Appendix B – Index to System/Component Cause Codes

Using This Appendix

This appendix contains system/component cause codes to use when completing GADS Event Report (07). For ease of use, it is divided into sections based on the type of generating unit, and each section contains all the codes that can be used for each unit type. For example, the section for fossil steam units includes codes for the boiler, steam turbine, generator, balance of plant, pollution control equipment, external, regulatory, safety and environmental, personnel errors, and performance testing. The section for hydro/pumped storage units contains the codes needed to report the electrical systems, generator, the hydro turbine/pump, external, regulatory, safety and environmental, personnel errors, and performance testing. (Table III-6, Page III-25, is a convenient reference that lists the appropriate system/component cause codes applicable to each type of generating unit.)

When copying the *GADS Data Reporting Instructions* for distribution to individual plants, copy only the section(s) of this appendix that are appropriate for the type(s) of unit(s) at each plant. Then the plant data reporter will have only the codes needed to report events, and may avoid some data reporting errors.

Additional cause codes for combined cycle and co-generation units are shown on Pages B-CC-1 to B-CC-31. There is also a section for geothermal units on Pages B-GE-1 to B-GE-16.

Guide for Code Selection

The intent of this appendix is not to provide an exhaustive list of codes for all possible causes or all components, but to provide the most common cause codes. Please add the details of events in the verbal description field to help understand what issues are occurring at the plant. Also, utilities have the option of reporting more detailed information concerning the manner in which a system or component failed using the Failure Mechanism Code. See Page III-29 and Appendix H for more information.

When reporting an event, select the code which best describes the cause or component responsible for the event. The following criteria are to be used in selecting a code:

- Assign the cause of the event to the major component or system that was responsible for the event, not to an auxiliary component or operation that triggered the failure of a major component or system. For instance, failure of an air line to one feedwater regulating valve may cause closure of that valve, resulting in a boiler trip on low level. In this case, the cause code for the feedwater regulating valve would be reported, not the code for the service air system. Note the fact that the valve closure was triggered by an air line failure in the verbal description. On the other hand, if the feedwater regulating valve closure had resulted from a complete loss of station air, the cause code for the station air system would be reported as the primary cause of the event. In this case, the station air system problem causes malfunctions of numerous valves and instruments throughout the plant, and no one major component or system could be uniquely identified as causing the outage.

- Report power supplies (motor control centers, breakers, etc.) which serve a particular component using the code for that component. Report power supply systems that serve multiple components using the code for the power supply system. For instance, if a breaker failure results in the loss of an FD fan, the code for the FD fan would be used. However, if a problem in the AC power distribution caused not only the loss of the FD fan but also the loss of several other major components, then use the code for AC power distribution.

- Report instruments or controls (such as pressure switches, pressure regulators, position indicators, etc.) that are part of a particular fan, pump, or valve, using the code for that component. Codes have been assigned to some control systems, such as feedwater control. Report all instruments, transmitters, logic

modules, etc., associated with these systems using the code for that control system.

- Use the codes for major overhaul only for non-specific overhaul work. Major repairs conducted during a major overhaul are to be reported separately using the appropriate code(s). For example, consider the case where a general turbine overhaul is conducted, during which reblading of a high pressure turbine wheel is required. Use the code 4400 to report the overhaul and include such things as opening and closing of the turbine, cleaning, and minor repairs as man-hours worked. Use the code 4012 to report the reblading of the HP turbine wheel and include only the man-hours worked on the reblading in the man-hours worked field.

- Use the codes for "External" and "Safety, Regulatory, and Environmental" only when no other system/component cause code applies. For instance, if stack emission limits are exceeded because of a fault in the flue gas scrubber, use a scrubber code. However, if a new limit on emissions is imposed and is exceeded even though the scrubber is functioning properly, then use an environmental code.

FOSSIL STEAM UNITS
INDEX TO SYSTEM/COMPONENT CAUSE CODES
(Unit Codes 100-199 and 600-649)

BOILER

This set of codes contains the following:

- Boiler
- Boiler internals (tubes, refractory, supports, etc.)
- All the fuel handling, storage fuel preparation and burning equipment.
- The forced/induced draft air system.
- Slag and ash removal except for particulate and gas cleanup. These latter items are covered under pollution control equipment.
- The main steam and reheat steam systems up to but not including the turbine stop or isolation valves.
- The feedwater system downstream of the final valve prior to entry into the economizer or boiler.
- Boiler blowdown systems.
- The startup bypass system including drains up to the heaters or condenser.
- Boiler water chemistry problems not due to problems in the condensate/feedwater system, the chemical addition system, or the demineralizer/polisher system.
- The instruments and controls associated with the above equipment.

