

Appendix B8 Combined Cycle Cogeneration Block Cause Codes

UNITS IN COMBINED CYCLE or COGENERATION BLOCKS INDEX TO SYSTEM/COMPONENT CAUSE CODES

(Gas Turbine Codes 300–399 or 700–799)

(Steam Turbine Codes 100–199)

(With Block Identifier 800–899)

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GAS TURBINE

Inlet Air System and Compressors (use HP compressor if only one)

Ducts and Filters

5000	Inlet air ducts
5001	Inlet air vanes / nozzles
5002	Inlet air filters
5003	Inlet cone
5004	Inlet air chillers
5005	Inlet air evaporative coolers
5006	Inlet air foggers
5009	Other inlet air problems

Compressors

5010	High pressure shaft
5011	High pressure bearings
5012	High pressure blades/buckets
5013	Compressor casing and bolts
5014	Compressor diaphragms
5015	Compressor seals
5016	High pressure compressor bleed valves
5017	Low pressure compressor bleed valves
5019	Other high pressure problems
5020	Low pressure shaft
5021	Low pressure bearings
5022	Low pressure blades/buckets
5029	Other low pressure problems
5030	Supercharging fans
5035	Compressor washing
5036	Compressor shaft and bearings for two-shaft machines
5037	Inlet Bleed Heat Valve

5039 Other compressor problems

Fuel, Ignition, and Combustion Systems

5040 Fuel tanks
5041 Fuel piping and valves
5042 Fuel nozzles/vanes
5043 Fuel filters
5044 Liquid fuel oil pump
5046 Liquid fuel oil transfer/forwarding pump
5047 Liquid fuel purge system
5048 Gas fuel system including controls and instrumentation
5049 Other fuel system problems
5050 Ignition system
5051 Pilot fuel piping and valves
5052 Pilot fuel nozzles/vanes
5053 Pilot fuel filters
5054 Water Injection System (Gas Turbine)
5060 Atomizing air system
5065 NOx water injection system including pump
5066 NOx Steam Injection System
5070 Combustor casing
5071 Combustor liner
5072 Combustor caps
5073 Flame scanners
5074 Flashback (including instrumentation)
5075 Blade path temperature spread
5079 Other combustor problems

Turbine

(use HP if only one)

5080 High pressure shaft
5081 High pressure bearings
5082 High pressure blades/buckets
5083 High pressure nozzles/vanes
5084 High pressure casing/expansion joints
5085 Interstage gas passages - HP
5086 High pressure shaft seals
5087 Thrust Bearing
5088 Gas Turbine cooling steam
5089 Other high pressure problems
5090 Low pressure shaft
5091 Low pressure bearings
5092 Low pressure blades/buckets
5093 Low pressure nozzles/vanes
5094 Low pressure casing/expansion joints

- 5095 Interstage gas passages - LP
- 5096 Low pressure shaft seals
- 5097 Other low pressure problems
- 5098 Expansion joints
- 5099 HP to LP coupling

Exhaust Systems

- 5100 Chamber
- 5101 Hoods
- 5102 Vanes/nozzles
- 5103 Silencer
- 5104 Cones
- 5105 Diverter Dampers
- 5106 Exhaust Stack
- 5108 High engine exhaust temperature
- 5109 Other exhaust problems (including high exhaust system temperature not attributable to a specific problem)

Auxiliary Systems

- 5110 Lube oil system - general
- 5111 Lube oil pumps
- 5112 Lube oil coolers
- 5113 Lube oil valves/piping
- 5114 Lube oil filters
- 5115 Oil vapor extractor
- 5116 Power Augmentation System Equipment
- 5117 Power Augmentation piping
- 5118 Power augmentation valves
- 5119 Power augmentation controls
- 5120 Hydraulic oil system
- 5121 Hydraulic oil system pumps
- 5122 Hydraulic oil system piping/valves
- 5130 Starting system (including motor)
- 5140 Battery and charger system
- 5150 Turning gear and motor
- 5151 Load gear compartment
- 5160 Cooling and seal air system
- 5170 Cooling water system
- 5180 Anti-icing system
- 5190 Other auxiliary system problems

Miscellaneous (Gas Turbine)

- 5200 Reduction gear
- 5201 Load shaft and bearings

5205	Main coupling between the turbine and generator
5206	Clutch
5210	Intercoolers
5220	Regenerators
5230	Heat shields
5240	Fire detection and extinguishing system
5241	Fire in unit
5245	Gas Turbine Control System - data highway
5246	Gas Turbine Control System - hardware problems (including card failure)
5247	Gas Turbine Control System - internal and termination wiring
5248	Gas Turbine Control System - logic problems
5249	Gas Turbine Control System – upgrades
5250	Controls and instrumentation Problems
5255	Computer
5260	Major overhaul (use for non-specific overhaul only; see page B-FS-2)
5261	Gas turbine/compressor washing
5262	Gas turbine exchange
5269	Combustion inspection (CI)
5270	Hot end inspection
5272	Boroscope inspection
5274	General unit inspection
5280	Vibration (not engine) in unit not attributable to bearings or other components
5285	Gas turbine vibration
5286	Gas Turbine lockout caused by OEM specifications
5290	Gas turbine performance testing - individual engines (use code 9999 for total unit performance testing)
5295	Synchronous condenser equipment
5298	Main gas filter
5299	Other miscellaneous gas turbine problems

JET ENGINE

Inlet Air System and Compressors

(use HP compressor if only one)

Ducts and Filters

5400	Inlet air ducts
5401	Inlet air vanes/noozles
5402	Inlet air filters
5403	Inlet and exhaust cones
5404	Inlet air chillers
5405	Inlet air evaporative coolers
5406	Inlet air foggers
5409	Other inlet air problems

Compressors

5410	High pressure shaft
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- 5411 High pressure bearings
- 5412 High pressure blades/buckets
- 5413 Other high pressure problems
- 5414 Compressor diaphragms/vanes
- 5420 Low pressure shaft
- 5421 Low pressure bearings
- 5422 Low pressure blades/buckets
- 5429 Other low pressure problems
- 5430 Supercharging fans
- 5435 Jet Engine Compressor Washing
- 5436 Compressor shaft and bearings for two-shaft machines
- 5439 Other compressor problems

