Unit Design Data

Fossil Steam (Voluntary Reporting)

(**Note:** The NERC Board of Trustees approved the *GADS Task Force Report* (dated July 20, 2011)[i], which states that design data collection outside the required nine fields is solely voluntary. However, the GADS staff encourages reporters to report and update GADS design data frequently. This action can be completed by sending in this form to gads@nerc.net. GADS staff encourages using the software for design entry and updating.

Instructions

Use these forms to report design and installed equipment information for FOSSIL (steam) units. FOSSIL units are units with a single steam generator connected to a single or cross-compound turbine generator drive train. Report units that have multiple steam generators and/or multiple turbine generators connected by headers using the forms found under the heading "MISCELLANEOUS."

Data reported on these forms should reflect the current condition and design of the unit. Do not report data for start-up equipment or equipment that is not used to carry normal load unless specifically requested.

Some data fields are designated as M1 and M2. These fields indicate that the equipment being reported may have been supplied by more than one manufacturer. Use fields designated as M1 to report all the data associated with one manufacturer's equipment and M2 for the other

Unit name:

Location of unit (State):

Energy Information Administration (EIA) Number:

Regional Entity:

Subregion:

Data reporter:

Telephone number:

Date:

GENERAL UNIT DATA

1. Identification

A series of codes uniquely identifies your utility and units. NERC assigned a unique code to identify your utility. You must assign the unique code that will identify the FOSSIL unit being reported. This code may be any number from 100 to 199 or 600 to 649. Enter the unique utility and unit code and the full name of the unit below:

Utility Code Unit Code

Name of Unit

2. Date the Unit Entered Service

The in–service date establishes the starting point for review of historical performance of each unit. Using the criteria described below, report the date the unit entered service:

Year Month Day

Criteria:
a) The date the unit was first declared available for dispatch at some level of its capability, OR
b) The date the unit first operated at 50% of its generator nameplate megawatt capability (product of the megavoltamperes (MVA) and the rated power factor as stamped on the generator nameplate(s)).

3. Unit Loading Characteristics at Time of Unit's Design

Enter the number from the list below that best describes the mode of operation the unit *was originally designed for:*

1 – Base load with minor load following
2 – Periodic start-up, load follow daily, reduced load nightly
3 – Weekly start-up, load follow daily, reduced load nightly
4 – Daily start-up, load follow daily, off-line nightly
5 – Start-up chiefly to meet daily peaks
9 – Other, describe ______________________

4. Design and Construction Contractors

Identify both the architect/engineer and the general construction contractor responsible for the design and construction of the unit. If your utility was the principal designer or general constructor, enter "SELF."

______________ Architect/Engineer

______________ Constructor

5. Boiler – Manufacturer

Enter the name of the manufacturer and the model or series name or number of the boiler:

____________________ Boiler manufacturer

____________________ Manufacturers' model, series name, or number

6. Boiler – Enclosure

Is 50% or more of the boiler outdoors (not enclosed in building framing and siding)?

☐ 1 – Yes 2 – No

7. Boiler – Nameplate Conditions

Enter the following steam conditions for the MAIN STEAM LINES at the full-load, valves-wide-open design point:

☐☐☐☐☐☐☐☐ Steam flow rate (in lbs/hr)

☐☐☐☐ Design temperature (☐F)

☐☐☐☐ Design pressure (psig)

8. Boiler – Fuel Firing System

☐ Enter the type of fuel firing system the unit *was designed for:*

- A – *Front OR Back* – wall-mounted burners on either the front OR the back of the furnace.
- B – *Opposed* – wall-mounted burners on BOTH the front and back of the furnace.
- C – *Vertical* – burners are mounted on the ceiling of the furnace.
- D – *Tangential* – firing from the corners of the furnace with burners capable of directing the fireball up or down.
- E – *Cyclone* – horizontal (burner) cylinders connected to furnace walls wherein fuel and air are combusted in a controlled environment. Combustion gases exit through re-entrant throat into furnace, and slag drains to slag tanks. Cyclone burners may be installed in either single walls or opposed walls.
- F – *Concentric* – staged combustion system, designed primarily for NO_2 control, in which the walls are blanketed with air.
- G – *Circulating fluidized bed* – upward flow of air holds the fuel and sorbent particles (e.g., limestone) in suspension in the combustion zone. Partially burned fuel passes into a collector and is routed back into the combustion zone.
- H – *Bubbling fluidized bed* – similar to circulating fluidized bed except the partially burned fuel is not recirculated.
- I – *Stoker* – overfeed method combined with suspension firing.

9. Boiler – Type of Circulation

☐ Enter the type of circulation the boiler *was originally designed for*:

1 – *Natural* (thermal) – water flows through furnace wall tubes unaided by circulating pumps. Primarily used with subcritical units.
2 – *Controlled* (forced or pump assisted thermal) – water flows through furnace wall tubes aided by boiler recirculation pumps located in the downcomers or lower headers of the boiler. Used on some subcritical units.
3 – *Once through* – no recirculation of water through the furnace wall tubes and no steam drum. Used on supercritical and some subcritical units.

10. Boiler – Circulation System

Enter the following information on the pumps used to recirculate water through the boiler:

__________________ Boiler recirculation pump(s) manufacturer(s).

__________________ TOTAL number of boiler recirculation pumps; include installed spares.

__________________ MINIMUM number of boiler recirculation pumps required to obtain maximum capacity from the unit.

M1 ☐ M2 ☐ Enter the type of boiler recirculation pump(s) at the unit:

1 – *Injection* (or injection seal) – controlled-leakage boiler recirculation pumps mounted vertically with a rigid shaft designed to carry its own thrust.
2 – *Leakless* (or canned, canned-motor, or zero-leakage) – pump and its motor are an integral pressurized sealed unit.
9 – *Other, describe* ____

11. Boiler – Type of Furnace Bottom

☐ Enter the type of furnace bottom the boiler *was originally designed for:*

1 – *Dry bottom* – no slag tanks at furnace throat area (throat area is clear). Bottom ash drops through throat to bottom ash water hoppers. Design used when ash-melting temperature is greater than temperature on furnace wall, allowing for relatively dry furnace wall conditions.
2 – *Wet Bottom* – slag tanks installed at furnace throat to contain and remove molten ash from the furnace.

12. Boiler – Furnace (Surface) Release Rate

Enter the furnace (surface) release rate of the PRIMARY FUEL. This rate is specified in the boiler contract as the heat available per hour, in Btu's per square foot of heat-absorbing surface in the furnace. The absorbing surface includes the furnace tube walls and the first convection superheater and reheater tubes. If the furnace contains superheater and reheater platens which extend into the furnace, these absorbing surfaces should be included also.

▲ Furnace (surface) release rate (in Btu's/SqFt/Hr)

13. Boiler – Furnace Volumetric Heat Release Rate

Enter the furnace volumetric heat release rate. This rate is the total quantity of thermal energy released into the furnace by the PRIMARY FUEL at its higher heating value (HHV). The volumetric heat-release rate is expressed in Btu's per cubic foot of furnace volume per hour. It does not include the heat added by the preheated air or the heat unavailable due to the evaporation of moisture in the fuel and the combustion of hydrogen.

								Furnace volumetric heat release rate (in Btu's/CuFt/Hr)

14. Boiler – Primary and Secondary Design Fuels

Enter information on the characteristics of the primary and secondary fuels considered in the DESIGN of the unit. These fuels are used to sustain load on the unit. PRIMARY is the first fuel of choice for economic or control reasons, or that fuel contributing 50% or more of the load-carrying Btu's. Fuel characteristics are based on design specifications. Additional notes are provided where appropriate.

