce environmental impact. Coal cleaning reduces the ash content of coal and of substances such as inorganic sulfur and sodium associated with corrosion and deposition in boilers. Besides the use of washed coal offers several other advantages to the plant owner, such as increase efficiency and availability, less wear and lower maintenance cost, and reduced waste generation at the plant.

- Switching to coals with low sulfur content is the simplest method for reducing SO_2 emissions. However, ultra-low sulfur coals may not be readily available. Nevertheless, low- to medium-sulfur coals are available in both China and India. However, with the large quantities of coal burned for power, industry and at the household level, particulate and SO_2 emissions remain high, especially in industrial and urban areas.

- The procedure outlined in the report for selecting environmentally friendly technologies requires evaluation and optimization of several technical, environmental and economic factors, including quality of coal, requirements on waste product, yearly operating time and operating lifetime of the plant.

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