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PR

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Technical Specification Change Request NPF-38-220
Supplement to Emergency Diesel Generator Allowed
Outage Time Increase

Gentlemen:

Per discussions with the NRC Staff, Entergy Operations, Inc. (EOI) is hereby submitting additional information to support the review of Technical Specification Change Request (TSCR) NPF-38-220, Emergency Diesel Generator Allowed Outage Time Increase. The information provided in these attachments addresses both deterministic and risk-informed issues. EOI has determined the need for an alternate A.C. source for the onsite power system during extended Emergency Diesel Generator (EDG) maintenance outages. An extended EDG maintenance outage is one that goes longer than 72 hours (not to exceed 10 days). Based on EOI's analyses, the plant risk impact, involving the extended EDG allowed outage time with an alternate A.C. source, met the acceptance guidelines contained in Regulatory Guide 1.177.

EOI is hereby requesting the attached information be incorporated with the original TSCR NPF-38-220 information transmitted by Letter W3F1-99-0022, dated July 29, 1999, and our response to a Request for Additional Information (RAI) provided in Letter W3F1-2000-0006, dated January 27, 2000. The Information contained in this correspondence will change the following information from the original submittal.

A001

- Deletes the requested incorporation of the Configuration Risk Management Program (CRMP) into Technical Specifications (TS) Section 6.0.
- Revises the Significant Hazards Consideration Determination.
- Revises the Proposed Marked-up Specifications, Attachment B.
- Deletes the Proposed Specification, Attachment C.

Per discussions with the NRC Staff, it was requested that EOI delete the incorporation of CRMP in the TS based on projected issuance of regulatory guidance regarding the implementation of 10 CFR 50.65(a)(4). That regulation involves risk-informed assessments of maintenance activities. EOI will proceduralize the CRMP to support Risk-Informed Technical Specification Allowed Outage Time submittals and implementation of 10 CFR 50.65(a)(4), the Maintenance Rule. Therefore, the request to incorporate CRMP into the TS has been deleted.

With respect to the original Significant Hazards Consideration Determination and Attachment B contained in the July 29, 1999 submittal, replace them with the enclosed Significant Hazards Consideration Determination contained in Attachment 1 and the Proposed Marked-up Specification contained in Attachment 3. In addition, please disregard Attachment C contained in the original submittal.

Consistent with the discussions with the NRC Staff following EOI's response to the RAI per Letter W3F1-2000-0006, dated January 27, 2000, EOI respectfully requests the NRC Staff approve TSCR NPF-38-220 based on the original submittal, the response to the RAI, and the information attached to this letter.

The proposed TS change has been evaluated in accordance with 10CFR50.91(a)(1), using the criteria in 10CFR50.92(c), and it has been determined that this request involves no significant hazards consideration.

The circumstances surrounding this change do not meet the NRC Staff criteria for exigent or emergency review; however, EOI is requesting NRC Staff approval of the TS change prior to July 7, 2000 to allow potential on-line maintenance in support of Refuel 10, which is currently scheduled to begin October 13, 2000. EOI requests the effective date for this TS change be within 60 days of approval.

This letter contains commitments that are documented on the attached commitment identification form. Should you have any questions or comments concerning this request, please contact Ron Williams at (504) 739-6255.

Pursuant to 28 U.S.C.A. Section 1746, I declare under penalty of perjury that the foregoing is true and correct. Executed on May 22, 2000.

Very truly yours,

C.M. Dugger
Vice President, Operations
Waterford 3

CMD/RLW/rtk
Attachment

Attachment 1- Supplement to TSCR NPF-38-220 Emergency Diesel Generator Allowed Outage Time Increase
Attachment 2- Commitment Identification/Voluntary Enhancement Form
Attachment 3- Proposed Marked-up Specifications

cc: E.W. Merschoff, NRC Region IV
N. Kalyanam, NRC-NRR
J. Smith
N.S. Reynolds
NRC Resident Inspectors Office

ATTACHMENT 1

NPF-38-220

Supplement to TSCR NPF-38-220
Emergency Diesel Generator Allowed Outage Time Increase

Supplement to Technical Specification Change Request NPF-38-220
Emergency Diesel Generator Allowed Outage Time Increase

Summary of Proposed Changes

EOI submitted Technical Specification Change Request (TSCR) NPF-38-220 in July 1999. A response to a Request for Additional Information (RAI), dated January 27, 2000 was subsequently submitted in Letter W3F1-2000-0006 to support NRC Staff review. The purpose of this supplement is to provide the revised results of our deterministic and risk-informed evaluations. This submittal provides additional justification for the change through implementation of compensatory measures in support of emergency diesel generator (EDG) extended allowed outage time (AOT), risk impact determination with the compensatory measures in place, and response to probabilistic risk assessment quality and fire IPEEE risk issues.

The proposed change revises Technical Specification (TS) 3.8.1.1. In addition, a revision to the TS Bases 3/4.8.1, 3/4.8.2 and 3/4.8.3 has been included to support this request. The purpose of this TSCR is to extend the AOT for the EDG from the existing limit of 72 hours to 10 days (240 hours). This extension will allow Waterford 3 to perform the following on-line maintenance work.

- Preplanned maintenance work (both preventive and corrective) known to require greater than 72 hours with implementation of required compensatory measures. This work would normally include the major eighteen-month or five-year preventive maintenance EDG overhauls.
- Unplanned corrective maintenance work that may be determined to take greater than 72 hours with implementation of required compensatory measures.

Compensatory measures will be implemented prior to any preplanned maintenance and within the 72 hour AOT following EDG inoperability for unplanned corrective maintenance activities, if deemed necessary. These compensatory measures consist of a temporary emergency diesel generator (TEDG) and other measures to ensure availability of the TEDG to supply auxiliary power to required safe shutdown loads in the event of a loss of offsite power, the failure of the operable EDG, and the turbine-driven emergency feedwater pump failure to start.

