Enclosure 2
Meeting Summary Handouts
of the June 23, 2010
ROP Public Meeting
Dated July 1, 2010

1999 - 2001 EDG Failures

Failure ID	Recommended EDG Failure Mode	Start	Load	Run	Discovery Date	EDG Running	EDG Secured as Result of Failure	Failure Time Ided	Status on Discovery Secured/ Loaded/ Unloading	Failure Time	Failure Description	Impact	Corrective Action	Comment
	148	**82**	**45**	**21**										
343	S	1	0	0	9/12/2000	No - Discovered Condition	No	Yes	Secured	Discovered after a surveillance run	Auto start light was not illuminated. Blown fuse causing auto voltage circuitry to be inoperable	EDG declared inoperable	Light socket and fuse replaced	
621	L	0	1	0	1/17/2000	Yes	Unknown	No	Loadimg	After breaker closure	Would not respond to repeated attempts to raise load. Load was at 3.5 MW. Pot had dead spot on pot winding	Condition cleared with no further operator action. Pot later found to have dead spot on winding	Replaced pot	
809	R	0	0	1	7/1/1999	Yes	Yes	Yes	Full Load	After approximately full load for one hour	LO pressure degraded to approximately 33psi (from 75 psi) from a combination of failed bolting and cracked braket (stub shaft bushing assembly). Discovered as part of the post maintenance testing. A non-manatory May 1972 maintenance bulletin to retrofit with a new design bracket in order to increase strength had not been implemented. Upgrade likely to have been planned in conjunction with turbo charger upgrades at a later date. Failure does not appear to be directly related to the maintenance actions.	EDG was shut down	Unknown	
944	S	1	0	0	1/28/1999	No - Discovered Condition	No	Yes	Secured	Discovered during walkdown on 1/28/1999. Failure likely the result of maintenance performed on 1/9/1999.	LO AMOT (cast iron) valve flanges were torqued such that the valve body cracked approximately 20 days after the maintenance was performed. Crack resulted in loss of LO.	EDG declared inoperable	Valve replaced and procedure revised	
945	S	1	0	0	1/29/1999	Yes	No	Yes	Full Load	Less than 1 hour.	Tachometer driven gear coupling tang broke. The tang connects the tachometer shaft to the bevel driven gear. In addition, the bevel drive gear had broken teeth. The bevel drive gear is attached to the governor power take off shaft. The tachometer drive shaft was bent. Failure investigation concluded that the gear mesh engagement was inadequately spaced. This caused excessive forces to be experienced by the tachometer driven gear and shaft. It was also determined that mesh adjustment could be achieved by varying the thickness of the bearing retainer cover gasket, which corrected the problem.	During Manual Slow Speed Start - this failure had little impact on engine operation. Local Panel Tachometer readout was erratic and reading between 0 and 200 RPM, even though the engine was being loaded at 900 RPM. At less than 200 RPM indicated, the standby keep warm engine systems automatically operated. Note: Had the Tachometer malfunctioned during an Auto-Start, the engine would have failed to run.	An undamaged Tachometer Assembly was installed, and the bearing retainer cover gasket thickness was altered to achieve the desired driven gear engagement.	On an actual LOOP, this Tachometer malfunction would have resulted in a failure to start. A slow start bypasses this input.
1463	R	0	0	1	4/22/2000	Yes	Yes	Yes	105% of rated load	23 hours and 12 minutes	Failure of fuel supply line from engine header to the jerk pump (high pressure fuel injection pump) suction	EDG secured via emergency stop	Replace fuel supply hose, inlet elbow and fuel injection pump	
1566	L	0	1	0	1/19/1999	Yes	Yes	Yes	100% load	Less than 1 hour.	EDG tripped during loading due to high temperature trip at 198F.	EDG was shut down and declared inoperable.	Adjusted cooling water valve position	
1568	S	1	0	0	2/18/1999	Yes	Yes	Yes	Unloaded	Less than 1 hour.	EDG tripped on high crankcase pressure trip due to the crankcase pressure trip switch being out of calibration.	EDG tripped from unloaded condition.	Crankcase pressure trip switch was calibrated.	
1781	L	0	1	0	2/5/1999	Yes	Yes	No	Loaded	Less than 1 hour.	Engine #2 caused the load inbalance by producing 4.6 MW instead of 4.0 MW which Engine #1 was producing. The #2 Engine Fuel Rack Limiter Jack vibrated out of position and required readjustment.	EDG was unavailable	Readjusted and locked down Fuel Rack Jack	
1828	S	1	0	0	9/13/1999	Yes	Yes	Yes	Unloaded	Less than 1 hour.	Operator were unable to control generator output frequency due to Generator Load Sharing and Speed Control Module	EDG was unavailable	The speed control module was replaced, calibrated, and tested	
1987	L	0	1	0	5/10/2000	Yes	Yes	Yes	Loaded	Less than 1 hour.	Engine oil sump was overfilled due to a problem with the insertion of the dipstick. This caused foaming during a test run. The foam caused a low level trip of the EDG within 5 minutes of loaded operation.	EDG was unavailable	Oil level was adjusted	
2059	L	0	1	0	4/16/2001	Yes	Yes	Yes	Loaded	Less than 1 hour.	EDG Radiator Fans were not running with the engine loaded, due to numerous electrical malfunctions including starting relay.	Rendered EDG unavailable	Wiring re-attached to Relay and breaker overcurrent trip settings raised	

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2453	L	0	1	0	8/31/1999	Yes	Yes	Yes	Unloaded	Less than 1 hour.	The root cause of the diesel generator output breaker tripping was an improper over-current trip set point for the Ampector (solid state trip device) of the breaker. Post trip testing revealed the over-current trip set point for 23 EDG was 3200 amps vs 6000 as intended. This improper setting was caused by the difficulty of setting the Ampector low in its high amp, coarse setting span.	EDG was unavailable during a test demand	Circuit breaker Amptector was recalibrated	
2644	L	0	1	0	1/10/1999	Yes	Yes	Yes	Loading	Less than 1 hour.	EDG did not load as required due to failure of Fuel Oil Booster Pump losing its prime. The cause was determined to be improper pump and piping configuration, which caused air in-leakage through the pump seal.	EDG was unavailable for power production	Booster pump piping modifications are being evaluated for installation	
2654	S	1	0	0	6/20/1999	Yes	Yes	Yes	Unloaded	Less than 1 hour.	EDG had a cracked Cylinder Head which leaked noticeably during unloaded operation. Leak prevented engine from running in its normal parameters and was shutdown.	EDG was unavailable for power production	Cracked cylinder was replaced	
2673	S	1	0	0	10/6/1999	Yes	Yes	Yes	Unloaded	Less than 1 hour.	EDG did not load as required due to a shorted diode resulting in loss of generator excitation. The shorted diode in the jacket water pressure permissive is an input into breaker 72-302 field flashing/excitation breaker logic.	EDG was unavailable for power production	The diode was replaced	
2683	R	0	0	1	6/24/1999	Yes	Yes	Yes	Loaded	Greater than 1 hour	With the EDG loaded the Lube Oil Pump P-212B, Relief Valve cycled open and closed, below its 130# setpoint. The Lube Oil Pressure was approximately 85#.	EDG was unavailable for power production	Lube Oil Pump and Relief Valve was replaced	
2955	L	0	1	0	5/23/1999	Yes	Yes	Yes	Loaded	Less than 1 hour.	DG would not load to greater than 1500 kW instead of the desired 3000 kW. EGA Motor Operated Pot was determined to be malfunctioning.	DG was taken out of service for repair. DG would have been able to pick up Full Load in a LOOP, however may not been able to parallel to restore buses when off-site power returned. A LOOP concurrent with a LOCA may challenge the 1500kW limit.	DG Motor operated POT was repaired	
3047	R	0	0	1	3/3/2000	Yes	Yes	Yes	Loaded	Greater than 1 hour	DG 2 Tripped while supplying power to Bus E-2, due to a failure of the Excitation Transformer.	DG was unavailable	Excitation Transformer was replaced	
3099	R	0	0	1	10/17/2000	Yes	Yes	Yes	Loaded	Greater than 1 hour	A Fuel Oil Leak at the fuel oil isolation valve occurred while the DG was being shutdown.	DG became unavailable	1/4" Close nipple was replaced	
4226	S	1	0	0	1/13/2000	Yes	Yes	Yes	Unloaded	Less than 1 hour.	Loose lead terminal on Governor caused unexpected Frequency Swings when 1A DG was running unloaded.	DG was unavailable	Trouble shooting activities identified the loose governor terminal lead, which was tightened.	
4555	S	1	0	0	2/5/1999	Yes	Yes	Yes	Unloaded	Less than 1 hour.	DG trouble alarm came in while engine was running unloaded. This alarm can be caused by multiple conditions, many of which were locally in alarm. Additionally, the engine speed spiked for a short time. The cause for all the alarms were from a Power Supply Failure in a control panel.	Failed Power Supply caused 1B DG to be inoperable and unavailable.	Power Supply was replaced with a functioning one	
5062	S	1	0	0	4/12/2000	Yes	Yes	Yes	Unloaded	Less than 1 hour.	EDG speed oscillated while unloaded. The fuel rack was moving as demanded by the governor. The Governor Solenoid was found to be open-circuited during trouble shooting.	EDG was inoperable and unavailable	Governor was repaired	
5277	R	0	0	1	3/9/2000	Yes	Unknown	Yes	Loaded	Unknown - assumed to occur after loading as this is a 24 endurance test	EDG electrical output drifted downward while paralleled, due to a governor problem. Missing fasteners caused the Governor Motor to vibrate and change its demand signal downward during 24 hour endurance test.	EDG was inoperable and might not have completed its mission time	Fasteners were installed on the governor housing	

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5278	S	1	0	0	3/11/2000	No - Failed Start Attempt	Yes	Yes	Secured	After endurance run and full load reject	EDG failed the hot restart test after and endurance run with full load reject. Trouble shooting did not identify a cause.	Engine did not restart to power the ECCS system as required	Trouble shooting activities did not identify a cause. Engine was successfully retested.	
5322	S	1	0	0	6/2/1999	No - Discovered Condition	No	No	Secured	Discovered during non-demand observation	EDG Jacket Water Cooling system partially drained due to leaking Heat Exchanger Tubes.	Engine would not have run loaded for greater than an hour.	Heat Exchanger tubes repaired	
6444	L	0	1	0	10/21/1999	Yes	No	Yes	Unloaded	After completion of the surveillance run	Burning odor came from EDG 12 Control Panel after the completion of a surveillance run. Linear Reactor 1 and the Current Potential Transformer in the Generator Exciter controls, were found to be completely functional, except that there was evidence of a grounded overheated location.	Failure report sates that the EDG was manually unlaoded and manually shutdown at the end of the surveillance test. Conservatively assumed that the Engine would have failed to Load.	Replaced with new components	
6481	L	0	1	0	5/6/2000	Yes	Yes	No	Loaded	Greater than 1 hour	Burning odor and smoke came from EDG 14 Control Panel during a surveillance run. EDG 14 was manually shutdown. Linear Reactor 1 in the Generator Exciter controls, were found to be completely functional, except that there was evidence of a grounded overheated location.	EDG was secured to burnging order	Replaced with new components	
6540	R	0	0	1	3/21/2001	Yes	Yes	No	Loaded	11 hours	EDG 14 Generator Outboard Bearing failed due to lack of lubrication 11 hours into its 24 hour endurance run.	EDG was unavailable after 11 hours of loaded run	Bearing was replaced and oil sightglass was calibrated.	
6696	L	0	1	0	7/16/1999	Yes	Yes	Yes	Loaded	Less than 1 hour.	EDG-2 Voltage Regulator failed which caused the trip of 2DF Emergency Bus. The Voltage Regulator failure caused the Bus offsite feeder to trip open, and erratic EDG voltage caused the operator to manually open the EDG output breaker on to that bus. EDG voltage ultimately went to zero, which instananeously caused the Offsite Power Feeder Breaker to trip on overcurrent.	EDG energized 2DF Emergency Bus but operator force to trip the EDG due to voltage swings.	Voltage Regulator was repaired	
6803	L	0	1	0	11/16/1999	Yes	Yes	Yes	Loaded	Less than 1 hour of Loaded Operation	D/G Tripped on OverCurrent while loading for Operations Testing. Problems were identified in Fuel Rack Linkages	This is a Failure to Load because the Test was secured prior to one hour of loaded operation.	Fuel Rack Linkages were replaced	
6842	L	0	1	0	2/6/2001	Yes	Yes	Yes	Loading	Less than 1 hour	DG tripped on Lo-Lo Lube Oil Pressure due to instrument slow response. The instrument line had sludge buildup restricting flow. The actual lube oil pressure was always above the trip setpoint.	DG tripped during manual loading	Oil Pressure Instrument Line was flushed	
6846	R	0	0	1	11/10/2000	Yes	Yes	No	Loaded	Unknown - Assumed to occur last as event occurred during a test run.	Smoke came from 1B D/G Control Panel during a test run. The D/G was carrying the emergency bus without being paralleled. The Voltage Regulator 3 Phase Power Potential Transformer was faulted.	1B D/G was secured from its loaded run, however it is unknown if it was tripped in less than 1 hour.	Replaced Voltage Regulator	
6965	L	0	1	0	2/7/2000	Yes	Yes	Yes	Unloaded	Less than 1 hour	DG Output Breaker Closing Coil malfunctioned such that it would not close when testing DG.	DG was inoperable since the Breaker was last closed on 2/7/00 (22 Days). The Breaker Failure prevented the DG from Loading.	Repaired Closing Coil.	

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7061	L	0	1	0	10/2/1999	Yes	Yes	Yes	Loaded	Less than 1 hour	DG experienced high exhaust temperatures on number 4 Left Cylinder accompanied by noise. Hydraulic cylinder required replacing. Subsequent testing resulted in replacing Exhaust Valve Insert, which was fractured.	DG was shutdown after being loaded for 15 minutes.	Cylinder was rebuilt	
7695	S	1	0	0	8/30/1999	Yes	Yes	Yes	Unloaded	Less than 1 hour	The B Battery Ground that was detected coincidentally with the loaded test run of EGDG-1B was localized to an Amphenol Connector on the DG Governor. Amphenol connector started to smoke when energized.	DG Test was suspended apparently prior to loading generator.	Connections were repaired	
7718	S	1	0	0	7/5/2001	Yes	Yes	Yes	Unloaded	Less than 1 hour	EDG failure due to loss of Fuel Oil Header Prime.	EDG would did not start and would not have been available.	Cause of Fuel Prime loss was identified and corrected.	
7876	S	1	0	0	5/22/2001	Yes	Yes	Yes	Unloaded	Less than 1 hour	EDG developed a serious radiator leak requiring immediate shutdown.	EDG was shutdown and deemed unavailable.	Radiator repaired	
7877	L	0	1	0	6/11/2001	Yes	Yes	Yes	Loaded	Less than 1 hour	EDG developed a serious radiator leak requiring immediate shutdown.	EDG was unavailable less than 1 hour into the loaded run	Radiator repaired	Report states that the Engine was Unloaded and Stopped
7884	S	1	0	0	7/2/2001	No - Discovered Condition	No	Yes	Secured	Pior to start	Air Start System Air Flasks Check Valve was leaking such that starting air pressure could not be maintained above the required limit.	EDG would not have been able to start if demanded.	Check valve was repaired	
8010	S	1	0	0	7/20/2000	Yes	Yes	Yes	Unloaded	Less than 1 hour	A failed Rectifier Diode prevented the EDG Voltage and Frequency to stabilize while attempting to parallel the Generator on the Safety Bus.	EDG 2B would not have been able to provide reliable power to the Emergency Bus	Diode was replaced	
8136	R	0	0	1	2/26/2000	Yes	Yes	Yes	Loaded	Greater than 1 hour	The ITD Time delay relay associated with the EDG governor failed causing a reverse power lockout and subsequent idling of the EDG.	EDG would not have remained loaded.	ITD Coil was failure tested and replaced	Assumed that the EDG was loaded for greater than minutes prior to opening.
8153	S	1	0	0	8/16/2000	Yes	Yes	Yes	Unloaded	Upon Starting	EDG Speed Control failed to control RPM from a Normal Start demand. Further, the EDG failed to Stop from the Control Room Push Button. The electronic section of the Governor had failed and defaulted to the mechanical section of the Governor.	EDG failed to start within normal parameters.	Capacitors and other electronic components were replaced.	
8214	S	1	0	0	10/24/1999	No - Discovered Condition	No	Yes	Secured	Discovered during non-demand observation	EDG Trouble Alarm annunciated for "EDG Not Ready for Emergency Start" and other similar conditions. Fuse Holders were found to be loose and non-conductive. This affected the DC Fuel Oil Pump.	Engine may not have started reliably	Fuse Clip holders replaced	
8399	R	0	0	1	1/29/2000	Yes	Yes	Yes	Loaded	Greater than 1 hour	EDG was manually tripped during Maintenance run due to #4L Link Pin Bushing damage which caused physical damage and vibrations. Engine ran for greater than 1 hour.	Engine would not have run loaded for for continued operation.	Link Pins and bearing supports repaired	This condition was unrelated to the planned maintenance on the EDG.
8416	R	0	0	1	3/23/2001	Yes	Yes	Yes	Loaded	Greater than 1 hour	An Oil Leak on the Turbocharger Lube Oil Piping required that EDG 2B be shutdown prior to the completion of the 24 hour run.	Engine was secured after being loaded for greater than 1 hour.	Leak was repaired	
8453	S	1	0	0	1/17/1999	No - Discovered Condition	No	Yes	Secured	Coincident with Alarm	"L.O. Temp Hi/Lo, Jacket Temp Hi/Lo Crankcase Press Hi/Lo" Alarm annunciated because the Lube Oil and Jacket Coolant Pumps were not running as required. Although the Breaker Door Handle/Switch indicated that the Breaker for these Loads were not tripped, the breaker was found to be tripped.	Engine may not have started reliably	Breaker door was repaired	