Primary Fuel

Secondary Fuel

Fuel Codes

CC	Coal	**PR**	Propane
LI	Lignite	**SL**	Sludge Gas
PE	Peat	**GE**	Geothermal
WD	Wood	**NU**	Nuclear
OO	Oil	**WM**	Wind
DI	Distillate Oil (#2)	**SO**	Solar
KE	Kerosene	**WH**	Waste Heat
JP	JP4 or JP5	**OS**	Other - Solid (Tons)
WA	Water	**OL**	Other - Liquid (BBL)
GG	Gas	**OG**	Other - Gas (Cu.Ft.)

Fuel Characteristics

Primary Fuel	Secondary Fuel	
[ ][ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ][ ]	Average Heat Content in Fuel (Btu/lb, Btu/bbl, Btu/CuFt)
[ ][ ].[ ]	[ ][ ].[ ]	% Ash Content (to one decimal place) (Btu/lb,Btu/bbl,Btu/CuF
[ ].[ ]	[ ].[ ]	% Sulfur Content (to one decimal place) (Btu/lb,Btu/bbl,Btu/CuF
[ ][ ].[ ]	[ ][ ].[ ]	% Moisture Content (to one decimal place) (Btu/lb,Btu/bbl,Btu/CuF
[ ][ ][ ][ ]	[ ][ ][ ][ ]	Ash Softening Temp (□F) (in a reducing atmosphere) (ASTM STD D-1857, Part 26) (coal units only)
[ ][ ][ ]	[ ][ ][ ]	Grindability Hardgrove Index (ASTM STD D-409, Part 26) (coal units only)
[ ][ ].[ ]	[ ][ ].[ ]	% Vanadium & Phosphorous (to one decimal place) (oil units only)

15. Boiler – Fuel Oil Forwarding System

Some units are equipped with a fuel oil forwarding system that transfers oil from the main storage tanks to smaller tanks closer to the unit. (Complete Item 18, below, if interim storage tanks are not used.) Enter the following data on the fuel oil forwarding system:

____________________	Fuel forwarding/transfer pump(s) manufacturer(s).
____________________	Manufacturer(s) of the motor(s) that drives the fuel forwarding/ transfer pump(s).
____________________	TOTAL number of fuel forwarding/transfer pumps; include installed spares
.	
____________________	MINIMUM number of pumps required to obtain maximum capacity from the unit.

16. Boiler – Burner System (General)

Enter the following information on the burner systems installed at the unit (this includes the nozzles, igniter, air registers, and the wind box arrangements):

Conventional Burners

____________________	Primary fuel burner(s) manufacturer(s)
____________________	TOTAL number of primary fuel burners.

Low No_x Burners

____________________	Manufacturer(s)
____________________	TOTAL number of Low No_x Burners; include installed spares.
____________________	MINIMUM number of Low No_x Burners required to obtain maximum capacity from the unit.

Installation date:

				Year		Month			Day

17. Boiler – Burner Management System

Enter the name of the manufacturer of each of the following burner management systems:

____________________	Manufacturer of the combustion control system that coordinates the feedwater, air, and fuel subsystems for continuous unit operation.
____________________	Manufacturer of the burner management system that monitors only the fuel and air mixture during all phases of operation to prevent the formation of an explosive mixture.

18. Boiler – Fuel Oil Burner Supply System (In-plant)

Enter the following information on the pumps used to forward fuel oil from the main storage tanks or the interim storage tanks (if the unit is so equipped) to the burners:

____________________	Fuel oil burner supply pump(s) manufacturer(s)
____________________	Manufacturer(s) of the motor(s) that drives the fuel oil burner supply pump(s).
____________________	TOTAL number of fuel oil burner supply pumps; include installed spares.
____________________	MINIMUM number of fuel oil burner supply pumps required to obtain maximum capacity from the unit.

19. Boiler – Igniter System

Enter the following information on the igniter system installed at the unit:

____________________	Igniter manufacturer

☐ Enter the type of fuel the igniter(s) *were originally designed for*:

A – Light (distillate) oil
B – Heavy oil
C – Gas
D – Coal
E – Oil and Gas
F – Propane
M – More than one

☐ Enter igniter type:

1 – *Pilot torch lighter* – an oil or gas igniter that uses an electric spark to ignite the fuel.
2 – *Carbon arc* – a carbon or graphite electrode that is energized and used to ignite the fuel.
3 – *High energy arc* – a low voltage, high energy pulse arc that is used to ignite the fuel.
4 – *Plasma arc* – a high dc voltage current used to ionize the air resulting in a high energy arc that ignites the fuel.
9 – *Other, describe* ____

20. Boiler – Coal Handling Systems – Yard Area

Enter the following information on the equipment installed in the coal yard:

____________________	Coal crusher(s) manufacturer(s)
____________________	Stacker/reclaimer system(s) manufacturer(s)
____________________	Number of critical path coal conveyor systems available to the unit.

21. Boiler – Coal Feeders for Pulverizers or Coal Mills

Enter the following information on the coal feeder equipment used to supply coal from the in-plant coal holding bunkers to the pulverizers or coal mills:

________________ Feeder(s) manufacturer(s).

________________ Manufacturer(s) of the motor(s) that drives the feeder(s).

________________ TOTAL number of feeders PER pulverizer or coal mill.

M1 ☐ M2 ☐ Enter the type of pulverizer or coal mill feeder(s) at the unit:

1 – *Gravimetric belt* – system that weighs the coal as it is fed to the pulverizer or coal mill.
2 – *Volumetric belt* – system that measures the volume of coal fed to the pulverizer or coal mill.
3 – *Star roll* – a multi-blade rotor that turns about a fixed, hollow, cylindrical core feeding a fixed measure of coal.
4 – *Rotating table* – system that operates by piling coal on a rotating table, and, as the table rotates, a stationary blade diverts the coal to a feed chute to the mill.
9 – *Other, describe* ________________________________

22. Boiler – Pulverizer or Coal Mill Capability

Enter the following information on the capability of the pulverizer(s) or coal mill(s):

________________ Pulverizer(s) or coal mill(s) manufacturer(s).

________________ Manufacturers' model number(s) for the pulverizer(s) or coal mill(s).

________________ Design coal flow rate in lb/hr (per pulverizer or coal mill) using design fuel.

________________ TOTAL number of pulverizers or coal mills; include installed spares.

________________ MINIMUM number of pulverizers or coal mills required to obtain maximum capacity from the unit.

M1 ☐ M2 ☐ Enter the type of pulverizer(s) or coal mill(s) at the unit:

1 – *Ball* – grinding elements are balls that operate freely in a race on a rotating grinding table.
2 – *Roll race* – rotating grinding table that moves coal through a series of rollers or wheels supported within the pulverizer or coal mill.
3 – *Ball tube* (Hardinge) – horizontal, rotating, grinding cylinder containing steel balls that move within the cylinder and grind or crush the coal.
4 – *Impact* (Attrition) – series of fixed or hinged hammers that rotate within a closed chamber impacting and crushing the coal.
9 – *Other, describe* ________________________________

23. Boiler – Primary Air System

Enter the following information on the primary air system that provides the air needed to transport the coal from the pulverizers or coal mills to the furnace (note: exhausters for pulverizers or coal mills covered in item 24):

__________________ Primary air fan(s) manufacturer(s)

__________________ Manufacturer(s) of the motor(s) that drives the primary air fan(s).

__________________ TOTAL number of primary air fans; include installed spares.

__________________ MINIMUM number of primary air fans required to obtain maximum capacity from the unit.

M1 M2

☐ ☐ Enter the type of primary air fan(s) at the unit:

