EXECUTIVE SUMMARY

10.1 Introduction

Erstwhile Maharashtra State Electricity Board (MSEB) has set up a thermal power station at Eklahare, Tahasil Nashik in District Nashik of Maharashtra. MahaGenCo plans to replace 2x140 MW set which were in operation with de-rated capacity of 2x125 MW. Since further extension of its life by way of renovation & modernization was not justifiable these units have been shut down since 30th June 2011.

In line with the guide lines issued by CEA, MAHAGENCO plans to install energy efficient 1x660 MW coal based super-critical thermal unit at Nashik as replacement project.

As per environment Impact Assessment Notification dated 14th Sep 2006, establishment and operation of power plant requires environmental clearance (EC) from MOEF. As the proposed power plant falls under item 1(d) of category 'A' the Environmental impact assessment is necessary for obtaining Environmental Clearance from MoEF before the commencement of ground activity. Accordingly, the 24th meeting of the reconstituted Expert Appraisal Committee (Thermal) was held on 2nd and 3rd May, 2011 for determining the TOR for preparation of EIA/EMP report for the proposed coal based power project. The TOR were prescribed by MOEF and communicated vide letter No.J-13012/40/2011-IA.II(T) dated 15th June 2011. Based on the TOR prescribed, draft EIA/EMP has been prepared for public consultation.

Importance of project

Maharashtra state is facing the acute power shortage. During year 2010-11, maximum power demand of the state was 19,559 MW against the power availability of 14,063 MW (inclusive of installed capacity & central sector share). As a result the state has to carry out the load shedding of about 5500 MW during peak demand.

As per 17th Electric Power Survey of India by Central Electricity Authority, the maximum demand for power in the state shall be as shown below in **Table 10.1 titled "Maximum Power Demand in Maharashtra"**

Table 10.1
Maximum Power Demand in Maharashtra

Year	2011-2012	2016-2017	2021-2022
Peak demand by Maharashtra (MW)	21,954	28348	35944

Source : 17th Electric Power Survey by CEA

The present shortfall in the power shall progressively increase, if there is no capacity addition. The prevailing power deficit of about 5000 MW to 5500 MW is mainly due to no capacity addition during past years. In order to minimize the gap in demand of power and availability & ultimately to eliminate the same, it is essential to immediately take up the implementation of power project having minimum gestation period.

Water requirement

Water required for 1x660 MW unit is about 17 MMC per annum. Water source is available from Gangapur Dam on Godavari River. The details about water availability & water requirement at Nashik TPS are indicated in **Table 10.2 Titled " Water requirement details at Nasik TPS".**

Table 10.2
Water requirement details at Nasik TPS

Water Requirement for 3x210 MW existing units	**23.50 MMC/Year**
Water Requirement for proposed 1 x 660 MW unit	**17.00 MMC/Year**
Total requirement	**40.50 MMC /Year**
Present water allocation from Gangapur Dam	**34 MMC/ year**
Additional water requirement	**6.50 MMC / Year**

The water will be sourced through the downstream of Gangapur Dam which is about 7.80 Mm^3 / Annum for which permission has already been granted by Irrigation Division. As the existing units of 2 x 140 MW have been shut down since June -2011 and since the only water consumption is for existing 3 x 210MW units, the net water requirement for the proposed 1 x 660 MW thermal power plant excluding the water requirement for the existing 3 x 210 MW units works out to be 6.50 Mm^3 for which permission has already been granted.

Fuel requirement

The fuel will be brought from MAHANADI coalfields which will be brought to Nasik Thermal Power Plant through existing railway siding coming from Odha in BOXN wagons. Though the total coal requirement is 3.44 MTPA, partly the coal requirement will be met through the coal meant for 2 x 140 MW units (as these units have been shut down since 30^{th} June 2011). The remaining coal required will be sourced from the MAHANADI coalfields which can be brought/transported by existing railway siding which will be suitably augemented or new system will be developed.

