ENVIRONMENTAL GUIDELINES
FOR
THERMAL POWER PLANTS

MINISTRY OF ENVIRONMENT & FORESTS
DEPARTMENT OF ENVIRONMENT,
FORESTS & WILDLIFE
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1.0 Introduction

1.1 Thermal power plants may contribute significantly towards economic growth but, they may bring in their wake associated ills of environmental pollution, resource depletion, displacement of population, health hazards, drastic change in the land use pattern, corrosion of structures, buildings and monuments, reduced yields of crops, loss of forests and often aesthetic blight. Many of the adverse impacts of thermal plants are amenable to technological control and can be foreseen and minimized through judicious siting, providing necessary preventive and control measures and finally through effective environmental management of the operating plants.

1.2 While electricity is a clean form of energy at the point of consumption, the process of its generation through thermal power plants is by no means non-polluting. The impact of a power station on the environment depends to a large extent on its location with respect to human settlements, meteorological conditions, ambient air quality, water bodies, agricultural and forest lands etc. The emission of large quantities of sulphur dioxide and oxides of nitrogen from the power plants may result in 'Acid Rain' problems.

1.3 The Ministry of Environment and Forests is the focal point in the Central Government for planning, promotion and coordination of environmental programmes. The Ministry has to play a "Watch dog" role, to study and bring to the attention of Government and Parliament instances, causes and consequences of environmental degradation in all sectors. The Ministry has the responsibility to appraise the development projects including the power plants from environmental angle and suggest and enforce necessary safeguards and conditions for the protection of the environment.

2.0 Siting Criteria

Proper siting of thermal power plants can reduce not only the cost of the required pollution control measures but also the total damage these stations could cause to natural and human environment. Due consideration needs to be given to topography, geology, hydrology, meteorology, fuel storage, ash disposal etc. in the selection of site. Selection of environmentally acceptable sites for TPS would be guided by siting criteria which would cover the following:—

2.2.1 Location of thermal power plants should be avoided within 25 km of the outer peripharies of the following.

1. metropolitan cities:
2. national parks and wildlife sanctuaries: and
3. ecologically sensitive areas like tropical forests, biosphere reserves, National Parks & Sanctuaries, important lakes and coastal areas rich in coral formations.

2.2.2 In order to protect the coastal areas above 500 m of HTL a buffer zone of 5 km should be kept free of any TPS.

2.2.3 The site (chimney) should not fall within the approach funnel of the runway of the nearest airport.

2.2.4 The site should be atleast 500 meters away from the Flood Plain of the Riverine Systems.

2.2.5 The site should also be atleast 1/2 km away from highways.

2.2.6 Location of TPS should be avoided in the vicinity (say 10 km) of places of archaeological, historical, cultural, religious or tourist importance and defence installations.

2.2.7 The TPS should be surrounded by an exclusion zone of 1.6 km and located on the leeward side of the exclusion zone with respect in the predominant wind direction, Residential/commercial development should be regulated in the exclusion zone on the basis of strict land use zoning.

2.2.8 No forest or prime agricultural land should be utilized for setting up of TPS, or for ash disposal.

3.0 ENVIRONMENTAL IMPACT STATEMENT (EIS)

3.1 Introduction

The purpose of the EIS is to determine as precisely as possible, within the present limits of knowledge and expertise, the likely environmental impacts of a planned developmental activity. A proper EIS, wherein all claims are supported by scientifically established data, modelling, should contain the following sections:

3.2 Description of Site and its Environs

The details related to the site, including the current land use pattern, the demographic and socio-economic profiles of the villages and nearby towns, flora and fauna, etc., should be described. A site map should be attached showing the location and the layout of the proposed plant. As alternative sites are normally considered, a brief justification is required as to why this site has been chosen over other sites about which general environment indicators should also be supplied.

3.3 Land Requirements

The total area and type of land to be acquired for the plant itself, for the housing colony, ash disposal areas and for fuel transportation and power evacuation corridors must be fully justified. The forest areas to be affected by the transmission lines should be detailed.

3.4 Rehabilitation of Displaced Population

There is a tendency amongst the proponents of TPS to acquire land in thousands of acres generally far in excess of the actual requirements. This results in the displacement of more local people than would otherwise be the case. Efforts should be made to identify sites where land is unoccupied or sparsely occupied. Plans for the re-location and effective rehabilitation of the displaced people, owners and dependants on land, must be detailed out and be the direct responsibility of the project authorities. These plans must incorporate the existing occupational and cultural ways of life of the displaced people. Details of the rehabilitation sites along with the land capability surveys and availability of water at the selected sites should be reflected. Details of compensation to be paid (land in lieu of land or cash payment, job etc), to each affected family vis-a-vis their willingness or otherwise may be mentioned. Objections received on the notification made for the acquisition of land may also be reflected in the Rehabilitation Plan.