Fuel, Ignition, and Combustion Systems

- 5440 Fuel tanks
- 5441 Fuel piping and valves
- 5442 Fuel nozzles/vanes
- 5443 Fuel filters
- 5444 Liquid fuel oil pump
- 5445 Liquid fuel oil transfer/forwarding pump
- 5446 Liquid fuel purge system
- 5447 Gas fuel system
- 5449 Other fuel system problems
- 5450 Ignition system
- 5451 Pilot fuel piping and valves
- 5452 Pilot fuel nozzles/vanes
- 5453 Pilot fuel filters
- 5454 Water Injection System (Jet Engine)
- 5455 Fuel nozzle/vane cooling air system
- 5460 Atomizing air system
- 5470 Combustor casing
- 5471 Combustor liner
- 5472 Combustor caps
- 5473 Flame scanners
- 5474 Flashback (including instrumentation)
- 5475 Blade path temperature spread
- 5479 Other combustor problems

Turbine

(use HP if only one)

- 5480 High pressure shaft
- 5481 High pressure bearings
- 5482 High pressure blades/buckets
- 5483 High pressure nozzles/vanes
- 5484 High pressure casing/expansion joint
- 5485 Interstage gas passages
- 5486 High pressure shaft seals
- 5487 Thrust Bearing
- 5489 Other high pressure problems
- 5490 Low pressure shaft
- 5491 Low pressure bearings

- 5492 Low pressure blades/buckets
- 5493 Low pressure nozzles/vanes
- 5494 Low pressure casing/expansion joints
- 5497 Other low pressure problems
- 5498 Expansion joints
- 5499 Shaft seals

Exhaust Systems

- 5500 Chamber
- 5501 Hoods
- 5502 Vanes/nozzles
- 5503 Silencer
- 5504 Cones
- 5505 Diverter Dampers
- 5508 High engine exhaust temperature
- 5509 Other exhaust problems (including high exhaust temperature not attributable to a specific problem)

Auxiliary Systems

- 5510 Lube oil system
- 5516 Power Augmentation System Equipment
- 5520 Hydraulic oil system
- 5530 Starting system (including motor)
- 5540 Battery and charger system
- 5550 Turning gear and motor
- 5551 Load gear compartment
- 5560 Cooling and seal air system
- 5570 Cooling water system
- 5580 Anti-icing system
- 5590 Other auxiliary system problems

Miscellaneous (Jet Engine)

- 5600 Reduction gear
- 5601 Load shaft and bearings
- 5605 Main coupling between the turbine and generator
- 5606 Clutch
- 5610 Intercoolers
- 5620 Regenerators
- 5630 Heat shields
- 5640 Fire detection and extinguishing system
- 5641 Fire in unit
- 5645 Jet Engine Control System - data highway
- 5646 Jet Engine Control System - hardware problems (including card failure)
- 5647 Jet Engine Control System - internal and termination wiring
- 5648 Jet Engine Control System - logic problems
- 5649 Jet Engine Control System – upgrades
- 5650 Other Controls and instrumentation Problems
- 5660 Major overhaul (use for non-specific overhaul only; see page B- FS-2)
- 5661 Engine/compressor washing
- 5662 Engine exchange

5665	Engine shafts and bearings
5670	Hot end inspection
5672	Boroscope inspection
5674	General unit inspection
5680	Vibration (not engine) in unit not attributable to bearings or other components
5685	Engine vibration
5686	Jet engine lockout caused by OEM specifications
5690	Engine performance testing - individual engines (use code 9999 for total unit performance testing)
5695	Synchronous condenser equipment
5699	Other miscellaneous jet engine problems

MISCELLANEOUS

Instrument and Control

6200	Combined cycle instruments and controls. (Report instruments and controls specific to the gas turbine; steam turbine; boiler; generator; or balance of plant using the codes for the appropriate piece of equipment.)
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EXPANDER TURBINE

7800	Couplings
7810	Shaft
7820	Bearings
7830	Blades
7840	Discs
7850	Spacers
7860	Nozzles/vanes
7870	Heat shields
7880	Exhaust diffusers
7890	Seal oil system and seals
7900	Inner casing
7910	Outer exhaust casing
7920	Lube oil system
7930	Controls and instrumentation
7940	Evactor
7950	Major overhaul
7960	Other expander turbine problems

STEAM TURBINE

Besides the turbine, this set includes the steam stop/control valves, turbine control system, and the turbine auxiliaries. The extraction steam codes are contained in the Balance of Plant set.

High Pressure Turbine

4000	Outer casing
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4001	Inner casing
4009	Nozzle bolting
4010	Nozzles and nozzle blocks
4011	Diaphragms
4012	Buckets or blades
4013	Diaphragms unit and shroud type
4014	Bucket or blade fouling
4015	Wheels or spindles
4020	Shaft seals
4021	Dummy rings
4022	Gland rings
4030	Rotor shaft
4040	Bearings
4041	Thrust bearings
4099	Other high-pressure turbine problems

Intermediate-Pressure Turbine

4100	Outer casing
4101	Inner casing
4109	Nozzle bolting
4110	Nozzles and nozzle blocks
4111	Diaphragms
4112	Buckets or blades
4113	Bucket or blade fouling
4115	Wheels or spindles
4120	Shaft seals
4121	Dummy rings
4122	Gland rings
4130	Rotor shaft
4140	Bearings
4141	Thrust bearings
4199	Other intermediate pressure turbine problems

Low-Pressure Turbine

4200	Outer casing
4201	Inner casing
4209	Nozzle bolting
4210	Nozzles and nozzle blocks
4211	Diaphragms
4212	Buckets or blades
4213	Bucket or blade fouling
4215	Wheels or spindles
4220	Shaft seals
4221	Dummy rings
4222	Gland rings
4230	Rotor shaft
4240	Bearings
4241	Thrust bearings
4250	Other low pressure turbine problems

Valves

- 4260 Main stop valves
- 4261 Control valves
- 4262 Intercept valves
- 4263 Reheat stop valves
- 4264 Combined intercept valves
- 4265 Miscellaneous drain and vent valves
- 4266 Main stop valve testing
- 4267 Control valve testing
- 4268 Reheat/intercept valve testing
- 4269 Other turbine valves

Piping

- 4270 Crossover or under piping
- 4279 Miscellaneous turbine piping

Lube Oil

(do not include bearing failures due to lube oil)