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8535	S	1	0	0	8/21/1999	No - Discovered Condition	No	Yes	Secured	Coincident with Alarm	"L.O. Temp Hi/Lo, Jacket Temp Hi/Lo Crankcase Press Hi/Lo" Alarm annunciated because the Standby Lube Oil Pump and Heater were not running as required. Pump and Heater was restarted locally and alarm cleared.	Engine may not have started reliably	Pump and Heater was restarted locally	
9098	S	1	0	0	5/5/2001	No - Discovered Condition	No	No	Secured	Coincident with Alarm	"LOW LUBE OIL TEMPERATURE" Alarm annunciated because the LO Standby Pump was found not running as required. The pump tripped on high motor current because it was mechanically bound	Engine may not have started reliably	Standby LO Pump was rebuilt	
9220	S	1	0	0	7/14/1999	Yes	Yes	Yes	Unloaded	Before breaker closure	Tachometer failed to indicate Div 1 D/G speed change when starting engine.	This condition would have prevented the DG from starting and loading.	Power Supplies for the Tachometer was replaced.	
9276	L	0	1	0	2/8/2001	Yes	Yes	Yes	Loaded	Less than 1 hour	The DIV II DG Tripped during a loaded run due to a fault. The Air Inlet valve inadvertently closed causing the engine to trip.	DG Tripped less than one hour after synchronising to the bus	Air Inlet Valve and Actuator repaired	
9684	S	1	0	0	3/4/1999	Yes	No	Yes	Unloaded	At the conclusion of the test run	STBY DG 21 Lube Oil Circ Pump did not Auto Start Following Surveillance Testing.	Condition could have affected the next start, however the condition was identified	Replaced starting relay	
11004	S	1	0	0	2/12/1999	No - Discovered Condition	No	Yes	Secured	Discovered during inspection	A loose diode on Div III Generator Exciter was found during inspection.	Generator may have been unavailable to provide power to the bus	Diode was re-torqued to proper specifications	
11010	S	1	0	0	1/26/1999	No - Discovered Condition	No	Yes	Secured	Discovered during maintenance	Three Relays were found outside their time delay range specifications. The Relays were Field Flash, Cranking Timer, and Jog Delay.	Engine may not have started reliably	Time delays for the relays were calibrated	
11022	S	1	0	0	3/7/1999	No - Failed Start Attempt	Yes	Yes	Secured	Prior to start	DG failed to start when 2 out of 3 Air Start Motors failed to engage when demanded. Problem with Air Start Solenoids prevented Air Start Motors from Engaging as required.	DG tripped after the 10 second time delay logic determined that engine was not running	Air Start Solenoids for the Air Start Motors were replaced	
11796	S	1	0	0	9/18/1999	Yes	Yes	Yes	Unloaded	Less than 1 hour	Bad Fuse connections caused EDG 103 Voltage Regulator to excite the Generator to only 3100 Volts instead of the 4100 Volts required.	EDG 103 was unavailable to provide power to its associated bus as required.	Fuses and Fuse Holders were replaced	
12187	L	0	1	0	3/15/2000	Yes	Yes	Yes	Loaded	Less than 1 hour	Div 1 DG was started for test when Voltage went to over 5kV instead of 4kV. A mispositioned Potential Transformer Fuse Carriage was discovered that caused the anomaly. The DG was tripped which resulted in a Dead Bus on SW101. Breaker was closed in on the bus.	DG was unavailable	Repaired PT assembly	
12652	R	0	0	1	11/25/1999	Yes	Yes	Yes	Loaded	Greater than 1 hour	DG tripped on High Crankcase Pressure during test run. Coolant leaking into the Crankcase through failed Lube Oil Cooler Welds vaporized causing high pressure.	Engine tripped from Loaded condition in greater than 1 hour. Engine was not readily available for restart	Lube Oil Cooler weld leaks repaired and coolant evacuated from crankcase	
12700	S	1	0	0	11/18/1999	Yes	Yes	No	Unloaded	Less than 1 hour	DG Surveillance Test aborted due to increase in Crankcase Pressure. The Crankcase Breather had a flow restriction and the Oil Level in the Sump was higher than normal. Both conditions contributed to high pressure.	DG was unavailable until corrective actions taken. DG was not loaded at the time.	Crankcase Breather Tube cleaned and oil level adjusted	

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12704	S	1	0	0	3/13/2000	Yes	Yes	Yes	Unloaded	Less than 1 hour	DG Failed to respond to Raise/Lower voltage demand from Volt Reg Norm/Stby Sel Switch. This caused to Voltage Regulator to fail as-is.	The Normal Voltage Controller was unavailable and it is unknown how this would affect Isochronous Operation	Control Switch Replaced	Assumed that the DG would not have been able to power bus
12705	L	0	1	0	5/26/2000	Yes	Yes	Yes	Loaded	Less than 1 hour	EDG Tripped after reaching rated speed and voltage due to a failed Circuit Board that falsely input a fuel rack differential trip.	DG Tripped less than 1 hour of loaded run. EDG was unavailable to provide emergency power	Circuit Board was replaced	
12707	S	1	0	0	10/29/2000	No - Discovered Condition	No	Yes	Secured	During Standby	EDG Conditioner Display failed while Engine in Standby. Discovered condition through normal plant rounds	DG was inoperable and would not function to provide power	Conditioner repaired	
12918	R	0	0	1	11/15/2000	No - Discovered Condition	No	Yes	Secured	Coincident with the engine barring	DG Engine Driven Jacket Water Pump Seal leak discovered during manual engine barring. Leak was minor, however engine was declared inoperable	DG would have been able to start, load, and run for several hours	Seal was replaced	Since engine would have run loaded for greater than 1 hour, run failure mode has been assumed.
13786	S	1	0	0	2/27/1999	Yes	Yes	Yes	Secured	Prior to Loading	EDG voltage went to 2kV after starting, then hesitated prior to reaching 4kV as required. Time to reach 4kV exceeded required 10 seconds. The problem was in the Field Flash Circuitry.	EDG was unavailable for power production	Trouble shooting and repair was performed on the Voltage Regulator.	
13807	L	0	1	0	9/10/1999	No - Discovered Condition	No	Yes	Secured	Discovered during operator rounds	52HG10 4kV Brkr to MCC 1G, 125 VDC control switch and red light lamp socket, found broken during operator round.	Would prevent EDG Breaker from closing on Bus. Also, if a seismic event had shorted out the lamp socket, it could have caused a loss of power to MCC 1G.	Replaced Lamp Socket, Control Switch, and Fuse	
13904	R	0	0	1	10/12/1999	Yes	Yes	Yes	Loaded	Greater than 1 hour	DG Output Breaker opened on Overcurrent during Loaded Test Run. Breaker opened 22 hours into 24 hour test run due to voltage regulator transformer becoming Grounded.	DG 2-1 failed Loaded Run Test	Transformer Replaced	
14089	L	0	1	0	12/31/1998	Yes	Yes	Yes	Loaded	Less than 1 hour	EDG Tripped on Overcurrent during routine Testing, from a loaded run. The Voltage Regulator was malfunctioning.	EDG tripped in less than one hour and was not available.	Voltage Regulator was repaired	
14116	S	1	0	0	5/19/1999	No - Discovered Condition	No	Yes	Secured	Discovered during a lube oil fill activity	EDG had a Lube Oil Leak at the Heat Exchanger Gasket	EDG was unavailable to run until leak was repaired	Leak Repaired	
14156	S	1	0	0	4/18/2000	Yes	Yes	Yes	Unloaded	Unknown	EDG Test Run was cut short due to a large Oil Leak at Cylinder 7R. The Engine was emergency shutdown.	DG Function was lost until it was repaired	Leak Repaired	
14169	S	1	0	0	8/6/2000	No - Discovered Condition	No	Yes	Secured	Discovery activity not specified	EDG Pre-Lube Pump was found in the OFF position and Lube Oil and Jacket Water Temps were Low out of Specification. This was due to a blown fuse in the Feeder Breaker	EDG may have started however it is not certain	Fuse replaced	
14540	S	1	0	0	2/23/2001	Yes	Yes	Yes	Unloaded	Discovered during EDG testing - output could not be increased above 920 RPM.	EDG could not be raised to full speed. Mechanical Governor needed adjustment.	Engine did not reach full speed and was not able to be loaded	Mechanical Governor required adjustment	
14756	L	0	1	0	3/6/2000	Yes	Yes	Yes	Loaded	Stated as ocurring during an "operability run"	DG Intercooler Temperatures rose out of specification due to TCV Disk Separated from Valve Stem.	Engine had to be shutdown	Repaired TCV	
15174	S	1	0	0	3/17/1999	No - Discovered Condition	No	Yes	Secured	Discovery activity not specified	Service Water Leak on elbow on Heat Exchanger Tube Side Vent Elbow. Pipe was found corroded.	DG was unavailable for operation	Minor through-wall leak. Repaired Leak	

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15227	S	1	0	0	11/1/2000	Yes	Yes	Yes	Running Unloaded	Less than 1 hour after engine start. The generator was not loaded	DG had to be shutdown due to High Crank Case Exhaust Pressure and Vibrations. In addition, smoke was reported in DG-1B building.	EDG was not loaded at the time of the trip	Engine had to be extensively rebuilt.	Engine was not available for start.
15228	L	0	1	0	12/1/2000	Yes	Yes	Yes	Loaded	Less than 1 hour after engine load	DG was recently rebuilt due to extensive damage. During its break-in runs engine had to be shutdown due to high d/p across lube oil strainer indicative of bearing failure.Bearing failure heating caused damage to multiple other components.	Engine was loaded for less than 1 hour when the damage occurred. Engine required complete rebuild.	Engine Rebuild.	Engine was not available for run.
15441	L	0	1	0	6/8/1999	Yes	Yes	Yes	Unloaded	Engine Running Unloaded	DG Output Breaker to 14 Bus Failed to Close. Breaker Trip Bar Misalignment prevented breaker operations. Breaker Frame had loose screws in C Phase Arc Chute	Breaker Failure prevented DG from loading bus. This is a Load Failure because the breaker was demanded to close but did not not close.	Breaker Rebuild	
15633	S	1	0	0	1/10/2001	Yes	Yes	Yes	Unloaded	Less than 1 hour run. Failed to Start because no voltage was developed	EDG failed to Develop Voltage after coming to rated speed during testing. Two shorted Diodes in the Rectifier Bridge	Although the engine started, the generator was unavailable to provide electrical power.	Rectifier Diodes were replaced	Failed to develop voltage therefore this is a Start Failure. The breaker never closed in on the Bus
15634	S	1	0	0	12/21/2000	Yes	Yes	Yes	Loaded	Instability in frequency occurred in less than an hour of operation, which is a failure to start.	Unstable Governor output caused DG to hunt and swing during unloading from load. Additionally, the DG experienced oscillations in load and speed during loaded operation and during unloaded operation	EDG was not available for loaded operation greater than one hour nor was it stable during unloaded operation therefore this is a failure to start	Governor modified	There were several run attempts that caused the DG load to oscillate prior to one our of loaded run.
15635	S	1	0	0	12/21/2000	Yes	Yes	Yes	Unloading	Instability in frequency occurred in less than an hour of operation, which is a failure to start.	Unstable Governor output caused DG to hunt and swing during unloaded, loading, and unloading operations. The cause was determined to be multifold including soldered joint connections and HVAC air flow interaction.	EDG was not reliably available to start.	Governor and HVAC system modified.	
15636	S	1	0	0	12/21/2000	Yes	Yes	Yes	Starting prior to loading	Less than 1 hour of starting the EDG prior to loading	EDG tripped on overspeed due to failed exciter diodes. The failed diodes prevented voltage from developing after field flash was applied.	EDG was not available to start.	Diodes were replaced.	
15973	S	1	0	0	1/12/1999	No - Discovered Condition	No - Taken out of standby	Yes	Secured	EDG was considered failed at time of discovery of red liquid on the floor near the breaker	EDG Feeder Breaker Current Transformer (CT) epoxy insulation liquified due to a known process.	EDG was taken out of service until CT was replaced	Replaced CT with a liquification resistant epoxy	EDG was assumed to be inoperable until CT repair was completed
16038	S	1	0	0	2/19/2001	Yes	Yes - Immediately on failure	Yes	Unknown	Less that one hour into run	Div I EDG Turbocharger Cooling Water Crack leaking and worsening as 24 hour run commenced.	Assumed that EDG was not loaded when failure necessitated engine shutdown	Leak Repaired	
16039	S	1	0	0	2/21/2001	Yes	Yes - Immediately on failure	Yes	Running Unloaded	Failure assumed to occur prior to loading EDG	Div 1 EDG Fuel Injector Plug developed a Fuel Leak. The leak was caused by an Injector Plug that became loosened.	EDG was immediately shutdown and taken out of service.	Leak Repaired	
16048	S	1	0	0	5/17/2001	No - Discovered Condition	No - Taken out of standby and Secured to prevent starting	Yes	Standby	Unknown - Assumed that the Valve manipulation at 0300, contributed to the leak.	Div 2 EDG Jacket Water Level was intentionally lowered. Later, the Low Jacket Water Tank Level Alarm annunciated. A crack was found in the Drain Valve Yoke Nut which caused the valve to leak through.	EDG was declared inoperable and removed from Standby. This failure would have prevented EDG from Starting.	Leak Repaired	
16141	S	1	0	0	1/10/1999	No - Discovered Condition	No - The EDG status was unknown	Yes	Standby	Failure occurred while EDG was in Standby.	EDG Control Power was inadvertently tagged out.	EDG was unavailable to start and run manually or automatically.	AC control power was restored	
16168	S	1	0	0	10/27/1999	No - Failed Start Attempt	Yes - Immediately on failure	Yes	Standby	Prior to EDG Start Demand	Air Start Motor failed to start EDG, which automatically shutdown during a start attempt, on Start Failure Lockout.	Although the Opposite Side Air Start Motor subsequently started the EDG, this engine was declared out of service. EDG was unavailable for starting	Air Start Motor was replaced	
16235	S	1	0	0	4/12/2001	No - Failed Start Attempt	Yes - Immediately on failure	Yes	During Start	Prior to EDG Start Demand	Rust scale blocking Air Start Pressure Control Valves in the Air Start System caused a failed start attempt on the EDG.	EDG was unavailable to start and run manually or automatically.	Strainers were installed in the system and procedures to clean them were adopted	
16689	S	1	0	0	8/18/2000	Yes	Yes	Yes	Starting prior to loading	Prior to start	EDG Tripped on Voltage Spike. Ground Relay Tripped due to a poor connection of the Potential Transformer primary side through a loose knife switch.	EDG was not available to start.	Replaced and tightened PT Stabs and Knife Switch connections	EDG did not achieve rated speed and voltage prior to engine trip
16691	S	1	0	0	10/13/2000	Yes	Yes	Yes	Starting prior to loading	Coincident to the EDG Trip when attempting to start	DG tripped due to a voltage spike when the K1 Relay contacts failed. DG A Normal Voltage Regulator swapped to Standby Voltage Regulator while engine was being started.	EDG was not available to start. EDG was being tested subsequent to maintenance to replace the SCRs	Replaced K1 Contactors	

