

## UNITS IN COMBINED CYCLE or CO-GENERATION 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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**Cause Code**

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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
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
5060	Atomizing air system

**Fuel, Ignition, and Combustion Systems** (Continued)

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
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
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

**Auxiliary Systems** (Continued)

5115	Oil vapor extractor
5116	Power Augmentation System Equipment
5120	Hydraulic oil system
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-1)
5261	Gas turbine/compressor washing
5262	Gas turbine exchange
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
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
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
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
5455	Fuel nozzle/vane cooling air system
5460	Atomizing air system
5470	Combustor casing

**Fuel, Ignition, and Combustion Systems** (Continued)

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
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-1)
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

**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
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

**Low Pressure Turbine** (Continued)

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

**Controls** (Continued)

- 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-1)
- 4401 Inspection
- 4402 Minor turbine overhaul (less than 720 hours) (use for non-specific overhaul only; see page B-1)
- 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 including the generator output breaker are included in this set of codes.

### Generator

4500	Rotor windings
4510	Rotor collector rings
4511	Rotor, General
4520	Stator windings, bushings, and terminals
4530	Stator core iron
4535	Stator, General
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-1)
- 4831 Minor generator overhaul (less than 720 hours) (use for non-specific overhaul only; see Page B-1)
- 4840 Inspection
- 4841 Generator double 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

#### **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
- 6120 IP steam piping up to turbine stop valves – Between 200 & 600 PSIG  
(see 0790 for piping supports)

### HRSG Boiler Piping System (Continued)

- 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
- 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)

#### **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

#### **HRSG 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

**HRSG Boiler Piping System** (Continued)

- 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

**HRSG Boiler Internals and Structures** (Continued)

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

**Air Supply**

1400	Forced draft fans
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

**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/attenuator 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/attenuator 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-1)
- 1801 Minor boiler overhaul (less than 720 hours)  
(use for non-specific overhaul only; see page B-1)
- 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 X other slagging and fouling problems, other control problems, etc. X 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; or, 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
- 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

**Electrical** (Continued)

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
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- 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 N<sub>2</sub> 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
- 3999 Other miscellaneous balance of plant problems

## POLLUTION CONTROL EQUIPMENT

### Continuous Emissions Monitoring Systems (CEMS)

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

### NO<sub>x</sub> Reduction Systems (Use code 0360 for Low NO<sub>x</sub> 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 <sub>x</sub> Ammonia injection grid piping/valves
8821	SCR NO <sub>x</sub> Ammonia tanks, piping and valves (not injection)
8822	SCR NO <sub>x</sub> Ammonia air blowers
8823	SCR NO <sub>x</sub> 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

## 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
9010	Fire, not related to a specific component
9020	Lightning
9025	Geomagnetic disturbance
9030	Earthquake
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)

**Economic** (Continued)

- 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 SO<sub>2</sub> stack emissions – Fossil
- 9603 SO<sub>2</sub> stack emissions – Gas Turbine
- 9604 SO<sub>2</sub> stack emissions – Jet Engines
- 9610 NO<sub>x</sub> stack emissions – Fossil
- 9613 NO<sub>x</sub> stack emissions – Gas Turbine
- 9614 NO<sub>x</sub> stack emissions – Jet Engines
- 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
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)