- 4280 Lube oil pumps
- 4281 Lube oil coolers
- 4282 Lube oil conditioners
- 4283 Lube oil system valves and piping
- 4284 Lube oil pump drive
- 4289 Other lube oil system problems

Controls

- 4290 Hydraulic system pumps
- 4291 Hydraulic system coolers
- 4292 Hydraulic system filters
- 4293 Hydraulic system pipes and valves
- 4299 Other hydraulic system problems
- 4300 Turbine supervisory system (use codes 4290 to 4299 for hydraulic oil)
- 4301 Turbine governing system
- 4302 Turbine trip devices (including instruments)
- 4303 Exhaust hood and spray controls
- 4304 Automatic turbine control systems - mechanical
- 4305 Automatic turbine control systems - mechanical - hydraulic
- 4306 Automatic turbine control systems - electro-hydraulic - analog
- 4307 Automatic turbine control systems - electro-hydraulic - digital
- 4308 Automatic turbine control systems - digital control and monitoring
- 4309 Other turbine instrument and control problems
- 4310 Steam Turbine Control System - data highway
- 4311 Steam Turbine Control System - hardware problems (including card failure)

- 4312 Steam Turbine Control System - internal and termination wiring
- 4313 Steam Turbine Control System - logic problems
- 4314 Steam Turbine Control System - upgrades

Miscellaneous (Steam Turbine)

- 4400 Major turbine overhaul (720 hours or longer) (use for non-specific overhaul only; see page B- FS-2)
- 4401 Inspection
- 4402 Minor turbine overhaul (less than 720 hours) (use for non-specific overhaul only; see page B- FS-2)
- 4410 Turning gear and motor
- 4411 Steam turbine gear box (single shaft configuration)
- 4412 Steam turbine clutch (single shaft configuration)
- 4415 Shaft coupling mechanism
- 4420 Vibration of the turbine generator unit that cannot be attributed to a specific cause such as bearings or blades (use this code for balance moves)
- 4430 Gland seal system
- 4450 Water induction
- 4460 Turbine overspeed trip test
- 4470 Differential expansion
- 4490 Turbine performance testing (use code 9999 for total unit performance testing)
- 4499 Other miscellaneous steam turbine problems

GENERATOR

This set of codes contains the generator, exciter, generator cooling systems, and generator controls. Note the main leads up to and includes the generator output breaker in this set of codes.

Generator

- 4500 Rotor windings
- 4510 Rotor collector rings
- 4511 Rotor, General
- 4512 Retaining Rings
- 4520 Stator windings, bushings, and terminals
- 4530 Stator core iron
- 4535 Stator, General
- 4536 Generator Heaters
- 4540 Brushes and brush rigging
- 4550 Generator bearings and lube oil system
- 4551 Generator bearings
- 4552 Generator lube oil system
- 4555 Bearing cooling system
- 4560 Generator vibration (excluding vibration due to failed bearing and other components)
- 4570 Generator casing
- 4580 Generator end bells and bolting

Exciter

- 4600 Exciter drive - motor
- 4601 Exciter field rheostat
- 4602 Exciter commutator and brushes
- 4603 Solid state exciter element
- 4604 Exciter drive - shaft
- 4605 Exciter transformer
- 4609 Other exciter problems

Cooling System

(report failures caused by water leaks into generator as codes 4500, 4510, etc.)

- 4610 Hydrogen cooling system piping and valves
- 4611 Hydrogen coolers
- 4612 Hydrogen storage system
- 4613 Hydrogen seals
- 4619 Other hydrogen system problems
- 4620 Air cooling system
- 4630 Liquid cooling system
- 4640 Seal oil system and seals
- 4650 Other cooling system problems

Controls

- 4700 Generator voltage control
- 4710 Generator metering devices
- 4720 Generator synchronization equipment
- 4730 Generator current and potential transformers
- 4740 Emergency generator trip devices
- 4750 Other generator controls and metering problems

Miscellaneous (Generator)

- 4800 Generator main leads
- 4805 Generator Bus Duct Cooling System
- 4810 Generator output breaker
- 4830 Major generator overhaul (720 hours or longer) (use for non-specific overhaul only; see Page B- FS-2)
- 4831 Minor generator overhaul (less than 720 hours) (use for non-specific overhaul only; see Page B- FS-2)
- 4840 Inspection
- 4841 Generator doble testing
- 4842 Reactive and capability testing
- 4850 Core monitor alarm
- 4860 Generator neutral grounding equipment
- 4899 Other miscellaneous generator problems

HEAT RECOVERY STEAM GENERATOR (HRSG) (Waste Heat Boiler)

HRSG Boiler Fuel Supply

Solid Fuel Feed Equipment from Bunkers to Boiler (FBC only)

- 0111 Solid fuel feeder conveyors
- 0112 Solid fuel feed tanks/hoppers
- 0113 Solid fuel tank/hopper fires
- 0114 Solid fuel volumetric feeder
- 0115 Solid fuel gravimetric feeder
- 0116 Solid fuel feeder motors
- 0117 Solid fuel pneumatic transport system including piping and valves
- 0118 Solid fuel drying system including screens
- 0119 Solid fuel crushers
- 0120 Solid fuel crusher motors
- 0121 Other solid fuel feed problems

Burners (Duct Burners)

- 0358 Oil burner piping and valves
- 0359 Gas burner piping and valves
- 0360 Duct burners
- 0361 Duct burner orifices
- 0370 Duct burner instruments and controls (except light-off)
- 0380 Light-off (igniter) systems (including fuel supply)
- 0385 Igniters
- 0410 Other duct burner problems

Oil and Gas Systems (except light-off)

- 0440 Fuel oil pumps (general)
- 0441 Fuel oil pumps (burner supply)
- 0442 Fuel oil pumps (forwarding/transfer)
- 0443 Fuel oil (burner supply) pump drives
- 0444 Fuel oil (forwarding/transfer) pump drives
- 0450 Fuel oil heaters
- 0460 Fuel oil atomizers
- 0470 Oil and gas fires
- 0480 Other oil and gas fuel supply problems (see codes 0360-0410 for burner problems)