Land requirement

The land requirement for the proposed 1 x 660 MW thermal power plant is given in Table 10.2(A)

Table 10.2(A)

Optimized land requirement for the proposed 1 x 660 MW Thermal Power Plant

Sr. No.	Land use of the project area	Area in Hectare
	For 1x 660 MW unit	
1.	Main Plant & Auxilliary	8.66
2.	Swiitchyard	4.12
3.	Water facilities including CT	7.39
4.	CHP	7.00
5.	Green belt	Existing
	Total	**27.17**
6.	Ash dyke area	Existing
7.	Township	Existing to be augmented
8.	Rail , ash & water corridors	7.04
	Grand Total	**34.21**

Table 10.2 (B)
Details of Environmental Setting

Sr. No.	Particulars	Details
1.	**Location**	
A	Project site	**Eklahare village**
B	Tehsil	Nasik
C	District	Nasik
D	State	Maharashtra
2.	Elevation in msl	563
	Land use at the proposed project area	Industrial
3.	Nearest Habitation	Gangawadi (0.85-km, W) Panchak (3-km,WNW)
4.	Nearest Major town	Nasik (10.05-km, WNW)
5.	Nearest Highway	State Highway- 7(1.8 -km,S)
6.	Nearest Railway station	Nasik (5.91 km,SW)
	Nearest Airport	Ozhar (13.5-km, NNE)
7.	Nearest Tourist places	Nil with in 15 km radius
8.	Defence Installations	Nil with in 15 km radius
9.	Archaeological important	Nil with in 15 km radius
10	Reserved/Protected forest	Nil with in 15 km radius

Sr. No.	Particulars	Details
	(from plant boundary)	
11.	Protected areas as per Wildlife protection act,1972(National parks, Wildlife sanctuaries, community reserves and conservation reserves)	Nil with in 15 km radius
12.	Presence of any wildlife migratory corridors, migratory bird paths in study area or presence of Sch-I animals in study area	Nil with in 15 km radius
13.	Nearest Major streams/Rivers (from plant boundary)	Goadavari (0.5 km , N)
14.	Seismic zone	Zone-III as per IS-1893 (Part-1)-2002.

10.2 Description of the project

MAHAGENCO intends to build a coal based 1 x 660 MW capacity power project with coal from MAHANADI coalfields in Orissa. The proposal is proposed to deploy the state-of-the-art technology and accordingly unit of size 660 MW is being considered with supercritical steam parameters to attain high cycle efficiency. Water would be available from the backwaters of Gangapur Dam Reservoir and transported through pipeline covering a route distance of nearly 30 Km. Salient features of the power plant is presented in **Table-10.2(C)**

Table 10.2(C)
Salient features of the project

Sr. No.	Details	Specification or Particulars
	Details of Boiler	
1.	Boiler	Once through
2.	Turbine	1HP+1IP+ 1/2LP
3.	Generator	780(MVA)
4.	LP heaters	Will be based on optimization of feed heating cycle.
5.	HP heaters	Will be based on optimization of feed heating cycle.
6.	Deaerator	1
7.	Condensate Extract Pumps	3x50%
8.	Boiler Feed Pumps	2 x 50% Turbine driven and 1 x 50% electric motor driven boiler feed pumps,
9.	Vacuum pumps	2x100%
10.	Condensate Polishing Units	2 x 50 % capacity
11.	Recirculation pumps	2
12.	Main steam	247kg/cm^2 (Abs) 565^{0}C

Sr. No.	Details	Specification or Particulars
13.	Reheater steam	593 ^{0}C
14.	Feed Water Temperature	293.5 ^{0}C
15.	Technical Data of Boiler andauxillaries	
16.	Nominal SH steam flow	2120 TPH
17.	Outlet Pressure	256 Kg/cm^2(a)
18.	Temperature	568^{0}C
19.	Temperature at out let	596^{0}C
20.	Station Heat rate	2317 kCal/KWH
21.	Coal Requirement	3.44 MTPA (10488 TPD)
22.	Gross Calorific value	3500 kCal/kg
23.	Sulphur content	0.5%(Design)
24.	Ash Content in Coal	45% (for washed coal)
25.	Ash generation	1.560 MTPA / 4728 TPD / 197 TPH
	Bottom Ash	0.156 MTPA / 472.8 TPD / 19.7 TPH
	Fly Ash	1.404 MTPA(4255 TPD) / 177.3 TPH
26.	ESP efficiency	99.9%
27.	Stack	275-m height
28.	Water Requirement	46488 m^3/day

10.3 Baseline Environmental Status

10.3.1 Air quality

The snapshot of air quality monitoring is depicted below :--

$PM_{2.5}$:- A minimum value of 4.2 μg/m^3 was observed at location Hinganwedhe village and maximum value of 15.9 μg/m^3 was observed at Plant site which is due to the operation of already existing units.

PM_{10} :- A minimum value of 12.7 μg/m^3 was observed at location Madsangvi village and maximum value of 37.7 μg/m^3 was observed at New Colony.

SO_2 :- A minimum value of 7.6 μg/m^3 was observed at location Hinganwedhe village and maximum value of 19.1 μg/m^3 was observed at Plant site which is due to the operation of already existing units.