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Failure ID	Recommended EDG Failure Mode	Start	Load	Run	Discovery Date	EDG Running	EDG Secured as Result of Failure	Failure Time Ided	Status on Discovery Secured/ Loaded/ Unloading	Failure Time	Failure Description	Impact	Corrective Action	Comment
16815	S	1	0	0	9/25/1999	No - Discovered Condition	No	Yes	Standby	Upon discovery of the lifted Air Dryer RV.	EDG declared inoperable based on Air Starting System Pressure <165psi. The Right Bank Air Dryer Relief Valve was relieving continuously bringing the air pressure to 150 psig. The Left Bank Compressor was inoperable for a motor replacement.	EDG was not available to start.	The Right Bank Air Dryer was manually by-passed and isolated. This restored starting air pressure but did not cause the EDG from being declared Operable.	This Starting Air System failure rendered the EDG unable to start.
16817	S	1	0	0	11/7/1999	Yes	Yes - Immediately on failure	Yes	Starting prior to loading	Immediate - prior to achieving 900 RPM during fast speed start.	EDG Control Power Ground occurred on the +48 VDC Bus preventing it to achieve 900 RPM during fast speed start. EDG was shutdown immediately thereafter. Troubleshooting found that the Field Flash Relay and Field Flash Cutout Relay needed replacement.	EDG failed to start within normal parameters.	The Field Flash and Cutout Relays were replaced.	
16821	S	1	0	0	3/10/2000	Yes	No - The EDG was continued to operate to carry the Bus Load, at a diminished capacity	Yes	Unloaded	Unknown - Condition existed prior to engine run	EDG Governor failed to bring speed up to rated Frequency during testing and prior to loading. After loading with the low frequency, the normal Bus Feeder Breaker Tripped. The breaker tripped prior to 1 hour of loaded operation.	The licensee decided to continue the test with the low frequency condition. After they loaded the engine the normal bus feeder breaker tripped due to EDG load swings. This condition is a Failure to Start because the rated Frequency was not satisfactorilly achieved.	Governor was repaired.	INL evaluated this as a Run Failure. This is a Start Failure because although the licensee Loaded the EDG with the faulted Governor, causing a subsequent transient, the EDG did not meet start criteria.
17391	S	1	0	0	3/1/1999	Yes	Yes	Yes	Unloaded	During loaded run	DG failed to maintain Frequency during the 18 Month Surveillance due to a bad Governor Resistor.	DG failed to load	All DG Governors at Watts Bar have been replaced to those that do not require this component.	One sentence description. The frequency swings implies that the EDG is not paralled
17428	S	1	0	0	9/8/1999	No - Maintenance Induced	No	Yes	Standby	Occurred coincident with maintenance activity on intake damper that resulted in EDG lockout	EDG Annunciators for "Crankcase Pressure HI" and DG Auto Start Locked Out" came in, in response to work being performed on the Room Ventilation Dampers. When an HVAC Damper failed shut, it caused a vacuum in the room, which actuated the Crankcase Pressure Switch Trip	The EDG was in Standby at the time of the lockout. The lockout prevented the EDG from starting if a demand signal came in. Therefore, the EDG would not have been able to start, load, and run if demanded.	HVAC equipment was repaired	Although this issue is related to room ventilation, the engine would not be able to perform its mission to to the vacuum in room.
17508	L	0	1	0	5/16/2001	Yes	Yes	Yes	Assumed that the EDG was running unloaded at the time, because breaker was taken to trip	Assuming EDG 1A-A was in operation at the time that the Breaker was taken to the Trip Position - Failure occurred coincident with breaker operation. Breaker was in degraded condition for an Unknown ammount of time when the Charging Spring Motor was installed incorrectly	EDG Spring Charging Motor was installed incorrectly which caused the breaker to remain Closed when its Hand Switch was taken to Trip Position, during a test. A new style Spring Charging Motor should have had a spacer installed, about which no vendor instructions were provided.	EDG would not have been available to load if a demand signal was present. This condition is considered a Start Failure because the Breaker would malfunction.	Installed Breaker Spring Charging Motors correctly	This is a Load Failure because it is not assured that the Breaker would close in on the Bus
17671	S	1	0	0	8/29/2000	Yes	No	Yes	Unloading from Loaded Ru	Greater than 1 hour of loaded operation, however the failure did not prevent the Loaded Run.	EDG tripped on Volts/Hertz at the time the Generator was being Unloaded and the Breaker opened. This caused a Breaker Lockout. The 5B Relay was found to be defective. This relay malfunction would have prevented future EDG Starts	The EDG would have not been available to Start	5B Relay was replaced	This event would prevent DG subsequent starts. This relay failure would not have prevented the EDG from continuing to run.
17678	L	0	1	0	12/20/2000	Yes	Yes	Yes	Loaded	Less than 1 hour of Loaded Operation	EDG Tripped during manual loading. When the EDG was synchronized, it immediately accepted 4MW and tripped when the operator attempted to reduce load. The UPR in the Governor was determined to have high resistance in the contacts	This is a Load Failure because the EDG was loaded when it tripped.	The Governor was subsequently modified	
18067	S	1	0	0	4/4/2000	No - Failed Start Attempt	Yes	Yes	starting from standby	During Start from Standby	EDG failed to Start on LOOP to its associated bus. A piston was found hydraulically locked and filled with oil.	EDG Failed to start on valid demand signal	None specified	
18074	S	1	0	0	6/22/2000	No - Discovered Condition	No - Taken out of standby and Secured to prevent starting	Yes	Standby	Coincident with Breaker Trip	EDG Trouble Alarm annunciated because Brkr 1-EE-BKR-1J1-1-G2 had tripped and MCC 1J1-A became De-Energized. The cause of the De-Energized MCC was that a Load, 1-HV-F-22C Motor in the HVAC System, failed and drew large amount of current. A breaker problem caused the entire MCC that feeds power to the 1J EDG to become De-Energized.	This condition would have prevented the DG from starting and loading.	Replaced the HVAC Motor	Protective tripping failed to prevent the lost of MCC which resulted in failure of the EDG.

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Failure ID	Recommended EDG Failure Mode	Start	Load	Run	Discovery Date	EDG Running	EDG Secured as Result of Failure	Failure Time Ided	Status on Discovery Secured/ Loaded/ Unloading	Failure Time	Failure Description	Impact	Corrective Action	Comment
18730	R	0	0	1	4/15/2000	No - Discovered Condition	No	No	Standby	Coincident with the out of specification operation	A Failed resistor caused the EDG Battery Charger output to go to 147 VDC and 28 Amps, which is greater than specifications.	For this event it is assumed that the Battery Charger is necessary for the long term operation of the EDG. The event does not describe the function of the Battery therefore it is conservatively assumed that it is used for Control Power. The EDG would start as required with the battery charger failure, however, it would not continue to Run as the battery charger is unavailable.	Resistor in the Battery Charger was replaced	This event is assumed to be a Failure to Run
18750	S	1	0	0	8/22/2000	Yes	Yes	No	Standby	EDG at 820 RPM	EDG found running with Mechanical Overspeed Lever in the Actuated Position during Surveillance Test. Breaker was also found tripped open.	EDG would not have been able to start and carry load if required.	Overspeed Trip assembly was repaired	
19195	S	1	0	0	7/24/1999		No - Taken out of standby and Secured to prevent starting	Yes	Standby	Coincident with Alarm with EDG in Standby	EDG Air Start System Flexible Hose Split, causing Air Receivers to lose pressure. "Starting Air Pressure Low" Alarm annunciated.	EDG was unavailable to start.	Hoses were replaced	Air Receivers lost air pressure during this event.
19198	S	1	0	0	11/11/1999	Yes	Yes	Yes	Unloading	Unknown - The wiring condition was degraded over time	EDG Output Breaker failed to Open at conclusion of Surveillance Test. Breaker had to be opened Locally. Problems occurred in Switch Wiring.	This event is conservatively evaluated as a Start Failure because it is not apparent whether the Breaker Wiring Problem would have allowed Breaker to Close as required.	Switch Rewired	Unclear as to whether this breaker would close in future demands. Assumed to be a failure to start.
19314	S	1	0	0	3/16/1999	Yes	Yes	Yes	Starting from standby	Prior to start	EDG failed to Flash the Generator field during Surveillance Test Auto-Start. Control Power fuses were found to be blown.	EDG experienced a Start Failure because it could not provide power to its associated bus.	Fuses Replaced	
19386	R	0	0	1	2/11/2000	No - Discovered Condition	No - Taken out of standby and Secured to prevent starting	Yes	Standby	Unknown - The leaking Seal was degrading over time when it was determined that it passed the threshold for operability	EDG Jacket Water Pump Mechanical Seal was discovered to be degraded and leaking during Preventive Maintenance Activities. Subsequent analysis determined that the Engine would not be able meet its 7 day Run requirement.	Engine would have not met its 7 day Run Time, therefore this is a Run Failure	Seal was replaced	Licensee determined that the Leakage would have exceeded the makeup capacity of the Jacket Water Head Tank
19387	S	1	0	0	6/7/2000	No - Discovered Condition	No - DG was in Maintenance	Yes	Secured for Maintenance	Unknown - Bearing was degrading over period of time.	Diesel Lube Oil Keep Warm Pump tripped during standby operation. It was found to have a Failed Outboard Bearing during Troubleshooting Activities, due to improper grease. A Bearing Sleeve was found to block the grease path to the bearing internals.	This event is conservatively evaluated as a Start Failure because it is not apparent whether the loss of Lube Oil Prelube would have prevented the engine to start successfully.	Bearing was re-fit with a proper Rotor Sleeve that would allow grease passage to the bearing internals.	Fairbanks Morse engines typically use Lube Oil Pressure to avoid a start failure. The engine also requires initial oil pressure to protect the most remote bearings from damage during start.
19505	S	1	0	0	8/11/2000	No - Discovered Condition	No- DG was in Maintenance	Yes	Secured for Maintenance	Unknown - Bearing was degrading over period of time.	EDG had excessive Wrist Pin Bearing Wear as found by vendor recommended routine Lube Oil Analysis.	This event is conservatively evaluated as a Start Failure because bad wrist pin bearings could have affected engine starting.	Engine was rebuilt.	
19815	S	1	0	0	6/1/2001	No - Failed Start Attempt	Yes	Yes	starting from standby	Prior to EDG Start Demand	EDG failed to start during testing due to failed UV initiation Relay. Relay and its contacts were in a degraded condition.	This event is a Start Failure	Relays were replaced	
20019	L	0	1	0	3/15/2001	Yes	Yes	No	Unloading	Breaker closed satisfactorilly 30 days prior to this Test	DG was being shutdown from a Surveillance run. DG output breaker was taken to Open, however, "Bus 6 from D/G B breaker 1-603 Closed" alarm was annunciating. This alarm should have cleared when the breaker was open. It was found that Breaker linkage was disconnected such that the breaker was no longer operable.	This event was conservatively evaluated as a Start Failure because the disconnected linkage could have prevented closure of the breaker.	Breaker Linkage Cotter Pins needed to be replaced and bent correctly.	
20031	S	1	0	0	4/10/2001	Yes	Yes	Yes	Running Unloaded	Less than 1 hour from Starting	During Test, EDG failed to develop Voltage, however, its Output Breaker Closed as expected. This caused a LOOP on the associated bus, which caused the EDG to run without Cooling Water for 10 minutes prior to shutting down the EDG. The K1 Relay failed to Open to allow the Generator to build up voltage.	As the EDG failed to develop the propoer voltage, it is assumed to be a start failure.	The K1 Relay was repaired. The EDG was checked for damage.	
20127	L	0	1	0	10/29/2000	Yes	Yes	No	Loaded	Less than 1 hour after loading	EDG Voltage and VARS were unable to be controlled upon connecting the generator to its associated Bus. Failure attributed to malfunctioning Auto Voltage Regulator Circuit Board.	This is a Load Failure because the EDG was loaded when it was shutdown	Auto Voltage Circuit Board was replaced	

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Failure ID	Recommended EDG Failure Mode	Start	Load	Run	Discovery Date	EDG Running	EDG Secured as Result of Failure	Failure Time Ided	Status on Discovery Secured/ Loaded/ Unloading	Failure Time	Failure Description	Impact	Corrective Action	Comment
20225	L	0	1	0	8/7/2001	Yes	Yes	Yes	Unloaded	Less than 1 hour after starting	DG Breaker to Bus 17 failed to Close during Test due to excess play in Breaker Mechanism.	This is a Start Failure	Repaired Breaker	
20392	L	0	1	0	8/8/2001	Yes	Unknown	No	Loaded	Breaker Closed - Actual Time Unknown	EDG failed to respond to Voltage Regulator Manual Control during Loaded Operation. VAR loading dropped without adjustment and would not respond to Control Board signal adjustment.	This event is a Load Failure because the Voltage Regulator failed while paralelled.	Unknown	This event was assumed to have occurred prior to one hour of loaded operation
20393	L	0	1	0	8/13/2001	Yes	Unknown	No	Loaded	Breaker Closed - Actual Time Unknown	EDG failed to respond to Voltage Regulator Manual Control during Loaded Operation. VAR loading dropped without adjustment and would not respond to Control Board signal adjustment.	This event is a Load Failure because the Voltage Regulator failed while paralelled.	Unknown	This event was assumed to have occurred prior to one hour of loaded operation
20404	S	1	0	0	8/8/2001		Unknown	No	Unloading	After completion of the surveillance run	EDG experienced spurious annunciation for Oil Pressure, Low Water Pressure, and Overspeed after generator after successful completion of test. A faulted LWD Relay was most likely the cause.	A relay failed. It is assumed that the annunciation is tied with actuation of the trips, therefore EDG unavailable when the faulted relay occurred. The EDG would have been unavailable for Starting after this event.	Relays were replaced	This is assumed to be a failure during Unloading.
20440	S	1	0	0	5/9/2001	Yes	Yes	Yes	Unloaded	Less than 1 hour of starting the EDG prior to loading	EDG failed to develop Voltage due to malfunction in the K1 Relay.	This is a failure to Start because the generator was not able to energize the bus	K1 relay was replaced	
20441	S	1	0	0	8/1/2001	Yes	Yes	Yes	Unloaded	Less than 1 hour of starting the EDG prior to loading	EDG failed to stabilize its Frequency output while running unloaded during a test.	This is a Start Failure	Governor was repaired	
20522	L	0	1	0	10/8/2001	Yes	Yes	Yes	Loaded	Less than 1 hour of Loaded Operation	EDG was Loaded when a Trouble Alarm annunciated that was caused by lowering Jacket Water Head Tank Level. A Leak from the Jacket Water Pump Seal was found. The Engine ran for 42 minutes of its one hour run.	This is a Load Failure because the EDG would not have completed one hour of Loaded Operation.	Mechanical Seal was replaced	
20578	S	1	0	0	4/26/2000	No - Failed Start Attempt	Yes	Yes	Starting from standby	Immediately upon start attempt	EDG failed to start following repairs to the Fuel Oil Filter System. Fuel Oil Sediment stirred up in the Fuel Oil Tank prevented the successful start. The sediment was stirred up from Maintenance Activities.	EDG was unavailable to start and run manually or automatically.	Sediment was removed from components and cleaned. Evaluated as indirectly related to the maintenance activity and therefore considered a failure.	
21305	R	0	0	1	10/8/2001	Yes	Yes	Yes	Loaded	Greater than one hour of loaded operation	DG Monthly Test was terminated after 1.5 hours of loaded operation because of noise coming from a cylinder and high exhaust temperature. Engine was found to have failed exhaust valve seat inserts.	EDG did not run because it was unable to carry full load after 1 hour.	Engine was rebuilt.	
21317	S	1	0	0	10/21/2001	No - Discovered Condition	No	Yes	Starting from standby	Prior to start - during baring operation	DG Control Power to its logic circuitry was lost during testing. Engine may have not been running at the time, however, it was being prepared for an operations test. Failure occurred when an operator changed a lamp, which shorted inside the lamp receptacle. This in turn caused a control power Fuse to blow.	DG became unavailable and had to be secured. Further, this failure affected the ability for restart, until the control power was restored and components reset.	Short was cleared, fuses replaced, and components were reset.	It is assumed that DG4 was being prepared for an Operations Run when the Fuse Blew.
21322	L	0	1	0	12/13/2001	Yes	Yes	Yes	Starting from standby	Less than one hour after breaker closure	Although, DG connected to its bus in the required time during an Operations Test, it immediately lost voltage. This failure occured during the ESF Bus during LOOP with ESF Test. The DG did not develop rated Voltage as desired during its starting cycle. A failed Exciter was identified.	DG was unavailable to Load and Run.	Exciter repaired	
21374	L	0	1	0	7/31/2001	Yes	Yes	Yes	Loaded	Less than one hour after breaker closure	During Operations Test of EDG A, the Voltage dipped 2 minutes and 30 seconds after Breaker Closure. A failure on the Voltage Regulator was identified.	The engine was secured for repair. EDG A would not have been able to Load.	Voltage Regulator was repaired	
21581	S	1	0	0	10/17/2001	No - Failed Start Attempt	Yes	No	Starting for Test	Prior to start	EDG failed to start on Test Signal simulating UV and SI. The EDG went through 3 cranking cycles without a successful start. This left the 1H Emergency Bus de-energized. The EDG's Governor Load Limit was found to be mispositioned. There were further complications with the EDG.	The EDG failed to Start.	The governor was adjusted and a jacket water leak was repaired.	