Steam System Desuperheaters/Attemperators

See cause codes 6140 to 6154

HRSG Boiler Piping System

HRSG Startup Bypass

See cause codes 6160 to 6183

HRSG Main Steam

- 6110 HP steam piping up to turbine stop valves – Greater than 600 PSIG
(see 0790 for piping supports)
- 6111 HP steam relief/safety valves
- 6112 Other HP steam valves (including vent and drain valves but not including the turbine stop valves)
- 6113 Other HP steam system problems
- 6114 HP steam isolation/boundary valves
- 6120 IP steam piping up to turbine stop valves – Between 200 & 600 PSIG
(see 0790 for piping supports)
- 6121 IP steam relief/safety valves
- 6122 Other IP steam valves (including vent and drain valves but not including the turbine stop valves)
- 6123 Other IP steam system problems
- 6124 IP steam isolation/boundary valves
- 6130 LP steam piping up to turbine stop valves – Less than 200 PSIG (see 0790 for piping supports)
- 6131 LP steam relief/safety valves
- 6132 Other LP steam valves (including vent and drain valves but not including the turbine stop valves)
- 6133 Other LP steam system problems
- 6134 Other main steam valves (including vent and drain valves but not including the turbine stop valves)
- 6135 LP steam isolation/boundary valves

HRSG Cold and Hot Reheat Steam

- 0540 Reheat steam piping up to turbine stop valves
- 0541 Cold reheat steam piping up to boiler
- 0550 Reheat steam relief/safety valves
- 0560 Other reheat steam valves (not including turbine stop or intercept valves)
- 0561 Other cold reheat steam valves (not including turbine stop or intercept valves)
- 0570 Other reheat steam problems

HRSG Desuperheaters/Attemperators

- 6140 HP Desuperheater/attemperator piping – Greater than 600 PSIG.
- 6141 HP Desuperheater/attemperator valves
- 6142 HP Desuperheater/attemperator spray nozzles
- 6143 HP Desuperheater/attemperator drums
- 6144 Other HP desuperheater/attemperator problems
- 6145 IP Desuperheater/attemperator piping – Between 200-600 PSIG
- 6146 IP Desuperheater/attemperator valves
- 6147 IP Desuperheater/attemperator spray nozzles
- 6148 IP Desuperheater/attemperator drums
- 6149 Other IP desuperheater/attemperator problems
- 6150 LP Desuperheater/attemperator piping – Less than 200 PSIG
- 6151 LP Desuperheater/attemperator valves
- 6152 LP Desuperheater/attemperator spray nozzles
- 6153 LP Desuperheater/attemperator drums
- 6154 Other LP desuperheater/attemperator problems

HRSB Startup Bypass

- 6160 HP Startup bypass system piping (including drain lines up to heaters or condenser)- Greater than 600 PSIG
- 6161 HP Startup bypass system valves
- 6162 HP Startup bypass tanks or flash tanks
- 6163 Other HP startup bypass system problems
- 6164 HP startup bypass instrumentation and controls
- 6170 IP Startup bypass system piping (including drain lines up to heaters or condenser) – Between 200-600 PSIG
- 6171 IP Startup bypass system valves
- 6172 IP Startup bypass tanks or flash tanks
- 6173 Other IP startup bypass system problems
- 6174 IP startup bypass instrumentation and controls
- 6180 LP Startup bypass system piping (including drain lines up to heaters or condenser) – Less than 200 PSIG
- 6181 LP Startup bypass system valves
- 6182 LP Startup bypass tanks or flash tanks
- 6183 Other LP startup bypass system problems
- 6184 LP startup bypass instrumentation and controls

Feedwater and Blowdown

- 0670 Feedwater piping downstream of feedwater regulating valve
- 0680 Feedwater valves (not feedwater regulating valve)
- 0690 Other feedwater problems downstream of feedwater regulating valve (use codes 3401 to 3499 for remainder of feedwater system)
- 0700 Blowdown system valves
- 0710 Blowdown system piping
- 0720 Blowdown system controls / instrumentation
- 0730 Other blowdown system problems

Boiler Recirculation

- 0740 Boiler recirculation pumps
- 0741 Boiler recirculation pumps - motors
- 0750 Boiler recirculation piping including downcomers
- 0760 Boiler recirculation valves
- 0770 Other boiler recirculation problems

Miscellaneous (Piping)

- 0775 Economizer piping
- 0780 Headers between tube bundles
- 0782 Headers and caps
- 0790 Pipe hangers, brackets, supports (general)
- 0799 Other miscellaneous piping system problems

HRSG Boiler Internals and Structures

0800	Drums and drum internals (single drum only)
0801	HP Drum (including drum level trips not attributable to other causes)
0802	IP Drum (including drum level trips not attributable to other causes)
0803	LP Drum (including drum level trips not attributable to other causes)
0810	Boiler supports and structures (use code 1320 for tube supports)
0820	Casing
0830	Doors
0840	Refractory and insulation
0845	Windbox expansion joints
0847	Other expansion joints
0848	Inlet panel
0850	Other internal or structural problems
0855	Drum relief/safety valves (Single drum only)
0856	HP Drum relief/safety valves
0857	IP Drum relief/safety valves
0858	LP Drum relief/safety valves
0859	Tube external fins/membranes

HRSG Boiler Tube Leaks

(use code 0859 for tube/membrane failures)

6005	HP Evaporator tubes
6006	IP Evaporator tubes
6007	LP Evaporator tubes
6010	HP superheater
6011	HP reheater
6012	HP economizer
6020	IP superheater
6021	IP reheater
6022	IP economizer
6030	LP reheater
6031	LP superheater
6032	LP economizer
6090	Other HRSG tube Problems

Miscellaneous HRSG Boiler Tube Problems

1300	Water side fouling
1305	Fireside cleaning (which requires a full outage)
1310	Water side cleaning (acid cleaning)
1320	Tube supports/attachments
1330	Slag fall damage
1340	Tube modifications (including addition and removal of tubes)
1350	Other miscellaneous boiler tube problems
1360	Boiler Drain System