Deterministic Assessment

Defense-in Depth Attributes and Safety Margins

The Waterford 3 onsite power system, including the onsite electric distribution system, satisfies the requirements of General Design Criterion 17 (GDC-17) of 10 CFR 50, Appendix A. These systems have sufficient independence, redundancy, and testability

to perform their safety functions assuming single failure. The onsite power system is designed to:

- Provide a reliable source of auxiliary power for safe shutdown of the reactor, assuming loss of offsite power and a single active failure in the onsite power system;
- Be capable of withstanding the effects of a design basis wind, tornado, flood and earthquake event without loss of power to safety-related components essential to safe shutdown; and
- Minimize the probability that the loss of one onsite power supply or its distribution system will cause loss of the other train or of the offsite power system.

Waterford 3 has two separate and independent EDGs to ensure that at least one onsite AC power source will be available to supply power to its associated Class 1E 4.16 kV onsite electric distribution system for the safe shutdown of the plant during accident conditions, coincident with a loss of offsite power and the failure of the alternate train EDG. Safety analysis assumptions are consistent with the design basis specified in GDC-17 and the acceptance criteria in the Updated Final Safety Analysis Report (UFSAR) are met.

Onsite power system operational requirements are established as part of the TS limiting conditions for operation (LCO), based on the intent of GDC-17 and using guidance provided in Regulatory Guide (RG) 1.93, "Availability of Electric Power Sources," December 1974. The LCO is met when all the electric power sources required by GDC-17 are available; however, RG 1.93 recognizes that, under certain conditions, it may be safer to continue operation at full or reduced power for a limited time rather than immediately shutdown the plant on the loss of some of the required electric power sources. Thus, the AOT provided in certain TS action statements are designed to permit limited operation with a temporary reduction of safety system operability but without an unacceptable reduction in the margin of safety. At issue is the acceptability of the maximum length of the AOT interval relative to the potential occurrence of design basis events during that interval. As such, the design basis for the onsite power system is not changed by extending the present 72-hour AOT for a single inoperable EDG, but the risk-impact of the unavailability of an EDG (onsite power system source) during the AOT interval must be addressed.

In the event that an EDG is inoperable in Modes 1 - 4, the following current TS 3.8.1.1 Action Statements shall apply:

- ACTION Statement "b" requires that within one hour the offsite power sources shall be demonstrated operable by verifying correct breaker alignment and at least once per eight hours thereafter; and the remaining EDG demonstrated operable within 8 hours by performing a 31 day operability run, unless the absence of any potential common failure for the remaining diesel generator is demonstrated. The EDG must

be restored to an operable status within 72 hours or the plant is placed in at least hot standby within the next 6 hours and in cold shutdown within the following 30 hours.

This required action is intended to provide greater assurance of offsite power source stability and the remaining redundant onsite power source (EDG) retains full capability to provide power to safely shutdown the plant and to mitigate the consequences of a design basis accident.

- ACTION Statement "d" requires that within two hours all required systems, subsystems, trains, components, and devices that depend on the remaining operable EDG as a source of emergency power be verified operable; and when in Modes 1, 2, or 3, the steam-driven emergency feedwater pump must also be verified operable.

  This required action is intended to provide assurance that a loss of offsite power event will not result in critical systems having a complete loss of safety function during the period one of the EDGs is inoperable.

In the event that all Waterford 3 offsite and onsite power sources fail, the station blackout (SBO) analysis demonstrates a four-hour DC coping duration to maintain the plant in Hot Standby through the duration of the SBO event. During the SBO duration, the plant is capable of maintaining adequate core cooling and containment integrity.

As discussed in the response to the RAI, dated January 27, 2000, the assumptions and the results of the SBO analysis are not changed by an extension of the AOT, and compliance with 10 CFR 50.63 will be maintained. In addition, the EDG reliability is maintained at or above the SBO target level, and the effectiveness of maintenance on the EDGs and support systems is monitored pursuant to the Maintenance Rule (10 CFR 50.65).

Based on the intent of GDC-17, appropriate regulatory guides such as RG 1.93, engineering principles such as the single failure criterion, and the proposed change impact to barriers to core damage, containment failure and the mitigation consequences, EOI determined that the proposed change met the design basis of the plant and was consistent with the defense-in-depth philosophy.

However, in evaluating the EDG AOT extension and the potential EDG unavailability beyond the current 72-hour duration in a probabilistic risk assessment of the plant, EOI determined that additional compensatory measures were warranted. The probabilistic risk assessment (PRA) determined that calculated risk increases caused by the proposed change were greater than the Reg. Guide 1.177 guideline value for an AOT risk increase of 5E-7 without the TEDG. Therefore, additional compensatory measures were identified to balance the calculated risk increase caused by the proposed change.

The compensatory measures included the utilization of a TEDG during the extended AOT time period.

Based on the above assessment, and to maintain a risk sensitive defense-in-depth design approach, EOI commits to utilizing a temporary alternate AC onsite power source whenever an EDG is removed from service for: preplanned maintenance work known to require greater than 72 hours or if deemed necessary for unplanned corrective maintenance work that will exceed the 72 hour AOT. This will involve the installation of a TEDG. The TEDG will be aligned for backup operation to the permanent EDG removed for maintenance.

The proposed compensatory measures, in support of an EDG extended 10 day maintenance outage, is to provide a reliable commercial grade diesel generator, capable of supplying auxiliary power to, at a minimum, required safe shutdown loads on the EDG train removed from service for the maintenance outage. In the PRA event of a loss of offsite power, the failure of the operable EDG, and the failure of the turbine-driven emergency feedwater pump to start, the TEDG would be started and ready for load within 25 minutes. Power would be supplied to deenergized 4.16 kV non-safety bus 2A or 2B, depending on which EDG train was declared inoperable, via a 4.16 kV breaker. Power from the non-safety bus 2A or 2B would be supplied to the associated class 1E 4.16 kV safety bus 3A or 3B through two existing plant cross-tie circuit breakers (2-3 and 3-2) to power the required safe shutdown loads.