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Failure ID	Recommended EDG Failure Mode	Start	Load	Run	Discovery Date	EDG Running	EDG Secured as Result of Failure	Failure Time Ided	Status on Discovery Secured/ Loaded/ Unloading	Failure Time	Failure Description	Impact	Corrective Action	Comment
21616	L	0	1	0	9/16/2001	Yes	Yes	Yes	Unloaded	While attempting to close breaker	25H3 Breaker to 2H Emergency Bus from EDG failed to close while attempting to parallel. An internal Breaker Failure prevented Closure.	The breaker would not have been able to be closed as required to load the EDG. Therefore, this is a Load Failure.	The Breaker, Synch Switch, and Control Switch was replaced.	
21693	L	0	1	0	7/9/2001	Yes	Yes	Yes	Starting from standby	Less than one hour after breaker closure	EDG shut down from Testing due to Exhauast Leaks. A failed exhaust gasket blew out of the manifold and prevented Turbocharger Operation. This condition rendered the EDG inoperable.	EDG was not available to load	Repaired Exhaust Leaks	
21695	S	1	0	0	10/20/2001	Yes	Yes	No	Running Unloaded	Prior to Loading	EDG "Lube Oil Reservoir" Alarm annunciated shortly after it was started for a test. Oil was observed coming from the Vent on the Reservoir and water was visible in the Sightglass. Engine was shutdown. Water was leaking into the Lube Oil Reservoir from a Jacket Water Leak. This occurred prior to paralleling the EDG with the Bus.	EDG was not available for Starting because the EDG Output Breaker was not yet closed.	Repaired Leak	
21782	S	1	0	0	12/26/2001	No - Discovered Condition	No	Yes	Standby	Discovered during non-demand observation	EDG Output Breaker Closing Spring not Charged causing the EDG to be inoperable.	EDG was unavailable for subsequent load. Closing Springs should automatically Charge when breaker is racked up. EDG would Start but not Load.	Breaker Repaired	With Breaker Closing Spring not charged, EDG can NOT carry the bus.
21912	L	0	1	0	10/16/2001	Yes	Yes	Yes	Loaded	Less than one hour of loaded operation	Speed Switch failed on EDG Start which caused its tripping on Reverse Power. The EDG was loaded for a short period of time prior to the tirp.	Failure to Load.	Speed Switches were replaced	
22001	S	1	0	0	6/21/2001	No - Discovered Condition	No	Yes	Standby	Discovered during non-demand observation	EDG Speed Switch was found with loose screws while EDG was in Standby. When touched, the Overspeed Trip, locked out the Engine which became unavailable for Starting.	Engine was unable to Start	Speed Switch was repaired	
22561	L	0	1	0	10/17/2001	Yes	Yes	Yes	Loaded	Less than one hour of loaded operation	EDG experienced Water/Oil Mixture coming out of Crankcase Air Box Drain during a Test Run. The Test was halted. A failed Plug was found on Cylinder #19.	This is a Failure to Load because the Test was secured prior to one hour of loaded operation.	Plug on Cylinder 19 was replaced	
22573	S	1	0	0	11/17/2001	No - Failed Start Attempt	Yes - for repair	Yes	Starting from standby	Starting from Standby	EDG failed to start during Testing due to failed START Relay 1. STR 1 did not allow Air Start Solenoid to Energize.	This is a Start Failure	STR1 was replaced.	
22583	L	0	1	0	10/17/2001	Yes	Yes	Yes	Loaded	Less than one hour of loaded operation	EDG had to be shutdown during loaded testing due to noise coming from the Scavenging Air System. Test was aborted prior to one hour of loaded operation. Fuel Rack was also found to be hunting.	This is a Load Failure	Found several mechanical problems and repaired	
23557	L	0	1	0	12/11/2001	Yes	No	Yes	Loaded	Less than one hour of loaded operation	EDG loaded but needed to be shutdown due to a Governor Oil Leak	EDG failed to Load	Oil Leak was repaired	This is a Failure to Load
23699	L	0	1	0	11/28/2001	Yes	Yes - for repair	Yes	Loaded	Less than one hour of loaded operation	EDG tripped due to High Crankcase Pressure during Monthly Test. EDG was Loaded for Less than one hour.	This is a Failure to Load because the Test was secured prior to one hour of loaded operation.	Cause of the Crankcase pressure was repaired after extensive troubleshooting.	
24139	S	1	0	0	10/30/2001	Yes	Yes - Tripped	Yes	Running Unloaded	Running Unloaded	EDG Tripped on Low Jacket Cooling Water Pressure, during Testing. Cause was valve mispositioning error. The JW Cooling Headtank isolation Valve was closed and should have been open.	This is a Start Failure as the EDG was not yet Paralleled to the Bus. The licensee stated that no power was lost.	Conducted investigation to the cause of the Valve Mispositioning Event	
24659	L	0	1	0	12/26/2001			Yes	Loaded	Less than 1 hour of Loaded Operation	0EDG Locked Out on Low Lube Oil Pressure even though adequate oil pressure existed. Tubing was inadequate to transmit the pressure to Pressure Switch.	EDG failed to Load	Installed Larger Tubing	
24702	S	1	0	0	12/11/2001	No - Discovered Condition	No	Yes	Standby	Discovered during non-demand observation	Malfunctioning Speed Switch caused Overspeed Trip Signal with EDG in Standby.	This is a Start Failure	Replaced Speed Switch	
26533	R	0	0	1	5/1/2001	Yes	Yes	No	Loaded	Greater than 1 hour of Loaded Operation	EDG Fuel Oil Day Tank Level was Low, during EDG Endurance Run. Fuel Oil Transfer Pump malfunctioned causing Low level in Day Tank. Pump had a Failed RV.	EDG would not have been able to Run over one hour of loaded operation with the Failed Transfer Pump	FOTP was repaired.	Day Tank Level was dropping 4" per hour. Day Tank had 25" in it when test started. EDG would not have been able to run for greater than 4 hours

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27306	L	0	1	0	4/15/2000	Yes	Yes	Yes	Loaded	Less than 1 hour of Loaded Operation	While Operating EDG For Surveillance Testing an acrid burning odor coming from the EDO control panel was detected. The Linear Reactor in the Exciter circuit was found grounded. Although this did not cause any operation problems, the degraded condition of the Reactor caused operations to shut down the engine.	This is a Load Failure because the engine was shutdown in less than one hour of loaded operation.	Repaired Linear Reactor	
27924	L	0	1	0	6/2/2000	Yes	Yes	Yes	Loaded	Less than 1 hour of Loaded Operation	EDG Tripped on Low Jacket Coolant Pressure in the first 20 minutes of loaded run. The test was an endurance run. A failed Jacket Water Coolant pump seal was identified	Engine was unavailable for Loading and Running	Replaced JW Cooling Pump	
28504	R	0	0	1	10/31/2000	Yes	Yes	Yes	Loaded	Greater than 1 hour of Loaded Operation	EDG surveillance run had to be terminated after several hours of operation due to high Lube Oil Strainer Differential Pressure. Unusual amounts of Lube Oil Debris were identified due to engine cylinder and piston wear in excess of what was expected.	Engine would not have been available for Running. This is assumed because of the Piston and Cylinder damage, not the Lube Oil Strainer DP.	Unknown	Assumed that Operators could swap Lube Oil Strainers during Engine Run. In this case, EDG could run longer.
29130	S	1	0	0	8/8/2001	Yes	Yes	Yes	Running Unloaded	Coincident with EDG Start	EDG started for no apparent reason. There was an problem in the Control Relay Panel.	Assuming that the failure affected the Start Logic, this event is conservatively evaluated as a Start Failure	Unknown	Assuming that this event is a Start Failure due to lack of detailed information and that it affected the Starting Logic.
34546	L	0	1	0	12/14/1999	No - Discovered Condition	No	Yes	Standby	Discovered during non-demand observation	Prior to Running, EDG was found with a broken Bearing Bullseye Oil Detector. Test was post-poned until after maintenance.	This would have prevented the EDG from operating for an extended period. Therefore, this is conservatively identified as a Load Failure	Bullseye was repaired	
34586	S	1	0	0	11/13/2001	No - Failed Start Attempt	Yes	Yes	Starting from standby	Coincident with the Start Signal	EDG failed to start from Local Control. The Time Delay relays were found with tight tolerances incompatible with actual engine performance requirements.	Start Failure	Time delays for the relays were calibrated	
37226	S	1	0	0	11/14/2000	No - Discovered Condition	No	No	Secured for Maintenance	Discovered during maintenance that jacket water had leaded into the lube oil	EDG Jacket Water Leaked into Lube Oil. Leakage was from the Lube Oil Ht Exchanger Floating Packing Head Connection. Significant amount of water was found in Lube Oil. This condition was identified during routine Maintenance.	Significant Damage could have ocurred if EDG was ran. This is a start faiure.	Heat Exchanger was rebuilt.	It is assumed that the Maintenance Activities were unrelated to repairing the Heat Exchanger.
37310	R	0	0	1	5/9/2001	Yes	Yes	Yes	Loaded	Coincident with EDG Run	DG was prematurely shutdown due to increasing crankcase pressure prior to it reaching the trip set-point. Causes of the hi-crankcase pressure include a change in Fuel Oil type and Lube Oil Problems.	The DG would not have been able to Run. It is assumed that the DG ran loaded for greater than 1 hour.	Investigation inconclusive	

EDG FOTP Lumped/Separate Sensitivities

Input										Results						Lumped Improvement	
Case	Description	Train Birnbaum	EDG Run Hours	EDG Mission Time	EDG Demands	EDG FTL Demands	FOTP Demands	FOTP FTS	FOTP demands / mission	P(G)/(G)	P(W)/(G)	P(Y)/(G)	P(G)/(W)	P(W)/(W)	P(Y)/(W)	P(G)/P(G) Sep-Lumped	P(G)/P(W) Sep-Lumped
1a	Lumped x16 Mid	5.00E-05	105	8	69	69	210	1.90E-03	16	91%	9%	0%	61%	39%	0%	-9%	38%
1b	Separate x16 Mid	5.00E-05	105	8	69	69	210	1.90E-03	16	99%	1%	0%	99%	1%	0%		
2a	Lumped x16 WY	5.00E-05	105	8	69	69	210	1.90E-03	16	91%	9%	0%	18%	82%	0%	-9%	78%
2b	Separate x16 WY	5.00E-05	105	8	69	69	210	1.90E-03	16	99%	1%	0%	96%	4%	0%		
3a	Lumped x1 Mid	5.00E-05	105	8	69	69	210	1.90E-03	1	98%	2%	0%	5%	95%	0%	-2%	66%
3b	Separate x1 Mid	5.00E-05	105	8	69	69	210	1.90E-03	1	99%	1%	0%	71%	29%	0%		
4a	Lumped x1 WY	5.00E-05	105	8	69	69	210	1.90E-03	1	98%	2%	0%	0%	89%	11%	-2%	1%
4b	Separate x1 WY	5.00E-05	105	8	69	69	210	1.90E-03	1	99%	1%	0%	1%	99%	0%		
5a	Lumped x2 Mid	5.00E-05	105	8	69	69	210	1.90E-03	2	91%	9%	0%	1%	99%	0%	-8%	67%
5b	Separate x2 Mid	5.00E-05	105	8	69	69	210	1.90E-03	2	99%	1%	0%	67%	33%	0%		
6a	Lumped x2 WY	5.00E-05	105	8	69	69	210	1.90E-03	2	91%	9%	0%	0%	23%	77%	-8%	0%
6b	Separate x2 WY	5.00E-05	105	8	69	69	210	1.90E-03	2	99%	1%	0%	0%	100%	0%		
7a	Lumped x1 Mid	5.00E-05	105	8	69	69	138	1.90E-03	2	95%	5%	0%	5%	95%	0%	-5%	77%
7b	Separate x1 Mid	5.00E-05	105	8	69	69	138	1.90E-03	2	99%	1%	0%	82%	18%	0%		
8a	Lumped x1 WY	5.00E-05	105	8	69	69	138	1.90E-03	2	95%	5%	0%	0%	87%	13%	-5%	3%
8b	Separate x1 WY	5.00E-05	105	8	69	69	138	1.90E-03	2	99%	1%	0%	3%	97%	0%		
9a	Lumped x1 Mid	5.00E-05	100	8	69	69	68	1.90E-03	1	97%	3%	0%	5%	95%	0%	-2%	66%
9b	Separate x1 Mid	5.00E-05	100	8	69	69	68	1.90E-03	1	99%	1%	0%	72%	28%	0%		
10a	Lumped x1 WY	5.00E-05	100	8	69	69	68	1.90E-03	1	97%	3%	0%	0%	90%	10%	-2%	1%
10b	Separate x1 WY	5.00E-05	100	8	69	69	68	1.90E-03	1	99%	1%	0%	1%	99%	0%		
11a	Lumped x1 Mid	1.00E-04	100	8	69	69	68	1.90E-03	1	80%	20%	0%	9%	91%	0%	-7%	52%
11b	Separate x1 Mid	1.00E-04	100	8	69	69	68	1.90E-03	1	87%	13%	0%	61%	39%	0%		
12a	Lumped x1 WY	1.00E-04	100	8	69	69	68	1.90E-03	1	80%	20%	0%	0%	79%	20%	-7%	5%
12b	Separate x1 WY	1.00E-04	100	8	69	69	68	1.90E-03	1	87%	13%	0%	5%	95%	0%		
13a	Lumped x1 Mid	1.00E-06	100	8	69	69	68	1.90E-03	1	100%	0%	0%					
13b	Separate x1 Mid	1.00E-06	100	8	69	69	68	1.90E-03	1	100%	0%	0%					
14a	Lumped x1 WY	1.00E-06	100	8	69	69	68	1.90E-03	1	100%	0%	0%					
14b	Separate x1 WY	1.00E-06	100	8	69	69	68	1.90E-03	1	100%	0%	0%					
15a	Lumped x1 Mid	2.50E-05	100	8	69	69	68	1.90E-03	1	100%	0%	0%	2%	98%	0%	0%	85%
15b	Separate x1 Mid	2.50E-05	100	8	69	69	68	1.90E-03	1	100%	0%	0%	87%	13%	0%		
16a	Lumped x1 WY	2.50E-05	100	8	69	69	68	1.90E-03	1	100%	0%	0%	0%	99%	1%	0%	0%
16b	Separate x1 WY	2.50E-05	100	8	69	69	68	1.90E-03	1	100%	0%	0%	0%	100%	0%		
17a	Lumped x3 Mid	5.00E-05	100	8	68	68	204	1.90E-03	3	90%	10%	0%	4%	96%	0%	-9%	84%
17b	Separate x3 Mid	5.00E-05	100	8	68	68	204	1.90E-03	3	99%	1%	0%	89%	11%	0%		
18a	Lumped x3 WY	5.00E-05	100	8	68	68	204	1.90E-03	3	90%	10%	0%	0%	86%	14%	-9%	7%
18b	Separate x3 WY	5.00E-05	100	8	68	68	204	1.90E-03	3	99%	1%	0%	7%	93%	0%		
19a	Lumped x5 Mid	5.00E-05	100	24	68	68	204	1.90E-03	5	63%	37%	0%	5%	91%	4%	-30%	86%
19b	Separate x5 Mid	5.00E-05	100	24	68	68	204	1.90E-03	5	92%	8%	0%	91%	9%	0%		
20a	Lumped x5 WY	5.00E-05	100	24	68	68	204	1.90E-03	5	63%	37%	0%	0%	23%	77%	-29%	49%
20b	Separate x5 WY	5.00E-05	100	24	68	68	204	1.90E-03	5	92%	8%	0%	49%	51%	0%		
21a	Lumped x11 Mid	5.00E-05	100	24	68	68	204	1.90E-03	11	63%	37%	0%	19%	81%	0%	-29%	73%
21b	Separate x11 Mid	5.00E-05	100	24	68	68	204	1.90E-03	11	92%	8%	0%	92%	8%	0%		
22a	Lumped x11 WY	5.00E-05	100	24	68	68	204	1.90E-03	11	63%	37%	0%	2%	84%	14%	-30%	87%
22b	Separate x11 WY	5.00E-05	100	24	68	68	204	1.90E-03	11	92%	8%	0%	88%	12%	0%		