Air Supply

- 1400 Forced draft fans
- 1401 Forced draft fan dampers
- 1407 Forced draft fan lubrication system
- 1410 Forced draft fan motors
- 1411 Forced draft fan motors – variable speed
- 1412 Forced draft fan drives (other than motor)
- 1415 Forced draft fan controls
- 1420 Other forced draft fan problems
- 1430 Air supply ducts
- 1431 Air supply dampers from FD fan
- 1432 Air supply duct expansion joints
- 1440 Air supply dampers
- 1450 Other air supply problems
- 1451 Fluidized Air Fan (FBC Only)
- 1456 Induced draft fan dampers
- 1536 Flue gas recirculating fan dampers

Miscellaneous (Boiler Air and Gas Systems)

- 1590 Stacks
- 1591 Stack damper and linkage
- 1592 Stack damper linkage motors
- 1599 Other miscellaneous boiler air and gas system problems

HRSG Boiler Control Systems

(including instruments which input to the controls)

- 1700 Feedwater controls (report local controls – feedwater pump, feedwater regulator valve, etc., – with component or system)
- 1710 Combustion/steam condition controls (report local controls with component or system)
- 1720 Desuperheater/attemperator controls (not local controls)
- 1730 Boiler explosion or implosion
- 1740 Gage glasses
- 1750 Burner management system
- 1760 Feedwater instrumentation (not local controls)
- 1761 Combustion /Steam condition instrumentation (not local controls)
- 1762 Desuperheater/attemperator instrumentation (not local controls)
- 1799 Other boiler instrumentation and control problems

HRSG Boiler Overhaul and Inspections

- 1800 Major boiler overhaul (720 hours or more) (use for non-specific overhaul only; see page B- FS-2)
- 1801 Minor boiler overhaul (less than 720 hours) (use for non-specific overhaul only; see page B- FS-2)
- 1810 Other boiler inspections
- 1811 Boiler Inspections – problem identification/investigative
- 1812 Boiler Inspections – scheduled or routine
- 1820 Chemical cleaning/steam blows

HRSG Boiler Water Condition

1850 Boiler water condition (not feedwater water quality)

HRSG Boiler Design Limitations

1900 Improper balance between tube sections not due to fouling or plugging

1910 Inadequate air not due to equipment problems

Miscellaneous (Boiler)

(use more specific codes - other slagging and fouling problems, other control problems, etc. whenever possible.
Describe miscellaneous problems in the verbal description.)

1980 Boiler safety valve test

6000 HRSG Boiler to gas turbine connecting equipment.

6100 Steam turbine to gas turbine coupling

1990 Boiler performance testing (use code 9999 for total unit performance testing)

1999 Boiler, miscellaneous

BALANCE OF PLANT

Condensing System

Condenser Tubes

3110 Condenser tube leaks

3111 Condenser tube fouling shell side

3112 Condenser tube fouling tube side

3113 Condenser tube and water box cleaning (including circulating water flow reversal)

3114 Air-cooled condenser tubes

3115 Air-cooled condenser pumps

3116 Air-cooled condenser fans

3117 Air-cooled condenser fan motors

3118 Other Air-cooled condenser problems

3119 Other air-cooled condenser tube casing or shell and internal problems

Condenser Casing or Shell and Internals

3120 Tube sheets

3121 Expansion joint

3122 Gaskets and seals

3123 Hot well

3124 Tube sheet fouling

3129 Other condenser casing or shell and internal problems

Vacuum Equipment

3130 Air ejectors

3131 Air ejector piping and valves

- 3132 Inter and after condensers
- 3133 Vacuum pumps
- 3134 Vacuum pump piping and valves
- 3135 Vacuum pump motor and auxiliaries
- 3139 Other air extraction system problems - general
- 3149 Loss of vacuum not attributable to a particular component such as air ejectors or valves; high back pressure not attributable to high circulating water temperature, or vacuum losses from a known cause.

Condenser Controls

- 3150 Hot well level controls
- 3151 Vacuum pump and air ejector controls
- 3152 Air-cooled condenser controls
- 3159 Other condensing system controls and instruments

Miscellaneous (Condensing System)

- 3170 Condenser inspection (use code 3110 to report looking for tube leaks)
- 3171 Air-cooled condenser inspections
- 3180 Major condenser overhaul
- 3185 Water side cathodic protection
- 3186 Auxiliary condenser and associated equipment
- 3190 Air leakage (for losses not attributable to previously noted equipment related codes)
- 3199 Other miscellaneous condensing system problems

Circulating Water Systems

- 3210 Circulating water pumps
- 3211 Circulating water pump motors
- 3220 Circulating water piping
- 3221 Circulating water piping fouling
- 3230 Circulating water valves
- 3231 Waterbox
- 3232 Condenser tube cleaning system including debris filter
- 3233 Circulating water priming system
- 3235 Cooling tower booster pump
- 3236 Cooling tower booster motor
- 3238 Cooling tower fan motors
- 3239 Cooling tower fan motors - variable speed
- 3240 Cooling tower fans
- 3241 Cooling tower efficiency below design
- 3242 Cooling tower fill damage
- 3243 Cooling tower icing
- 3244 Cooling tower fires
- 3245 Other cooling tower problems
- 3246 Cooling tower fouling
- 3247 Cooling tower instrumentation
- 3250 Circulating water system instruments and controls
- 3260 Traveling screens

- 3261 Traveling screen fouling
- 3269 Circulating water biological conditions (ie, zebra mussels)
- 3270 Intake system problems other than traveling screens
- 3271 Intake grating fouling
- 3272 Circulating water screenwash system
- 3273 Debris in circulating water from outside sources (leaves, mud, etc.)
- 3280 High circulating water temperature (not due to season, tower efficiency below design, or other listed equipment problem)
- 3281 Circulating water tempering system
- 3282 Circulating water cooling ponds
- 3285 Circulating water chemistry
- 3299 Other circulating water system problems

Waste Water (zero discharge) Systems

- 3290 Waste water (zero discharge) tanks, pumps and motors
- 3291 Waste water (zero discharge) system fouling
- 3292 Waste water (zero discharge) piping
- 3293 Waste water (zero discharge) valves
- 3294 Waste water (zero discharge) controls and instrumentation
- 3295 Other waste water (zero discharge) problems

Condensate System

Pumps, Piping, and Valves

- 3300 Condensate water pre-treatment
- 3310 Condensate/hotwell pumps
- 3311 Condensate/hotwell pump motor
- 3312 Condensate booster pump
- 3313 Condensate booster pump motor
- 3314 Condensate booster pump motor - variable speed
- 3315 Condensate booster pump drive (other than 3313 and 3314)
- 3320 Condensate piping
- 3330 Condensate valves