Additional design measures were also considered to ensure the adequacy of this proposed TEDG as an alternate power source. The existing plant switchgear, breakers, and protective relaying were evaluated to ensure adequate rating for the anticipated load. The switchgear is adequately rated at 3000 Amps, 350 MVA (symmetrical). The feeder breakers to the 4.16kV safety bus 3A(B) are also adequately rated along with adequate protective relaying coordination. These feeder breakers are used for normal plant operation and safe shutdown. The protective relays associated with the 4.16 kV breaker on non-safety bus 2A(B) may need to be adjusted to coordinate with the TEDG rating. The protective relaying associated with the TEDG will be verified for coordination and adequacy.

Procedure(s) will be developed to implement onsite power system recovery action in conjunction with the present Emergency Operating Procedures (EOP) and appropriate Off Normal Procedures in the event it is necessary to use the alternate AC power source. The procedure(s) will include the following requirements:

- Address the minimum required safe shutdown loads to be supplied from the TEDG and the appropriate loading sequence, accomplished through manual operation or auto-sequencing via the installed sequencer. The final temporary diesel sizing will be optimized based on the required safe shutdown loads and other desirable loads for

operational support of plant activities. The basis for minimum TEDG sizing is listed in the following table.

Required Loads	**Rating**	**Running kW****
One Emergency Feedwater Pump	400 Hp	305
One Charging Pump	100 Hp	65
One measurement channel SUPS	20 KVA	27
One Battery Charger	34 KVA	3
One Component Cooling Water Pump	300 Hp	240
One bank of 15 Dry Cooling Tower Fans	600 Hp	480
Three additional room coolers	15 Hp	10
Computer SUPS (desired)	225 KVA	70
One group pressurizer heaters	150 KW	150
Safety SUPS	20 KVA	10
Chiller compressor for room coolers	≈ 500KVA	380
Chilled Water Pump and oil pumps	41.5 Hp	23
Control Room HVAC	75 Hp	34
Switchgear Room HVAC	65Hp	40
*Misc. loads	100 KVA	80
TOTAL ANTICIPATED LOADING		**1917**
**Approx.10% margin between nominal rating & anticipated loading		200
NOMINAL RATING		**2117**

* *This includes cable and transformer losses, some lighting loads, and valves.*

** *Running load values under steady state conditions obtained from FSAR Table 8.3-1. It should be noted that there would be inrush current from each motor that is energized. The battery charger may have a higher load factor (150Amps max.) for the initial few minutes due to the initial discharge. The nominal rating of the TEDG will be more than adequate to accommodate these demands. The sizing criteria accounts for margin between anticipated loading and nominal rating.*

- Availability of the TEDG will be verified prior to removing the permanent plant EDG from service for any preplanned maintenance scheduled to take more than 72 hours and statused every 72 hours thereafter to ensure continued availability.

  TEDG availability is verified by: (1) starting the TEDG and verifying proper operation; (2) verifying 24 hour onsite fuel supply; and (3) ensuring the TEDG is aligned to supply power through a 4.16 kV non-safety bus to the 4.16kV safety bus.

A status check for TEDG availability shall consists of: (1) verifying the TEDG equipment is mechanically and electrically ready for manual operation; (2) verifying 24 hour onsite fuel supply; and (3) ensuring the TEDG is aligned to supply power through a 4.16 kV non-safety bus to the 4.16kV safety bus.

- 24-hour onsite fuel supply will be verified for the TEDG prior to removing the permanent plant EDG from service for maintenance and statused every 72 hours to ensure fuel availability.
- Operator actions
  - Manually start the TEDG
  - Provide actions to ensure the loads are stripped from the busses and the sequencer is disabled to ensure stability of the TEDG prior to manually loading the TEDG.
  - Energize the previously deenergized non-safety 4.16 kV bus using the TEDG.
  - Control Room personnel can energize the safety-related 4.16 kV bus from the main control panels.
- Provide actions to protect the TEDG when there are adverse weather conditions (e.g., high winds, lightning, and icing conditions) or other abnormal conditions that could potentially threaten the TEDG availability. Off Normal Procedure OP-901-521, "Severe Weather and Flooding", would apply if weather or grid conditions degrade or threaten to degrade to a point where off-site power could be lost. Further actions would be taken to expeditiously restore vital plant systems and components to service in the event the National Weather Service issues a Hurricane, Tropical Storm, or Tornado Watch or Warning for the Waterford 3 area.
- Test instructions to perform the TEDG availability verification testing and periodic availability status checks, as required.

EDG Post Maintenance Tests

Questions concerning post-maintenance testing following major EDG maintenance or overhaul were detailed in EOI's response to RAI questions 6a through 6d per Letter W3F1-2000-0006, dated January 27, 2000. Post-maintenance testing following the preplanned maintenance outages, that include routine inspections (18-month or 5-year inspections), is performed in accordance with Maintenance procedure ME-004-021, Emergency Diesel Generator. This post-maintenance testing includes several unloaded EDG runs that are used to verify proper operation of the electrical and mechanical governors and the voltage regulator. This testing is designed to identify maintenance-induced problems while the EDG is separated from the electrical system, thus minimizing the occurrence of system transients.