EDG Success Data

DeviceID	Test Start Demands	Operation Start Demands	Total Start Demands	Avg Starts / Month	Test Load Demands	Operation Load Demands	Total Load Demands	Avg Load Run / Start	Test Run Hours	Operation Run Hours	Total Run Hours	Run - Load Run Hours	Comments
28468	42	4	46	1.3	61	4	65	1.5	153.45	7.61	161.06	96.06	Actual
92	38	5	43	1.2	59	5	64	1.6	193.31	8.26	201.57	137.57	Actual
30727	60		60	1.7	50		50	0.8	124.01		124.01	74.01	Actual
54598	51		51	1.4	44		44	0.9	109.52		109.52	65.52	Actual
64497	46		46	1.3	44		44	1.0	69		69	25	Actual
64832	49		49	1.4	46		46	0.9	72		72	26	Actual
70252	47	2	49	1.4	45	1	46	1.0	70.5	20	90.5	44.5	Actual
71036	43		43	1.2	41		41	1.0	64.5		64.5	23.5	Actual
75429	36	22	58	1.6	42	24	66	1.2	148.71	96.82	245.53	179.53	No Load Run data recorded for 1999 - 2001. Used 200301 - 200512,
75430	37.43	32	69.43	1.9	44	26	70	1.2	121.22	121.16	242.38	172.38	No Load Run data recorded for 1999 - 2001. Used 200301 - 200512,
103913	47.47	30	77.47	2.2	43	24	67	0.9	143.46	123.68	267.14	200.14	No Load Run data recorded for 1999 - 2001. Used 200301 - 200512,
103804	62.64	28	90.64	2.5	43	18	61	0.7	102.11	134.58	236.69	175.69	Actual
124217	56		56	1.6	46		46	0.8	95		95	49	Estimated per 36 months - effective 200201
920861	53		53	1.5	45		45	0.8	88.4		88.4	43.4	Estimated per 36 months - effective 200201
124306	57		57	1.6	44		44	0.8	94.6		94.6	50.6	Estimated per 36 months - effective 200201
124307	54		54	1.5	46		46	0.9	118.7		118.7	72.7	Estimated per 36 months - effective 200201
129113	52		52	1.4	46		46	0.9	95.2		95.2	49.2	Estimated per 36 months - effective 200201
129112	52		52	1.4	45		45	0.9	92.8		92.8	47.8	Estimated per 36 months - effective 200201
129115	60		60	1.7	51		51	0.9	117.1		117.1	66.1	Estimated per 36 months - effective 200201
129117	56	1	57	1.6	48	1	49	0.9	122.7	0.63	123.33	74.33	Estimated per 36 months - effective 200201
138701	40.5	8	48.5	1.3	37.5	2	39.5	0.9	256.5	21.6	278.1	238.6	Estimated per 24 months - effective 200101
138703	40.5	8	48.5	1.3	27.5	2	29.5	0.7	256.5	10.1	266.6	237.1	Estimated per 24 months - effective 200101
138705	40.5	8	48.5	1.3	27.5		27.5	0.7	256.5	13.42	269.92	242.42	Estimated per 24 months - effective 200101
138707	40.5	8	48.5	1.3	27.5		27.5	0.7	256.5	14.02	270.52	243.02	Estimated per 24 months - effective 200101
144445	72		72	2.0	60		60	0.8	216		216	156	Estimated per 12 months - effective 199701
144447	72		72	2.0	60		60	0.8	216		216	156	Estimated per 12 months - effective 199701
149279	72		72	2.0	60		60	0.8	216		216	156	Estimated per 12 months - effective 199701
149281	72		72	2.0	60		60	0.8	216		216	156	Estimated per 12 months - effective 199701
154071	66		66	1.8	66		66	1.0	66		66	0	Estimated per 18 months - effective 200301
154072	76		76	2.1	76		76	1.0	76		76	0	Estimated per 18 months - effective 200301
159750	74		74	2.1	51		51	0.7	92		92	41	Actual
159126	52		52	1.4	49		49	0.9	80.2		80.2	31.2	Actual
163626	55		55	1.5	44		44	0.8	93.7		93.7	49.7	Actual
163078	54		54	1.5	48		48	0.9	101.8		101.8	53.8	Actual
166779	46		46	1.3	46		46	1.0	214.3		214.3	168.3	Actual
166780	47		47	1.3	42		42	0.9	192.5		192.5	150.5	Actual
173053	49		49	1.4	47		47	1.0	160.6		160.6	113.6	Actual
172652	67		67	1.9	59		59	0.9	231.3		231.3	172.3	Actual
178388	51	1	52	1.4	42	1	43	0.8	169.44	8.6	178.04	135.04	Estimated per 24 months - effective 200301
178752	52.5	1	53.5	1.5	42	1	43	0.8	214.35	9.3	223.65	180.65	Estimated per 24 months - effective 200301
185770	44		44	1.2	43		43	1.0	137.63		137.63	94.63	Estimated per 36 months - effective 200301
185526	44		44	1.2	44		44	1.0	41.4		41.4	-2.6	Estimated per 36 months - effective 200301
191043	76		76	2.1	70		70	0.9	206		206	136	Estimated per 18 months - effective 200301
190618	72		72	2.0	70		70	1.0	200		200	130	Estimated per 18 months - effective 200301
196783	72	1	73	2.0	70	1	71	1.0	194	7.35	201.35	130.35	Estimated per 18 months - effective 200301
197074	68		68	1.9	66		66	1.0	184		184	118	Estimated per 18 months - effective 200301
250005	63.6		63.6	1.8	58.8		58.8	0.9	276.4		276.4	217.6	Load-run estimated per 30 months - effective 200301, run estimated per 20 months -effective 199703
246629	52.8	1	53.8	1.5	48		48	0.9	267.1		267.1	219.1	Load-run estimated per 30 months - effective 200301, run estimated per 20 months -effective 199703
262755	42	3	45	1.3	43	2	45	1.0	158.45	7.5	165.95	120.95	Actual
262756	47	4	51	1.4	42	4	46	0.9	160.3	1	161.3	115.3	Actual
269404	49	11	60	1.7	39	1	40	0.8	99.13	5.35	104.48	64.48	Actual
268257	45	17	62	1.7	41	3	44	0.9	94.85	8.39	103.24	59.24	Actual
272113	54.8	6	60.8	1.7	42.3	1	43.3	0.8	87.7	37.28	124.98	81.68	Estimated per 23 months - effective 200207
272071	120	3	123	3.4	56	1	57	0.5	296.44	39.06	335.5	278.5	Based on 9 months (199901,04,,07)

EDG Success Data

DeviceID	Test Start Demands	Operation Start Demands	Total Start Demands	Avg Starts / Month	Test Load Demands	Operation Load Demands	Total Load Demands	Avg Load Run / Start	Test Run Hours	Operation Run Hours	Total Run Hours	Run - Load Run Hours	Comments
272072	132	4	136	3.8	68	1	69	0.5	251.68	41.12	292.8	223.8	Based on 9 months (199901,04,,07)
276584	52	3	55	1.5	40		40	0.8	65.68	4.07	69.75	29.75	Based on 9 months (199901,04,,07)
276585	92.57	3	95.57	2.7	48		48	0.5	162.9	6.02	168.92	120.92	Estimated per 21 months - effective 200301
276858	85.7	3	88.7	2.5	53.1		53.1	0.6	176.6	8.14	184.74	131.64	Estimated per 21 months - effective 200301
201637	44		44	1.2	40		40	0.9	104		104	64	Estimate per 18 months - effective 200101
201638	44	2	46	1.3	40	4	44	0.9	104	4.28	108.28	64.28	Estimate per 18 months - effective 200101
202801	44		44	1.2	40		40	0.9	104		104	64	Estimate per 18 months - effective 200101
202802	44	1	45	1.3	40	1	41	0.9	104	2.05	106.05	65.05	Estimate per 18 months - effective 200101
281254	115.2	2	117.2	3.3	115.2		115.2	1.0	411.3	5.6	416.9	301.7	Estimated per 20 months - effective 199703. Start demands assumed equal to load runs
281253	48.6		48.6	1.4	48.6		48.6	1.0	171.7		171.7	123.1	Estimated per 20 months - effective 199703. Start demands assumed equal to load runs
285123	54	1	55	1.5	54		54	1.0	80	2.53	82.53	28.53	Estimated per 18 months - effective 199705. Start demands assumed equal to load runs
292556	48.75	10	58.75	1.6	42	10	52	0.9	101.41	10	111.41	59.41	Estimated per 48 months - effective 200201. Run data actual.
293925	52.5	10	62.5	1.7	42	10	52	0.8	101.55	10.2	111.75	59.75	Estimated per 48 months - effective 200201. Run data actual.
373820	55		55	1.5	45		45	0.8	111.68		111.68	66.68	Actual
373380	49		49	1.4	44		44	0.9	103.83		103.83	59.83	Actual
373369	57		57	1.6	44		44	0.8	108.57		108.57	64.57	Actual
378663	57		57	1.6	53		53	0.9	103.19		103.19	50.19	Actual
378777	47		47	1.3	49		49	1.0	110.93		110.93	61.93	Actual
294268	97		97	2.7	70		70	0.7	155		155	85	Actual
294265	89		89	2.5	59		59	0.7	151		151	92	Actual
294266	104		104	2.9	58		58	0.6	138		138	80	Actual
299053	81		81	2.3	58		58	0.7	140		140	82	Actual
305131	60	3	63	1.8	59	3	62	1.0	196.15	5.9	202.05	140.05	Actual
305200	62	1	63	1.8	51	1	52	0.8	176.92	3.2	180.12	128.12	Actual
305133	55		55	1.5	54		54	1.0	177.46		177.46	123.46	Actual
305202	62		62	1.7	57		57	0.9	205		205	148	Actual
315455	70	1	71	2.0	45	1	46	0.6	136.4	0.5	136.9	90.9	Actual
315392	82	1	83	2.3	43	1	44	0.5	121.1	0.7	121.8	77.8	Actual
323887	84		84	2.3	49		49	0.6	236.4		236.4	187.4	Actual
324067	80		80	2.2	49		49	0.6	168.09		168.09	119.09	Actual
713103	48	7	55	1.5	48	7	55	1.0	240	39.3	279.3	224.3	Estimated per 18 months - effective 200101
713379	48	9	57	1.6	48	9	57	1.0	240	11.4	251.4	194.4	Estimated per 18 months - effective 200101
384243	54		54	1.5	52		52	1.0	285.14		285.14	233.14	Estimated per 18 months - effective 199707
384680	52		52	1.4	52		52	1.0	193.44		193.44	141.44	Estimated per 18 months - effective 199707
384249	46		46	1.3	46		46	1.0	177.72		177.72	131.72	Estimated per 18 months - effective 199707
384251	48		48	1.3	46		46	1.0	140.42		140.42	94.42	Estimated per 18 months - effective 199707
390338	51	24	75	2.1	51	18	69	1.0	111	37.91	148.91	79.91	Estimated per 24 months - effective 200301
390359	60	35	95	2.6	60	33	93	1.0	90	22.25	112.25	19.25	Estimated per 24 months - effective 199807
390342	45	35	80	2.2	45	32	77	1.0	108	25.2	133.2	56.2	Estimated per 24 months - effective 199807
394357	46		46	1.3	42		42	0.9	80.09		80.09	38.09	Actual
394359	50		50	1.4	43		43	0.9	80.47		80.47	37.47	Actual
394291	53		53	1.5	44		44	0.8	79.16		79.16	35.16	Actual
309388	89		89	2.5	101		101	1.1	95.51		95.51	-5.49	Estimated per 26 months - effective 200301
309446	89		89	2.5	101		101	1.1	97.21		97.21	-3.79	Estimated per 26 months - effective 200301
309390	89		89	2.5	104		104	1.2	101.47		101.47	-2.53	Estimated per 26 months - effective 200301
309392	97		97	2.7	104		104	1.1	109.08		109.08	5.08	Estimated per 26 months - effective 200301
399159	51		51	1.4	43		43	0.8	232.02		232.02	189.02	Actual
399176	54		54	1.5	41		41	0.8	249.56		249.56	208.56	Actual
402984	68	1	69	1.9	52	2	54	0.8	137.69	22.02	159.71	105.71	Actual
402986	61		61	1.7	41		41	0.7	127.35		127.35	86.35	Actual
408836	67		67	1.9	52		52	0.8	146.71		146.71	94.71	Actual
413910	30		30	0.8	49.5		49.5	1.7	53.25		53.25	3.75	Estimated per 24 months - effective 199611. Startt demand were shown as 2 per 24 months. This appears to be an error as more recent data shows monthly testing. Assumed 20 per 24 months.

EDG Success Data

DeviceID	Test Start Demands	Operation Start Demands	Total Start Demands	Avg Starts / Month	Test Load Demands	Operation Load Demands	Total Load Demands	Avg Load Run / Start	Test Run Hours	Operation Run Hours	Total Run Hours	Run - Load Run Hours	Comments
414093	30		30	0.8	49.5		49.5	1.7	53.25		53.25	3.75	Estimated per 24 months - effective 199611. Startt demand were shown as 2 per 24 months. This appears to be an error as more recent data shows monthly testing. Assumed 20 per 24 months.
414094	30		30	0.8	49.5		49.5	1.7	53.25		53.25	3.75	Estimated per 24 months - effective 199611. Startt demand were shown as 2 per 24 months. This appears to be an error as more recent data shows monthly testing. Assumed 20 per 24 months.
413911	30		30	0.8	49.5		49.5	1.7	53.25		53.25	3.75	Estimated per 24 months - effective 199611. Startt demand were shown as 2 per 24 months. This appears to be an error as more recent data shows monthly testing. Assumed 20 per 24 months.
420673	30		30	0.8	49.5		49.5	1.7	53.25		53.25	3.75	Estimated per 24 months - effective 199611. Startt demand were shown as 2 per 24 months. This appears to be an error as more recent data shows monthly testing. Assumed 20 per 24 months.
420941	30		30	0.8	49.5		49.5	1.7	53.25		53.25	3.75	Estimated per 24 months - effective 199611. Startt demand were shown as 2 per 24 months. This appears to be an error as more recent data shows monthly testing. Assumed 20 per 24 months.
420943	30		30	0.8	49.5		49.5	1.7	53.25		53.25	3.75	Estimated per 24 months - effective 199611. Startt demand were shown as 2 per 24 months. This appears to be an error as more recent data shows monthly testing. Assumed 20 per 24 months.
420945	30		30	0.8	49.5		49.5	1.7	53.25		53.25	3.75	Estimated per 24 months - effective 199611. Startt demand were shown as 2 per 24 months. This appears to be an error as more recent data shows monthly testing. Assumed 20 per 24 months.
426106	78		78	2.2	49		49	0.6	206.9		206.9	157.9	Actual
425897	83		83	2.3	56		56	0.7	193.9		193.9	137.9	Actual
431267	70		70	1.9	46		46	0.7	214.5		214.5	168.5	Actual
431268	76		76	2.1	49		49	0.6	222.6		222.6	173.6	Actual
440377	30	1	31	0.9	45		45	1.5	185.4		185.4	140.4	Actual
440379	25		25	0.7	41		41	1.6	194.06		194.06	153.06	Actual
444272	10		10	0.3	50		50	5.0	142.94		142.94	92.94	Actual
444340	10		10	0.3	55		55	5.5	153.65		153.65	98.65	Actual
450139	45		45	1.3	42		42	0.9	80.88		80.88	38.88	Actual
449718	48		48	1.3	48		48	1.0	100.32		100.32	52.32	Actual
736429	56	1	57	1.6	51	1	52	0.9	261.5	35.48	296.98	244.98	No data recorded for 1999 - 2001. Used 200201 - 200412,
736430	59	1	60	1.7	57	1	58	1.0	277.53	39.17	316.7	258.7	No data recorded for 1999 - 2001. Used 200201 - 200412,
453530	44	1	45	1.3	40	1	41	0.9	52.11	9.16	61.27	20.27	Actual
453794	37	9	46	1.3	35	7	42	0.9	63.31	34.64	97.95	55.95	Actual
456878	43.9	11	54.9	1.5	37.9	2	39.9	0.9	176.8	9.77	186.57	146.67	Estimated per 20 months - effective 199610
456879	43.9	14	57.9	1.6	37.9	11	48.9	0.9	161.8	34.34	196.14	147.24	Estimated per 20 months - effective 199610
518352	44	1	45	1.3	44	1	45	1.0	122		122	77	Estimated per 18 months - effective 199701
511898	44	1	45	1.3	44	3	47	1.0	122	12.27	134.27	87.27	Estimated per 18 months - effective 199701
572985	44		44	1.2	44		44	1.0	122		122	78	Estimated per 18 months - effective 199701
534562	44		44	1.2	44		44	1.0	122		122	78	Estimated per 18 months - effective 199701
590380	119	1	120	3.3	97	1	98	0.8	131.8	3.4	135.2	37.2	Actual
590381	108		108	3.0	89		89	0.8	127.7		127.7	38.7	Actual
593097	60	12	72	2.0	60	5	65	1.0	300	450.56	750.56	685.56	Estimated per 18 months - effective 200101
593098	60	11	71	2.0	60	6	66	1.0	300	453.75	753.75	687.75	Estimated per 18 months - effective 200101