Low/Intermediate Pressure Heater and Deaerators

- 3339 LP heater head leaks
- 3340 LP heater tube leaks
- 3341 Other LP heater – general
- 3342 IP heater tube leaks
- 3343 Other IP heater – general
- 3344 Deaerator (including level control)
- 3345 IP heater head leaks

Polishers/Chemical Addition

- 3350 Condensate polishing and filtering systems
- 3351 Chemical addition systems

3352 Feedwater chemistry (not specific to condenser, polishers, or chemical addition)

Miscellaneous (Condensate System)

3360 Condensate makeup and return (including storage tanks)
3370 Condensate system controls and instrumentation (not hotwell level, heater level, or deaerator level controls: see codes 3150-3159, 3344, 3502.
3380 Condensate coolers
3399 Other miscellaneous condensate system problems

Feedwater System

(excluding extraction or drain systems)

3401 Startup feedwater pump
3402 Startup feedwater pump drives - all types
3407 Feedwater pump suction screens
3408 Feedwater pump drive – local controls
3409 Feedwater pump drive motor - variable speed
3410 Feedwater pump
3411 Feedwater pump drive - motor
3412 Feedwater pump drive - steam turbine
3413 Feedwater pump coupling and drive shaft
3414 Feedwater pump local controls
3415 Feedwater pump/drive lube oil system
3416 Other feedwater pump problems
3417 Feedwater pump drive - main shaft
3418 Feedwater pump drive - other
3419 Feedwater pump drive - gear
3420 Feedwater piping and supports
3430 Feedwater regulating (boiler level control) valve
3431 Other feedwater valves
3439 HP heater head leaks
3440 High pressure heater tube leaks
3441 Other high pressure heater problems (see condensate system for LP and IP heater codes)
3451 Feedwater booster pump suction screens
3452 Feedwater booster pump drive - local controls
3453 Feedwater booster pump drive motor - variable speed
3454 Feedwater booster pump
3455 Feedwater booster pump drive - motor
3456 Feedwater booster pump drive - steam turbine
3457 Feedwater booster pump coupling and drive shaft
3458 Feedwater booster pump local controls
3459 Feedwater booster pump/drive lube oil system
3460 Other feedwater booster pump problems
3461 Feedwater booster pump drive - main shaft
3462 Feedwater booster pump drive - other
3463 Feedwater booster pump drive - gear
3499 Other feedwater system problems

Heater Drain Systems

3501 Heater drain pumps

- 3502 Heater level control
- 3503 Heater drain piping
- 3504 Heater drain valves
- 3505 Heater drain pump drive
- 3509 Other heater drain system problems

Extraction Steam

- 3520 HP Extraction steam piping
- 3521 HP Extraction steam valves
- 3522 HP Extraction steam instruments and controls
- 3529 Other HP extraction steam system problems
- 3530 IP Extraction steam piping
- 3531 IP Extraction steam valves
- 3532 IP Extraction steam instruments and controls
- 3539 Other IP extraction steam system problems
- 3540 LP Extraction steam piping
- 3541 LP Extraction steam valves
- 3542 LP Extraction steam instruments and controls
- 3549 Other LP extraction steam system problems

Electrical

- 3600 Switchyard transformers and associated cooling systems – external (OMC)
- 3601 Switchyard transformers and associated cooling systems – external (not OMC)
- 3610 Switchyard circuit breakers – external (not OMC)
- 3611 Switchyard circuit breakers – external (OMC)
- 3612 Switchyard system protection devices – external (OMC)
- 3613 Switchyard system protection devices – external (not OMC)
- 3618 Other switchyard equipment – external (not OMC)
- 3619 Other switchyard equipment – external (OMC)
- 3620 Main transformer
- 3621 Unit auxiliaries transformer
- 3622 Station service startup transformer
- 3623 Auxiliary generators
- 3624 Auxiliary generator voltage supply system
- 3629 Other switchyard or high voltage system problems
- 3630 400-700-volt transformers
- 3631 400-700-volt circuit breakers
- 3632 400-700-volt conductors and buses
- 3633 400-700-volt insulators
- 3634 400-700-volt protection devices
- 3639 Other 400-700-volt problems
- 3640 AC instrument power transformers
- 3641 AC Circuit breakers
- 3642 AC Conductors and buses
- 3643 AC Inverters
- 3644 AC Protection devices
- 3649 Other AC instrument power problems
- 3650 DC instrument power battery chargers
- 3651 DC circuit breakers

- 3652 DC conductors and buses
- 3653 DC protection devices
- 3659 Other DC power problems
- 3660 4000-6000-volt transformers
- 3661 4000-6000-volt circuit breakers
- 3662 4000-6000-volt conductors and buses
- 3663 4000-6000-volt insulators
- 3664 4000-6000-volt protection devices
- 3669 Other 4000-6000-volt problems
- 3670 12-15kV transformers
- 3671 12-15kV circuit breakers
- 3672 12-15kV conductors and buses
- 3673 12-15kV insulators
- 3674 12-15kV protection devices
- 3679 Other 12-15kV problems
- 3680 Other voltage transformers
- 3681 Other voltage circuit breakers
- 3682 Other voltage conductors and buses
- 3683 Other voltage insulators
- 3684 Other voltage protection devices
- 3689 Other voltage problems
- 3690 Station Service Power Distribution System, General

Power Station Switchyard

- 3700 Powerhouse switchyard (non generating unit equipment)
- 3710 Transmission line (connected to powerhouse switchyard to 1st Substation)
- 3720 Transmission equipment at the 1st substation) (see code 9300 if applicable)
- 3730 Transmission equipment beyond the 1st substation (see code 9300 if applicable)

Auxiliary Systems

Open Cooling Water System

- 3800 Open cooling water pumps and motors
- 3801 Open cooling water piping
- 3802 Open cooling water valves
- 3803 Open cooling water heat exchangers
- 3804 Open cooling water system fouling
- 3805 Open cooling water system instrumentation
- 3806 Open cooling water strainer
- 3809 Other open cooling water problems

Service Water (Open System)