NOx :- A minimum value of 9.9 μg/m^3 was observed at location Madsangvi village and maximum value of 25.6 μg/m^3 was observed at Eklahare.

Ozone :- A minimum value of 1.6 μg/m^3 was observed at location New Colony and maximum value of 10.2 μg/m^3 was observed at Plant site.

Hg :-- The levels of Hg at all the locations were found to be < 0.01 μg/m^3

At all locations the maximum values of $PM_{2.5,}$ PM_{10}, SO_2, NO_x, Ozone and Hg were found to be within the prescribed limits of CPCB.

10.3.2 Noise quality

Residential Zone

Noise levels (L_{eq}) observed during daytime in this zone in the range of 43.1 to 48.7 dB (A) while during nighttime it is 33.5 to 38.9 dB (A).

Industrial Zone

Noise level is observed as 61.2 dB (A) during daytime while it is 55.0 dB (A) during nighttime at which is within prescribed limits of 75 dB (A) and 70 dB (A) of industrial zone

The L_{eq} was found to be within the prescribed limits as promulgated by CPCB.

10.3.3 The ground water quality was analysed at 8 locations and surface water quality was recorded at 100 m u/s and 100m d/s of river Godavari.

Ground water parameters.

The Ph varied from 7.02 – 8.04, temperature varied from 23^0C to 24^0C, TDS ranged from 560 mg /lit – 1114 mg/lit , Chlorides ranged from 95 mg /lit – 450 mg /lit, Nitrates varied from 9.00 mg /lit – 22.0 mg/lit and sulphates ranged from 26.0 mg /lit – 74.0 mg/lit

Surface Water Samples

The samples from Godavari river were collected from upstream and downstream near village Odha:"

The results are discussed below :--

- The conductivity was observed as 339 µmhos/cm and 344 µmhos/cm in the U/s and D/s respectively.

- The total hardness was observed as 156 mg /lit and 140 mg /lit in the U/s and D/s respectively.

- The chlorides were observed as 18 mg/lit and 33 mg/lit in the U/s and D/s respectively.

- The COD was observed to be 10.5 mg/lit and 12.0 mg/lit in the U/s and D/s respectively.

- The BOD was observed to be 4.0 mg/lit and 4.5 mg /lit in the U/s and D/s respectively.

- The D.O was observed to be 5.1 mg/lit and 4.9 mg /lit in the U/s and D/s repectively.

10.3.4 The soil quality parameters were recorded at 6 locations

The results of the soil quality parameters are summarized below :--

- The Ph was found to vary from 8.08 – 8.47 , conductivity varied from 113 – 382 µmhos/cm, Water holding capacity ranged from 34.0% to 45.0%., Total nitrogen ranged from 0.03% – 0.15%., Total potassium ranged from 0.04 % - 0.08%. and Total phosphorus ranged from 0.03 % - 0.05%.

10.4 Environmental Impacts and Mitigation Measures

10.4.1 Impacts during Construction Phase

This includes the following activities related to leveling of site, construction of related structures and installation of related equipment.

- **Impact on Land Use**

The expansion project land is mostly industrial land and this land use will be changed into industrial category comprising of main plant and auxiliaries, switchyard , water facilties including cooling tower, coal handling plant, greenbelt ,ash dyke area , township, rail,ash and water corridors. The entire land is private land and land has been under possession of MAHAGENCO and there is no forest or ecologically sensitive land within proposed site. No residential or habitation areas are proposed to be acquired, hence no displacement of residential areas is envisaged.

Construction of plant will lead to permanent change in land use pattern at the site as a direct impact. The proposed project involves construction of large scale civil works including levelling within project premises.

The environmental pollution impacts during constructional phase would be temporary and are expected to gradually stabilize by the time of commissioning of proposed project.

There are no sensitive receptors (locations such as archaeological monuments, Tiger reserves, Elephant reserves, Wildlife sanctuaries, National parks, conservation reserves and community reserves) critical pollution zones as specified by CPCB, etc within 15-km radial distance around the boundary of proposed project site, No major changes in land use pattern of study area (region) will occur due to the project activities. Hence, no major impact is envisaged on land use pattern of the project site or buffer zone.

- **Impact on Soil**

The construction activities will result in loss of vegetation cover, topsoil and earthen material to some extent in the plant area. However, it is proposed to use the soil and earthen material for greenbelt development and levelling of project site. Greenbelt will be developed in phased manner from construction stage onwards.

Apart from localized construction impacts at the plant site, no adverse impacts on soil in the surrounding area are anticipated.