The initial loaded run of the EDG is performed by synchronizing the EDG with offsite power and loading the EDG in accordance with the normal EDG operating and

surveillance procedures to support the manufacturer's recommended post-maintenance 18-month or five year Emergency Diesel Engine Inspection engine analysis. Proper frequency and voltage response is verified prior to connecting the EDG to the 4.16kV safety buses and again while loading the EDG. Diesel generator operability is satisfactorily assured through performance of TS 4.8.1.1.2.a.4 surveillance tests that demonstrate the EDG is capable of performing its intended safety functions.

The routine inspections (18-month and 5-year inspections) expected to be accomplished during an extended maintenance outage normally do not require a post-maintenance full load rejection test to verify operability, since disassembly is primarily for access and not for overhaul of major components. However, if extensive governor maintenance is performed, the appropriate post-maintenance tests would be evaluated, based on manufacturer's recommendations and maintenance test procedures, to ensure EDG operability. Appropriate post-maintenance tests for major governor work may include a 100% load rejection test to ensure EDG operability.

A full load rejection test at Waterford 3 would require the EDG to be 100% loaded and operating in parallel with offsite power. The EDG output breaker would then be opened, which would strip the EDG of its load and isolate it from the 4.16kV safety bus. The load would then be simultaneously picked up by the offsite power source. To date, Waterford 3 has never performed an EDG full load rejection test with the plant at power. A full-load rejection test is required by TS to be performed every 18 months during shutdown.

In reviewing the Waterford 3 full-load rejection test data from Refueling Outage 9, the results indicated that voltage on the 4.16kV safety buses dropped approximately 2% and stabilized in about 0.5 seconds. This is a relatively minor transient and well within the capability of the loads on the vital (ESF) buses. The design basis for bus voltage transients on the safety buses is based on 4160 volts nominal voltage and consists of the following voltage conditions:

- An instantaneous Loss of Voltage at $\geq$ 3245 volts (TS trip setpoint value).
- Undervoltage protection for degrading voltage values $\leq$ 3675 volts (88.3%) provided by undervoltage relays with inverse time characteristics (i.e. between a high of 9 seconds to a low of 2 seconds).
- Undervoltage protection for sustained degraded voltage values $\leq$ 3875 volts (93.1%) with a time delay of 12.5 seconds.
- Rated maximum voltage for the switchgear of 4760 volts.

If a 100% load rejection test is deemed necessary as a post maintenance retest to prove an EDG operable following a complete governor replacement while on-line, EOI will review past surveillance records prior to the load rejection test performance. EOI will ensure the voltage transients experienced on the safety buses during the EDG

100% Load Rejection surveillance test were within (±)5% of the initial test voltage with stabilization within 1 second. The selected voltage transient range is based on the following criteria:

- The (+)5% value is adequate to ensure stability of the safety bus and does not approach the design rating of the switchgear (4760 Volts).
- The (-)5% value is above the instantaneous Loss of Voltage TS trip setpoint of ≥ 3245 Volts. The instantaneous Loss of Voltage trip was used for a tolerance value based on the Refueling Outage 9 EDG 100% load rejection test data that resulted in a voltage drop of approximately 2% with stabilization in about 0.5 seconds. The degraded voltage trip of 93.1% has a time delay of 12.5 seconds.

Conclusion

Based on the above discussion, extending the AOT for a single inoperable EDG from 72 hours to 10 days to perform: (1) preplanned maintenance work known to require greater than 72 hours; or (2) unplanned corrective maintenance work prior to exceeding the 72 hour AOT is acceptable provided appropriate compensatory measures described above are implemented. The proposed EDG AOT extension with the compensatory measures satisfies the principle that adequate defense-in-depth and safety margins are maintained. A generic discussion of deterministic factors associated with EDG unavailability is also provided in Section 6.2 of CE NPSD-996, "Joint Applications Report for Emergency Diesel Generators AOT Extension." The Waterford 3 plant-specific risk impact from EDG unavailability during the extended AOT and the implementation of compensatory measures in the form of a TEDG is evaluated in the following probabilistic safety assessment section.

Probabilistic Safety Assessment (PSA)

Risk Assessment with TEDG Installed

The change in core damage probability (CDP) due to the extended AOT was recalculated with credit for a TEDG. The current version of the Waterford 3 PSA fault tree was revised to depict the proposed configuration of a TEDG in place of a permanent EDG removed from service for preventive or corrective maintenance. The fault tree change consisted of replacing all EDG B (worst case out of service EDG due to modeled plant equipment alignment) failure gates with new gates for the temporary DG. The gate for the "fail to run" events was replaced with a single "Temp DG Fails to Run" event, since the TEDG is self-contained with no outside support systems. The gate for the "fail to start" events was replaced with a gate consisting of the TEDG failing to start OR the operator failing to start it. No common cause events were assumed to

occur between the TEDG and permanent EDGs, due to different operating histories, manufacturers, design, and set-up.

Generic diesel generator failure data, found in NUREG/CR-4550, Volume 6, Rev 1, was used for the temporary DG failure rates. The EPRI HCR/ORE methodology, supplemented with the Cause-Based Approach, was used to determine the probability that an Operator would fail to start the TEDG within 50 minutes (time to core uncovery) of event initiation. The probability of failure of the Operator to start the TEDG was determined to be approximately 0.049.

The results of the evaluation yielded the following values:

Parameter	**PM**	**Risk Increase**	**CM**	**Risk Increase**
Baseline CDF with one EDG never out for Test/Maint.	1.09E-5	N/A	1.09E-5	N/A
CCDF with B EDG OOS and TEDG installed	1.72E-5	N/A	1.998E-5	N/A
ICCDP for 3 Day AOT	5.18E-8	N/A	7.46E-8	N/A
ICCDP for 10 Day AOT	1.73E-7	1.21E-7	2.49E-7	1.74E-7
ICLERP for 10 Day AOT	5.19E-9	N/A	7.47E-9	N/A

CDF: core damage frequency
CCDF: conditional core damage frequency
ICCDP: incremental conditional core damage probability
ICLERP: incremental conditional large early release probability

Reg. Guide 1.177 provides a guideline value for an AOT risk increase as 5E-7 and defines ICCDP as the difference between the conditional core damage frequency (CCDF) with the equipment in question out of service and the baseline CDF, multiplied by the duration of the single AOT under consideration. This is the manner in which the above ICCDP values were calculated. As shown, both the preventive and corrective maintenance values are below the 5E-7 guideline.