- 3810 Service water pumps and motors
- 3811 Service water piping
- 3812 Service water valves
- 3813 Service water heat exchangers
- 3814 Service water system fouling
- 3815 Service water strainer
- 3819 Other service water problems

Closed Cooling Water Systems

- 3820 Closed cooling water pumps
- 3821 Closed cooling water piping
- 3822 Closed cooling water valves
- 3823 Closed cooling water heat exchangers
- 3824 Closed cooling water system fouling
- 3825 Closed cooling water instrumentation
- 3826 Closed cooling water strainer
- 3829 Other closed cooling water system problems

Auxiliary Steam

- 3830 Auxiliary boiler
- 3831 Auxiliary steam piping
- 3832 Auxiliary steam valves
- 3833 Auxiliary steam controls and instruments
- 3834 Auxiliary boiler tube leaks
- 3835 Auxiliary boiler burner management system
- 3836 Steam transfer to other unit
- 3839 Other auxiliary steam problems (also see extraction steam codes 3520 to 3529; startup bypass codes 0630 to 0660; and soot blower steam code 0870)

Service Air

- 3840 Service air compressors
- 3841 Service air piping
- 3842 Service air valves
- 3843 Service air dryers
- 3844 Soot blowing air compressor and system
- 3849 Other service air problems

Instrument Air

- 3850 Instrument air compressors
- 3851 Instrument air piping
- 3852 Instrument air valves
- 3853 Instrument air dryers
- 3854 N₂ backup to instrument air
- 3859 Other instrument air problems

Fire Protection System

- 3860 Fire protection system pumps
- 3861 Fire protection system piping
- 3862 Fire protection system valves
- 3863 Fire protection system fouling
- 3864 Fire protection system instrumentation and controls
- 3869 Other fire protection system problems

Low-pressure Gas Compression System

- 3870 Fuel Gas Compressor and Motors
- 3871 Fuel Gas Compressor Piping
- 3872 Fuel Gas Compressor Valves
- 3873 Fuel Gas Compressor Heat Exchangers
- 3874 Fuel Gas Compressor Controls and Instrumentation
- 3875 Fuel Gas Compressor Filters
- 3876 Fuel Gas Compressor Fire System
- 3879 Fuel Gas Compressor – Other

Seal Air Fans

- 3880 Seal air fan
- 3881 Seal air fan drive - motor
- 3882 Seal air control dampers and drives
- 3883 Seal air filters
- 3889 Other seal air problems

Miscellaneous (Auxiliary Systems)

- 3898 Miscellaneous plant auxiliary process and services instrumentation and controls
- 3899 Other miscellaneous auxiliary system problems
- 6299 Other combined cycle block problems (Use other gas turbine problem codes, other steam turbine codes, etc., whenever appropriate.)
- 6399 Other coal gasification equipment problems

Miscellaneous (Balance of Plant)

- 3950 Process computer
- 3960 Thermal derating (thermal efficiency losses in balance of plant when specific cause(s) unknown)
- 3970 Distributive Control System (DCS) – process computer
- 3971 DCS – data highway
- 3972 DCS – hardware problems (including card failure)
- 3973 DCS – internal and termination wiring
- 3974 DCS – logic problems
- 3975 DCS – upgrades
- 3979 Other DCS problems
- 3980 Programmable Logic Controller (PLC)
- 3981 PLC – data highway
- 3982 PLC – hardware problems (including card failure)
- 3983 PLC – internal and termination wiring
- 3984 PLC – logic problems
- 3985 PLC – upgrades
- 3989 Other PLC problems
- 3995 Powerhouse heating and ventilating systems
- 3996 Air conditioning systems – rooms and areas
- 3998 Balance of plant overhaul/outage
- 3999 Other miscellaneous balance of plant problems

POLLUTION CONTROL EQUIPMENT

Continuous Emissions Monitoring Systems (CEMS)

8700	CEMS Certification and Recertification
8710	SO ₂ analyzer problems
8720	NO _x analyzer problems
8730	CO analyzer problems
8740	CO ₂ analyzer problems
8750	O ₂ analyzer problems
8760	Opacity monitor problems
8770	Flow monitor problems
8780	Data acquisition system problems
8790	Miscellaneous CEMS problems

NO_x Reduction Systems

(Use code 0360 for Low NO_x Burners)

Selective Non-Catalytic Reduction Systems

8800	Reagent
8801	Carrier gas
8802	Control system
8803	SNCR Performance testing
8809	Other SNCR problems

Selective Catalytic Reduction Systems

8810	Reactor
8811	Reagent
8812	Catalyst
8813	Injection grid piping/valves
8814	Catalyst support material
8815	Soot blowers
8816	Plugging
8817	Control system
8820	SCR NO _x Ammonia injection grid piping/valves
8821	SCR NO _x Ammonia tanks, piping and valves (not injection)
8822	SCR NO _x Ammonia air blowers
8823	SCR NO _x Other ammonia system problems
8825	Other SCR problems

Catalytic Air Heaters

8830	Active catalyst
8831	Support materials
8832	Plugging
8835	Other CAH problems

CO Reduction

- 8840 Active catalyst
- 8841 Support materials
- 8842 Plugging
- 8845 Other CO reduction problems

Miscellaneous (Pollution Control Equipment)

- 8265 Scrubber booster ID fan dampers
- 8275 Scrubber booster FD fan dampers

EXTERNAL

Use this set of codes to report events caused by external factors (flood, lightning, etc); economic factors (lack of fuel, labor strikes, etc.); operator training; and transmission system problems external to the plant.