Boiler Fuel Supply to Bunker

Coal Handling Equipment up Through Bunkers

0010	Thaw shed failure or fire
0020	Coal car dumpers, shakers, and unloaders
0022	Unloading/receiving hopper (train/truck)
0024	Rotary plow
0026	Dust suppression system
0028	Dust collection system
0030	Coal conveyors and feeders
0035	Metal detector/collector (including magnetic separator)
0040	Coal elevators
0050	Coal storage fires
0060	Coal crushers including motors
0070	Coal samplers
0075	Storage silos/hoppers
0080	Stackers/reclaimers
0084	Coal conveyor scales storage coal pile
0085	Bunker feeder coal scales
0090	Bunker fires
0095	Bunker flow problems
0100	Bunker gates
0105	Bunker structures
0106	Coal drying system (see additional codes 0125-0127)
0107	Screen (prior to bunkers)
0110	Other coal fuel supply problems up through bunkers
0125	Coal crusher dryer hammers (see code 0106)
0126	Coal crusher lube oil system (see code 0106)
0127	Other coal crusher dryer problems (see code 0106)
0129	Other coal processing system problems

Boiler Fuel Supply from Bunkers to Boiler

Pulverizers, Primary Air Fans, and Associated Ducts

0200	Pulverizer exhauster fan (for indirect firing)
0205	Pulverizer exhauster fan drive
0210	Pulverizer heater (for indirect firing)
0220	Pulverizer system cyclone separator
0230	Pulverizer bag filter
0240	Pulverized coal bin
0250	Pulverizer feeders
0253	Pulverizer feeder motor
0255	Pulverizer feeder coal scales
0256	Seal air system (air to pulverizers)
0257	Coal Cursher/dryer between feeder and pulverizer
0260	Primary air fan
0262	Primary air fan lube oil system
0263	Primary air fan drives
0264	Other primary air fan problems
0265	Primary air heater
0266	Primary air heater fouling
0267	Primary air flow instrumentation
0270	Primary air duct and dampers
0280	Pulverizer fires
0290	Pulverizer reduced capacity due to wear
0300	Pulverizer motors and drives
0310	Pulverizer mills
0312	Pulverizer mill classifiers
0313	Pulverizer mill trunnion seals
0314	Pulverizer mill ball charger hopper (ball mills only)
0315	Pulverizer mill coal level controls
0320	Foreign object in Pulverizers mill
0325	Pulverizer skidding
0330	Pulverizer coal leak (pulverizers only)
0331	Pulverizer system coal leaks (other than pulverizers)
0335	Pulverizer lube oil system
0338	Pulverizer control systems (temperature and pressure)
0339	Pulverizer System Puff
0340	Other pulverizer problems
0341	Pulverizer deluge system
0342	Pulverizer Inert system
0344	Pulverizer inspection
0345	Pulverizer overhaul
0346	Pulverizer pyrite removal system
0350	Pulverized fuel and air piping (from pulverizer to wind box) (see code 0898 for pulverizer reject system problems)

Burners

0358	Oil burner piping and valves
0359	Gas burner piping and valves
0360	Burners
0362	Burner tilts
0361	Burner orfices
0370	Burner instruments and controls (except light off)
0380	Light off (igniter) systems (including fuel supply)
0385	Igniters
0390	Burner wind boxes and dampers
0400	Burner wind box fires
0410	Other burner problems

Cyclone

0415	Cyclone feeders
0420	Cyclone crusher
0425	Cyclone dampers
0426	Cyclone air ducts
0430	Cyclone furnace
0435	Other cyclone 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)

Boiler Piping System

Main Steam

0500	Main steam piping up to turbine stop valves
0510	Main steam relief/safety valves off superheater
0520	Other main steam valves (including vent and drain valves but not the turbine stop valves)
0530	Other main steam system problems

Cold and Hot Reheat Steam

0540 Hot reheat steam piping up to turbine stop valves
0541 Cold reheat steam piping up to boiler
0550 Reheat steam relief/safety valves
0560 Other hot 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