Centrifugal – blades mounted on an impeller (or rotor) that rotates within a spiral or volute housing. Mark the type of blades used on this type of fan:

1 – Forward curved
2 – Straight (radial or radial tipped)
3 – Backward curved (air foil or flat)
4 – *Axial* (fixed or variable pitch) – blades attached to central hub parallel to air flow.
9 – *Other, describe* ______________________________

24. Boiler – Exhausters for Pulverizers or Coal Mills

Enter the following information on the exhausters used to transport the pulverized coal from the pulverizer(s) or coal mill(s) to the burner front:

__________________ Exhauster fan(s) manufacturer(s).

__________________ Manufacturer(s) of the motor(s) that drives the exhauster fan(s).

__________________ TOTAL number of exhauster fans; include installed spares.

__________________ MINIMUM number of exhauster fans required to obtain maximum capacity from the unit.

M1 M2

☐ ☐ Enter the type of exhauster fan(s) at the unit:

Centrifugal – blades mounted on an impeller (or rotor) which rotates within a spiral or volute housing. Mark the type of blades used on this type of fan:

1 – Forward curved
2 – Straight (radial or radial tipped)
3 – Backward curved (air foil or flat)
4 – *Axial* (fixed or variable pitch) – blades attached to central hub parallel to air flow.
9 – *Other, describe* ______________________________

25. Boiler – Balanced Draft or Pressurized Draft

☐ Enter the type of draft the boiler *was designed for*:

1 – *Balanced draft* – equipped with both induced draft and forced draft fans. The furnace operates at positive pressure at air entry and negative pressure at flue gas exit.
2 – *Pressurized draft* – equipped with forced draft fans only. The furnace and draft system operate at positive pressure.

IF the unit was designed as a pressurized draft unit and converted to a balanced draft design, enter the date the conversion was completed:

☐☐☐☐ Year ☐☐ Month ☐☐ Day

26. Boiler – Forced Draft Fan System

Enter the following information on the forced draft fans installed at the unit:

__________________ Forced draft fan(s) manufacturer(s).

__________________ Manufacturer(s) of the motor(s)/steam turbine(s) that drives the forced draft fan(s).

__________________ TOTAL number of forced draft fans; include installed spares.

__________________ MINIMUM number of forced draft fans required to obtain maximum capacity from the unit.

M1 M2
☐ ☐ Enter the type of forced draft fan(s) at the unit:

Centrifugal – blades mounted on an impeller (or rotor) which rotates within a spiral or volute housing. Mark the type of blades used on this type of fan:
1 – Forward curved
2 – Straight (radial or radial tipped)
3 – Backward curved (air foil or flat)
4 – *Axial* (fixed or variable pitch) – blades attached to central hub parallel to air flow.
9 – *Other, describe* ______________________________________

M1 M2
☐ ☐ Enter the type of forced draft fan drives(s) at the unit:

1 – Single speed motor
2 – Two speed motor
3 – Variable speed motor
4 – Steam turbine
9 – Other, describe ______________________________________

27. Boiler – Induced Draft Fan System

Enter the following information on the induced draft fans installed at the unit:

__________________ Induced draft fan(s) manufacturer(s)

__________________ Manufacturer(s) of the motor(s)/steam turbine(s) that drives the induced draft fan(s).

__________________ TOTAL number of induced draft fans; include installed spares.

__________________ MINIMUM number of induced draft fans required to obtain maximum capacity from the unit.

M1 M2

☐ ☐ Enter the type of induced draft fan(s) at the unit:

Centrifugal – blades mounted on an impeller (or rotor) which rotates within a spiral or volute housing. Mark the type of blades used on this type of fan:

1 – Forward curved
2 – Straight (radial or radial tipped)
3 – Backward curved (air foil or flat)
4 – *Axial* (fixed or variable pitch) – blades attached to central hub parallel to air flow.
9 – *Other, describe* ____

M1 M2

☐ ☐ Enter the type of induced draft fan drive(s) at the unit:

1 – Single speed motor
2 – Two speed motor
3 – Variable speed motor
4 – Steam turbine
9 – Other, describe ____

28. Boiler – Gas Recirculating Fan System

Enter the following information on the gas recirculating fans installed at the unit:

__________________ Gas recirculating fan(s) manufacturer(s).

__________________ Manufacturer(s) of the motor(s)/steam turbine(s) that drives the gas recirculating fan(s).

__________________ TOTAL number of gas recirculating fans; include installed spares.

__________________ MINIMUM number of gas recirculating fans required to obtain maximum capacity from the unit.

M1 M2

☐ ☐ Enter the type of gas recirculating fan(s) at the unit:

Centrifugal – blades mounted on an impeller (or rotor) which rotates within a spiral or volute housing. Mark the type of blades used on this type of fan:

1 – Forward curved
2 – Straight (radial or radial tipped)
3 – Backward curved (air foil or flat)
4 – *Axial* (fixed or variable pitch) – blades attached to central hub parallel to air flow.
9 – *Other, describe* ____

28. Boiler – Gas Recirculating Fan System (Continued)

M1 ☐ M2 ☐ Enter the type of gas recirculating fan drive(s) at the unit:

1 – Single speed motor
2 – Two speed motor
3 – Variable speed motor
4 – Steam Turbine
9 – Other, describe ____________________

29. Boiler – Primary Air Heating System

Enter information about the air heaters used to transfer the excess heat from the flue gases to the incoming primary air for the furnace:

____________ Primary air heater(s) manufacturer(s).

____________ TOTAL number of primary air heaters.

M1 ☐ M2 ☐ Enter the type of primary air heater(s) at the unit:

1 – *Regenerative* (Ljungstrom) – rotating heat exchanger that continuously rotates sections (baskets) composed of metal plates from the hot flue gas furnace exit plenum to the furnace intake air plenums.
2 – *Tubular* – hot flue gas from the furnace is channeled through tubes (vertical or horizontal) where the heat is transferred to the furnace intake air passing across the outside of the tubes.
3 – *Steam Coil* – similar to tubular except steam is used to preheat the intake air.
4 – *Regenerative* (Rothemule)
9 – *Other, describe* ____________________

30. Boiler – Secondary Air Heating System

Enter information about the secondary (or backup) air heaters used to transfer the excess heat from the flue gases to the incoming primary air for the furnace:

____________ Secondary air heater(s) manufacturer(s).

____________ TOTAL number of secondary air heaters.

M1 ☐ M2 ☐ Enter the type of secondary air heater(s) at the unit:

1 – *Regenerative* (Ljungstrom) – rotating heat exchanger that continuously rotates sections (baskets) composed of metal plates from the hot flue gas furnace exit plenum to the furnace intake air plenums thus heating the intake air.
2 – *Tubular* – hot flue gas from the furnace is channeled through tubes (vertical or horizontal) where the heat is transferred to the furnace intake air passing across the outside of the tubes.
3 – *Steam Coil* – similar to tubular except steam is used to preheat the intake air.
4 – *Regenerative* (Rothemule)
9 – *Other, describe* ____________________

31. Boiler – Soot Blowers

Enter the following information on the soot blower system installed on the furnace:

__________________ Soot blower(s) manufacturer(s)

__________________ TOTAL number of soot blowers installed on the furnace.

Enter the type(s) of medium(s) used to blow the soot. If a variety of soot blowers are used at the unit, note the number of each type used.