Catastrophe

- 9000 Flood
- 9001 Drought
- 9010 Fire [including wildfires](#), not related to a specific component
- 9020 Lightning
- 9025 Geomagnetic disturbance
- 9030 Earthquake
- 9031 Tornado
- 9035 Hurricane
- 9036 Storms (ice, snow, etc)
- 9040 Other catastrophe

Economic

- 0000 Reserve shutdown
- 9130 Lack of fuel (water from rivers or lakes, coal mines, gas lines, etc) where the operator is not in control of contracts, supply lines, or delivery of fuels
- 9131 Lack of fuel (interruptible supply of fuel part of fuel contract)
- 9134 Fuel conservation
- 9136 Problems with Primary Fuel for Units with Secondary Fuel Operation
- 9137 Ground water or other water supply problems.
- 9140 Plant modifications to burn different fuel that are not regulatory mandated
- 9150 Labor strikes company-wide problems or strikes outside the company's jurisdiction such as manufacturers (delaying repairs) or transportation (fuel supply) problems.
- 9151 Labor strikes direct plant management grievances that result in a walkout or strike are under plant management control.
- 9160 Other economic problems
- 9180 Economic (for internal use at plants only)
- 9181 Economic (for internal use at plants only)

- 9182 Economic (for internal use at plants only)
- 9183 Economic (for internal use at plants only)
- 9184 Economic (for internal use at plants only)
- 9185 Economic (for internal use at plants only)
- 9186 Economic (for internal use at plants only)
- 9187 Economic (for internal use at plants only)
- 9188 Economic (for internal use at plants only)
- 9189 Economic (for internal use at plants only)
- 9190 Economic (for internal use at plants only)
- 9191 Economic (for internal use at plants only)
- 9192 Economic (for internal use at plants only)
- 9193 Economic (for internal use at plants only)
- 9194 Economic (for internal use at plants only)
- 9195 Economic (for internal use at plants only)
- 9196 Economic (for internal use at plants only)
- 9197 Economic (for internal use at plants only)
- 9198 Economic (for internal use at plants only)
- 9199 Economic (for internal use at plants only)

Fuel Quality

(Use code 9600 to 9650 if the fuel quality results in excess stack emissions through no fault in the pollution control equipment. Use the appropriate equipment code to report fouling and slagging.)

- 9200 High ash content (OMC)
- 9201 High ash content (not OMC)
- 9205 Poor quality natural gas fuel, low heat content
- 9210 Low grindability (OMC)
- 9211 Low grindability (not OMC)
- 9220 High sulfur content (OMC)
- 9221 High sulfur content (not OMC)
- 9230 High vanadium content (OMC)
- 9231 High vanadium content (not OMC)
- 9240 High sodium content (OMC)
- 9241 High sodium content (not OMC)
- 9250 Low BTU coal (OMC)
- 9251 Low BTU coal (not OMC)
- 9260 Low BTU oil (OMC)
- 9261 Low BTU oil (not OMC)
- 9270 Wet coal (OMC)
- 9271 Wet coal (not OMC)
- 9280 Frozen coal (OMC)
- 9281 Frozen coal (not OMC)
- 9290 Other fuel quality problems (OMC)
- 9291 Other fuel quality problems (not OMC)

Miscellaneous (External)

- 9300 Transmission system problems other than catastrophes (do not include switchyard problems in this category; see codes 3600 to 3629, 3720 to 3730)
- 9305 Ash disposal problem

- 9310 Operator training
- 9320 Other miscellaneous external problems
- 9340 Synchronous Condenser Operation

REGULATORY, SAFETY, ENVIRONMENTAL

Use these codes only for events not directly attributable to equipment failures. Inspections or testing of certain equipment due to regulation are reported using the appropriate equipment cause codes, and the fact that it was a regulatory requirement noted in the verbal description section.

Regulatory

- 9504 Regulatory (environmental) proceedings and hearings - regulatory agency initiated
- 9506 Regulatory (environmental) proceedings and hearings - intervener initiated
- 9510 Plant modifications strictly for compliance with new or changed regulatory requirements (scrubbers, cooling towers, etc.)
- 9520 Oil spill in Gulf of Mexico (OMC)
- 9590 Miscellaneous regulatory (this code is primarily intended for use with event contribution code 2 to indicate that a regulatory-related factor contributed to the primary cause of the event)

Stack Emission

(include exhaust emissions)

- 9600 SO₂ stack emissions – Fossil
- 9603 SO₂ stack emissions – Gas Turbine
- 9604 SO₂ stack emissions – Jet Engines
- 9610 NO_x stack emissions – Fossil
- 9613 NO_x stack emissions – Gas Turbine
- 9614 NO_x stack emissions – Jet Engines
- 9616 CO Stack emissions
- 9620 Particulate stack emissions – Fossil
- 9623 Particulate stack emissions – Gas Turbine
- 9624 Particulate stack emissions – Jet Engines
- 9630 Opacity – Fossil
- 9633 Opacity – Gas Turbine
- 9634 Opacity – Jet Engines
- 9650 Other stack or exhaust emissions – Fossil
(use codes 9200 to 9290 if fuel quality causes pollution control equipment problems that result in excess stack emissions)
- 9653 Other stack or exhaust emissions – Gas Turbine
(use codes 9200 to 9290 if fuel quality causes pollution control equipment problems that result in excess stack emissions)
- 9654 Other stack or exhaust emissions – Jet Engines
(use codes 9200 to 9290 if fuel quality causes pollution control equipment problems that result in excess stack emissions)
- 9656 Other stack or exhaust emissions testing - Fossil
- 9657 Other stack or exhaust emissions testing – Gas Turbine
- 9658 Other stack or exhaust emissions testing – Jet Engines

Other Operating Environmental Limitations

9660	Thermal discharge limits – Fossil
9663	Thermal discharge limits – Gas Turbines
9664	Thermal discharge limits – Jet Engines
9670	Noise limits (not for personnel safety) – Fossil
9673	Noise limits (not for personnel safety) – Gas Turbines
9674	Noise limits (not for personnel safety) – Jet Engines
9677	Noise limits testing - Fossil
9678	Noise limits testing - Gas Turbine
9679	Noise limits testing - Jet Engines
9680	Fish kill
9683	Fish kill (gas turbine)
9684	Fish kill (jet engine)
9690	Other miscellaneous operational environmental limits – Fossil
9693	Other miscellaneous operational environmental limits – Gas Turbines
9694	Other miscellaneous operational environmental limits – Jet Engines

Safety

9700	OSHA-related retrofit or inspection
9720	Other safety problems

PERSONNEL OR PROCEDURE ERRORS

9900	Operator error
9910	Maintenance personnel error
9920	Contractor error
9930	Operating procedure error
9940	Maintenance procedure error
9950	Contractor procedure error
9960	Staff shortage

INACTIVE STATES

0002	Inactive Reserve Shutdown
9990	Retired unit
9991	Mothballed unit

PERFORMANCE

9997	NERC Reliability Standard Requirement
9998	Black start testing
9999	Total unit performance testing (use appropriate codes for individual component testing)