- **Impact on Topography**

The proposed project premises is a generally plain land with a general elevation of about 563 m above MSL. Most of the buffer zone of the project is flat land.

It is proposed to level the project area. There will be no tall structures except stacks. Also, the contours of natural drainage will not be disturbed.In view of the above, there will be no major adverse impact on topography of the project site.

- **Impact on Air Quality**

The main sources of emission during the construction period are the movement of equipment at site and dust emitted during the leveling, grading, earthwork, foundation works and exhaust emissions from vehicles and equipment deployed during the construction phase. These emissions are likely to result in marginal increase in the levels of SO_2, NOx, SPM and CO. The impact will be for short duration and confined within the project boundary and is expected to be negligible outside the plant boundaries. The impact will, however, be reversible, marginal and temporary in nature. Proper maintenance of vehicles and construction equipment will help in controlling the gaseous emissions. Water sprinkling on roads and construction site will prevent fugitive dust.

- **Impact on Water Quality**

Impact on water quality during construction phase may be due to non-point discharges of solids from soil loss and sewage generated from the construction workforce stationed at the site. However, due to the construction being carried out

on generally plain terrain, the soil losses will be negligible. Further, the construction will be more related to mechanical fabrication, assembly and erection; hence the water requirements would be small. The construction water will be available at site from existing water system of the existing project. Temporary sanitation facilities (septic tanks and soak pits) will be set-up for disposal of sanitary sewage generated by the workforce. This will be part of EPC contractor's scope and supervised by project proponents during developmental phase. The overall impact on water environment during construction phase due to proposed project is likely to be short term and insignificant.

- **Impact on Terrestrial Ecology**

The initial construction works at the project site involves land clearance. During construction vegetation may be disturbed. Greenbelt will be developed phase wise during construction to improve the aesthetic value in the area and to screen out the fugitive dust generated during construction.

The removal of vegetation from the soil and loosening of the topsoil generally causes soil erosion. However, such impacts will be confined to the project site and will be minimized through paving and water sprinkling.

There are not many existing matured trees in the site. However, greenbelt will be developed surrounding the plant facilities. The existing trees will be preserved to the extent possible. Thus, no major adverse impacts are envisaged on terrestrial ecology.

10.4.2 Impacts during operational phase

- **Impact due to solid waste**

The impact of ash disposal could be multi faceted:

Large area of about 277 hectares is required for final disposal of ash which is available with MAHAGENCO. The disposal of ash into the ash ponds will convert this land into non usable land. The ash storage ponds will affect the air quality in the vicinity of the ponds. In addition to the impacts on land, there are possibilities of impact on the ground water through leaching of heavy metals.

The fly ash is disposed in ash ponds in form of ash slurry. This ash is deposited and stored in these ash ponds for a long time.

The retention of the water on the ash pond surface as well as the rain water collected may force the soluble constituents of the ash into ground water. By virtue of the leaching characteristics of the ash, the heavy metals contained in the ash

may gradually and slowly get leached from the ash and percolate to the ground water.Even though these effects seem to be very small, continuous storage of the ash at a particular location will result in cumulative effects of the exposure, leaching and percolation. Thus the ash dumped in the ponds may lead to one or more of the following processes.

I. leaching of water soluble components from ash into ground water.

II. incorporation of the ash into soil matrix,

Mitigaton measures

- **Fly Ash Slurry Disposal System**

Ash from each of the fly ash silos will be fed by rotary feeders and ash conditioners into the slurry mixing tank. The conditioned dry fly ash will be wetted out by water to be added in the mixing tank and the entire ash will blended to a uniform consistency by the mixer.

One (1) mixing tank and one (1) ash slurry pump (HCSD type) will be provided for fly ash silo. Each slurry pump discharge piping will be provided up to the disposal area with all necessary isolation valves, line flushing valves etc. The ash slurry pump will be piston diaphragm type, single acting , triplex and shall be suitably designed for high concentration disposal (HCSD) system. The ash mixing and pumping process will operate in cyclic mode and automatically dispose of ash so as to accommodate changes in ash production caused by fluctuating boiler loads or other variables. Ash disposal pipelines will be installed above ground with flange joints wherever necessary and it will suit the maximum pressure encountered in the pipeline or otherwise pipelines will be welded. The ash slurry disposal will be designed for 60-70% concentration (solids by weight). The disposal area will be filled in such a way that the deposits can reach the required height within the area and no ash retaining structures are to be constructed.

- The ash collected from TPP in dry form will be filled in covered trucks and sent to cement factories, brick making units, road building, etc.