M1		M2		M3	
☐	☐☐☐	☐	☐☐☐	☐	☐☐☐
Type	Number	Type	Number	Type	Number

1 – Steam
2 – Air
3 – Water
4 – Sonic
5 – Steam/Air
9 – Other, describe ______________________________

32. Boiler – Bottom Ash Handling System

__________________ Bottom ash handling system manufacturer.

33. Boiler – Mechanical Fly Ash Precipitator System

Fly ash contained in the furnace exit flue gases can be removed by various types of mechanical precipitators including cyclone collectors, and wet or venturi scrubbers (note: SO_2 scrubbers covered in items 37–48). Enter the following information on the mechanical precipitator equipment:

__________________ Mechanical precipitator manufacturer.

☐ Enter the location of the mechanical precipitator with respect to the air heaters:

1 – Before air heaters
2 – After air heaters
3 – Both – precipitators installed both before and after the air heaters.
9 – Other, describe ______________________________

34. Boiler – Electrostatic Precipitator

Fly ash contained in the furnace exit flue gases can be removed by using an electrostatic precipitator. Enter the following information on the electrostatic precipitator:

__________________ Electrostatic precipitator manufacturer.

☐ Enter the location of the electrostatic precipitator with respect to the air heaters:

1 – Before air heaters
2 – After air heaters
3 – Both – Flue gas is extracted both before and after the air heaters.
9 – Other, describe ______________________________

35. Boiler – Baghouse Fly Ash System

Fly ash contained in the furnace exit flue gas may be removed using fabric or fabric bag filters. Enter the following information on the baghouse fly ash system:

____________________ Baghouse system manufacturer.

____________________ Manufacturer of the baghouse exhauster booster fans.

____________________ Manufacturer of the motor that drives the baghouse booster fans.

____________________ TOTAL number of baghouse booster fans installed on the unit.

☐ Enter the baghouse type:

1 – *Reverse* – clean flue gas is blown in the direction counter to normal operation to remove fly ash from the bag.
2 – *Pulse* (or pulse set) – short bursts of compressed air are blown into the bag to cause a momentary expansion of the bag to dislodge the entrapped fly ash.
3 – *Shaker* – the bag is literally shaken to remove the fly ash collected on its surface.
9 – *Other, describe* ____

☐ Enter the type of baghouse booster fan(s) at the unit:

Centrifugal – blades mounted on an impeller (or rotor) which rotates within a spiral or volute housing. Mark the type of blades used on this type of fan:
1 – Forward curved
2 – Straight (radial or radial tipped)
3 – Backward curved (air foil or flat)
4 – *Axial* (fixed or variable pitch) – blades attached to central hub parallel to air flow.
9 – *Other, describe* ____

36. Boiler – Fly Ash Transport System

Enter the following information on the fly ash removal system:

____________________ Fly ash removal system manufacturer.

☐ Enter the type of fly ash removal system:

1 – *Vacuum* – ash conveying system operates at a vacuum relative to the fly ash collection hoppers.
2 – *Pressure* – ash conveying system operates at a pressure greater than the pressure in the fly ash collection hoppers.
3 – *Vacuum-pressure* – employs the best features of both the vacuum and pressure systems.
4 – *Water* (sluice) – employs water to sluice the ash away from the hoppers.
5 – *Vacuum and water slurry*
9 – *Other, describe* ____

37. FGD Manufacturer

Enter the following information on the FGD system (venturi scrubbers covered in Item 33):

____________________ FGD system manufacturer

38. FGD Installation Date

Enter the date the FGD system was initially operated:

☐☐☐☐ Year ☐☐ Month ☐☐ Day

Was the FGD system a part of the original design of the unit? A "no" answer means the FGD system was a retrofit after the unit entered service.

☐ 1 – Yes 2 – No

39. FGD Cycle Type

☐ Enter the type of FGD cycle used by the unit:

1 – *Single loop* – single recirculation loop for controlling the reagent.
2 – *Dual loop* – two separate and distinct recirculation loops for controlling the reagent (same reagent used in both loops).
3 – *Dual alkali* – two separate and distinct reagents controlled through the use of separate recirculation loops operated in series.
9 – *Other*

40. FGD Absorbing Reagents

The "reagent" is the substance that reacts chemically with the flue gas to remove the resident sulfur dioxide. Name the reagent(s) used in the unit's FGD system:

____________________ Reagent #1

____________________ Reagent #2 (if dual alkali system)

41. FGD Flow Rates

Enter the following information regarding the flue gas flow rates into the FGD system:

Maximum design flue gas flow rate at the exit of the boiler in actual cubic feet per minute (ACFM).

☐☐☐☐☐☐☐☐

Maximum design flue gas flow rate capable of passing through the FGD system in ACFM.

☐☐☐☐☐☐☐☐

42. FGD Bypass Capacity

The flue gas bypass capacity is the percent of the total flue gas flow (maximum design condition) that can be bypassed around the FGD while permitting the unit to operate within compliance. Enter the following information:

Percent of scrubber bypass capacity at compliance levels. (Enter 0% if no bypass capacity exists.)

☐☐☐.☐

43. FGD Modules

Several towers may work together in series or in parallel to form a single FGD module with one or more modules installed at a single unit. Enter the following information:

☐ TOTAL number of FGD modules on the unit
☐ TOTAL number of FGD towers per module
☐ MINIMUM number of FGD modules required to obtain maximum capacity from the unit.
☐ Are the FGD modules shared with another unit? 1 – Yes 2 – No

44. Scrubber/Absorber Tower Type

The scrubber/absorber tower type identifies the interaction methods used between the flue gas and the reagent.

☐ Enter the type combination of types of scrubber/absorber used on the unit:

1 – *Venturi* – a conveying throat to accelerate the inlet flue gas to a higher velocity.
2 – *Spray* – an open gas absorption vessel in which scrubbing slurry is introduced into the gas stream from atomizing nozzles.
3 – *Tray* – tray(s) internal to the scrubber/absorber consists of a horizontal metal surface perforated with holes or slots mounted transversely across the vessel.
4 – *Packed* – a bed of stationary (static) or mobile (moving bed) packing, mounted transversely across the vessel.
5 – *Combination* – two or more of the above-noted designs used in the same tower.
9 – *Other*, describe ______________________________

45. FGD Fans

FGD fans are those USED EXCLUSIVELY to induce or force flue gases through the FGD towers. These fans help overcome the pressure drop through the FGD and are IN ADDITION to the boiler I.D. and F.D. fans. Enter the following information:

______________ FGD fan(s) manufacturer(s).

______________ Manufacturer(s) of the motor(s) that drives the FGD fan(s).

______________ TOTAL number of FGD fans; include installed spares.

______________ MINIMUM number of FGD fans required to obtain maximum capacity from the unit.

M1 M2
☐ ☐ Enter the type of FGD fan(s) at the unit:

Centrifugal – blades mounted on a impeller (or rotor) which rotates within a spiral or volute housing. Mark the type of blades used on this type of fan:
1 – Forward curved
2 – Straight (radial or radial tipped)
3 – Backward curved (air foil or flat)
4 – *Axial* (fixed or variable pitch) – blades attached to central hub parallel to air flow.
9 – *Other, describe*

____

M1 M2
☐ ☐ Enter the location of the FGD fan(s) with respect to the FGD:

1 – Before
2 – After
9 – Other, describe ______________________________

46. Scrubber Recycle (Liquid) Pumps

Recycle (liquid) pumps circulate reagent through the FGD towers. Enter the following information on the scrubber recycle pumps at the unit:

____________________ Recycle pump(s) manufacturer(s).

____________________ Manufacturer(s) of the motor(s) that drives the recycle pump(s)

____________________ TOTAL number of recycle pumps PER tower; include installed spares.

____________________ MINIMUM number of recycle pumps required to obtain maximum capacity from the unit.

47. Stack Gas Reheater Methods

After the flue gases leave the FGD system, the exit gases may be heated before discharge through the stack. Two methods commonly used to reheat the flue gases are: direct (injection of hot gases) or indirect (passing through a heat exchanger).

