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Environmental impact of coal industry and thermal power plants in India

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Abstract

Coal is the only natural resource and fossil fuel available in abundance in India. Consequently, it is used widely as a thermal energy source and also as fuel for thermal power plants producing electricity. India has about 90,000 MW installed capacity for electricity generation, of which more than 70% is produced by coal-based thermal power plants. Hydro-electricity contributes about 25%, and the remaining is mostly from nuclear power plants (NPPs). The problems associated with the use of coal are low calorific value and very high ash content. The ash content is as high as 55–60%, with an average value of about 35–40%. Further, most of the coal is located in the eastern parts of the country and requires transportation over long distances, mostly by trains, which run on diesel. About 70% oil is imported and is a big drain on India's hard currency. In the foreseeable future, there is no other option likely to be available, as the nuclear power programme envisages installing 20,000 MWe by the year 2020, when it will still be around 5% of the installed capacity. Hence, attempts are being made to reduce the adverse environmental and ecological impact of coal-fired power plants.

The installed electricity generating capacity has to increase very rapidly (at present around 8–10% per annum), as India has one of the lowest per capita electricity consumptions. Therefore, the problems for the future are formidable from ecological, radio-ecological and pollution viewpoints. A similar situation exists in many developing countries of the region, including the People's Republic of China, where coal is used extensively. The paper highlights some of these problems with the data generated in the author's laboratory and gives a brief description of the solutions being attempted. The extent of global warming in this century will be determined by how developing countries like India manage their energy generation plans. Some of the recommendations have been implemented for new

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plants, and the situation in the new plants is much better. A few coal washeries have also been established. It will be quite some time before the steps to improve the environmental releases are implemented in older plants and several coal mines due to resource constraints.

Keywords: Thermal power plants; Pollution; Radioactivity; India

1. Introduction

When India got independence in 1947, the total installed electricity generating capacity in the country was less than 1500 MWe. This capacity had to be increased rapidly to meet the industrial, domestic and agricultural requirements of a very large population. Today, the installed capacity is more than 90,000 MWe and it is growing rapidly. More than 70% of this power is generated from coal. The only fossil fuel available in abundance is coal, and hence its usage will keep growing for another 2–3 decades at least till nuclear power makes a significant contribution. Many mega hydro-projects were taken up in 1950s and early 1960s, which are contributing about 25% of the power. However, now such projects meet tough opposition from environmental groups and are difficult to complete. At present, only two big hydro-projects (one in northern India called Tehri and the other in central part called Narmada) are under construction and are expected to start generating power within the next 1–2 years.

The coal available in India is of poor quality, with very high ash content and low calorific value, and most of the coal mines are located in the eastern part of the country. This requires long distance transport to power stations located all over the country. In view of the above facts, a long-term study was taken up by the author's laboratory more than a decade ago. There are three aspects to this study.

1. Eisenbud and Petro (1964) first pointed out that the radiation dose from the use of fossil fuel for power generation could be a significant addition to the natural radiation dose. Hence, the first aspect of our study was to measure the natural radioactivity content of coal and fly-ash from more than 30 power plants and in coal samples from coal mines. In two plants, one using coal and the other lignite, actual external gamma dose was measured using scintillometers. The first results were reported in 1980 (Mishra et al., 1980). At the end of this phase, all the results were summarized in 1989 (Ramachandran and Mishra, 1989), and findings were given in an invited paper in 1991 (Mishra, 1991). Comparison with the radiation dose from nuclear power plants (NPPs) of similar capacity and the methodology adopted for dose estimation were given in an earlier publication (Lalit et al., 1986).
2. The second aspect of the study was to estimate the overall impact of gaseous and particulate pollution caused by coal-based and nuclear power plants to assess the impact of the coal and the nuclear fuel cycle.