- Care will be taken to ensure that the run-off/ percolated water will not affect ground water or surrounding land.

- Sludge from water treatment processes is not expected to contain hazardous chemicals and will be used for the purpose of land filling/manure Similarly sludge from sewage treatment can be used as manure to enhance growth of trees in the green belt.

➢ Canteen and kitchen waste which is biodegradable shall be disposed off through vermi- composting mixing with the sludge generated from STP and shall be used as manure for the development of green belt. The manure will be organic in nature and will act as soil enricher. Thus the quality of the soil will improve and therefore the impact on soil will be positive.

➢ All other solid wastes such as e.g, empty containers, polythene bags, metal scrap will be sold off to authorised dealers for recycling.

- **Ash utilization plan**

MoEF vide gazette notification dated 3rd November 2009 have stipulated about the utilization of ash generated by coal / lignite based thermal power station. The details are as under:

New coal and / or lignite based thermal power station and / or expansion units commissioned after this notification to achieve the target of fly ash utilization as per **Table10.3** given below:

Table 10.3
MoEF's directive to achieve target of fly ash utilization

Sr.No	Fly ash utilization level	Target date
1.	At least 50% of fly ash utilization	One year from date of commissioning
2.	At least 70% of fly ash utilization	Two years from date of commissioning
3.	90% of fly ash generation	Three years from date of commissioning
4.	100% of fly ash generation	Four years from date of commissioning

With a view of proper utilization, fly ash has to be handled separately and fly ash has to be stored in dry form for subsequent utilization. The dry fly ash could be transported in closed trucks for commercial utilization. Alternately, to minimize the cost of transportation, fly ash utilization plants could be located close to the thermal power stations.Bottom ash after being collected in ash bins for decantation is conveyed in trucks outside the plant site, and is used extensively as a replacement for cinders. The use of bottom ash in area filling has provide satisfactory alternative over the years,by the virtue of which it finds ready marketability.

Fly ash, being a high temperature product, has pozzolonic properties and forms cement like material when mixed with lime and water. These properties make it

suitable for a number of commercial uses; the most promising of these are as follows:

a) Bulk Utilization

Fly ash can be utilized in bulk form filling low lying areas, abandoned mines and in forming dykes and bunds. For this purpose, fly ash slurry is prepared specially to render the mass semi-rock once it settles in low lands, thereby making the reclamation of land possible. The slurry thus prepared is termed as 'Emulgate'. 'Emulgate' can also be used to serve irrigation projects by creating bunds to channelize water. Other probable uses can be for making rail & canal embankments, filling for making roads, land scaping etc.

b) Value Added Utilization

Modest quantities of fly ash can be used by generating a product which has some commercial value. The products are made by making use of some of the qualities of fly ash. The pozzolanic activity and lime reactivity of fly ash is employed for numerous uses including manufacture of building construction materials, as listed below:

i) Fly ash clay bricks
ii) Fly ash - lime & sand bricks
iii) Cellular bricks / blocks
iv) Light weight aggregate
v) Protland pozzolana cement
vi) Precast concrete blocks
vii) Sewerage pipes etc.

c) High Value Utilization

Products / services of high value can be made by utilizing fly ash. The value of the end product is much more pronounced than the quantity of ash utilized. Probable usage / products are as follows:

i) Treatment of acidic soil for waste land reclamation for agricultural purposes.
ii) Construction of road sub-base and rigid pavements for runways.
iii) Manufacture of coagulants to remove turbidity of water.
v) Manufacture of insulating bricks.

For the proposed 1 x 660 MW power plant, fly ash will be collected in dry form. This dry fly ash will then be transported to the neighboring ash utilization plants, to be set

up by private parties, by truck. Any surplus fly ash not used in the manufacture and bottom ash will be disposed off in slurry form to the ash dyke.

- **Impact on Air Quality**

The proposed project will use Indian coal as fuels for the proposed Boiler of the power plant.

The unit will use coal for which steam turbine has been envisaged.In extreme emergency, Diesel Generator will be used for running the important equipment and street light. This will be limited to a few hours only. As such, the pollutants expected to be released in the emission will mainly be the Particulate Matter (PM).

The concerning emission will be only from Point Source i.e. from Stack of Boiler, which will be released through a stack of 275 m. height.

The emissions from other point source i.e. exhausts of Diesel set will be of insignificant value.