However, the risk value for corrective maintenance is conservative. In calculating this value, following the CEOG Joint Application Report CE NPSD-996 guidelines, the common cause factor assumed is the value of the beta factor throughout the entire period of the AOT. Because Waterford 3 must evaluate the remaining operable EDG for common cause within 8 hours of failure of an EDG in accordance with TS 3.8.1.1 ACTION statement b, the beta factor is actually only applicable to the 8 hour period allowed for this investigation. At the end of that 8 hours, if a common cause failure is found, the remaining operable EDG is declared inoperable and TS 3.8.1.1. ACTION statement "f" is entered (two EDGs inoperable), which is not affected by this AOT extension request. If no common cause failure is found, then the beta factor should have been zero for the entire AOT period, making the risk due to corrective

maintenance the same as that for preventive maintenance. Therefore, because the Waterford 3 Technical Specifications require confirmation within 8 hours that a common cause failure does not exist in the operable EDG, EOI maintains that the above ICCDP for corrective maintenance is not realistic and is overly conservative.

The risk decrease due to not having an EDG out of service for extended periods during refuel outages should also be considered. This reduction in shutdown risk would partially and may significantly offset the proposed risk increase due to on-line maintenance. Therefore, considering both operating risk and shutdown risk, there may be a net decrease in overall risk. EOI does not currently have a shutdown risk model for Waterford 3 with which to perform this calculation. However, a similarly designed plant has calculated that performing EDG maintenance on-line would actually decrease their net risk. EOI understands that the calculation was plant-specific and the values determined cannot be used at Waterford 3, however, the risk decrease from the increased EDG availability during outages would certainly decrease the net risk increase at Waterford 3, and should therefore be a consideration.

Probabilistic Risk Assessment (PRA) Quality Issues

EOI (for Waterford 3) has participated in a Combustion Engineering Owners Group PSA cross-comparison project. The cross comparison provides a level of review for the quality of the PRA model. This project examined the reasons for similarities and differences in plant risk profiles between the CEOG plants. Any apparent differences in features of a plant's PSA were investigated to determine whether a basis for the difference existed. No unjustified differences between the Waterford 3 PSA and the other CEOG plant PSAs were found.

In addition, the use of the TEDG when in the extended AOT preserves the defense-in-depth of the two EDGs. The addition of a new failure mode (operator fails to manually start the TEDG) is partially offset by the absence of any significant common cause coupling between the permanent EDG and the TEDG, since the TEDG is completely self-contained, operated in a different environment with its own operating procedure, a different design, and is maintained by an outside vendor. The use of a TEDG to replace the out of service permanent EDG results in a very small change in risk for the extended AOT.

The primary quality issues described in the Individual Plant Examination Safety Evaluation Report (IPE SER) are: (1) the Loss of Offsite Power (LOOP) Recovery Curve is too Optimistic; (2) the Turbine-driven EFW Pump Run Failure Rate is too Low; (3) Inconsistent treatment of Common Cause Failure; and (4) HRA Issues. These issues are addressed individually. In addition, the potential impact of fire IPEEE risk on the EDG AOT risk is described.

Loss of Offsite Power Recovery Curve is too Optimistic

The recovery curve used in the IPE was overly optimistic. We have recalculated the curve based on the latest EPRI data on LOOP events and their recovery times. This new curve was included in the risk calculations provided in the EOI's response to the RAI, dated January 27, 2000, and is included in the present risk calculations for the TEDG shown above. Using the new, more realistic curve data, the LOOP non-recovery probability at 6 hours increased by a factor of 3 and the probability at 24 hours increased by a factor of 588.

Turbine-driven EFW Pump Run Failure Rate is too Low

The IPE SER stated that Waterford should use the higher NUREG-4550 run failure rates for the EFW turbine-driven pump. We do not believe that is appropriate, because Waterford 3's operating experience with our turbine-driven EFW pump has been very good. A review of the available records shows that there has never been a run failure of this pump at Waterford 3. EOI has long been proactive in its maintenance of the EFW turbine-driven pump and its incorporation of industry experience. Nevertheless, a sensitivity study was performed in which the turbine driven pump run failure rate was increased by over an order of magnitude (from 8.9E-5 per hour to 1E-3 per hour). The resulting 10-day incremental conditional core damage probability (ICCDP) for CM was 3.55E-7 and for PM was 2.73E-7, still below the 5.0E-7 threshold for a small change in risk. This does not include any credit for operator recoveries, such as actions that could be taken locally to restore a failed pump

Inconsistent treatment of Common Cause Failure

The potential impact of this issue was addressed by adding appropriate common cause failure (CCF) events to systems that are important to the EDG AOT risk calculation and recalculating the EDG AOT ICCDP values.

CCF events were added to the EFW system logic for air-operated valves (AOVs), check valves, pump motor breakers, and all three EFW pumps (CCF for the motors was already included). The resulting 10-day ICCDP values for CM and PM were 4.55E-7 and 3.64E-7, respectively, still below the 5.0E-7 threshold for a small change in risk. This does not include any credit for operator recoveries, such as manually opening an EFW injection AOV to restore flow following a common cause failure.

CCF for electrical busses was evaluated and determined not to have a significant effect on the AOT calculation, because the effect of such CCFs would be to produce a SBO. Therefore, in this case, the availability or unavailability of a permanent EDG would be irrelevant since both safety busses would already be failed.