Desuperheaters/Attemperators

0580 Desuperheater/attemperator piping
0590 Desuperheater/attemperator valves
0600 Desuperheater/attemperator spray nozzles
0610 Desuperheater/attemperator drums
0620 Other desuperheater/attemperator problems

Startup Bypass

0630 Startup bypass system piping (including drain lines up to heaters or condenser)
0640 Startup bypass system valves
0650 Startup bypass tanks or flash tanks
0655 Steam by-pass system instrumentation and controls
0660 Other startup bypass system problems

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
0742 Boiler recirculation pumps – motors – cooling system
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

Boiler Internals and Structures

0800 Drums and drum internals (single drum)
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
0850 Other internal or structural problems
0855 Drum relief/safety valves (single drum)
0859 Tube external fins/membranes

Slag and Ash Removal

0860 Soot blowers - air (see code 3844 for air delivery system)
0870 Soot blowers - steam
0871 Soot blowers - sonic
0872 Soot blowers - water
0873 Soot blower drives
0876 Soot blower controls
0880 Fly ash Removal System (not precipitators, scrubbers, mechanical collectors, or baghouses)
0885 Fly ash Removal System – wet transport
0890 Bottom ash systems (wet or dry)
0891 Bottom ash hoppers (including gates)
0892 Bottom ash clinker grinders
0893 Bottom ash water pumps and motors
0894 Bottom ash piping and valves
0895 Ashpit trouble
0896 Bottom ash dewatering bin system, instruments and controls
0897 Bottom ash rotary (drag chain type) conveyor and motor
0898 Bottom ash pyrite hopper (pulverizer reject) system
0899 Bottom ash controls and instrumentation
0900 Slag-tap (cyclone furnace)
0910 Slag-tap (other than cyclone furnace)
0920 Other slag and ash removal problems

Boiler Tube Leaks

(use code 0859 for tube/membrane failures)

1000 Waterwall (Furnace wall)
1003 Steam generating tubes between steam drum and mud drum
1005 Generating tubes
1010 Cyclone furnace (in cyclone area only)
1020 Convection pass wall (water tubes only)
1030 Boiler screen, wing wall, or slag screen (water tubes only)
1035 Platen superheater
1040 First superheater
1050 Second superheater
1055 External superheater link tubing
1060 First reheater
1070 Second reheater
1075 External reheater link tubing
1080 Economizer
1090 Other boiler tube leaks

Boiler Tube Fireside Slagging or Fouling

(use codes 0860 and 0870 for fouling or slagging due to unavailability of soot blowers or their air or steam supply)

1100 Waterwall (Furnace wall)
1103 Steam generating tubes between steam drum and mud drum
1105 Generating tubes
1110 Cyclone furnace (in cyclone area only)
1120 Convection pass wall
1130 Boiler screen, wing wall, or slag screen (water tubes only)
1140 First superheater
1150 Second superheater
1160 First reheater
1170 Second reheater
1180 Economizer
1190 Other tube slagging or fouling
1200 Operation at reduced power to avoid slagging or fouling (use codes 1100 to 1190 to report power reductions for slag accumulation or slag removal)
1210 Operation at reduced power to avoid slagging or fouling on waterwalls (Furnace walls) (use codes 1100-1190 to report power reductions for slag accumulation or slag removal)

Miscellaneous Boiler Tube Problems

1300 Water side fouling
1305 Fireside cleaning (which requires a full outage) Use code 1200 for cleanings that cause deratings.
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 drains system

Boiler Air and Gas Systems

(excluding burner pipes, wind boxes, primary air, or pulverizer exhausters)

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)
1413 Forced draft fan couplings
1415 Forced draft fan controls
1420 Other forced draft fan problems
1421 Secondary air fans/blowers
1422 Secondary air fan/blower motors - single speed
1423 Secondary air fan/blower motors - variable speed
1424 Secondary air fan/blower controls
1430 Air supply ducts from FD fan
1431 Air supply dampers from FD fan
1432 Air supply duct expansion joints
1440 Air supply dampers
1450 Other air supply problems

Flue Gas

1455 Induced draft fans
1456 Induced draft fan dampers
1457 Induced draft fan lubrication systems
1460 Induced draft fan fouling
1470 Induced draft fan motors and drives
1471 Induced draft fan motors - variable speed
1472 Inducted draft fan coupling
1475 Induced draft fan controls
1476 Induced draft fan speed changer
1480 Other induced draft fan problems
1487 Air heater (tubular)
1488 Air heater (regenerative)
1489 Air heater (heat pipe, plate-type)
1492 Air heater fouling (tubular)
1493 Air heater fouling (regenerative)
1495 Other air heater fouling (heat pipe, plate-type)
1500 Air heater soot blowers
1510 Flue gas ducts (except recirculation)
1512 Flue gas expansion joints
1520 Flue gas dampers (except recirculation)
1530 Other flue gas problems