The 1st highest predicted GLC's due to the operations of proposed 1x 660 MW thermal power plant for the winter season are given in **Table 10.4 and the resultant concentrations at AAQM locations in the winter season (Dec - 2011) are given in Table 10.5**

Table 10.4

1st highest predicted GLC's from the operations of the proposed 1 x 660 MW thermal power plant

Sr. No.	Pollutant	Max GLC µg/m^3	Distance w.r.t plant centre (km)	Direction w.r.t plant centre
1.	PM_{10}	1.74	2.0	W
2.	SO_2	13.10	2.0	W
3.	NO_x	2.83	2.0	W

Table 10.5
Resultant concentrations due to operations of the proposed 1 x 660 MW power plant (December 2011)

Pollutant	Location	Project Site	Ganga-wadi	Panchak	Madsangvi	Kotamgaon	Hinganwedhe	Eklahare	New Colony
		AQ1	AQ2	AQ3	AQ4	AQ5	AQ6	AQ7	AQ8
NO_x	Baseline	15.1	19.2	17.6	17.5	15.9	14.9	15.6	18.3
	Incremental	0.4	0.8	1.2	0	0.4	0	0	1.6
	Resultant	**15.5**	**20**	**18.8**	**17.5**	**16.3**	**14.9**	**15.6**	**19.9**
SO_2	Baseline	29.6	27.2	18.6	16.5	14.8	13.5	22.3	22.3
	Incremental	1.0	4.0	6.0	0	0	0	0	8
	Resultant	**30.6**	**31.2**	**24.6**	**16.5**	**14.8**	**13.5**	**22.3**	**30.3**
PM_{10}	Baseline	36.8	35.9	35.7	33.8	23.4	19.8	31.3	37.7
	Incremental	0	0.4	0.8	0	0.2	0	0	1.0
	Resultant	**36.8**	**36.3**	**36.5**	**33.8**	**23.6**	**19.8**	**31.3**	**38.7**

The **Table 10.3** and **Table 10.4** reflect that the highest GLC's and resultant concentrations at AAQM locations are well within the NAAQS promulgated in 2009.

Impact on water quality

The water balance during operational phase for the 1 x 660 MW coal based thermal power plant is given in Table 10.6

Table 10.6: Water balance for 1 x 660 coal based thermal power plant

Sr. No.	Particulars	Water Requirement (m^3/day)	Loss (m^3/day)	Effluent generation (m^3/day)	Remarks
1	Cooling tower make-up	40800	40460	340	Effluent will be Treated and used in ash handling system
2	Power cycle-make-up	1128	1030	98	Effluent will be Treated and used in ash handling
3	Service water	960	384	576	Effluent will be Treated and used for dust suppression
4	Ash handling system	2500*	2500	0	(70 % water recirculated)
5	Dust suppression	674*	674	0	
6	Fire fighting	2500	0	2500	Used for greenbelt development, ash handling, dust suppression
7	Colony	200	40	160	Treated in sewage treatment plant and used for greenbelt development

8	Greenbelt	500*	500	0	
Total (1+2+3+6+7)		**45588**	**41914**	**3674**	

***Treated water from ETP /STP**

During operation phase of the proposed plant, the water requirement wil be met from the backwaters of Gangapur Dam on the Godavari river. The total water requirement of plant is about 45588 m^3/day .About 1174 m^3/day of effluent will be generated out of which 340 m^3/day of cooling tower blowdown will be treated and used in ash handling system, 98 m3/day of effluent will be generated from the boiler which will also be treated and used in ash handling system. About 576 m^3/day of effluent will be generated from service water which will be treated and used for dust suppression. The effluent from colony will be treated in STP and used for green belt development thereby implementing zero discharge concept. The water from Gangapur dam will be used for cooling water requirement. For the cooling purpose closed cycle cooling circulating water system, using the river water shall be used. This ensures there is no additional burden on the water resources of the region due to the proposed plant.The factor influencing the water quality in the region may generally due to discharge of waste water from plant and sewage.

The mitigation measures for maintaining the water quality of are given below :--

Mitigation measures

- Zero effluent discharge will be implemented resulting in minimal impact on the surface water quality.

The sources of plant effluent are mainly:

a) CW System blow down
b) Plant drains and boiler blow down
c) Oily waste

CW system blow down should be utilized for meeting the requirement of ash handling system (such as bottom ash disposal, refractory cooling, fly ash conditioning etc.), Coal handling system (dust suppression). Excess blow down, if any, shall be led to the Central Monitoring Basin (CMB).

Water treatment plant effluent comprises of DM and CPU regeneration waste. This effluent shall be pumped to the Central Monitoring Basin (CMB) after neutralizing.