☐ Enter the type of stack gas reheating method used at the unit:

1 – *In-line* – installation of a heat exchanger in the flue gas duct downstream of the mist eliminators.
2 – *Direct combustion* – firing of gas or oil burners and mixing product gases with the cooler scrubbed flue gas.
3 – *Indirect hot air* – heating of ambient air in an external heat exchanger (using steam) and injecting this heated air into scrubbed flue gas discharge.
4 – *Waste heat recovery* – use of unscrubbed flue gas in a heat exchanger to reheat the scrubbed stack gas.
5 – *Exit gas recirculation* – a portion of the scrubbed gas is diverted from the exit stream, reheated by a heat exchanger and then injected into the scrubbed flue gas before entering the stacks.
6 – *Bypass reheater* – bypass of a portion of the hot unscrubbed flue gas around the FGD system for injection into the cooler scrubbed flue gas.
9 – *Other, describe* ____

48. FGD Primary Mist Eliminator

Enter the following information on the FGD primary mist eliminators:

☐ Enter the type of mist eliminator(s) used in the FGD towers:

1 – *Impingement* (or inertial impaction) – open or chevron vanes placed in the gas stream divert and collect the mist on their surfaces and direct the droplets away.
2 – *Electrostatic* – mist removal through the use of an electrostatic field.
3 – *Centrifugal* – uses baffles that impart a centrifugal force on the gas.
4 – *Cyclonic* – uses tangential inlets which impart a swirl or cyclonic action to the gas as it passes through the separator chamber.
9 – *Other, describe* ____

A "mist eliminator stage" is a single set of separate and distinct elements through which the flue gas must pass.

☐ Enter the total number of mist eliminator stages on each FGD tower.

49. Steam Turbine – Manufacturer

Enter the name of the manufacturer of the steam turbine:

____________________ Steam turbine manufacturer

50. Steam Turbine – Enclosure

Is 50% or more of the steam turbine outdoors (not enclosed in building framing and siding)?

☐ 1– Yes 2 – No

51. Steam Turbine – Nameplate Rating in MW

"Nameplate" is the design capacity stamped on the steam turbine's nameplate or published on the turbine guarantee flow diagram. In cases where the steam turbine's nameplate rating cannot be determined, approximate the rating by multiplying the MVA (megavoltamperes) by the rated power factor found on the nameplate affixed to the unit's generator (or nameplates in the case of cross compound units).

☐☐☐☐.☐ Steam turbine's nameplate rating (MW).

52. Steam Turbine – Type of Steam Turbine

Identify the steam turbine's casing or shaft arrangement.

☐ Enter the type of steam turbine at the unit:

1 – *Single casing* – single (simple) turbine having one pressure casing (cylinder).
2 – *Tandem compound* – two or more casings coupled together in line.
3 – *Cross compound* – two cross-connected single casing or tandem compound turbine sets where the shafts are not in line.
4 – *Triple compound* – three cross-connected single casing or tandem compound turbine sets.
9 – *Other, describe* ______________________________

53. Steam Turbine – Manufacturer's Building Block or Design Codes

Steam turbine building blocks or manufacturer's design codes are assigned by the manufacturer to designate a series of turbine designs, LM5000 or W501 for example. Enter the following information:

☐☐☐☐☐☐ Manufacturer's code, first shaft

☐☐☐☐☐☐ Manufacturer's code, second shaft (cross or triple compound units)

☐☐☐☐☐☐ Turbine configuration and number of exhaust flows (e.g., tandem compound, four flow)

54. Steam Turbine – Steam Conditions

Enter the following information on the Main, First Reheat, and Second Reheat Steam design conditions:

	Main Steam	First Reheat	Second Reheat
Temperature (☐F)	☐☐☐☐	☐☐☐☐	☐☐☐☐
Pressure (psig)	☐☐☐☐	☐☐☐☐	☐☐☐☐

55. Steam Turbine – High, Intermediate, and Low Pressure Sections

Enter the following information describing various sections of the steam turbine:

High Pressure Casings

☐ TOTAL number of high pressure casings, cylinders or shells

☐☐.☐ Back pressure of the high pressure condenser (if applicable) to the nearest one-tenth inch of mercury at the nameplate capacity and design water temperature.

Combined High Pressure/Intermediate Pressure Casings

☐ TOTAL number of high/intermediate pressure casings, cylinders or shells.

Intermediate Pressure Casings

☐ TOTAL number of intermediate pressure casings, cylinders or shells.

Combined Intermediate/Low Pressure Casings

☐ TOTAL number of intermediate/low pressure casings, cylinders or shells.

Low Pressure Casings

☐ TOTAL number of low pressure casings, cylinders or shells.

☐☐.☐ Back pressure of the low pressure condenser to the nearest one-tenth inch of mercury at nameplate capacity and design water temperature.

☐☐.☐ The last stage blade length (inches) of the low pressure turbine, measured from hub to end of top of blade.

56. Steam Turbine – Governing System

Enter the following information for the steam turbine governing system:

☐ Enter the type of governing system used at the unit:

1 – *Partial arc* – main steam flow is restricted to one sector of the turbine's first stage at startup.
2 – *Full arc* – main steam is admitted to all sectors of the turbine's first stage at startup.
3 – *Either* – capable of admitting steam using either partial or full arc techniques.
9 – *Other*, describe ____________________

☐ Enter the type of turbine governing system used at the unit:

1 – *Mechanical hydraulic control (MHC)* – turbine speed monitored and adjusted through mechanical and hydraulic linkages.
2 – *Analog electro-hydraulic control (EHC)* – analog signals control electro-hydraulic linkages to monitor and adjust turbine speed.
3 – *Digital electro-hydraulic control (DHC)* – same as EHC except signals are digital rather than analog.
9 – *Other*, describe ____________________

57. Steam Turbine – Lube Oil System

Enter the following information for the steam turbine main lube oil system:

________________ Main lube oil system manufacturer.

________________ Main lube oil pump(s) manufacturer.

________________ Manufacturer of the motor(s)/steam turbine(s) that drives the main lube oil pump(s).

________________ TOTAL number of steam turbine main lube oil pumps; include installed spares.

☐ Enter the type of driver on the main lube oil pump:

1 – Motor
2 – Shaft
3 – Steam turbine
9 – Other, describe ________________________________

58. Generator – Manufacturer

Enter the name of the manufacturer of the electric generator:

________________ Generator manufacturer

59. Generator – Enclosure

Is 50% or more of the generator outdoors (not enclosed in building framing and siding)?

☐ 1 – Yes 2 – No

60. Generator – Ratings and Power Factor

Enter the following information about the generator:

Design (Nameplate) Item	Main Generator	Second* Shaft	Third* Shaft
Voltage to nearest one-tenth kV	☐☐☐▲☐	☐☐☐▲☐	☐☐☐▲☐
Megavoltamperes (MVA) Capability	☐☐☐☐	☐☐☐☐	☐☐☐☐
RPM	☐☐☐☐	☐☐☐☐	☐☐☐☐
Power Factor (enter as %)	☐☐☐▲☐	☐☐☐▲☐	☐☐☐▲☐

*Cross compound units.

61. Generator – Cooling System

Two types of cooling methods are typically used. First is the "innercooled" method, where the cooling medium is in direct contact with the conductor copper or is separated by materials having little thermal resistance. The other is the "conventional" cooling method where the heat generated within the windings must flow through the major ground insulation before reaching the cooling medium.