CCF for the batteries was already included in the IPE model and the current PSA model. The CCF probability for 6 of 6 battery chargers was estimated to be 7.3E-7 (an independent failure probability of 3.2E-4 times a Multiple Greek Letter CCF factor of 2.2E-3). This is negligible, compared to the battery CCF probability of 1.7E-5, and thus has no impact on the EDG extended AOT calculation.

Human Reliability Analysis Issues

Most of the significant Human Reliability Analysis (HRA) issues are related to non-SBO and non-LOOP transient sequences (e.g., loss of feedwater scenarios). The dominant human action in the SBO sequence is the recovery of offsite power, which is modeled using a Weibull fit to the EPRI LOOP recovery time data (EPRI TR-110398).

The first operator failure in the SBO cut sets (except for the operator failure to start the TEDG) was in a cut set with a probability of about 10^{-10}, which is negligible. The operator action to start the TEDG was quantified using an up-to-date HRA method based on EPRI TR-100259 and NUREG/CR-1278.

The impact of HRA issues on the non-SBO sequences as related to the EDG AOT calculation was estimated by looking at the dominant non-SBO scenario that includes a LOOP: a transient with total loss of feedwater (TB), with a CDF of 2.6E-6. Other sequences that include LOOP are much lower in probability (< 2E-8). For the portion of sequence TB with the LOOP initiator, there were two operator actions that were significant: (1) failure to recover from HVAC failures; and (2) failure to switch the EFW suction source to the backup water supply. The first operator action has always been set to a conservatively high screening value of 0.5, so the weaknesses identified in the IPE are not applicable. The second operator action is included in cut sets that do not involve AC power failures, so the availability or unavailability of an EDG is not important. The remaining operator actions were in cut sets with probabilities below 3E-9. Since the HRA changes would affect both the base case and the EDG extended AOT case in a similar manner, the HRA issues identified in the IPE SER do not have a significant effect on the EDG extended AOT calculation.

The quality issues do not change what is of primary importance in determining the risk impact of the extended AOT: the replacement of a permanent EDG with the TEDG and its risk trade-off. The effect of the quality issues is to potentially shift upward (or downward) the overall risk for both cases (two permanent EDGs in service versus one permanent EDG with a TEDG). Since it is the incremental change in core damage frequency (CDF) between the two cases that determines the risk impact of the extended AOT, and both cases are similarly affected by the quality issues, the EDG extended AOT risk is not significantly affected by the quality issues.

Fire IPEEE Risk

The fire risk assessment is conservative and should not be added to the internal events CDF due to the very different methodology used. The potential impact of fires on the EDG extended AOT risk was evaluated by considering a worst-case fire scenario: a fire in the A Switchgear Room (through which both the A and B offsite power cables pass) with the B EDG out of service. The limiting fire scenario in this fire area was a large, unsuppressed fire in the A 4.16 kV safety bus that produced a hot gas layer that failed all A train components and both offsite power cables. No credit for the TEDG was included. The ICCDP for a 10-day AOT for this limiting fire scenario was 2.6E-9, which is very small compared to the internal events ICCDPs. Since this risk value does not credit the availability of the TEDG, the actual fire risk is significantly lower. Therefore, fire risk does not have a significant effect on the ICCDP risk calculations for the EDG AOT extension request.

No Significant Hazards Consideration Determination

The proposed changes described above have been evaluated in accordance with 10CFR 50.92(c). The change shall be deemed to involve a significant hazards consideration if there is a positive finding in any of the following areas:

1. Will the operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response:

   The EDGs are backup alternating current power sources designed to power essential safety systems in the event of a loss of offsite power. As such, the EDGs are not accident initiators in any accident previously evaluated. Therefore, this change does not involve a significant increase in the probability of an accident previously evaluated.

   The proposed changes to the TS will extend the allowed outage time (AOT) for a single inoperable emergency diesel generator (EDG) from the current limit of 72 hours to 10 days with the implementation of compensatory measures. These compensatory measures consist of a temporary emergency diesel generator (TEDG) capable of supplying auxiliary power to required safe shutdown loads on the EDG train removed from service. In the probabilistic risk Assessment (PRA) event of a loss of offsite power, the failure of the operable EDG, and the failure of the turbine-driven emergency feedwater pump to start, the TEDG would be started and ready for load within 25 minutes. In the PRA assumptions to calculate the risk

increase to core damage, 50 minutes is available until core uncovery. The AOT would be extended for: (1) preplanned maintenance work (both preventive and corrective) known to require greater than 72 hours; and (2) unplanned corrective maintenance work which may be determined to take greater than 72 hours.

The plant defense-in-depth has been preserved by the use of a TEDG to supply required safe shutdown loads. The design basis for the onsite power systems will continue to conform to 10 CFR 50, Appendix A, General Design Criterion 17.

Therefore, the proposed change will not involve a significant increase in the probability or consequences of any accident previously evaluated.

2. Will the operation of the facility in accordance with this proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response:

The EDGs are backup alternating current power sources designed to power essential safety systems in the event of a loss of offsite power. The proposed changes to the TS will extend the allowed outage time (AOT) for a single inoperable emergency diesel generator (EDG) from the current limit of 72 hours to 10 days with the implementation of compensatory measures. These compensatory measures consist of a temporary emergency diesel generator (TEDG) capable of supplying auxiliary power to required safe shutdown loads on the EDG train removed from service. In the PRA event of a loss of offsite power, the failure of the operable EDG, and the failure of the turbine-driven emergency feedwater pump to start, the TEDG would be started and ready for load within 25 minutes. In the PRA assumptions to calculate the risk increase to core damage, 50 minutes is available until core uncovery. The AOT would be extended for: (1) preplanned maintenance work (both preventive and corrective) known to require greater than 72 hours; and (2) unplanned corrective maintenance work which may be determined to take greater than 72 hours.