EDG Success Data

DeviceID	Test Start Demands	Operation Start Demands	Total Start Demands	Avg Starts / Month	Test Load Demands	Operation Load Demands	Total Load Demands	Avg Load Run / Start	Test Run Hours	Operation Run Hours	Total Run Hours	Run - Load Run Hours	Comments
596679	50	28	78	2.2	50	28	78	1.0	271.03	9.25	280.28	202.28	Estimated per 36 months - effective 200101
596680	49	23	72	2.0	49	23	72	1.0	262.83	8.8	271.63	199.63	Estimated per 36 months - effective 200101
603103	50	28	78	2.2	50	28	78	1.0	271.03	9.25	280.28	202.28	Estimated per 36 months - effective 200101
603104	49	23	72	2.0	49	23	72	1.0	262.83	8.8	271.63	199.63	Estimated per 36 months - effective 200101
610313	50	28	78	2.2	50	28	78	1.0	271.03	9.25	280.28	202.28	Estimated per 36 months - effective 200101
610315	49	23	72	2.0	49	23	72	1.0	262.83	8.8	271.63	199.63	Estimated per 36 months - effective 200101
615673	178.5	22	200.5	5.6	88.5	4	92.5	0.5	189	9.5	198.5	106	Estimated per 24 months - effective 200304
615674	178.5	14	192.5	5.3	88.5		88.5	0.5	189	1.66	190.66	102.16	Estimated per 24 months - effective 200304
615675	178.5	12	190.5	5.3	88.5	4	92.5	0.5	189	9	198	105.5	Estimated per 24 months - effective 200304
615676	178.5	10	188.5	5.2	88.5		88.5	0.5	189	2	191	102.5	Estimated per 24 months - effective 200304
626613	71		71	2.0	54		54	0.8	96.54		96.54	42.54	Actual
626615	77		77	2.1	62		62	0.8	83.34		83.34	21.34	Actual
632139	41	1	42	1.2	39	1	40	1.0	64.08	7.22	71.3	31.3	Actual
632109	43	1	44	1.2	39	1	40	0.9	62.1	8.53	70.63	30.63	Actual
635704	36	2	38	1.1	36	2	38	1.0	132.6		132.6	94.6	Estimated per 12 months - effective 200101
635653	36	2	38	1.1	36	2	38	1.0	103.5		103.5	65.5	Estimated per 12 months - effective 200101
635812	36	2	38	1.1	36	2	38	1.0	161.7		161.7	123.7	Estimated per 12 months - effective 200101
635811	36		36	1.0	36		36	1.0	225.9		225.9	189.9	Estimated per 12 months - effective 200101
641686	39		39	1.1	39		39	1.0	168.53		168.53	129.53	Actual
641679	35		35	1.0	35		35	1.0	160.73		160.73	125.73	Actual
645367	39	14	53	1.5	41	2	43	1.1	170.48	3	173.48	130.48	Actual
645606	50		50	1.4	45		45	0.9	233.24		233.24	188.24	Actual
648766	100.4	2	102.4	2.8	66.3	2	68.3	0.7	75.8	5.34	81.14	12.84	Estimated per 19 months - effective 199706
648777	132.6		132.6	3.7	36		36	0.3	43.6		43.6	7.6	Estimated per 19 months - effective 199706
653988	81.5	3	84.5	2.3	36	2.5	38.5	0.4	43.6	2.97	46.57	8.07	Estimated per 19 months - effective 199706
319512	40	2	42	1.2	40		40	1.0	40		40	0	Estimated per 18 months - effective 199701
319513	40		40	1.1	40		40	1.0	40		40	0	Estimated per 18 months - effective 199701
707056	103	1	104	2.9	80	1	81	0.8	240.75	1.03	241.78	160.78	Actual
656958	77		77	2.1	68		68	0.9	196.66		196.66	128.66	Actual
716627	72	2	74	2.1	51	2	53	0.7	152.4	3.07	155.47	102.47	Estimated per 36 months - effective 200201
716195	65	2	67	1.9	54	2	56	0.8	142.4	3	145.4	89.4	Estimated per 36 months - effective 200201
716626	75	2	77	2.1	55	2	57	0.7	136.3	2.97	139.27	82.27	Estimated per 36 months - effective 200201
720261	61	2	63	1.8	49	2	51	0.8	122.2	3.6	125.8	74.8	Estimated per 36 months - effective 200201
720262	63	2	65	1.8	51	2	53	0.8	139.5	2.73	142.23	89.23	Estimated per 36 months - effective 200201
720709	68	2	70	1.9	54	2	56	0.8	131.7	3.48	135.18	79.18	Estimated per 36 months - effective 200201
724718	62		62	1.7	60		60	1.0	150		150	90	Estimated per 36 months - effective 199801
724771	66		66	1.8	64		64	1.0	137		137	73	Estimated per 36 months - effective 199801
731388	59		59	1.6	57		57	1.0	135		135	78	Estimated per 36 months - effective 199801
731367	62		62	1.7	60		60	1.0	129		129	69	Estimated per 36 months - effective 199801
926916	53	4	57	1.6	42		42	0.8	136.8	17.5	154.3	112.3	Actual
926917	49	4	53	1.5	41		41	0.8	82.8	17.06	99.86	58.86	Actual
926922	58	4	62	1.7	42	2	44	0.7	108.62	15.32	123.94	79.94	Actual
926924	52	4	56	1.6	40		40	0.8	126.46	18.06	144.52	104.52	Actual
367900	52	3	55	1.5	50	2	52	1.0	239.6	4.47	244.07	192.07	Estimated per 36 months - effective 200201
367902	56	1	57	1.6	52	3	55	0.9	240.3	0.53	240.83	185.83	Estimated per 36 months - effective 200201
750279	51	7	58	1.6	51	11	62	1.0	568.8	15.3	584.1	522.1	Estimated per 18 months - effective 200304
749675	51	8	59	1.6	51	2	53	1.0	568.8	9.85	578.65	525.65	Estimated per 18 months - effective 200304
749676	51	8	59	1.6	51	7	58	1.0	568.8	21.95	590.75	532.75	Estimated per 18 months - effective 200304
756647	51.6	7	58.6	1.6	51.6	4	55.6	1.0	568.8	12.08	580.88	525.28	Estimated per 18 months - effective 200304
756108	51.6	4	55.6	1.5	51.6	1	52.6	1.0	568.8	4.8	573.6	521	Estimated per 18 months - effective 200304
756646	51.6	10	61.6	1.7	51.6	3	54.6	1.0	568.8	48.45	617.25	562.65	Estimated per 18 months - effective 200304
760785	60		60	1.7	48		48	0.8	139.6		139.6	91.6	Estimated per 18 months - effective 199801
760685	60		60	1.7	48		48	0.8	166.6		166.6	118.6	Estimated per 18 months - effective 199801
765968	60		60	1.7	48		48	0.8	139.6		139.6	91.6	Estimated per 18 months - effective 199801
765935	60		60	1.7	48		48	0.8	166.6		166.6	118.6	Estimated per 18 months - effective 199801
814319	58	1	59	1.6	48	1	49	0.8	148.94		148.94	99.94	Estimated per 18 months - effective 199701
820522	52	2	54	1.5	48	2	50	0.9	155.9		155.9	105.9	Estimated per 18 months - effective 199701
830214	56	1	57	1.6	48	1	49	0.9	184		184	135	Estimated per 18 months - effective 199701
865592	43		43	1.2	43		43	1.0	193.42		193.42	150.42	Starts appear to be underestimated. Changed to be consistent with load run

EDG Success Data

DeviceID	Test Start Demands	Operation Start Demands	Total Start Demands	Avg Starts / Month	Test Load Demands	Operation Load Demands	Total Load Demands	Avg Load Run / Start	Test Run Hours	Operation Run Hours	Total Run Hours	Run - Load Run Hours	Comments
865593	50		50	1.4	50		50	1.0	215.78		215.78	165.78	Starts appear to be underestimated. Changed to be consistent with load run
865544	50		50	1.4	50		50	1.0	199.72		199.72	149.72	Starts appear to be underestimated. Changed to be consistent with load run
865545	45		45	1.3	45		45	1.0	214.34		214.34	169.34	Starts appear to be underestimated. Changed to be consistent with load run
865594	61		61	1.7	61		61	1.0	256.08		256.08	195.08	Starts appear to be underestimated. Changed to be consistent with load run
868007	39	1	40	1.1	84	1	85	2.2	39	2.5	41.5	-43.5	Estimated per 24 months - 199911
868008	39	1	40	1.1	84	1	85	2.2	39	1.13	40.13	-44.87	Estimated per 24 months - 199911
871940	36	13	49	1.4	36		36	1.0	54	16	70	34	Estimated per 18 months - 199801
871775	36	10	46	1.3	36		36	1.0	54	7	61	25	Estimated per 18 months - 199801
875868	36	7	43	1.2	36		36	1.0	54	9.4	63.4	27.4	Estimated per 18 months - 199801
875869	36	17	53	1.5	36		36	1.0	54	8.6	62.6	26.6	Estimated per 18 months - 199801
769866	72		72	2.0	52		52	0.7	116.6		116.6	64.6	Estimated per 36 months - effective 200201
769940	52		52	1.4	46		46	0.9	112.4		112.4	66.4	Estimated per 36 months - effective 200201
878576	43		43	1.2	45		45	1.0	137.07		137.07	92.07	Start Demands estimated per 36 months - effective 200201. Other failure modes actual data
878423	58		58	1.6	44		44	0.8	132.1		132.1	88.1	Start Demands estimated per 36 months - effective 200201. Other failure modes actual data
883291	56		56	1.6	56		56	1.0	177.9		177.9	121.9	No data recorded for 1999 - 2001. Used 200301 - 200512,
882490	53		53	1.5	53		53	1.0	172.9		172.9	119.9	No data recorded for 1999 - 2001. Used 200301 - 200512,
887650	52		52	1.4	47		47	0.9	143.2		143.2	96.2	No data recorded for 1999 - 2001. Used 200301 - 200512,
887652	51		51	1.4	49		49	1.0	137.1		137.1	88.1	No data recorded for 1999 - 2001. Used 200301 - 200512,
892650	60		60	1.7	40		40	0.7	327.94	3.5	331.44	291.44	Actual
892685	55		55	1.5	42		42	0.8	307.06		307.06	265.06	Actual
898018	48		48	1.3	43.5		43.5	0.9	117		117	73.5	Estimated per 24 months - effective 200304
898020	48		48	1.3	43.5		43.5	0.9	117		117	73.5	Estimated per 24 months - effective 200304
898886	46.5		46.5	1.3	43.5		43.5	0.9	117		117	73.5	Estimated per 24 months - effective 200304
898885	46.5	1	47.5	1.3	43.5	1	44.5	0.9	117	8.57	125.57	81.07	Estimated per 24 months - effective 200304
903501	70		70	1.9	53		53	0.8	110.9		110.9	57.9	Actual
903397	58		58	1.6	46		46	0.8	121.8		121.8	75.8	Actual
TOTAL	**12977**	**795**	**13772**	**1.7**	**11319**	**525**	**11843**	**1.0**	**35607**	**2406**	**38013**	**26170**	
AVERAGE			**62**				**53**				**171**	**118**	Average per EDG for three years
FAILURES			**82**				**45**				**21**	**21**	
Table 8 RATE			**5.00E-03**				**3.00E-03**				**8.00E-04**	**8.00E-04**	
MLE RATE			**5.95E-03**				**3.80E-03**				**5.52E-04**	**8.02E-04**	

Documentation and Changes

Each licensee will have the system boundaries, monitored components, ~~and~~ monitored functions, and success criteria which differ from design basis readily available for NRC inspection on site. Design basis criteria do not need to be separately documented. Additionally, plant-specific information used in Appendix F should also be readily available for inspection. An acceptable format, listing the minimum required information, is provided in Appendix G**.** The objective of maintaining and accurate basis document is to administratively reflect the current as-built plant which in turn supports inspection activities that verify performance indicator implementation. Changes to the site PRA of record, the site basis document, and the CDE database should be made in accordance with the following:

Changes to PRA ~~coefficient~~information: Updates to the MSPI coefficients~~-~~ (which are~~are taken developed from~~ directly obtained from the plant specific PRA) will be made ~~as soon as practical following an~~in the quarter following the official update to the plant-specific PRA of record. The updated~~revised~~ coefficients from the PRA of record will be used in the MSPI calculation the quarter following the PRA of record update. Thus, the PRA ~~coefficients~~ coefficients in use at the beginning of a quarter will remain in effect for the remainder of that quarter. In addition, c~~C~~hanges to the CDE database and MSPI basis document that are necessary to reflect changes to the plant-specific PRA of record should be incorporated ~~as soon as practical but need not be completed prior to the start of the reporting quarter in which they become effective~~the quarter following the update to the plant specific PRA of record. The quarterly data submittal should include a comment that provides a summary of any changes to the MSPI coefficients (i.e., changes to the plant specific PRA of record). The comments automatically generated by CDE when PRA coefficients are changed do not fulfill this requirement. The plant must generate a plant–specific comment that describes what was changed. Any PRA model change will take effect the following quarter (model changes include error, corrections, updates, etc.). For example, if a plant's PRA model of record is approved on September 29 (3rd quarter), MSPI coefficients based on that model of record should be used for the 4th quarter. The calculation of the new coefficients should be completed (including a revision of the MSPI basis document if

required by the plant-specific processes) and input to CDE prior to reporting the 4th quarter's data (i.e., completed by January 21).

NOTE: The impact of pending PRA changes (e.g., plant modification that affects the PRA but has not been reflected since the PRA of record is not due for an update) on the MSPI program can be evaluated in the interim in a timely manner commensurate with risk using applicable guidance provided by ASME standards.

Changes to non-PRA information: Updates to information that are~~is~~ not directly obtained from the PRA (e.g., unavailability baseline data, estimated demands/run hours) can affect both the MSPI basis document and the CDE database. Changes to the basis document and CDE database that are needed to reflect changes to non-PRA information that will be made~~become effective in the quarter following an approved revision to the site MSPI basis document. Changes to the CDE database that are necessary to reflect changes to the site basis document should be incorporated as soon as practical but need not be completed by~~prior to the start of the next reporting quarter~~. in which they become effective~~. The quarterly data submittal should include a comment that provides a summary of any changes to the basis document. Any~~The~~ comments automatically generated by CDE when ~~PRA coefficients~~information or data is~~are~~ changed do not fulfill this requirement. The plant must generate a plant-specific comment that describes what was changed.

Plant Modifications: Any changes to the plant should be evaluated for their impact on the MSPI basis document, CDE database, and the PRA of record. Plant modifications have the potential to involve both changes to PRA information and non-PRA information, while some modifications may be limited to either PRA or non-PRA information. Modifications to the plant design that result in a change to segment or train boundaries or monitored components shall be reflected in the basis document the quarter following the completed implementation. Additionally, if modifications are made to sub-components within the boundary of a monitored component (such as the replacement of an emergency AC voltage regulator with a different type) and that sub-component is described in the basis document, the basis document should be updated to reflect the sub-component modification the quarter following the completed implementation. If the plant modifications affect monitored functions or success criteria, which in turn would require an

update to the plant PRA, these changes should be reflected in the basis document and the CDE database, if applicable, the quarter following the official update to the plant specific PRA of record. The quarterly data submittal should include a comment that provides a summary of any changes to the basis document. Any comments automatically generated by CDE when information or data is changed do not fulfill this requirement. The plant must generate a plant specific comment that describes what was changed.

FAQ TEMPLATE

Plant: Generic
Date of Event: NA
Submittal Date: January 21, 2010
Licensee Contact: Ken Heffner Tel/email: 919-270-5611/kmh@nei.org
NRC Contact: Nathan Sanfiilipo Tel/email: 301-415-3951/nathan.sanfillipo@nrc.gov

Performance Indicator:

NA

Site-Specific FAQ (Appendix D)? No

FAQ requested to become effective when approved

Question Section

Existing Guidance on Page E-3 beginning at line 16

Withdrawal of FAQs

A licensee may withdraw a FAQ after it has been accepted by the joint ROP Working Group. Withdrawals must occur during an ROP Working Group monthly (approximately) meeting. However, the ROP Working Group should further discuss and decide if a guidance issue exists in NEI 99-02 that requires additional clarification. If additional clarification is needed then the original FAQ should be revised to become a generic FAQ.

Event or circumstances requiring guidance interpretation

The staff has expressed concern that when a licensee withdraws an FAQ, the efforts that they expend during the discussions preceding the withdrawal of the FAQ are not captured.

If licensee and NRC resident/region do not agree on the facts and circumstances explain

NA

Response Section

Proposed Resolution of FAQ

Recommended Change

Withdrawal of FAQs

A licensee may withdraw a FAQ after it has been accepted by the joint ROP Working Group. Withdrawals must occur during an ROP Working Group meeting. However, the ROP Working Group should further discuss and decide if a guidance issue exists in NEI 99-02 that requires additional clarification. If additional clarification is needed then the original FAQ should be revised to become a generic FAQ. In many cases, there are lessons learned from the resources expended by the ROP Working Group that should be captured. In those cases, the FAQ will be entered in the FAQ log as a generic FAQ. If there is disagreement between the staff and industry, both positions should be articulated in the FAQ. These withdrawn FAQs should be considered as historical and are not considered to be part of NEI 99-02. Although they do not establish precedence, they do offer insights into perspectives of both industry and NRC staff and, as such, can inform future decisions to submit an FAQ.

If appropriate, provide proposed rewording of guidance for inclusion in next revision.

See proposed resolution

NRC Response to FAQ:

The staff agrees with the proposed resolution in the Response Section of this FAQ.

UNPLANNED SCRAMS WITH COMPLICATIONS (USWC)

Purpose

This indicator monitors that subset of unplanned automatic and manual scrams that require, or have the potential to require*, additional operator actions beyond that of ~~the~~a "normal" scram. Such events or conditions have the potential to present additional challenges to the plant operations staff and therefore, may be more risk-significant than "uncomplicated" scrams.

* When determining Main Feedwater (MFW) unavailability or non-recoverability using approved plant procedures the focus is not on whether MFW was used, but whether MFW could have been used (i.e., was available to perform its intended function). This note is also specifically applicable to the Indicator Definition, Data Reporting Elements, Calculation, and MFW sections (too include Appendix H "USwC Bases").

...

Indicator Definition

The USwC indicator is defined as the number of unplanned scrams while critical, both manual and automatic, during the previous 4 quarters that require, or had the potential to require*, additional operator actions as defined by the applicable flowchart (Figure 2) and the associated flowchart questions.