3.5 Impacts During Construction

An EIS should also include plans as to from where construction materials like stones and sand will be acquired and transported to the site EIS report should include the impacts on land, soil, hydrology, water quality, air quality, ecology, demography etc.; during the construction, phase.

3.6 Meteorology and Air Quality

3.6.1 The existing background ambient air quality levels for sulphur-dioxide, nitrogen oxides, and total suspended particulates should be provided along with the meteorological conditions at the site covering the three seasons i.e. winter, summer and monsoon.

3.6.2 Using the data from 3.6.1 and the expected emissions from the TPS, the predicted levels (isopleths) of these pollutants should be computed for an area within a radius of 30 km around the plant.

3.7 Hydrology and Water Quality

Possibly the second most serious impact of TPS is on the water quality of receiving bodies. An EIS should include details of the source and total requirements of water and quality of water required for the process, cooling system, colony etc. The intake and the final discharge points for cooling water and the choice of cooling systems (closed or once through) should be indicated. The water characteristics of the cooling tower and condenser blowdown and of the effluent from the ash dykes should be predicted. Finally, details of the proposed liquid effluent treatment system and of the impact of the discharge water temperature on aquatic life should be clearly spelt out. In view of the limited availability of fresh water sources and to avoid thermal pollution, TPS should avoid once through cooling and give preference to dry/wet cooling towers. A firm commitment regarding the availability of water front the competent authority may be obtained. A water balance diagram should also be given. Data on ground water profie along with the estimation of the levels of heavy metals in the area vis-a-vis soil permeability data should be collected.

3.8 Occupational Safety and Health

An estimation of likely stresses (heat, noise, dust and chemical pollutants in different areas of the plant and a listing of protective and safety measures to be taken for workers engaged in different operations, especially at the coal handling areas, conveyors, tippling and transfer …….etc should be given.

3.9 Transport and Handling of Coal

An EIS should contain details of how coal will be brought to the plant. The arrangements for coal handling at the plant should also be described.

3.10 Impacts on Sensitive Terrestrial Targets

Within the 25 km radius of the project site both short-term and long-term impacts on especially sensitive targets, such as habitat of endangered species of wildlife or plants, sites/monuments of historical and cultural importance; centres with concentrated populations of senior citizens or school going children etc., must be spelt out separately.

3.11 Control Technologies

An EIS must contain a description of necessary measures and control equipments to be adopted to meet the stipulated standards. Details of post-operational environmental monitoring and the redundancies incorporated in control technologies should also be provided.

4.0 ENVIRONMENTAL MANAGEMENT OF THERMAL POWER STATIONS

4.1 Introduction

Necessary safeguards must be built in during the construction phase of TPS and their effectiveness monitored periodically after the plant has become operational. These are enumerated below:

4.2 Solid Wastes

4.2.1 To the extent possible, dry flyash from the ESPs and boiler furnace, should be utilized for making such economically useful products as bricks, road filters and binders, cement etc.

1.2.2 When the reuse of sold wastes is uneconomical for any particular location, the ash should be used as land-fill or disposed off in some other environmentally acceptable manner, e.g. in abandoned underground mines, not susceptible to seepage.

4.2.3 Ash disposal areas should be planned downwind of villages and townships.

4.2.4 The site for waste disposal should be checked to estimate soil permeability so that inorganic substances do not contaminate the ground aquifers or surface water bodies.

4.2.5 A detailed & phased programme for stabilisation of disposal areas should be prepared through creation of vegetal covers. The ash disposal areas should be divided into a number of blocks so that when one block has been filled-up with ash, the other block would be taken up for filling. The filled-in blocks should be provided with vegetal cover.

4.3 Human Settlements

4.3.1 The rehabilitation of persons who are displaced or have lost agricultural land due to siting of the power plant should be carried out by the project authorities in consultation with and to the satisfaction of the affected population. The project authorities should meet the cost of rehabilitation.

4.3.2 Residential colonies should be located on upwind side away from the power plants at a distance more than 20 times of the effective stack height.

4.4 Air Pollution

4.4.1 Monitoring of background pollution levels should be carried out regularly with all precautionary measures so that reliable estimates could be made as to (he impacts on the ambient air quality from the plant concerned.

4.4.2 The stack height of the TPS should conform to the standards prescribed by Central/State Pollution Control Board for better dispersal of pollutants over a wide area.

4.4.3 Adequate control equipment should be installed for controlling the emission of pollutants from the various stacks as per the standards stipulated by the Central/State Pollution Control Boards. In those special circumstances when sulphur removal is considered essential (e.g. for high sulphur fuel, multiple stations in close proximity, future variations in fuel quality etc., provision should be made for desulphurization.

4.4.4 For start-up and for flame stabilization at partial loads, a low-sulphur petrochemical should be used to reduce SO_2 emissions.

4.4.5 Efficiency of pollution control equipment should be monitored and recorded regularly. Pollution control equipment should be designed for the worst anticipated quality of coal (45-50%)

4.4.6 The emission levels of pollutants from the different, stacks should conform to the pollution control standards prescribed by Central or State Boards.