The proposed change does not alter the design, configuration, and method of operation of the plant for safety-related equipment during the EDG AOT extension period. The plant defense-in-depth has been preserved by the use of a TEDG to supply power to required safe shutdown loads.

The change does involve the modification of non-safety permanent plant equipment. The modification will involve preparing a 4.16kV non-safety bus breaker for connection to the output of the TEDG. There is no change being made to the parameters within which the plant is operated, and the setpoints at

which the protective or mitigative actions initiate. The design basis on which the plant was licensed will not be changed. In the PRA event of a loss of offsite power, the failure of the operable EDG, and the failure of the turbine-driven emergency feedwater pump to start, the TEDG would be started and ready for load within 25 minutes. In the PRA assumptions to calculate the risk increase to core damage, 50 minutes is available until core uncovery.

Procedures will be developed to implement onsite power system recovery action in conjunction with the present Emergency Operating Procedures (EOP) and appropriate Off Normal Procedures in the event it is necessary to use the alternate AC power source. The developed procedures support compensatory measures that provide additional assurance that if a coincident Loss of Offsite Power and failure of the operable EDG (outside the design basis of the plant) occurred during a preplanned maintenance (both preventive and corrective) or unplanned corrective maintenance extended EDG AOT outage, appropriate guidance would be available to safely shutdown the plant. There are no alterations to the existing plant procedure that will decrease assurance that the plant will remain within analyzed limits. As such, no new failure modes are being introduced that would involve any potential initiating events that would create any new or different kind of accident. The proposed change will only provide the plant some flexibility in the AOT for accomplishing preplanned maintenance (both preventive and corrective) normally performed during refueling outages and any potential unplanned corrective maintenance that may exceed the normal 72-hour AOT during plant operation in Modes 1, 2, 3, and 4. The change does not alter assumptions made in the safety analysis and licensing basis.

Therefore, since there will be no permanent hardware modifications to safety-related equipment nor alterations in the way in which the plant or equipment is operated during any design basis event, the proposed change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Will the operation of the facility in accordance with this proposed change involve a significant reduction in a margin of safety?

Response:

The proposed change does not affect the LCO's or their Bases used in the deterministic analysis to establish the margin of safety. The margin of safety is established through equipment design, operating parameters, and the setpoints at which automatic actions are initiated. There is no significant impact on the margin of safety. PSA methods were used to evaluate the proposed change. The results of these evaluations indicated the risk contribution from this proposed

AOT with compensatory measures implemented during this extended EDG AOT time period is small and within the Regulatory Guide 1.177 risk-informed acceptance guidelines.

Therefore, the change does not significantly impact the margin of safety, involve a permanent change in safety-related plant design, or have any affect on the plant protective barriers. Therefore, the proposed change will not involve a significant reduction in a margin of safety.

Safety and No Significant Hazards Consideration Determination

Based on the above No Significant Hazards Consideration Determination, it is concluded that: (1) the proposed change does not constitute a significant hazards consideration as defined by 10CFR50.92; (2) there is a reasonable assurance that the health and safety of the public will not be endangered by the proposed change; and (3) this action will not result in a condition which significantly alters the impact of the station on the environment as described in the NRC final environmental statement.

ATTACHMENT 2

NPF-38-220

COMMITMENT IDENTIFICATION/VOLUNTARY
ENHANCEMENT FORM

COMMITMENT IDENTIFICATION/VOLUNTARY ENHANCEMENT FORM

Attachment 2 to W3F1-2000-0065
Technical Specification Change Request NPF-38-220
Supplement to Emergency Diesel Generator Allowed
Outage Time Increase

May 18, 2000

COMMITMENT(S)	ONE-TIME ACTION*	CONTINUING COMPLIANCE *	SCHEDULED COMPLETION DATE (IF REQUIRED)	ASSOCIATED CR OR ER
Procedure(s) will be developed to implement onsite power system recovery action in conjunction with the present Emergency Operating Procedures (EOP) and appropriate Off Normal Procedures in the event it is necessary to use the alternate AC power source (temporary emergency diesel generator). Procedures will be developed to perform the TEDG availability verification and availability status checks.		X	Following Proposed TS change approval by the NRC	
Verify protective relaying associated with 4.16 kV breaker on non-safety bus 2A(B) has been adjusted, if required, to coordinate with the TEDG rating. The protective relaying associated with the TEDG will be verified for co-ordination and adequacy.		X	Following Proposed TS change approval by the NRC	
If a 100% load rejection test is deemed necessary as a post maintenance retest to prove an EDG operable following a complete governor replacement while on-line, prior to the load rejection test performance EOI will review past surveillance records and ensure the voltage transients experienced on the safety buses during the EDG 100% Load Rejection surveillance test were within (±)5% of the initial test voltage and stabilized within 1 second.	X		Following Proposed TS change approval by the NRC	
EOI commits to utilizing an alternate AC onsite power source whenever an EDG is removed from service for preplanned maintenance work known to require greater than 72 hours or if deemed necessary, unplanned corrective maintenance work that will exceed the 72-hour AOT. This will involve the installation of a temporary emergency diesel generator (TEDG). The TEDG will be aligned for backup operation to the permanent EDG removed for maintenance.		X	Following Proposed TS change approval by the NRC	
EOI will proceduralize the CRMP to support Risk-Informed Technical Specification Allowed Outage Time submittals and implementation of 10 CFR 50.65(a)(4), the Maintenance Rule.		X	Following Proposed TS change approval by the NRC	

ATTACHMENT 3

NPF-38-220

PROPOSED MARKED-UP SPECIFICATIONS

(This attachment supersedes and replaces
Attachment B of W3F1-99-0022 in its entirety)