Data Reporting Elements

The following data are required to be reported for each reactor unit.

The number of unplanned automatic and manual scrams while critical in the previous quarter that required, or had the potential to require*, additional operator response as determined by the flowchart criteria.

Calculation

The indicator is determined using the values reported for the previous 4 quarters as follows:

value = total unplanned scrams while critical in the previous 4 quarters that required, or had the potential to require*, additional operator response as defined by the applicable flowchart and the associated flowchart questions.

Definition of Terms

Scram means the shutdown of the reactor by the rapid addition of negative reactivity by any means, e.g., insertion of control rods, boron, use of diverse scram switches, or opening reactor trip breakers

Normal Scram means any scram that is not determined to be complicated in accordance with the guidance provided in the Unplanned Scrams with Complications indicator. A normal scram is synonymous with an uncomplicated scram.

Unplanned scram means that the scram was not an intentional part of a planned evolution or test as directed by a normal operating or test procedure. This includes scrams that occurred during the execution of procedures or evolutions in which there was a high chance of a scram occurring but the scram was neither planned nor intended.

Scram Response refers to the period, or duration of time, in which the operators are in the EOP that contains the initial post scram actions and verifications.

Scram Recovery refers to the period, or duration of time, after the operators have exited the EOP that contains the initial post scram actions and verifications until the plant achieves a normal and stabilized condition in accordance with criteria established in approved plant procedures.

…

PWR FLOWCHART QUESTIONS (See Figure 2)

Did two or more control rods fail to fully insert?

…

Did the turbine fail to trip?

…

Was power lost to any ESF bus?

…

Was a Safety Injection signal received?

…

Was ~~Main Feedwater~~(MFW) unavailable or not recoverable using approved plant procedures following the scram?

If operating prior to the scram, did ~~Main Feedwater~~MFW cease to operate and was it unable to be restarted during the reactor scram response~~?~~ or scram recovery? The consideration for this question is whether ~~Main Feedwater~~MFW could be used to feed the steam generators if necessary. The qualifier of "not recoverable using approved plant procedures" will allow a licensee to answer "No" to this question if there is no physical equipment restraint to prevent the operations staff from starting the necessary equipment, aligning the required systems, or satisfying required logic using plant procedures approved for use and in place prior to the

reactor scram occurring.

The operations staff must be able to start and operate the required equipment using normal alignments and approved normal and off-normal operating procedures to feed the minimum number of steam generators required by the EOPs to satisfy the heat sink criteria. Manual operation of controllers/equipment, even if normally automatic, is allowed if addressed by procedure. Situations that require maintenance activities or non-proceduralized operating alignments require an answer of "Yes." Additionally, the restoration of MFW must be capable of feeding the Steam Generators in a reasonable period of time. Operations should be able to start a ~~Main Feedwater~~MFW pump and start feeding Steam Generators with the ~~Main Feedwater~~MFW system within about 30 minutes~~.~~ after a scram. Additionally, if MFW is initially available post scram and then becomes unavailable, the 30 minute estimate could be used as a reasonable period of time it would take to recover MFW. Again, this 30 minute time period is just an estimate used to quantify what a reasonable period of time would be to start or recover MFW under normal conditions. During startup conditions where ~~Main Feedwater~~MFW was not placed in service prior to the scram this question would not be considered and should be skipped. If design features or procedural prohibitions prevent restarting ~~Main Feedwater~~MFW under certain plant conditions, and MFW is free from damage or failure and available for use, the MFW system is not considered unavailable and this question should be answered as "No."

Was the scram response procedure unable to be completed without entering another EOP?

…

BWR FLOWCHART QUESTIONS (See Figure 2)

Did an RPS actuation fail to indicate / establish a shutdown rod pattern for a cold clean core?

…

Was pressure control unable to be established following the initial transient?

…

Was power lost to any Class 1E Emergency / ESF bus?

…

Was a Level 1 Injection signal received?

…

Was ~~Main Feedwater~~MFW not available or not recoverable using approved plant procedures?

If operating prior to the scram, did ~~Main Feedwater~~MFW cease to operate and was it unable to be restarted during the reactor scram response or recovery? The consideration for this question is whether ~~Main Feedwater~~MFW could be used to feed the reactor vessel if necessary. The qualifier of "not recoverable using approved plant procedures" will allow a licensee to answer "NO" to this question if there is no physical equipment restraint to prevent the operations staff from starting the necessary equipment, aligning the required systems, or satisfying required logic circuitry using plant procedures approved for use that were in place prior to the scram occurring.

The operations staff must be able to start and operate the required equipment using normal alignments and approved normal and off-normal operating procedures. Manual operation of controllers/equipment, even if normally automatic, is allowed if addressed by procedure. Situations that require maintenance activities or non-proceduralized operating alignments will not satisfy this question. Additionally, the restoration of ~~Main~~MFW must be capable of being restored to provide feedwater (FW) to the reactor vessel in ~~Feedwater must be capable of being restored to provide feedwater to the reactor vessel in~~ a reasonable period of time. Operations should be able to start a ~~Main Feedwater~~MFW pump and start feeding the reactor vessel with the ~~Main Feedwater System~~MFW system within about 30 minutes~~.~~ after a scram. Additionally, if MFW is initially available post scram and then becomes unavailable, the 30 minute estimate could be used as a reasonable period of time it would take to recover MFW. Again, this 30 minute time period is just an estimate used to quantify what a reasonable period of time would be to start or recover MFW under normal conditions. During startup conditions where ~~Main Feedwater~~MFW was not placed in service prior to the scram, this question would not be considered, and should be skipped. If design features or procedural prohibitions prevent restarting MFW under certain plant conditions, and MFW is free from damage or failure and is available for use, the MFW system is not considered unavailable and this question should be answered as "No."

Following initial transient, did stabilization of reactor pressure/level and drywell pressure meet the entry conditions for EOPs?

…

APPENDIX H

USwC Basis Document

The USwC PI will monitor the following six conditions that complicate, or have the potential to complicate*, the operators' scram response actions and, if applicable, scram recovery actions.

1. Reactivity Control
2. Pressure Control (BWRs)/Turbine Trip (PWRs)
3. Power available to Emergency Busses
4. Need to actuate emergency injection sources
5. Availability of Main Feedwater (MFW)
6. Utilization of scram recovery Emergency Operating Procedures (EOPs)

…

H 1 PWR Flowchart Basis Discussion

H 1.1 Did two or more control rods fail to fully insert?

…

H 1.2 Did the turbine fail to trip?

…

H 1.3 Was power lost to any ESF bus?

…

H 1.4 Was a Safety Injection signal received?

…

H 1.5 Was ~~Main Feedwater~~MFW unavailable or not recoverable using approved plant procedures following the scram?

This section of the indicator is a holdover from the Scrams with Loss of Normal Heat Removal indicator which the USwC indicator is replacing. Since all PWR designs have an emergency ~~Feedwater~~FW system that operates if necessary, the availability of the normal or main ~~main Feedwater~~FW systems ~~is~~ , as a backup in emergency situations, can be important for managing risk following a reactor scram. This portion of the indicator -is designed to measure that backup availability directed by ~~the~~ approved plant procedures (e.g., EOPs) on a loss of all emergency ~~Feedwater~~FW. Licensees should rely on the material condition availability of the equipment to reach the decision for this question.

It is not necessary for the ~~main Feedwater~~MFW system to continue operating following a reactor trip. ~~The~~Some plants have design features in place to prevent MFW from continued operation or from allowing it to be restarted unless certain criteria are met. Although these design features are in place to protect the plant, the MFW system must be free from damage or failure that would prohibit restart of the system if necessary. ~~Since~~For example, some plant designs do not include electric driven ~~main Feedwater~~MFW pumps (steam driven pumps only) and it may not be possible to restart ~~main Feedwater~~MFW pumps without a critical reactor. ~~Those plants should answer this question as "No" and move on. Some~~ Additionally, some other plant designs have interlocks and signals in place to prevent feeding the steam generators with ~~main Feedwater~~MFW unless reactor coolant temperature is greater than the no-load average temperature. These plants ~~should also answer~~may be justified in answering this question as "No"~~and move on.~~ if the design feature is active and the MFW system is otherwise free from damage or failure and available to perform its intended function.

~~Licensees should rely on the material condition availability of the equipment to reach the decision for this question. Condenser vacuum, cooling water, steam pressure values should be evaluated based on the requirements to operate the pumps may be lower than normal if procedures allow pump operation at that lower value.these support systems are able to be restarted (if not running) to support main feedwater restart within them 30 minute timeframe they can be considered as available. These requirements apply until the completion or exit of the scram response procedure.~~

~~The availability of steam dumps to the condenser does NOT enter into this indicator at all Use of atmospheric steam dumps following the reactor trip is acceptable for any duration.~~

~~Loss of one feed pump does not cause a loss of main feedwater. Only one is needed to remove residual heat after a trip. As long as at least one pump~~As long as the minimum number of pump(s) and valve(s) can still operate and provide ~~Feedwater~~FW to the minimum number of steam generators required by the EOPs to satisfy the heat sink criteria, ~~main feedwater~~MFW should be considered available.

~~The failure in a closed position of a feedwater isolation valve to a steam generator is a loss of feed to that one steam generator. As long as the main feedwater system is able to feed the minimum number of steam generators required by the EOPs to satisfy the heat sink criteria, the loss of ability to feed other steam generators should not be considered a loss of feedwater. Isolation of the feedwater regulating or isolation valves does not constitute a loss of feedwater if nothing prevents them from being reopened in accordance with procedures .~~

~~A Steam Generator Isolation Signal or Feedwater Isolation Signal does not constitute a loss of main feedwater as long as it can be cleared and feedwater restarted. If the isolation signal was caused by a high steam generator level, the estimate time frame should start once the high level isolation signal has cleared.~~

~~The 30 minute time frame for restart of main Feedwater~~The 30 minutes time frame for restart of MFW was chosen based on restarting from a hot and filled condition. Since this time frame will not be measured directly it should be an estimation developed based on ~~the material condition of~~

~~the plants systems following the reactor trip~~specific plant design and plant operating experience. If no abnormal material conditions exist the 30 minutes should normally be met. If actions to restart MFW as directed by plant procedures and design would ~~require more~~take longer than 30 minutes to complete (even if all systems were hot and the material condition of the plants systems following the reactor trip ~~were~~was normal~~,~~) that routine time should be used in the evaluation of this question, provided SG dry-out cannot occur on an uncomplicated trip ~~if the time is~~lasting longer than 30 minutes. The ~~opinion~~professional judgment of the on-shift licensed SRO during the reactor trip should be ~~accepted~~considered in determining if this timeframe was met.

H 1.6 Was the scram response procedure unable to be completed without entering another EOP?

…

H 3 BWR Flowchart Basis Discussion

H 3.1 Did an RPS actuation fail to indicate / establish a shutdown rod pattern for a cold clean core?

…

H 3.2 Was pressure control unable to be established following the initial transient?

…

H 3.3 Was power lost to any Class 1E Emergency / ESF bus?

…

H 3.4 Was a Level 1 Injection signal received?

…

H 3.5 Was Main Feedwater not available or not recoverable using approved plant procedures?

If operating prior to the scram, did ~~Main Feedwater~~MFW cease to operate and was it unable to be restarted during the reactor scram response or recovery? The consideration for this question is whether ~~Main Feedwater~~MFW could be used to feed the reactor vessel if necessary. The qualifier of “not recoverable using approved plant procedures” will allow a licensee to answer “NO” to this question if there is no physical equipment restraint to prevent the operations staff from starting the necessary equipment, aligning the required systems, or satisfying required logic circuitry using plant procedures approved for use that were in place prior to the scram occurring.

The operations staff must be able to start and operate the required equipment using

Normal alignments and approved normal and off-normal operating procedures. Manual operation of controllers/equipment, even if normally automatic, is allowed if addressed by procedure. Situations that require maintenance activities or non-proceduralized operating alignments will not satisfy this question. Additionally, the restoration of ~~Main Feedwater~~MFW must be capable of being restored to provide feedwater (FW) to the reactor vessel in a reasonable period of time. Operations should be able to start a ~~Main Feedwater~~MFW pump and start feeding the reactor vessel with the ~~Main Feedwater System~~MFW system within about 30 minutes~~.~~ after a scram. Additionally, if MFW is initially available post scram and then becomes unavailable, the 30 minute estimate could be used as a reasonable period of time it would take to recover MFW. Again, this 30 minute time period is just an estimate used to quantify what a reasonable period of time would be to start or recover MFW under normal conditions. During startup conditions where ~~Main Feedwater~~MFW was not placed in service prior to the scram, this question would not be considered, and should be skipped. If design features or procedural prohibitions prevent restarting MFW under certain plant conditions, and MFW is free from damage or failure and available for use, the MFW system is not considered unavailable and this question should be answered as "No."

H 3.6 Following initial transient, did stabilization of reactor pressure/level and drywell pressure meet the entry conditions for EOPs?

Since BWR designs have an emergency high pressure system that operates automatically between a vessel-high and vessel-low level, it is not necessary for the ~~Main Feedwater~~MFW ~~System~~system to continue operating following a reactor trip. ~~However,~~Although these design features are in place to protect the plant, the MFW system must be available (i.e., free from damage or failure that would prohibit restart of the ~~Main Feedwater System~~system if necessary). Therefore, failure of the MFW system to be available is considered to be risk significant enough to require a "Yes" response for this PI~~. To be considered available, the system must be free from damage or failure that would The system must be free from damage or failure that would prohibit restart of the system if necessaryTherefore, there is some~~. Therefore, there is significant reliance on the material condition or availability of the equipment to reach the decision for this question. Condenser vacuum, cooling water, and steam pressure values should be evaluated based on the requirements to operate the pumps, and may be lower than normal if procedures allow pump operation at that lower value.

The 30 minute time frame for restart of ~~Main Feedwater~~MFW was chosen based on restarting from a hot condition with adequate reactor water level. Since this time frame will not be measured directly~~,~~ it should be an estimation developed based on ~~the material condition of the plants systems following the reactor trip~~specific plant design and plant operating experience. If no abnormal material conditions exist~~,~~ the 30 minutes should normally be ~~capable of being~~ met. If plant procedures and design would require more than 30 minutes~~,~~ (even if all systems were hot and the material condition of the plants systems following the reactor trip were normal~~, a~~) that routine time should be used in the evaluation of this question. The ~~considered opinion~~professional judgment of ~~an~~ the on-shift licensed SRO during the reactor trip should be considered in ~~meeting~~determining if this ~~time frame is acceptable.~~timeframe was met.

…

Plant: Wolf Creek Generating Station (WCGS)
Date of Event: April 28, 2009
Submittal Date: March 18, 2010
Revised: May 20, 2010

Licensee Contact: Terry Damashek Telephone: 620-364-8831, ext #8012
Email: tedamas@wcnoc.com
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Performance Indicator: IE04, Unplanned Scrams with Complications
Site-Specific FAQ (Appendix D)? No
FAQ requested to become effective when approved.

QUESTION

NEI 99-02 Guidance needing interpretation:

Page 19, "Was Main Feedwater unavailable or not recoverable using approved plant procedures following the scram." Attachment H, Page H-4, Lines 36 through 39, "Some other designs have interlocks in place to prevent feeding the steam generators with main Feedwater unless reactor coolant temperature is greater than the no-load average temperature. These plants should also answer this question as "No" and move on."

Event or Circumstances requiring guidance interpretation:

On April 28, 2009, WCGS experienced a reactor trip (scram)/turbine trip due to 'B' Steam Generator (SG) lolo water level caused by a main feedwater regulating valve (MFRV) controller failure. All equipment functioned as required. Steam generator water level control during and immediately after the scram was not an issue and the plant responded as expected. As designed, both Steam Driven Main Feedwater Pumps tripped on the feedwater isolation signal and steam generator water levels were restored and maintained by auxiliary feedwater flow. RCS temperature stabilized below 560°F and remained there. All required systems for a non-complicated scram functioned as required. Normal plant trip procedures were used and then normal plant recovery procedures were entered. Both the plant design and the approved EOPs do not allow for restart of the main feedwater pumps during a normal plant trip for WCGS.

Prior to the trip, the Main Feedwater Pumps were operating normally, and subsequently tripped per design on the expected Feedwater isolation signal. At the time of the trip, there was no indication that the main feedwater pumps would not have functioned. Several days later, during preparations for restart and return of the plant to power, both Steam Driven Main Feedwater Pumps and the Startup Feed pump required maintenance assistance to return them to service. The event was reported in the monthly performance indicator IE01 as an Unplanned Scram per 7000 Hours.

On a normal scram from power, WCGS expects to receive a feedwater isolation signal on low Tavg coincident with P-4 and a LoLo SG level Feedwater Isolation signal. If main feedwater does not isolate following a scram, manual isolation of feedwater is directed in the scram response procedures. The logic for main feedwater isolation on low Tavg coincident with P-4 can be reset any time after the signal is received, however the SG LoLo water level isolation signal cannot be cleared until the SG LoLo water level condition is cleared. This prevents feeding with the main feedwater pumps and adding positive reactivity via cooling of the moderator. Emergency Operating scram response procedures do not include reset of the feedwater isolation signal for low Tavg coincident with P-4, or restart of the Main Feedwater Pumps. After Emergency Operating procedures are exited, Normal Operating procedures are entered. The Normal Operating procedures provide the Operator options to restart the Steam Driven Main Feedwater Pumps, or the Startup Feedwater pump, or continue to maintain SG water level using the Auxiliary Feedwater Pumps.