☐ Enter the type of cooling method used by the generator:

1 – Stator innercooled and rotor innercooled.
2 – Stator conventionally cooled and rotor conventionally cooled.
3 – Stator innercooled and rotor conventionally cooled.
9 – Other, describe ____________________

Enter the mediums used to cool the generator's stator and rotor:

☐ **Stator**	**Medium**	**Rotor** ☐
A	Air	A
H	Hydrogen	H
O	Oil	O
W	Water	W

62. Generator – Hydrogen Pressure

☐☐☐ Enter the generator hydrogen pressure IN PSIG at nameplate MVA.

63. Exciter – Configuration

Enter the following information about the main exciter:

____________ Exciter manufacturer

____________ TOTAL number of exciters; include installed spares.

____________ MINIMUM number of exciters required to obtain maximum capacity from the unit

☐ Enter the type of main exciter used at the unit:

1 – *Static* – static excitation where dc is obtained by rectifying ac from generator terminals, and dc is fed into rotor by collector rings.
2 – *Rotating dc generator* – exciter supplies dc from a commutator into the main rotor by means of collector rings.
3 – *Brushless* – an ac (rotating armature type) exciter whose output is rectified by a semiconductor device to provide excitation to an electric machine. The semiconductor device would be mounted on and rotate with the ac exciter armature.
4 – *Alternator rectifier*
9 – *Other, describe* ____________________

☐ Enter the type(s) of exciter drive(s) used by the main exciter IF it is rotating:

1 – Shaft direct
2 – Shaft gear
3 – Motor
9 – Other, describe ____________________

64. Auxiliary Systems – Main Condenser

Enter the following information for the main condenser and its auxiliaries:

____________________	Main condenser manufacturer
____________________	TOTAL number of passes made by the circulating water as it passes through the condenser.
____________________	TOTAL number of condenser shells.
____________________	Condenser tube materials used in the majority (50% or more) of the condenser tubes.
____________________	Air ejector(s) or vacuum pump(s) manufacturer.

☐ Enter the type of air removal equipment used on the condenser:

1 – Vacuum pump
2 – Steam jet air ejector
3 – Both
9 – Other, describe ____

☐ Enter the type of cooling water used in the condenser:

1 – *Fresh* – salinity values less than 0.50 parts per thousand.
2 – *Brackish* – salinity value ranging from approximately 0.50 to 17 parts per thousand.
3 – *Salt* – salinity values greater than 17 parts per thousand.
9 – *Other*, describe ____

☐ Enter the origin of the circulating water used in the condenser:

1 – River
2 – Lake
3 – Ocean or Bay
4 – Cooling Tower
9 – Other, describe ____

65. Auxiliary Systems – Condenser Cleaning System

Enter the following information about the ON-LINE main condenser cleaning system (leave blank if cleaning is manual):

____________________	On-line main condenser cleaning system manufacturer.

☐ Enter the type of on-line main condenser cleaning system used at the unit:

1 – Ball sponge rubber
2 – Brushes
9 – Other, describe ____

66. Auxiliary Systems – Condensate Polishing System

A "condensate polisher" is an in-line demineralizer located in the condensate water system to treat water coming from the condenser to the boiler. It is not the demineralizer that prepares raw or untreated water for eventual use in the steam production process.

Enter the following information about the condensate polishing system at the unit:

____________________ Condensate polishing system manufacturer

Enter the % of the condensate flow at maximum unit capacity that can be treated:

▲ % Treated

67. Auxiliary Systems – Condensate Pumps

Enter the following information for the main condensate pumps (those at the discharge of the condenser):

____________________ Condensate pump(s) manufacturer(s).

____________________ Manufacturer(s) of the motor(s) that drives the condensate pump(s).

____________________ TOTAL number of condensate pumps; include installed spares.

____________________ MINIMUM number of condensate pumps required to obtain maximum capacity from the unit.

68. Auxiliary Systems – Condensate Booster Pumps

Condensate booster pumps increase the pressure of the condensate water between the low pressure and the intermediate or high pressure feedwater heaters. Enter the following information for the condensate booster pumps:

____________________ Condensate booster pump(s) manufacturer(s)

____________________ Manufacturer(s) of the motor(s) that drives the condensate booster pump(s).

____________________ TOTAL number of condensate booster pumps; include installed spares.

____________________ MINIMUM number of condensate booster pumps required for maximum capacity from the unit.

69. Auxiliary Systems – Feedwater (Boiler Feed) Pumps

The feedwater (boiler feed) pumps move the feedwater through the feedwater system into the boiler. Enter the following information on the feedwater pumps installed at the unit:

____________________ Feedwater (boiler feed) pump(s) manufacturer(s).

____________________ Normal operating speed (RPM) of the feedwater pumps.

____________________ TOTAL number of feedwater pumps; include installed spares.

____________________ MINIMUM number of feedwater pumps required to obtain maximum capacity from the unit.

▲ PERCENT (%) of the unit's maximum capacity that can be achieved with a single feedwater pump.

70. Auxiliary Systems – Feedwater (Boiler Feed) Pump Drives

Enter the following information for the feedwater (boiler feed) pump drives:

________________ Manufacturer(s) of motor(s) or steam turbine(s) that drives the feedwater pump(s).

M1 M2

☐ ☐ Enter the type of equipment used to drive the feedwater (boiler feed) pumps:

1 – Motor – single speed
2 – Motor – two speed
3 – Motor – variable speed
4 – Steam turbine
5 – Shaft
6 – Motor gear
7 – Steam gear
8 – Shaft gear
9 – Other, describe ________________________

M1 M2

☐ ☐ Specify coupling type used for feedwater (boiler feed) pump.

1 – Hydraulic
2 – Mechanical
9 – Other, describe ____________________________________

71. Auxiliary Systems – Startup Feedwater (Boiler Feed) Pumps

Enter the following information for the startup feedwater pump(s) at the unit:

________________ Startup feedwater pump(s) manufacturer(s).

________________ Manufacturer(s) of the motor(s) that drives the startup feedwater pump(s).

☐☐☐▲☐ PERCENT (%) of the unit's maximum capacity that can be achieved with a single startup feedwater pump.

M1 M2

☐ ☐ Indicate the additional capabilities of the startup feedwater pump:

1 – ADDITIVE: operated in conjunction with the feedwater (boiler feed) pumps.
2 – REPLACEMENT: can carry load when the feedwater pumps are inoperative.
3 – STARTUP only: cannot be used in lieu of the feedwater pumps.
9 – Other, describe ____________________________________

72. Auxiliary Systems – High Pressure Feedwater Heaters

High pressure feedwater heaters are heat exchangers between the feedwater (boiler feed) pumps discharge and the economizer inlet. Enter the following information for the HIGH pressure feedwater heaters at the unit:

________________ High pressure feedwater heater(s) manufacturer(s).

________________ TOTAL number of high pressure feedwater heaters.

________________ Feedwater heater tube materials used in 50% or more of the tubes.

72. Auxiliary Systems – High Pressure Feedwater Heaters (Continued)

M1 M2
☐ ☐ Enter the type of HIGH pressure feedwater heater(s):

1 – Horizontal – longitudinal axis of the heater shell is horizontal.
2 – Vertical – longitudinal axis of the heater shell is vertical.
3 – Both
9 – Other, describe ______________________________

73. Auxiliary Systems – Intermediate Pressure Feedwater Heaters

Intermediate pressure feedwater heaters are heat exchangers between the condensate booster pump discharge and the deaerator. Enter the following information for the INTERMEDIATE pressure feedwater heaters at the unit:

__________ Intermediate pressure feedwater heater(s) manufacturer(s).

__________ TOTAL number of intermediate pressure feedwater heaters.

__________ Feedwater heater tube materials used in 50% or more of the tubes.

M1 M2
☐ ☐ Enter the type of INTERMEDIATE pressure feedwater heater(s):

1 – Horizontal – longitudinal axis of the heater shell is horizontal.
2 – Vertical – longitudinal axis of the heater shell is vertical.
3 – Both
9 – Other, describe ______________________________

74. Auxiliary Systems – Low Pressure Feedwater Heaters

Low pressure feedwater heaters are heat exchangers between the condensate pump discharge and the condensate booster pump inlet. If the unit does not have condensate booster pumps, the low pressure feedwater heaters are located between the condensate pumps and the deaerator. Enter the following information for the LOW pressure feedwater heaters at the unit:

__________ Low pressure feedwater heater(s) manufacturer(s).

__________ TOTAL number of low pressure feedwater heaters.

__________ Feedwater heater tube materials used in 50% or more of the tubes.

M1 M2
☐ ☐ Enter the type of LOW pressure feedwater heater(s):

1 – Horizontal – longitudinal axis of the heater shell is horizontal.
2 – Vertical – longitudinal axis of the heater shell is vertical.
3 – Both
9 – Other, describe ______________________________

75. Auxiliary Systems – Deaerator Heater

Enter the following information on the deaerator heater at the unit:

____________________ Deaerator manufacturer(s)

M1 M2

☐ ☐ Enter the type of deaerator heater(s):

1 – Spray – high-velocity stream jet atomizes and scrubs the condensate.
2 – Tray – series of trays over which the condensate passes and is deaerated.
3 – Vacuum – a vacuum condition inside the shell for deaeration.
4 – Combination
9 – Other, describe ____

76. Auxiliary Systems – Heater Drain Pumps

Enter the following information for the heater drain pumps at the unit:

____________________ Heater drain pump(s) manufacturer(s).

____________________ Manufacturer(s) of the motor(s) that drives the heater drain pump(s).

77. Auxiliary Systems – Circulating Water Pumps

Enter the following information for the circulating water pumps:

____________________ Circulating water pump(s) manufacturer(s).

____________________ Manufacturer(s) of the motor(s) that drives the circulating water pump(s).

____________________ TOTAL number of circulating water pumps; include installed spares.

____________________ MINIMUM number of circulating water pumps required to obtain maximum capacity from the unit DURING WINTER SEASON.

78. Auxiliary Systems – Cooling Tower and Auxiliaries

Enter the following information for the cooling towers and all related auxiliary equipment at the unit:

____________________ Cooling tower manufacturer(s)

____________________ Cooling tower fan(s) manufacturer(s).

____________________ Manufacturer(s) of the motor(s) that drives the cooling tower fan(s).

M1 M2

☐ ☐ Enter the type of cooling tower(s) used:

1 – *Mechanical draft* (induced, forced, cross-flow and counterflow) – fan(s) used to move ambient air through the tower.
2 – *Atmospheric spray* – air movement is dependent on atmospheric conditions and the aspirating effect of the spray nozzles.
3 – *Hyperbolic* (natural draft) – temperature difference between condenser circulating water and ambient air conditions, aided by hyperbolic tower shape, creates natural draft of air through the tower to cool the water.

78. Auxiliary Systems – Cooling Tower and Auxiliaries (Continued)

4 – *Deck-filled* – wetted surfaces such as tiers of splash bars or decks aid in the breakup and retention of water drops to increase the evaporation rate.
5 – *Coil shed* – a combination structure of a cooling tower installed over a substructure that houses atmospheric coils or sections.
9 – *Other, describe* ______________________________

The cooling tower booster pumps increase the pressure of the circulating water and force the water to the top of the cooling tower.

__________ Cooling tower booster pump(s) manufacturer(s).

__________ Manufacturer(s) of the motor(s) that drives the cooling tower booster pump(s).

__________ TOTAL number of cooling tower booster pumps; include installed spares.

__________ MINIMUM number of cooling tower booster pumps required to obtain maximum capacity from the unit.

79. Balance of Plant – Main Transformer

The "main transformer" is the unit step-up transformer connecting the generator (or multiple generators if unit is cross compound) to the transmission system. Enter the following information for the MAIN transformer(s) at the unit:

__________ Main transformer(s) manufacturer(s).

__________ TOTAL number of main transformers; include installed spares.

__________ Megavoltampere (MVA) size of the main transformer(s).

__________ HIGH SIDE voltage in kilovolts (kV) of the main transformer(s) at 55 ☐.

M1 ☐ M2 ☐ Enter the type of MAIN transformer at the unit:

1 – Single phase
2 – Three phase
9 – Other, describe ______________________________

80. Balance of Plant – Unit Auxiliary Transformer

The "unit auxiliary transformer" supplies the auxiliaries when the unit is synchronized. Enter the following information for this transformer:

__________ Unit auxiliary transformer(s) manufacturer(s).

__________ TOTAL number of unit auxiliary transformer(s).

__________ LOW SIDE voltage in kilovolts (kV) of the unit auxiliary transformer(s) at 55 ☐.

81. Balance of Plant – Station Service Transformer

The "station service (start-up) transformer" supplies power from a station high voltage bus to the station auxiliaries and also to the unit auxiliaries during unit start-up and shutdown. It also may be used when the unit auxiliary transformer is not available or nonexistent.

________________ Station service transformer(s) manufacturer(s).

________________ TOTAL number of station service transformer(s).

________________ HIGH SIDE voltage in kilovolts (kV) of the station service transformer(s) at 55 ☐.

________________ LOW SIDE voltage in kilovolts (kV) of the station service transformer(s) at 55 ☐.

82. Balance of Plant – Auxiliary (Start-up) Boiler

Enter the following information on the auxiliary boiler at the unit:

________________ Auxiliary boiler manufacturer(s).

83. Balance of Plant – Auxiliary Generator

Enter the following information on the auxiliary generator at the unit:

________________ Auxiliary generator manufacturer(s).

Is the auxiliary generator shaft driven?

M1 ☐ M2 ☐ 1 – Yes 2 – No

84. Balance of Plant – Plant Process Computer

Enter the following information for the plant process computer(s):

________________ Plant process computer manufacturer(s).

M1 ☐ M2 ☐ Enter the number of plant process computers available to the unit:

1 – One computer for this unit only.
2 – Two computers for this unit only.
3 – One computer shared by one or more units.
4 – Two computers shared by one or more units.
9 – Other, describe ________________________________

M1 ☐ M2 ☐ Describe how the plant process computers are linked within the plant:

1 – Centralized
2 – Distributive
3 – Stand alone
9 – Other, describe ________________________________

84. Balance of Plant – Plant Process Computer (Continued)

M1 ☐ M2 ☐ Enter the system capability of the plant process computer:

1 – Monitor only
2 – Monitor and control
9 – Other, describe ____________________

85. CEMS – General

____________________ System vendor

First-certified date:

☐☐☐☐ Year ☐ Month ☐☐ Day

☐ Monitoring technique

1 – Extractive
2 – Dilution
3 – In Situ

☐ Analysis Method

1 – Wet
2 – Dry
9 – Other, describe ____________________

86. CEMS – Pollutant Gas and Diluent Gas Analyzers/Monitors

1. Sulfur Dioxide (SO_2) Analyzers

____________________ Manufacturer(s)

____________________ Model number(s)

M1 [ ][ ] M2 [ ][ ] Number of installed analyzers

M1 [ ][ ] M2 [ ][ ] Number of installed spare analyzers

M1 [ ] M2 [ ] Type(s)

