

## GAS TURBINE UNITS INDEX TO SYSTEM/COMPONENT CAUSE CODES

(Unit Codes 300-399 and 700-799)

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## BALANCE OF PLANT

### Electrical

3600	Switchyard transformers and associated cooling systems – external (OMC)
3601	Switchyard transformers and associated cooling systems – external (not OMC)
3610	Switchyard circuit breakers – external (not OMC)
3611	Switchyard circuit breakers – external (OMC)
3612	Switchyard system protection devices – external (OMC)
3613	Switchyard system protection devices – external (not OMC)
3618	Other switchyard equipment – external (not OMC)
3619	Other switchyard equipment – external (OMC)
3620	Main transformer
3621	Unit auxiliaries transformer
3622	Station service startup transformer
3623	Auxiliary generators
3624	Auxiliary generator voltage supply system
3629	Other switchyard or high voltage system problems
3630	400-700-volt transformers
3631	400-700-volt circuit breakers
3632	400-700-volt conductors and buses
3633	400-700-volt insulators
3634	400-700-volt protection devices
3639	Other 400-700-volt problems
3640	AC instrument power transformers
3641	AC Circuit breakers
3642	AC Conductors and buses
3643	AC Inverters
3644	AC Protection devices
3649	Other AC instrument power problems
3650	DC instrument power battery chargers
3651	DC circuit breakers
3652	DC conductors and buses
3653	DC protection devices
3659	Other DC power problems
3660	4000-7000-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
3669	Other 4000-7000-volt problems

**Electrical** (Continued)

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****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
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
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
3839	Other auxiliary steam problems

**Service Air**

- 3840 Service air compressors
- 3841 Service air piping
- 3842 Service air valves
- 3843 Service air dryers
- 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

**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
3999	Other miscellaneous balance of plant 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
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
4590	Generator brakes

### 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 overhaul (more than 720 hours) (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 dole testing
- 4842 Reactive and capability testing
- 4850 Core monitor alarm
- 4860 Generator neutral grounding equipment
- 4899 Other miscellaneous generator problems

## GAS TURBINE

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

#### Ducts and Filters

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

#### Compressors

5010	High pressure shaft
5011	High pressure bearings
5012	High pressure blades/buckets
5013	Compressor casing and bolts
5014	Compressor diaphragms
5015	Compressor seals
5016	High pressure compressor bleed valves
5017	Low pressure compressor bleed valves
5019	Other high pressure problems
5020	Low pressure shaft
5021	Low pressure bearings
5022	Low pressure blades/buckets
5029	Other low pressure problems
5030	Supercharging fans
5035	Compressor washing
5036	Compressor shaft and bearings for two-shaft machines
5039	Other compressor problems

### Fuel, Ignition, and Combustion Systems

5040	Fuel tanks
5041	Fuel piping and valves
5042	Fuel nozzles/vanes
5043	Fuel filters
5044	Liquid fuel oil pump
5046	Liquid fuel oil transfer/forwarding pump
5047	Liquid fuel purge system
5048	Gas fuel system including controls and instrumentation
5049	Other fuel system problems
5050	Ignition system
5051	Pilot fuel piping and valves
5052	Pilot fuel nozzles/vanes
5053	Pilot fuel filters
5054	Water injection system

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

5060	Atomizing air system
5070	Combustor casing
5071	Combustor liner
5072	Combustor caps
5073	Flame scanners
5074	Flashback including instrumentation
5075	Blade path temperature spread
5079	Other combustor problems

**Turbine** (use HP if only one)

5080	High pressure shaft
5081	High pressure bearings
5082	High pressure blades/buckets
5083	High pressure nozzles/vanes
5084	High pressure casing/expansion joints
5085	Interstage gas passages - HP
5086	High pressure shaft seals
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	Other 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
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

## 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

## POLLUTION CONTROL EQUIPMENT

### Miscellaneous (Pollution Control Equipment)

8656 Controls and instrumentation

### Continuous Emissions Monitoring Systems (CEMS)

8700 CEMS Certification and Recertification  
 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  
 8770 Flow monitor problems  
 8780 Data acquisition system problems  
 8790 Miscellaneous CEMS problems

### NO<sub>x</sub> Reduction Systems

#### 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 (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)
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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 9603 to 9653 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
- 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)
- 9260 Low BTU oil (OMC)
- 9261 Low BTU oil (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)
- 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 - intervenor 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)

- 9603 SO<sub>2</sub> stack emissions – gas turbines
- 9613 NO<sub>x</sub> stack emissions – gas turbines
- 9623 Particulate stack emissions – gas turbines
- 9633 Opacity – gas turbines
- 9653 Other stack or exhaust emissions – gas turbines  
(use codes 9200 to 9290 if fuel quality causes pollution control equipment problems that result in excess stack emissions)
- 9657 Other stack or exhaust emissions testing - gas turbines

### Other Operating Environmental Limitations

- 9663 Thermal discharge limits – gas turbines
- 9673 Noise limits (not for personnel safety) – gas turbines
- 9683 Fish kill – gas turbines
- 9693 Other miscellaneous operational environmental limits – gas turbines

### 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)