Flue Gas Recirculation

1535 Flue gas recirculating fan
1536 Flue gas recirculating fan dampers
1537 Flue gas recirculating fan lubrication systems
1540 Flue gas recirculation fan fouling
1550 Flue gas recirculation fan motors
1555 Flue gas recirculation fan controls
1560 Other flue gas recirculation fan problems
1570 Flue gas recirculation ducts
1572 Flue gas recirculation duct expansion joints
1580 Flue gas recirculation dampers

Miscellaneous (Boiler Air and Gas Systems)

1590 Stacks (use code 8430 for stack problems due to pollution control equipment)
1591 Stack damper and linkage
1592 Stack damper linkage motors
1599 Other miscellaneous boiler air and gas system problems

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 — burners, pulverizers, etc., — with component or system)
1720 Desuperheater/attemperator controls (not local controls)
1730 Boiler explosion or implosion
1740 Boiler gage glasses /level indicator
1741 Furnace and water gauge television auxiliary system
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

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/investigation
1812 Boiler Inspections – scheduled or routine
1820 Chemical cleaning/steam blows

Boiler Water Condition

1850 Boiler water condition (not feedwater water quality)

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
1990 Boiler performance testing (use code 9999 for total unit performance testing)
1999 Boiler, miscellaneous

BALANCE OF PLANT

Condensing System

Condenser Tubes and Support Equipment

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 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
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.)
3274 Ice blockages at intake structures including frazil ice, sheets, blocks of ice, 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

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
3299 Other circulating water system 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 - external
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 4000-7000-volt transformers
3661 4000-7000-volt circuit breakers
3662 4000-7000-volt conductors and buses
3663 4000-7000-volt insulators
3664 4000-7000-volt protection devices

Electrical (continued)

3669 Other 4000-7000-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 Power Station 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 N_2 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 instruments 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

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

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
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

Miscellaneous (Gas Turbine)

5298 Main Gas Filter

POLLUTION CONTROL EQUIPMENT*

Use this set of codes to report problems with flue gas desulphurization equipment and stack gas particulate removal equipment. If outages or deratings occur due to reasons other than equipment problems, use the set of codes for Regulatory, Safety, Environmental stack emission limits.

Wet Scrubbers

Chemical Supply

8000 Chemical feed storage, mill feeders, and conveyors
8002 Screw conveyors
8003 Bucket elevators
8006 Weigh feeders
8010 Crushers/mills
8020 Mill slurry tanks supply problems
8030 Classifiers
8040 Slurry transfer pumps and motors
8050 Chemical unavailability
8099 Other chemical supply problems

Wet Scrubber

8100 Scrubber/absorber tower or module
8110 Spray nozzles
8115 Disc scrubber throats
8120 Spray pumps and motors
8125 Scrubber recycle (liquid) pumps
8127 Scrubber recycle (liquid) pump motors
8130 Recirculation tanks including agitators
8140 Reaction tanks including agitators
8150 Tubes
8160 Mist eliminators/demisters and washdown
8199 Other scrubber problems

Piping, Ducting, Dampers, and Fans

8200	Piping
8210	Valves
8220	Strainers or filters
8225	Drain pots
8230	Ducting
8235	Demister
8240	Bypass dampers
8250	Dampers other than bypass
8260	Scrubber booster I.D. fan (fan specific to the scrubber)
8261	Scrubber booster I.D. fan drive

* Use code 9510 for outages or deratings required to install pollution control equipment. Use codes 9600 to 9650 only when the pollution control equipment problems are not responsible for exceeding emission limits.