1 – Ultraviolet
2 – Infrared
3 – Fluorescence
9 – Other, describe ____

M1 [ ] M2 [ ] Instrument range (parts per million)

1 – 0-50
2 – 0-150
3 – 0-500
9 – Other, describe ____

M1 [ ] M2 [ ] Shared? (1 – Yes, 2 – No)

2. Oxides of Nitrogen (NO_x) Analyzers

____________________ Manufacturer(s)

____________________ Model number(s)

M1 [ ][ ] M2 [ ][ ] Number of installed analyzers

M1 [ ][ ] M2 [ ][ ] Number of installed spare analyzers

M1 [ ] M2 [ ] Type(s)

1 – Infrared
2 – Chemiluminescent

86. CEMS – Pollutant Gas and Diluent Gas Analyzers/Monitors (Continued)

9 – Other, describe ______________________________

M1 M2
☐ ☐ Instrument range (parts per million)

1 – 0-50
2 – 0-150
3 – 0-500
9 – Other, describe ______________________________

M1 M2
☐ ☐ Shared? (1 – Yes, 2 – No)

3. Carbon Monoxide (CO) Analyzers

__________ Manufacturer(s)

__________ Model number(s)

M1 M2
☐☐ ☐☐ Number of installed analyzers

M1 M2
☐☐ ☐☐ Number of installed spare analyzers

M1 M2
☐ ☐ Type(s)

1 – Infrared solid state
2 – Infrared luft
3 – Gas filter correlation
9 – Other, describe ______________________________

M1 M2
☐ ☐ Instrument range (parts per million)

1 – 0-50
2 – 0-150
3 – 0-500
9 – Other, describe ______________________________

86. CEMS – Pollutant Gas and Diluent Gas Analyzers/Monitors (Continued)

4. Carbon Dioxide (CO_2) Analyzers

__________________ Manufacturer(s)

__________________ Model number(s)

M1 ☐☐ M2 ☐☐ Number of installed analyzers

M1 ☐☐ M2 ☐☐ Number of installed spare analyzers

M1 ☐ M2 ☐ Instrument range (parts per million)

1 – 0-50
2 – 0-150
3 – 0-500
9 – Other, describe ____

M1 ☐ M2 ☐ Shared? (1 – Yes, 2 – No)

5. Oxygen (O_2) Analyzers

__________________ Manufacturer(s)

__________________ Model number(s)

M1 ☐☐ M2 ☐☐ Number of installed analyzers

M1 ☐☐ M2 ☐☐ Number of installed spare analyzers

M1 ☐ M2 ☐ Type(s)

1 – Zirconia oxide
2 – Paramagretic
3 – Fuel cell
9 – Other, describe ____

M1 ☐ M2 ☐ Instrument range (parts per million)

1 – 0-50
2 – 0-150
3 – 0-500
9 – Other, describe ____

M1 ☐ M2 ☐ Shared? (1 – Yes, 2 – No)

86. CEMS – Pollutant Gas and Diluent Gas Analyzers/Monitors (Continued)

6. Opacity Monitors

________________ Manufacturer(s)

________________ Model number(s)

M1 [ ][ ] M2 [ ][ ] Number of installed analyzers

M1 [ ][ ] M2 [ ][ ] Number of installed spare analyzers

M1 [ ] M2 [ ] Probe placement (if unit is equipped with a FGD system)

1 – Before scrubber
2 – After scrubber

87. CEMS – Flue Gas Flow Monitors

________________ Manufacturer(s)

________________ Model number(s)

M1 [ ][ ] M2 [ ][ ] Number of installed monitors

M1 [ ][ ] M2 [ ][ ] Number of installed spare monitors

Volumetric Flow Rate (ACFM):

M1 [ ][ ][ ][ ][ ][ ][ ][ ] M2 [ ][ ][ ][ ][ ][ ][ ][ ]

M1 [ ] M2 [ ] Flow rate measurement technique

1 – Thermal sensing (hot-wire anemometer or dispersion)
2 – Differential pressure array
3 – Acoustic velocimetry (ulrasonic transducers)
4 – Combination
9 – Other, describe ________________________________

88. CEMS – Data Acquisition and Reporting System

__________________ Hardware manufacturer

☐ Hardware architecture

1 – Vendor-supplied dedicated system
2 – Modified existing plant computer
3 – Stand alone, pc-based system not supplied by CEMS system vendor
9 – Other, describe ______________________________________

__________________ Software supplier

☐ Shared? (1 – Yes, 2 – No)

NO_X REDUCTION SYSTEMS

These systems include Selective Non-catalytic Reduction, Selective Catalytic Reduction, Catalytic Air Heaters, and Staged NO_X Reduction, which is a combination of the three methods. Excluded from this category are Low NO_X burners (see Item 16, Page E-9), combustion modifications, and flue gas recirculation.

Please complete the following information for the NO_X Reduction Systems installed on your unit. (The appropriate items under each method should be completed for a Staged NO_X Reduction System).

89. Selective Non-Catalytic Reduction System (SNCR)

☐ Reagent

1 – Ammonia
2 – Urea
9 – Other, describe ______________________________________

☐ Injector Type

1 – Wall nozzles
2 – Lance
9 – Other, describe ______________________________________

☐ Injection Equipment Location

1 – Furnace
2 – Superheater
3 – Economizer
9 – Other, describe ______________________________________

__________________ Number of Injectors

89. Selective Non-Catalytic Reduction System (SNCR) (Continued)

☐ Carrier Gas Type

1 – Steam
2 – Air
9 – Other, describe ____________________

________ Total flow rate (lb./hr.)

________ Pressure at nozzle (psi)

________ Nozzle exit velocity (ft./sec.)

90. Selective Catalytic Reduction System (SCR)

☐ Reactor

1 – Separate
2 – In Duct

________ Flue gas take-off location

☐ Reagent

1 – Ammonia
2 – Urea
9 – Other, describe ____________________

☐ Ammonia Injection Grid Location

1 – Furnace
2 – Superheater
3 – Economizer
4 – Zoned

☐ Duct Configuration

1 – Flow straighteners
2 – Turning vanes
3 – Dampers

90. Selective Catalytic Reduction System (SCR) (Continued)

☐ Catalyst Element Type

1 – Plate
2 – Honeycomb
9 – Other, describe ____

☐ Catalyst Support Material

1 – Stainless steel
2 – Carbon steel
9 – Other, describe ____

☐ Catalytic Material Configuration

1 – Vertical
2 – Horizontal
9 – Other, describe ____

_________________ Surface face area (sq. ft.)

_________________ Catalyst volume (cu. ft.)

_________________ Number of layers

_________________ Layer thickness (inches)

☐ Sootblowers (if applicable)

1 – Air
2 – Steam
3 – Both air and steam

_________________ Manufacturer(s)

_________________ Number of sootblowers

91. Catalytic Air Heaters

☐ Element Type

1 – Laminar surface
2 – Turbulent surface
9 – Other, describe ____________________

☐ Support Material, if any

1 – Stainless steel
2 – Carbon steel
9 – Other, describe ____________________

☐ Catalyst Material Configuration

1 – Horizontal air shaft
2 – Carbon steel
9 – Other, describe ____________________

__________ Total face area (sq. ft.)
__________ Open face area (sq. ft.)
__________ Layer thickness (inches)

[i] http://www.nerc.com/pa/RAPA/gads/MandatoryGADS/Revised_Final_Draft_GADSTF_Recommendation_Report.pdf)