Plant drains from Fuel Oil Tank Farm area, Lube oil system, Transformer area and TG area shall be led to a sump. These oily effluents shall be treated in an oil water

separator for removal of oil. The clear water shall be led to the Central Monitoring Basin (CMB) and the dirty oil shall be disposed off in drums separately.

The Central Monitoring Basin shall have two (2) compartments,each compartment having adequate storage to collect a day's effluents. Facilities in the form of chemical dosing system, effluent recirculation system, etc shall be provided to treat the effluent and to bring the quality suitable for disposal outside the plant, if required.

- **Impact on Noise Levels**

The main noise generating stationary sources from the power plant will be pumps, compressors along with cooling tower and boilers. The noise levels at the source for these units will be in the range of 75- 80 dB(A). The noise dispersion from the plant units has been computed based on the mathematical model.

The incremental noise levels will be less than 43.2 dB(A) at all the surrounding habitations. It is seen from the simulation results that the incremental noise levelswill be well within the CPCB standards.

10.5 Additional Studies

A comprehensive onsite and off – site disaster management plan has been proposed to counter any eventuality resulting from the proposed operation of the proposed thermal power plant and detailed socio-economic study has been conducted to assess the perception of the local populace towards the project. The socio –economic study revealed that people welcomed the project subject to the provision of facilties by MAHAGENCO such as roads, drinking water facility , etc.

10.6 Benefits of the project

As a part of CSR activities MAHAGENCO has carried out the following elaborate measures which are outlined as follows:--

- Health check up camps
- Felicitation for talented/ meritorious students
- Free auditory check up
- Free eye check up camp
- School level scholarship
- School level sports competition
- Self employment camps
- Plantation programme
- Public awareness programmes
- Farmers meet

- Animal husbandry programme
- Distribution of study material
- Awareness of use of non- conventional energy sources
- Fitness and health camps

Further the total no. of beneficiaries of the CSR welfare measures in the fiscal year 2010-11 were 948. The total expenditure towards CSR welfare measures is Rs 25,50,000/- during the fiscal year 2011-12.

10.7 Environmental Management Plan

10.7.1 Environment Management Plan during Construction Phase

During construction phase, the construction activities like site levelling, grading, transportation of the construction material cause various impacts on the surroundings. However, the constructional phase impacts are temporary and localised phenomena except the permanent change in local landscape and land use pattern of the project site.

- **Land Environment Management**

Preparation of site will involve excavations and fillings. The earthen material generated during excavations and site grading periods, shall be properly dumped and slope stabilisation shall be taken. The topsoil generated during construction shall be preserved and reused for plantations.

No nallas of water courses are present in the project site. The Godavari river is about 0.35 km from project site .However, natural drainage pattern shall not be disturbed as far as possible.

The approach road to project site shall be appropriately widened and strengthened to facilitate vehicular movement.

The greenbelt area shall be delineated before start-up of earthwork and tree plantation shall be taken up during construction stage itself.

- **Air Quality Management**

The activities like site development, grading and vehicular traffic contribute to increase in SPM and NOx concentrations. The mitigation measures recommended to minimize the impacts are:

- Water sprinkling in construction area;
- Asphalting the main approach road;
- Proper maintenance of vehicles and construction equipment; and
- Tree plantation in the area earmarked for greenbelt development.

- **Water Quality Management**

The soil erosion at site during heavy precipitation contributes to the increase in suspended solids. The wastewater from vehicle and construction equipment maintenance centre will contribute to oil and grease concentration. The wastewater from labour colony will contribute to higher BOD concentrations. The mitigation measures recommended to minimize the impacts are:

- Sedimentation tank to retain the solids from run-off water;
- Oil and grease trap at equipment maintenance centre;
- Packaged STP/Septic tanks to treat sanitary waste at labour colony; and
- Utilizing the wastewater in greenbelt development.

- **Noise Level Management**

Operation of construction equipment and vehicular traffic contribute to the increased noise level. Recommended mitigation measures are:

- Good maintenance of vehicles and construction equipment;
- Restriction of construction activities to day time only;
- Plantation of trees around the plant boundary to attenuate the noise; and
- Provision of earplugs and earmuffs to workers.

- **Social community Management**

Constructional activities will generate employment to about 1500 workers. For construction work force, temporary sanitation facilities (septic tanks and soak pits) will be set-up for disposal of sanitary sewage. Similarly, rest rooms and canteen facilities will be provided for truck drivers during construction as well as operation phase of power plant.

10.7.2 Environment Management Plan during Operation Phase

During operation phase, the impacts on the various environmental attributes should be mitigated using appropriate pollution control equipment. The Environment Management Plan prepared for the proposed project aims at minimizing the pollution at source.