4.4.7 A continuous monitoring and recording system for estimation of emission of sulphur dioxide, oxides of Nitrogen and particulates from the stacks of the TPS should be established. Further, it is recommended to monitor the efficiency of boiler by continuously monitoring of emissions of O_2, CO and CO_2.

4.4.8 Ambient air quality monitoring should be undertaken regularly in areas near the power plant. Infrastructural facilities including meteorological observations should be provided for monitoring emissions and measuring the ambient air quality in the areas.

4.5 Water Pollution

4.5.1 Liquid effluents containing oils, grease, resins and other chemicals from the different plants of the power station should be treated as per the standards prescribed by Central/State Water Pollution Control Boards.

4.5.2 The hot water discharge from the condenser should be cooled down as per the standards of the Central/State Water Pollution Control Hoards before being discharged into the surface water to avoid any adverse effect due to thermal pollution on the

aquatic life (fishes, phyto-and zoo-plankton) and marine life (oysters, corals, shrimp. drabs etc.).. It is desirable to study the potential impact of heated water on the aquatic life in water sources near the discharge. The rise in ambient water temperature from the discharge should be periodically monitored.

4.5.3 Appropriate steps for disposal/reuse of ash slurry must be taken so that adjoining surface or groundwater supplies are not polluted.

4.5.4 Assessment of water quality by biological indicators (bacteria, algae and macro-invertebrates) should be periodically carried out.

4.6 Occupational Safety and Health

4.6.1 Proper precautionary measures for the workers engaged in coal handling operations should be taken. They should be examined regularly for lung diseases. Personal protective equipment such as dust masks, respirators, helmets, face shields etc. should be provided to the workers.

4.6.2 Adequate measures should be taken to control the levels of noise and vibration in the compressor room, turbine areas, etc. and the noise levels kept below 85 dB. Where the noise level exceeds 85 dB, workers should wear ear plugs or ear muffs for their protection. Vibrations must be controlled at source as ear plugs or car muffs will not provide protection against vibration hazards.

4.7 House Keeping

4.7.1 Proper house keeping and cleanliness should be maintained both inside and outside the plant.

4.7.2 Adequate dust control and other pollution abatement measures should be taken to check the emission of dust from coal handling areas, such as wagon tippling points, crushers, pulverizers, conveyor transfer points, etc.

4.7.3 A green belt whose width would vary between 50-500 m depending upon meteorological conditions and the extent of nearby habitations should surround the periphery of the IPS and should be taken in hand before construction.

4.8 Emergency Planning

4.8.1 Disaster planning for meeting emergency situations arising due to tire and/or explosions particularly in the coal, oil and gas handling areas is essential for all power stations. Fire fighting equipment should be kept ready for use during emergencies.

4.8.2 Redundancies and space capacities have to be built into the pollution control equipments so that the standards are always adhered to.

4.9 Environmental Management Cell

4.9.1 An environment management cell with appropriate expertise and training facilities should be established at the TPS for managing the environmental problems arising both within and outside the plant.

5.0 Environmental Appraisal Procedure

5.1 The project proponents are required to submit environmental information at the earliest stage in the planning of the project. The feasibility reports for thermal power projects invariably include an environmental section, though the information provided is often inadequate for environmental appraisal. In view of this, the project authorities are required to furnish information in the prescribed questionnaire if the total capacity of the project is not exceeding 500 MW. If the capacity of the proposed plant is exceeding 500 MW (including the existing units), environmental impact statement (EIS) report is required in addition to the filled-in questionnaires. EIS reports may also be required in case of power plants of less than 500 MW, if they are to be located in sensitive/critical areas.

5.2 The relevant information and material required for the appraisal of thermal power projects are given below:—

(i) Filled-in questionnaire (20 copies)
(ii) EIS reports (20 copies)
(iii) Feasibility Report/Project Report (one copy)

In addition to the above pre-requisite, the Department may call for the following information depending upon the specific cases:—

(i) Background pollution levels of particulates, Sulphur dioxide and oxides of nitrogen.
(ii) Data on water quality and ground water profile.
(iii) No objection certificate from the Central/State Pollution Control Board.
(iv) Environmental Management Plan.
(v) Rehabilitation Master Plan.
(vi) Compensatory Afforestation Plan for the forest areas to be lost.
(vii) Environmental implications due to Mining Activity if a new coal mine; is to be opened.
(viii) Any other relevant details.

5.3 The projects are placed before the Committee for environmental appraisal. If need be, site visits are also made to have on the spot assessment of the related environmental issues. Based on the recommendations of the Committee, the Department may take the following course or actions:

(i) rejection of the project on substantive environmental grounds
(ii) relocation of the project on substantive environmental grounds.

(iii) according environmental clearance to the project with or without incorporation of the specific and/or general environmental safeguards.