Piping, Ducting, Dampers, and Fans (Continued)

8262	Scrubber booster I.D. fan vibration (fan specific to the scrubber)
8264	Scrubber booster I.D. fan blades (fan specific to the scrubber)
8265	Scrubber booster ID fan dampers
8270	Scrubber booster F.D. fan (fan specific to the scrubber)
8271	Scrubber booster F.D. fan drive
8272	Scrubber booster F.D. fan vibration (fan specific to the scrubber)
8274	Scrubber booster F.D. fan blades (fan specific to the scrubber)
8275	Scrubber booster FD fan dampers
8280	Reagent feed piping
8290	Demister wash piping assembly
8299	Other piping, ducting, damper, and fan problems

Waste Disposal and Recovery

8300	Waste disposal/recovery tanks
8310	Waste disposal/recovery pumps
8320	Waste disposal ponds
8325	Ash disposal problems
8330	Dewatering equipment(thickener, centrifuge, etc.)
8335	Dryers
8340	Centrifuge/vacuum filter
8345	Calciners
8349	Other waste disposal and recovery problems
8399	Solids conveying and mixing system problems

Miscellaneous (Wet Scrubber)

8400 Scrubber gas discharge reheaters - general
8402 Scrubber gas discharge reheaters - vibration
8404 Scrubber gas discharge reheaters - tube leaks
8406 Scrubber gas discharge reheaters - ducts
8410 Scrubber instruments and controls
8415 Liquid level controls
8420 Heat tracer
8425 Miscellaneous mechanical failures
8426 Miscellaneous electrical failures
8430 Stack damage related to scrubber system
8440 Major overhaul
8450 Inspection
8460 Testing
8470 SO_2 monitor
8499 Other miscellaneous wet scrubber problems

Dry Scrubbers

Reagent\Slurry Supply

8500 Slurry storage and feed tanks
8501 Reagent storage, feed bins, and conveyors
8502 Weigh feeders
8503 Screw conveyors
8504 Mills/slakers
8505 Scalping screens
8506 Slurry pipelines
8507 Reagent uploading and transfer systems
8508 Reagent unavailability
8510 Slurry mixers and agitators
8520 Slurry transfer pumps and motors
8521 Reagent/slurry problems

Piping, Ducting, and Dampers

8522 Piping
8523 Valves
8524 Strainers or filters
8525 Ducting
8526 Dampers
8527 Other piping, ducting, and damper problems

Dry Scrubber

8528 Dry scrubber instruments and controls
8529 Gas dispersers
8530 Spray towers
8531 Spray machine/atomizer
8532 Spray machine/atomizer motors
8533 Spray machine/atomizer lubrication systems
8534 Spray machine/atomizer vibration problems

Waste Disposal and Recovery

8535 Fly ash conveyors
8536 Bucket elevators
8537 Weigh hoppers
8538 Recycle storage and feed tanks including agitators
8539 Recycle slurry transfer pumps
8540 Waste disposal
8541 Recycle feed bins
8542 Recycle feed bins aeration systems
8543 Powder coolers

Miscellaneous (Dry Scrubber)

8544 Mechanical failures
8545 Electrical failures
8546 Major overhaul
8547 Inspection
8548 Testing
8549 Other dry scrubber problems

Precipitators

8550 Electrostatic precipitator fouling
8551 Electrostatic precipitator field out of service
8560 Electrostatic precipitator problems
8570 Mechanical precipitator fouling
8580 Mechanical precipitator problems
8590 Other precipitator problems

Miscellaneous (Pollution Control Equipment)

8600 Flue gas additives (furnace injection)
8601 SO3 mitigation
8620 Mercury Abatement Equipment
8650 Baghouse systems, general
8651 Bag failures and rebagging
8652 Shakers and rappers
8653 Inflation and deflation fans and motors
8654 Baghouse booster fans and motors
8655 Structural duct work and dampers
8656 Controls and instrumentation
8657 Ash handling system and hoppers
8658 Slurry system from precipitators
8670 Emission monitors (other than CEMS)
8699 Other miscellaneous pollution control equipment problems

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 NOx Ammonia injection grid piping/valves"
8821 SCR NOx Ammonia tanks, piping and valves (not injection)"
8822 SCR NOx Ammonia air blowers"
8823 SCR NOx 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
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)
9132	Wet Fuel - Biomass
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	SO_2 stack emissions – fossil
9610	NO_x stack emissions - fossil
9620	Particulate stack emissions – fossil
9630	Opacity - fossil
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)
9656	Other stack or exhaust emissions testing - fossil

Other Operating Environmental Limitations

9660	Thermal discharge limits – fossil and nuclear
9670	Noise limits (not for personnel safety) - fossil
9677	Noise limits testing - fossil
9680	Fish kill – fossil and nuclear
9690	Other miscellaneous operational environmental limits – fossil and nuclear

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)