GOVERNMENT OF KHYBER PAKHTUNKHWA
CLIMATE CHANGE, FORESTRY, ENVIRONMENT
AND WILDLIFE DEPARTMENT
(SECTION ENVIRONMENT)

NOTIFICATION

Peshawar Dated the 25/07/2025

No. SO(ENVT)/CCFE&WD/1-8/EPC-2025: In exercise of powers conferred under Clause xxii of Section 7 of the Khyber Pakhtunkhwa Environmental Protection Act, 2014, (Khyber Pakhtunkhwa Act No. XXX of 2022), the Khyber Pakhtunkhwa Environmental Protection Council (EPC) in its 3rd Meeting held on 13.05.2025 has been pleased to approve the following guidelines for General Environmental Approval (GEA);

GUIDELINES FOR COAL POWER PLANTS (CAPACITY LESS THAN 01 MW)

1. **INTRODUCTION:**

i. **COAL**

Coal is a nonrenewable fossil fuel,it is a black or brownish-black sedimentary rock that can be burned as fuel.

ii. **A COAL POWER PLANT;**

A coal power plant generates electricity through a series of energy stages

a. Coal is burned in boilers to produce high pressure steam,
b. The steam expends and drives a turbine,
c. And the mechanical energy of the turbine is converted into electrical energy by a generator.

iii. **COAL POWER PLANT WORKING PROCESSES:**

Coal is used in power plant/station to generate electricity. The coal is first milled to a fine powder, which increases the surface area and allows it to burn more quickly. In these pulverized coal combustion (PCC) systems, the powdered coal is blown into the combustion chamber of a boiler where it is burnt at high temperature. The hot gases and heat energy produced converts water (in tubes lining the boiler) into steam. The high pressure steam is passed into a turbine containing thousands blades. The steam pushes the blades, causing the turbine shaft to rotate at high speed. A generator is mounted at one end of the turbine shaft and consists of carefully wound wire coils. Electricity is generated when these are rapidly rotated in a strong magnetic field. After passing through the turbine, the steam is condensed and returned to the boiler to be heated once again.

2. **ENVIRONMENTAL IMPACT OF A COAL POWER PLANT:**

i. When coal is burned it releases pollutants. Such as mercury, lead, sulfur dioxide, nitrogen oxides, particulates, and various other heavy metals.

ii. The burning of coal also produces sulfur and nitrogen oxides that react with atmospheric moisture to produce sulfuric and nitric acids—so-called acid rain.

iii. The burning of coal, like the burning of all fossil fuels (oil and natural gas included), releases large quantities of carbon dioxide (CO_2) into the atmosphere and is a major driver of global warming.

3. **MITIGATION MEASURES TO REDUCE OR ELIMINATE THE POLLUTANTS;**

i.SITE SELECTION CRITERIA:

Site selection play very important role to manage the environment issues of a coal power plant, the following points shall be considered during the site selection process.

a. The site should be located in industrial areas or at a suitable site, at least 300 m away from residential area, medical care facilities, schools, child care facilities, parks, wildlife areas.
b. The existing development context of the site should be compatible with the activity.
c. At the design stage of new power plants, consideration should be given to the site lay-out, with a view to avoiding disturbances to the surrounding environment. In particular, attention should be paid to the location of entrances, exits, car parks, access roads and amenities.
d. The site should not be located within any Environmentally Sensitive Area (ESA) and other sites such as wetland, steep slope and in areas that are likely to be affected by hazards such as inland flooding and landslide etc.
e. On-site wastewater disposal facility such as septic tanks and pits shall be located not less than 30 m from any water course/water body.
f. Existing natural drains and watercourses on or in the vicinity of the site shall not be tampered with.

ii. CLEANER FUELS SELECTION:

- Low sulfur, low ash coal

iii. CLEAN COAL TECHNOLOGIES:

It offers the possibility of reducing or eliminating emissions of some pollutants especially Sox, when the main fuel option is low quality, high sulfur hard coal, brown coal or lignite. Followingtechnologies are used to control emissions.

a. Integrated Gasification and Combined Cycle (IGCC)

✓ Sulfur of the fuel is converted to Hydrogen sulfide
✓ Fuel nitrogen is converted to molecule nitrogen

b. Atmospheric Fluidized Bed Combustion(AFBC)

✓ Lower operating temperature reduce Nox, Sox formation
✓ Sox is reduced by the presence of calcium based limestone of dolomitChlorine in the coal is removed with waste liquors.

c. Pressurized Fluidized Bed Combustion (PFBC)

✓ Lower Nox emissions result from the lower operating temperature of the PFBC.
✓ All the Nox produced fromnitrogen content of the coal.

iv. PARTICULATE REMOVAL:

Any advance and appropriate Technology should be adopted to remove the Particulate, which is emitted from the combustion process. Some technologies are given below

a. Fabric filters (Bag Houses)
b. Electrostatic precipitators (ESPs).
c. Wet scrubber
d. Cyclones

v. DESULFURIZATION TECHNOLOGIES:

The use of Desulfurized technologies depends upon the content of sulfur in the fuel.

a. Low sulfur coal(specific control not required)

b. 3 percent sulfur feul (Sorbent Injection or Fluidized bed combustion is adequate)
c. High sulfur fuel Desulfurization technologies or other clean coal technologies are required to be applied

❖ **FGD(Flue Gas Desulfurization) System wet scrubbers:**

- A solution containing calcium,nitrogen or ammonia based sorbents absorb Sox to produced wet by product.(sludge is dumped in landfill sites)
- Sea water based sorbents.(sludge is dumped in landfill sites)
- Limestone based sorbents (Gypsum can be dumped or used in buildings)

❖ **FGD system Dry Scrubbers:**

- Dry product with fly ash (used in lime spray dryer).

