



Effects of Thermal Power Plants on Environment

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ABSTRACT

Thermal Power plants are the major source of generation of electricity for any developing country. Around 60% of electricity generation in our country is met by thermal power plants. Fuel is blown into the combustible chamber of the boiler where it is burnt at high temperature where Heat energy converts water into steam. High energy steam is passed through the turbine and the steam creates force on the turbine causing the shaft to rotate at high speed. A generator is coupled at one end of the turbine shaft which generates power. The thermal power plant has serious impacts on land, soil, air and various social impacts the thermal power plant is also said to emit large amount of mercury and generate large quantity of fly ash which destroys the surrounding environment. These plants also consume a large amount of water. Due to these problems, they require a proper Environmental impact assessment before commencement of the project which is not done judiciously in our country.

Keywords: Coal, EIA, Environment, Thermal Power Impact, Thermal Powerplant.

I. INTRODUCTION

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. Power generation in India has increased manifold in the recent decades to meet the demand of the increasing population. 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. 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. Whatever good quality coal available is used by the metallurgical industry, like steel plants. The coal supplied to power plants is of the worst quality. Some of the coal mines are owned by private companies, and they do not wish to invest on quality improvement.

Power generating units are mega project, which require not only huge capital investment but also various natural resources like, fossil fuels and water, thus create an immeasurable & everlasting impact on the environment and generate tremendous stress in the local eco-system in spite of stringent government norms to control and mitigate the damages to the environment by the power plants. Due to continuous & long-lasting emission of SO_x & NO_x, which are the principal pollutants coal based plants, surrounding structures, buildings, monuments of historic importance & metallic structures too are affected very badly due to corrosive (Acid rain) reactions. Well known example of this is the victimized Taj mahal of Agra which is being deteriorated due to these toxic gases. It is also worth to note that very high amount of carbon dioxide (CO₂) emission (0.9-0.95 kg/kwh) from thermal power plants contribute to global warming leading to climate change.



II. EIA

An environmental impact assessment (EIA) is an assessment of the possible impacts that a proposed project may have on the environment, consisting of the environmental, social and economic aspects. The purpose of the assessment is to ensure that decision makers consider the environmental impacts when deciding whether or not to proceed with a project. The International Association for Impact Assessment (IAIA) defines an environmental impact assessment as "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made. EIAs are unique in that they do not require adherence to a predetermined environmental outcome, but rather they require decision makers to account for environmental values in their decisions and to justify those decisions in light of detailed environmental studies and public comments on the potential environmental impacts.

III. FLY ASH

The present coal consumption in thermal power station in India results in adding ash estimated 12.21 million tons fly ash in to the environment a year of which nearly a third goes in to air and the rest is dumped on land or Water in spite of various research results a consistent utilization is not evident, and it expected that stocks piles of fly ash will continue to grow with the increasing number of super thermal power station in India. As reliance upon coal as a fuel source increases, this large quantity of this material will be increasingly brought into contact with the water and soil environment.

IV. PROBLEMS ASSOCIATED OF INCREASING FLY ASH

India has about 211 billion tons of coal reserves, which is known to be the largest resource of energy and presently 240MT of coal is being used annually to meet the Nation's electricity demand. In terms of energy, India stands at world sixth position accounting 3.5% of the world commercial energy demand in 2001, but the electricity generation yet not completely fulfilled the present requirement. Environmental pollution by the coal based thermal power plants all over the world is cited to be one of the major sources of pollution affecting the general aesthetics of environment in terms of land use, health hazards and air, soil and water in particular and thus leads to environmental dangers. Fly ash water also affects the scale structure because it is a directly in contact with water. Heavy metals can also adversely affect the growth rate in major carps. Coal combustion residues (CCRs) are a collective term referring to the residues produced during the combustion of coal regardless of ultimate utilization or disposal. It includes fly ash, bottom ash, boiler slag, and fluidized bed combustion ash and other solid fine particles. In India, presently coal based thermal power plants are releasing 105MT of CCRs which possess major environmental problems. Presently from all these thermal power plants, dry fly ash has been collected through Electrostatic Precipitator (ESP) in dry condition as well as pond ash from ash ponds in semi-wet condition. In India, most of the thermal power plants do not have the facility for automatic dry ash collection system. Commonly both fly ash and bottom ash together are discharged as slurry to the ash pond/lagoon these effect on environment, economy, and social factor.



V. IMPACT ON WATER

The water requirement for a coal-based power plant is about 0.005-0.18 m³/kwh. At STPS, the water requirement has been marginally reduced from about 0.18 m³/kWh to 0.15 m³/kwh after the installation of a treatment facility for the ash pond decant. Still the water requirement of 0.15 m³/kwh = 150 Litres per Unit of electricity is very high as compared to the domestic requirement.

Ash pond decant contains harmful heavy metals like B, As, Hg which have a tendency to leach out over a period of time. Due to this the ground water gets polluted and becomes unsuitable for domestic use. This is harmful to the fisheries and other aquatic biota in the water body. The exposure of employees to high noise levels is very high in the coal based thermal power plant. Moreover, the increased transportation activities due to the operation of the power plant leads to an increase in noise levels in the adjacent localities.

VI. IMPACT ON LAND

The land requirement per megawatt of installed capacity for coal, gas and hydroelectric powerplants are 0.1-4.7 ha., 0.26 ha. and 6.6 ha. respectively. In case of coal based power plants the land requirement is generally near the area to the coal mines. While in the case of gas-based it is any suitable land where the pipeline can be taken economically. Land requirement of hydroelectric power plants is generally hilly terrain and valleys. 321 ha., 2616 ha. and 74 ha. of land were used to dispose fly ash from the coal based plants at Ramagundam, Chandrapur and Gandhinagar respectively. Thus, large area of land is required for coal based thermal power plant. Due to this, natural soil properties change in near about areas. It becomes more alkaline due to the alkaline nature of fly ash.

VII. BIOLOGICAL & THERMAL IMPACT

The effect on biological environment can be divided into two parts, viz. the effect on flora and the effect on fauna. Effect on flora is due to two main reasons, land acquisition and due to flue gas emissions. Land acquisition leads to loss of habitat of many species. The primary effects of thermal pollution are direct thermal shocks, changes in dissolved oxygen, and the redistribution of organisms in the local community. Because water can absorb thermal energy with only small changes in temperature, most aquatic organisms have developed enzyme systems that operate in only narrow ranges of temperature. These stenothermic organisms can be killed by sudden temperature changes that are beyond the tolerance limits of their metabolic systems. Periodic heat treatments used to keep the cooling system clear of fouling organisms that clog the intake pipes can cause fish mortality.

VIII. CONCLUSION

Thermal Power Plant affects environmental segments of the surrounding region very badly. Large number of SO_x, NO_x & SPM are generated which damage the environment and are highly responsible for deterioration of health of human beings, animal kingdom as well as plants. Emission of SPM & RSPM disperse over 25 Kms radius land and cause respiratory and related ailments to human beings and animal kingdom. SPM gets deposited on the plants which affect photosynthesis. Due to penetration of pollutants inside the plants through



leaves & branches, imbalance of minerals, micro and major nutrients in the plants take place which affect the plant growth severely. Spreading & deposition of SPM on soil, disturb the soil strata thereby the fertile and forest land becomes less productive. Because of continuous & long-lasting emission of SO_x & NO_x, which are the principal pollutants emitted from a coal based power plant, structures & buildings get affected due to corrosive reactions.

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