Plant start up procedures do not place the Steam Driven Feedwater Pumps in service until after the reactor is restarted and producing power above the point of adding heat. This is due to the high steam demand needed for motive force.

The following information is from the WCGS Technical Specification Bases and describes the functions of the ESFAS interlock -Reactor Trip/P-4 (which include feedwater isolation coincident with P-4):

- *Engineered Safety Feature Actuation System Interlocks - Reactor Trip, P-4*

  The P-4 interlock is enabled when a reactor trip breaker (RTB) and its associated bypass breaker is open. Manual reset of SI following a 60 second time delay, in conjunction with P-4, generates an automatic SI block. This Function allows operators to take manual control of SI systems after the initial phase of injection is complete. Once SI is blocked, automatic actuation of SI cannot occur until the RTBs have been manually closed.

  The functions of the P-4 interlock are:

  - Trips the main turbine;
  - *Isolates MFW with coincident low Tave;* [emphasis added]
  - Allows manual block of the automatic reactuation of SI after a manual reset of SI; and
  - Allows arming of the steam dump valves and transfers the steam dump from the load rejection Tave controller to the plant trip controller; and
  - Prevents opening of the MFW isolation valves if they were closed on SI or SG Water Level – High High.

  Each of the above Functions is interlocked with P-4 to avert or reduce the continued cooldown of the RCS following a reactor trip. An excessive cooldown of the RCS following a reactor trip could cause an insertion of positive reactivity with a subsequent increase in core power. To avoid such a situation, the noted

> *Functions have been interlocked with P-4 as part of the design of the unit control and protection system.* [emphasis added]

Based on the emphasized information above, normal main feedwater is not required and unavailability does not impact normal scram recovery actions. A review of the Updated Safety Analysis Report showed that the Main Feedwater Pumps are not credited in the safety analysis for Wolf Creek Generating Station.

Wolf Creek Nuclear Operating Corporation's (WCNOC) position is that current plant design, which includes an Engineered Safety Features Actuation System (ESFAS) interlock (Reactor Trip, P-4) to prevent feeding the SGs with the Main Feedwater System when Tavg is < 564°F (no-load Tavg is 557 °F) and the reactor tripped, along with normal scram response procedures that do not permit reset of this signal, would result in answering "No" to the question "Was Main Feedwater unavailable or not recoverable using approved plant procedures following the scram?" WCNOC's position is based on the following guidance contained in NEI 99-02:

- NEI 99-02, Page 17, describes the purpose of Unplanned Scrams with Complications Indicator as follows: "This indicator monitors that subset of unplanned automatic and manual scrams that require additional operator actions beyond that of a normal scram. Such events or conditions have the potential to present additional challenges to the plant operations staff and therefore, may be more risk-significant than uncomplicated scrams." As described above, the condition of the Main Feedwater Pumps (tripped) does not require additional operator actions in response to a scram. The normal scram response procedures do not reset the P-4/Lo TAVG signal, and do not recover the Main Feedwater Pumps.
- NEI 99-02, Page 19, describes criteria for answering the question "Was Main Feedwater unavailable or not recoverable using approved plant procedures following the scram?". This section states the following: "If design features or procedural prohibitions prevent restarting Main Feedwater this question should be answered as 'No'." As described earlier, plant design (P-4 interlock) prevents restarting Feedwater and the scram response procedures to not permit resetting of the Feedwater Isolation signal for Low Tavg coincident with P-4.
- NEI 99-02, page H-4, Section H 1.5, second paragraph, which states: "Some other designs have interlocks in place to prevent feeding the steam generators with main Feedwater unless reactor coolant temperature is greater than the no-load average temperature. These plants should also answer this question as 'No' and move on." As described above, the P-4 interlock coincident with Lo Tavg isolates Main Feedwater and prevents feeding Steam Generators any time the reactor trip breakers are open and Tavg is below 564 °F.

If Auxiliary Feedwater cannot maintain adequate decay heat removal for any reason, guidance is provided in emergency response procedure EMG FR H-1, "Response to Loss of Secondary Heat Sink," to restore the Main Feedwater System on a loss-of-all-feedwater flow to the steam generators. It gives directions to defeat isolation signals by

installing four to six jumpers per SG behind the main control boards. Utilization of this pathway would result in a scram with Complications because WCNOC would have to answer 'Yes' to the next question, "Was the scram response procedure unable to be completed without entering another EOP?" found on page 20, lines 2 & 3 and Figure 2.

In summary, this performance indicator was developed to track scrams where operators were required to perform actions outside of those expected for a normal scram. The importance of Main Feedwater as a mitigating system varies by plant design, and in WCNOCs case, Main Feedwater is not required for response to normal uncomplicated scrams. Availability of a component or system when not required should not be considered a factor for this indicator. While WCNOC was not satisfied with the performance of the Main feedwater pumps in this instance, their performance is monitored through Maintenance Rule indicators that are separate from the indicator discussed in this FAQ.

Although WCNOC reported an earlier SCRAM as complicated with similar circumstances, this should not be set as precedence. This was reported without a detailed review of the NEI 99-02 guidance contained in Attachment H.

NRC Senior Resident Inspector Position:

SRI Position Summary
The SRI disagrees with Wolf Creek and feels that the April 28 trip should have been reported as a scram with complications. On April 28, 2009, Wolf Creek did not have the ability to restore and use main feedwater in normal or emergency operating procedures because all three main feedwater pumps required maintenance, and not because of isolation signals. Any of the three main feedwater pumps can be procedurally started in Mode 3. The FWIS, including P4+Tavg <564F and lo lo S/G level, can be cleared with the pushbuttons or jumper wires per normal or emergency operating procedures. Page H-4, lines 27 to 29 state that the PI measures the **ability** [emphasis added] to implement emergency procedures on loss of auxiliary feedwater. Actual implementation of other emergency procedure is monitored elsewhere. This approach is also consistent with page H-5, lines 20-23, which provide for clearing of isolation signals in order to use main feedwater.

SRI Basis
The SRI believes that although there is a Feedwater Isolation Signal (FWIS, P4 interlock), the April 28, 2009 scram should still count towards the Scrams with Complications PI. Wolf Creek procedure GEN 00-005, "Minimum Load to Hot Standby," revision 62 directs reactor operators to depress the FWIS reset pushbuttons and check that the P4 FWIS annunciator is clear. Main feedwater valves can then be opened even if reactor trip breakers are open, coincident with reactor coolant system temperature below 564F. The control room pushbutton circuitry has a retentive memory device and the valves will remain open until the reactor trip breakers are cycled or the RCS goes above and below 564F. If this happens a second time, the reset button can be depressed again and main feedwater can be re-established. This interlock does not prevent feeding the steam generators with main feedwater because of normal (GEN 5) and off-normal

(EMG FR-H1) plant procedures and the reset pushbutton. The SRI felt page H-5, lines 20 to 23 state that a FWIS does not constitute a loss of main feedwater as long as it can be cleared and feedwater restarted. Procedure EMG FR-H1 also provides instructions for reactor operators to clear the P4+564F and lo lo steam generator level signals with jumper wires. The FWIS handswitch could also be used for P4. The flow path was viable.

The SRI agrees with Wolf Creek's position that actual use of EMG FR-H1 would count towards the PI because of entry into another EMG per NEI 99-02 section H 1.6. The plant trip on April 28, 2009, did not require entry into procedure EMG FR-H1.

Procedure EMG FR-H1 allows and provides steps to use any of the three main feed pumps. However, if procedure EMG FR-H1 was used on April 28, 2009, the main feedwater portion of the procedure would not have been successful because all three main feedwater pumps required maintenance (speed switch, servo valve, and a circuit breaker). Consistent with page 19 of NEI 99-02, Revision 6 and page H-4, lines 24 to 29, the PI monitors the ability of main feedwater to be used to feed the steam generators if necessary in emergency operating procedures. On April 28, 2009, Wolf Creek did not have the ability to restore and use main feedwater in normal or emergency operating procedures because all three main feedwater pumps needed maintenance, and not because of isolation signals.

Wolf Creek does not appear to be a design that applies to page H-4, lines 36 to 38. The P4 FWIS occurs with Tave at 564F which is above no load Tave of 557F cited on page H-4. A Tave of 564F corresponds to a reactor power of approximately 11%. The Wolf Creek total plant setpoint document defines low Tave as 553F (P-12) and lo lo Tave as 550F (Turbine loading stop). If auxiliary feedwater actually failed, and EMG FR-H1 was used, then the RCS is likely to be at 557F or above. RCS temperature is likely not to be a concern prohibiting initial use of main feedwater until the plant is cooled below 564F and the signal would have to be reset again.

Wolf Creek did count the March 2008 scram as complicated. There is no discussion of the main feedwater in Wolf Creek's NRC PI procedure.

Expected reactor trip parameters should not be used as a reason to exclude main feedwater availability from this performance indicator. But, if the NEI/NRC ROP Working Group determines that Wolf Creek is correct, then the Appendix H should be rewritten to explicitly exclude Westinghouse units from the main feedwater availability portion of this performance indicator.

Potentially Relevant Existing FAQ Numbers:
None

RESPONSE:

Proposed Resolution of FAQ:
This event should not count against the Unplanned Scrams w/Complications PI.

NRC Response to the FAQ:

The April 28, 2009 reactor trip at WCGS will be counted as an Unplanned Scram with Complications.

After an extensive review of the guidance in NEI 99-02 and detailed discussions at three ROP Working Group public monthly meetings, the key factor in determining MFW unavailability is the material health of the system (i.e., the system must be free from damage and shall not require repair or maintenance to restore availability). Any active design features (e.g., interlocks or signals that isolate MFW after a reactor trip) used as the basis in answering "No" to the question "Is MFW Unavailable?" is applicable only if the MFW system is free from damage and does not need repair or maintenance (i.e., the MFW system is capable of performing its intended function if called upon).

FAQ 10-04

Plant: **Browns Ferry Nuclear Plant, Unit 1 (BFN 1)**

Date of Event: 6/1/2007
Submittal Date: 4-21-2010
Licensee Contact: Rod Cook Tel/email: (423) 751-2834
NRC Contact: _____ Tel/email: _____

Performance Indicator: MS06 - MS10

Site-Specific FAQ (Appendix D)? Yes ~~or No~~

FAQ requested to become effective when approved or _____

Question Section

NEI 99-02 Guidance needing interpretation (include page and line citation):

Add BFN 1 to Table 7 of Appendix F, Generic CCF Adjustment Values. The values for BFN 1 are the same as those presented for BFN 2 and BFN 3 since all BFN plants are of the same design.

Event or circumstances requiring guidance interpretation:

Return of BFN 1 to operating status during summer of 2007

If licensee and NRC resident/region do not agree on the facts and circumstances explain

NA

Potentially relevant existing FAQ numbers

NA

Response Section

Proposed Resolution of FAQ

Add BFN 1 to Table 7 of Appendix F with plant-specific Generic CCF Adjustment Values.

If appropriate, provide proposed rewording of guidance for inclusion in next revision.

The following is proposed to be added to Appendix F, Table 7:

	EDG	MDP Running or Alternating[+]	MDP Standby	MDP Standby	TDP **	MDP Standby
Browns Ferry 1	1.25	1	1	1	1	3

Figure E-1

NRC Response to FAQ:
The NRC concurs with the proposed resolution stated in the Response Section of this FAQ.

FAQ 10-05
IE04 USwC FAQ

Plant:	**Palo Verde Nuclear Generating Station**		
Date of Event:	**December 3, 2009**		
Submittal Date:	April 14, 2010		
Licensee Contact:	Del Elkinton	Tele/email:	623-393-5656 Delbert.Elkinton@aps.com
NRC Contact	Ryan Treadway	Tele/email:	623-393-3737 Ryan.Treadway@nrc.gov

Performance Indicator: IE04 – Unplanned Scrams With Complications

Site-Specific FAQ (Appendix D)? Yes

FAQ requested to become effective when approved.

QUESTION SECTION
NEI 99-02 Guidance needing interpretation (include page and line citation):

IE04 page 21 Lines 2 -10:
"Was the scram response procedure unable to be completed without entering another EOP?"

Appendix H2.3 PWR Case Study 3, page H-14 Line 9 through H-17 line 23:
This case study discusses a PWR event with loss of forced circulation and entry into natural circulation that was answered "NO" for question six regarding entry into EOPs.

The IE04 guidance currently excludes counting loss of forced circulation (LOFC) under the Westinghouse ES01 Emergency Operating Procedure (EOP) scheme, but requires counting the same scenario under the Combustion Engineering CEN-152 EOP scheme. The proposed resolution would add an Appendix D FAQ to also exclude counting LOFC events under the Combustion Engineering CEN-152 EOP scheme.

The Westinghouse exclusion is based on normal scram recovery and restoration of forced circulation being addressed within the single Westinghouse ES01 EOP. Transition to another EOP is not required. For the same LOFC event, the CEN-152 EOP scheme organizes the response into two EOPs, the normal scram and LOFC.

The administrative arrangement of Westinghouse ES01 for a LOFC without a cooldown using natural circulation provides no safety benefit over the arrangement of CEN-152.

Without any other complications, an LOFC event does not require counting as an unplanned scram with complications in the ES01 scheme and it should not count in the CEN-152 scheme.

Event or circumstances requiring guidance interpretation:
On December 3, 2009, Palo Verde Unit 3 experienced a loss of containment instrument air that resulted in an eventual loss of normal reactor coolant pump (RCP) seal bleed-off flow. This caused the seal bleed-off relief valve to lift to send bleed-off to the reactor drain tank (RDT). To prevent overfill of the RDT and a breach of the RDT rupture disk, control room staff elected to scram the reactor and secure all four RCPs. After completing the standard post-trip actions (SPTAs), the plant remained in mode 3 via natural circulation until forced circulation was restored after instrument air

was restored in containment. A cooldown using natural circulation was NOT initiated. The safety functions were met. All rods fully inserted, the turbine tripped automatically upon scramming the reactor, class and non-class AC busses remained energized, no safety injection occurred, and main feedwater remained in service or available throughout the event. During the event, charging remained available through the pressurizer auxiliary spray line. Letdown and the ability to pump down the RDT were lost because the respective air-operated containment isolation valves shut upon loss of instrument air pressure. These losses were addressed by the use of abnormal operating procedures that do not require entry into another EOP. A contingency action from EOP standard appendices was used to manually align turbine gland seal steam. The RDT rupture disk remained intact, and the each of the RCPs' 3-stage seals operated per design without experiencing abnormal leak-off or heating.

To address the event after diagnosing the loss of instrument air inside containment, the control room staff entered the SPTA EOP. The RCPs were secured and the LOFC EOP was entered to control the plant using natural circulation until forced circulation was restored.

If licensee and NRC resident/region do not agree on the facts and circumstances explain
The NRC resident and Palo Verde are in agreement on the facts of the event and the content of NEI guidance. Both agree that after the reactor trip and manual shutdown of the RCPs, the station entered a second EOP (the LOFC EOP) to maintain heat removal via natural circulation until instrument air and forced circulation were restored.

The NRC resident and Palo Verde differ on whether the guidance provided in NEI 99-02 regarding the Westinghouse ES01 EOP scheme provides an adequate basis for a plant specific exemption that would permit a "No" answer for the question whether the scram procedure was able to be completed without entering another EOP. The NRC resident's contention is based on the purpose of the performance indicator, which is track performance related to "events or conditions that may have the potential to present additional challenges to the plant operations staff and therefore, may be more risk-significant than uncomplicated scrams" given the challenges the Operations staff faced during the December 3, 2009, Unit 3 loss of instrument air event.

Potentially relevant existing FAQ numbers
There are no relevant existing FAQs

RESPONSE SECTION
Proposed Resolution of FAQ
Enter a Combustion Engineering NSSS vendor specific FAQ into Appendix D of NEI 99-02 that would permit a "NO" answer in response to the question "Was the scram response procedure unable to be completed without entering another EOP?" for specific scram events that require entry into the Loss of Forced Circulation EOP. This exception would not apply to LOFC events that were initiated by a loss of offsite power or resulted in a plant cooldown using natural circulation.

To align the December 3, 2009, Palo Verde scram with the indicator as described in the IE04 guidance for Westinghouse design and EOPs, approval of this FAQ would allow the event to be counted only as an unplanned scram.

If appropriate, provide proposed rewording of guidance for inclusion in next revision.
Not applicable – Appendix D FAQ

FAQ 10-05
IE04 USwC FAQ

NRC Response to FAQ:

The December 3, 2009 scram will be counted as an unplanned scram with complications.

The guidance in NEI 99-02 clearly indicates that if more than one EOP is entered following a scram, then the unplanned scram is considered complicated. Since reactor designs and associated EOP structures are different, it is recommended that the inquiries in this FAQ be explored in a generic FAQ.