❖ **FGD System in furnace sorbent injection**

- Pulverized lime or limestone sorbent is injected into furnace to react with the combustion gases.
- This process removes Sox after combustion.

❖ **Re-generable FGD (Flue Gas Desulfurization) Systems;**

- Wet sorbent sodium sulphite or magnesium oxide is used to remove Sox
- The reaction product is separated and the sorbent is regenerated, and reused.

❖ **Coal Benefication:**

- Physical Processes such as crushing, grinding,screening and various washing techniques including forth floatation, hydro-cyclones and dewatering.
- Inorganic sulfur and ash.

vi.DE NITRIFICATION TECHNOLOGIES:

Nox emission can be reduced through following techniques
a. Low Nox Combustion Modification
b. Selective catalytic Reduction
c. Selective non catalytic Reduction

a. Low Nox Combustion Modification:

✓ The Nox formation can be control through reducing combustion temperature or oxygen concentration.
✓ This can be achieved in a number of ways including the following.

❖ Pulverizing the coal; it reduces the amount of air required to the boiler.
❖ Combustion with low excess air in the furnace; this can reduce Nox formation
❖ Flue gas recirculation increases the flow rate through the boiler.
❖ Low Nox burner; it converts fuel nitrogen to elemental nitrogen instead of Nox

b. Selective catalytic Reduction:

Nitrogen oxides in the flue gases react with ammonia in the presence of catalyst (Tilanum oxide) to produce water and elemental nitrogen(N2)

c. Selective non catalytic Reduction;

Ammonia is used to react with Nox at high temperature without a catalyst to produce elemental nitrogen.

vii.CO2 REDUCTION:

Co2 can be controlled/reduced through the following techniques

A. **Pre-combustion; CO2** capture typically involves gasification processes, such as integrated gasification combined cycle (IGCC) technology, where coal or biomass is converted into gaseous components by applying heat under pressure in the presence of steam. IGCC plants may be designed so that concentrated CO2 at a high pressure can be captured from the synthesis gas that emerges from the gasification reactor before it is mixed with air in a combustion turbine..

B. **Post-combustion CO2** capture involves physical and chemical processes to separate CO2 from the exhaust flue gas. The trace impurities in the flue gas tend to reduce the effectiveness of the CO2 adsorbing processes, and compressing captured CO2 from atmospheric pressure to pipeline pressure represents a large parasitic load. One technological option, oxygen combustion (oxy-combustion), combusts coal in an enriched oxygen environment using pure oxygen diluted with recycled CO2 or water. This process enables a relatively concentrated stream of CO2 to be captured by condensing the water in the exhaust stream. Oxy-combustion offers several potential benefits for existing coal-fired plants

viii.**FLY ASH REMOVAL**:

A. Fly ash dry handling system;
It involves wetting the ash 10-20 percent moisture to improve the handling characteristics and mitigate the dust generated during the disposal.

B. Fly ash wet handling system;
The ash is mixed with water to produce a liquid effluent having some solid particles. this is discharged to settling ponds through pipeline.The settled solid of the pond are dredged and removed for final disposal to the landfilling area.

ix.WATER USAGE REDUCTION:

- It is possible to reduce the water for cooling systems by installing evaporative cooling systems. Careful management is required to minimize befouling.Waste water from the other process can be recycled after proper treatment.

x.WATER TEMPERATURE REDUCTION:

- This can be achieved by lengthening the outlet channel.

xi.OTHER POLLUTANTS

- Fabric filters or ESPs operated in combination with FGD techniques, such as limestone FGD, Dry Lime FGD, or sorbent injection.
- Fuel cleaning (mainly the cleaning of coal) is used to remove mercury from the fuel prior to combustion.
- Mechanical devices using pulsating water, air and Centrifugal force is used to separateimpurities from coal.
- Dense media washing, which uses heavy liquid solutions usually consisting of magnetite (finely ground particles of iron oxide) to separate coal from impurities.
- Smaller sized coal is sometimes cleaned using froth flotation. This technique differs from the others because it focuses less on gravity and more on chemical separation.

xii.LIQUID EFFLUENTS

- Coal pile runoff and leachate may contain significant concentrations of toxics such as heavy metals. Where leaching of toxics to groundwater or their transport in surface

runoff is a concern, suitable preventive and control measures such as protective liners and collection and treatment of runoff should be put in place.

xiii. OLID WASTES

- Solid wastes, including ash and FGD sludges, that do not leach toxic substances or other contaminants of concern to the environment may be disposed in landfills or other disposal sites provided that they do not impact nearby water bodies. Where toxics or other contaminants are expected to leach out, they should be treated by, for example, stabilization before disposal.

xiv. NOISE

- A buffer zone (greenbelt) should be developed around the battery limit of the industry
- PPEs should be arranged and ensure the use by the workers in the factory

xv. General Mitigation measures:

- First aid facility should be arranged for the workers/emplyees in the factory..
- Stack height of the plant is not less than 50 meters.

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Secretary to Govt. of Khyber Pakhtunkhwa
Climate Change, Forestry, Environment & Wildlife Department

No. SO(ENVT)/CCFE&WD/1-8/EPC-2025:

Copy for information to;

1. All members of Environmental Protection Council (EPC) Khyber Pakhtunkhwa
2. PS to Secretary Climate Change, Forestry, Environment & Wildlife Department, Khyber Pakhtunkhwa

20/8/25

Muhammad Ishaq
Section Officer (Environment)