- **Air Pollution Management**

Fugitive and stack emissions from the power plant will contribute to increase in concentrations of SPM, SO_2, and NOx pollutants. The mitigative measures recommended in the plant are:

- Installation of ESP of efficiency more than 99.9% to limit the SPM concentrations below 50 mg/Nm^3;
- Provision of 275-m height chimney for wider dispersion of gaseous emissions;
- Provision of water sprinkling system at raw material storage yard;
- Asphalting of the roads within the plant area;
- Provision of dust extraction systems at dust generating source;
- Developing of greenbelt (50 -m wide towards village areas and river course) around the plant to arrest the fugitive emissions;
- Design of control equipment to meet the standards stipulated by CREP;
- Online flue gas monitors as well as flue gas flow rates and temperature measurement shall be provided for all stacks; and
- Usage of washed/beneficiated coal may be explored.

To control fugitive hydrocarbon emissions, the following measures shall be adopted:

- Provision and periodic inspections of mechanical seals in pumps;
- Preventive maintenance of valves, flanges, joints, roof vents of storage tanks; and
- Submerged filling of liquid fuel storage tanks.

The fugitive dust emissions shall be controlled by installation of closed conveyor system along with suitable dust suppression measures.

- **Water Pollution Management**

Wastewater will be generated from cooling towers, boilers in the power plant. Besides, domestic wastewater from canteen and employees wash area, township will also be generated. The recommended measures to minimise the impacts and conservation of fresh water are:

- Recycling of wastewater generated in cooling tower into process and ash disposal, coal handling and service water requirements;

- The plant raw water requirement shall be optimised. The COC in cooling system shall be maximised (such as COC=5);

- The effluent carrying oil spillage in the plant area shall be sent to oil-water separator for removal of oil;

- Coal stock piles and ash ponds shall be provided with garland drains and water shall be treated for suspended / floating solids;

- Adequate treatment of wastewater prior to recycling/reuse to maximum extent;

- Provision of sewage treatment plant to treat domestic sewage generated from plant and township;

- Utilization of treated domestic wastewater in toilet flushing, greenbelt development and dust suppression;
- Lining of effluent pond suitably to prevent any seepage into ground to avoid any groundwater contamination;
- Provision of separate storm water system to collect and store run-off water during rainy season and utilization of the same in the process to reduce the fresh water requirement;
- Suitable rainwater harvesting structures to be constructed.

- **Solid Waste Management**

Solid waste in the form of ash will be generated in a coal based thermal power plant. The total ash generated in the plant will be 1.560 MTPA out of which 10% will be bottom ash i.e. 0.156 MTPA and balance will be fly ash of 1.404 MTPA. The following measures shall be taken for solid waste management:

- In general ash will be given to potential ash users;
- The excess ash will be disposed off using high concentration slurry disposal system to HDPE lined ash pond;
- The generated waste oil shall be explored to be used in boiler furnace with HFO or shall be given to authorized recyclers;
- The organic portion of solid waste generated in the Sewage Treatment Plant (STP) will be used as manure in greenbelt development; and
- Maintaining the data base on solid waste generation such as quantity, quality, and treatment/management.

Fly Ash Disposal

The balance ash after utilisation shall be disposed in ash ponds. Ash disposal system proposed is High Concentration Slurry Disposal (HCSD). Treated wastewater will be used in ash handling plant. The ash pond will be provided with HDPE liners.

The ash will be utilized in various construction materials to the maximum extent and 100% utilization will be achieved.

The cost of environmental protection measures is given in Table 10.7

Table 10.7 : Cost of environmental protection measures

The capital cost for the environmental protection measures is Rs. 283.41 crores and

Sr. No.	Description of Item	Capital Cost (Rs crores)	Recurring Cost per annum (Rs. Crores)
1.	Air :-- i) ESP ii) Dust suppression system for coal handling for coal handling and at ash silo	80.00 3.00	2.00 0.10
2.	RCC single flue chimney	40.0	0.10
3.	Cooling Tower	90	1.0
4.	Bottom ash and fly ash collection, storage , dispensing system	55.0	5.5
5.	ETP , STP etc	11.0	0.55
6.	Pollution monitoring instrument / equipment	2.50	0.40
7.	Other unforeseen items	3.00	0.40
8.	CSR	18.91 (0.4% of project cost)	3.78 (0.08% of project cost)
Total		**283.41**	**14.33**

recurring cost per annum is Rs. 14.43 crores.