3.8.1.1 As a minimum, the following A.C. electrical power sources shall be OPERABLE:

a. Two physically independent circuits between the offsite transmission network and the Onsite Class 1E distribution system, and

b. Two separate and independent diesel generators, each with:

1. Diesel oil feed tanks containing a minimum volume of 339 gallons of fuel, and

2. A separate diesel generator fuel oil storage tank containing:

a. A minimum volume of 38,760 gallons of fuel, or

b. A fuel oil volume less than 38,760 gallons and greater than 38,000 gallons of fuel for a period not to exceed 5 days (provided replacement fuel oil is onsite within the first 48 hours), and

3. A separate fuel transfer pump.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

a. With one offsite circuit of 3.8.1.1a inoperable, demonstrate the OPERABILITY of the remaining A.C. circuit by performing Surveillance Requirements 4.8.1.1.1a. within 1 hour and at least once per 8 hours thereafter. Restore the offsite A.C. circuit to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With one diesel generator of 3.8.1.1b inoperable, demonstrate the OPERABILITY of the remaining A.C. circuits by performing Surveillance Requirements 4.8.1.1.1a (separately for each offsite A.C. circuit) within 1 hour and at least once per 8 hours thereafter. If the diesel generator became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned preventive maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE diesel generator (unless it has been successfully tested in the last 24 hours) by performing Surveillance Requirement 4.8.1.1.2a.4. within 8 hours unless the absence of any potential common mode failure for the remaining diesel generator is demonstrated. Restore the diesel generator to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

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c. With one offsite A.C. circuit and one diesel generator of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining offsite A.C. circuit by performing Surveillance Requirement 4.8.1.1.1a within 1 hour and at least once per 8 hours thereafter; and, if the diesel generator became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned ~~preventive~~ maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE diesel generator by performing Surveillance Requirement 4.8.1.1.2a.4 within 8 hours (unless it is already operating) unless the absence of any potential common mode failure for the remaining diesel generator

delete

INSERT 1

b. With one diesel generator of 3.8.1.1b inoperable:

(1) Demonstrate the OPERABILITY of the remaining A.C. circuits by performing Surveillance Requirements 4.8.1.1.1a (separately for each offsite A.C. circuit) within 1 hour and at least once per 8 hours thereafter. If the diesel generator became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE diesel generator (unless it has been successfully tested in the last 24 hours) by performing Surveillance Requirement 4.8.1.1.2a.4 within 8 hours unless the absence of any potential common mode failure for the remaining diesel generator is demonstrated.

(2) Restore the diesel generator to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours, unless the following condition exists:

(a) The requirement for restoration to OPERABLE status within 72 hours may be extended to 10 days if a temporary emergency diesel generator is verified available, and

(b) If at any time the temporary emergency diesel generator availability cannot be met, either restore the temporary emergency diesel generator to available status within 72 hours (not to exceed 10 days from the time the permanent plant EDG originally became inoperable), or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

3/4.8.1, 3/4.8.2, and 3/4.8.3 A.C. SOURCES, D.C SOURCES, and ONSITE POWER DISTRIBUTION SYSTEMS

The OPERABILITY of the A.C. and D.C. power sources and associated distribution systems during operation ensures that sufficient power will be available to supply the safety-related equipment required for (1) the safe shutdown of the facility and (2) the mitigation and control of accident conditions within the facility. The minimum specified independent and redundant A.C. and D.C. power sources and distribution systems satisfy the requirements of General Design Criterion 17 of Appendix A to 10 CFR Part 50.

The Limiting Condition for Operation (LCO) ensures that each diesel generator storage tank contains fuel oil of a sufficient volume to operate each diesel generator for a period of 7 days. The minimum required volume is based on the time dependent loads of the diesel generator following a loss of offsite power and a design bases accident and includes the capacity to power the engineered safety features in conformance with Regulatory Guide 1.137 October 1979. The minimum onsite stored fuel oil is sufficient to operate the diesel generator for a period longer than the time to replenish the onsite supply from the outside sources discussed in FSAR 9.5.4.2.

An additional provision is included in the LCO which allows the diesel generators to remain operable when their 7 day fuel oil supply is not available. This provision is acceptable on the basis that replacement fuel oil is onsite within the first 48 hours after falling below the 7 day supply.

The ACTION requirements specified for the levels of degradation of the power sources provide restriction upon continued facility operation commensurate with the level of degradation. The OPERABILITY of the power sources are consistent with the initial condition assumptions of the safety analyses and are based upon maintaining at least one redundant set of onsite A.C. and D.C. power sources and associated distribution systems OPERABLE during accident conditions coincident with an assumed loss-of-offsite power and single failure of the other onsite A.C. source. The A.C. and D.C. source allowable out-of-service times are based on Regulatory Guide 1.93, "Availability of Electrical Power Sources," December 1974. When one diesel generator is inoperable, there is an additional ACTION requirement to verify that all required systems, subsystems trains, components, and devices that depend on the remaining OPERABLE diesel generator as a source of emergency power are also OPERABLE, and that the steam-driven auxiliary feedwater pump is OPERABLE. This requirement is intended to provide assurance that a loss-of-offsite power event will not result in a complete loss of safety function of critical systems during the period one of the diesel generators is inoperable. The term verify as used in this context means to administratively check by examining logs or other information to determine if certain components are out-of-service for maintenance or other reasons. It does not mean to perform the Surveillance Requirements needed to demonstrate the OPERABILITY of the component.

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The OPERABILITY of the minimum specified A.C. and D.C. power sources and associated distribution systems during shutdown and refueling ensures that (1) the facility can be maintained in the shutdown or refueling condition for extended time periods and (2) sufficient instrumentation and control capability is available for monitoring and maintaining the unit status.

INSERT 2

When one diesel generator is inoperable to perform either preplanned maintenance (both preventive and corrective) or unplanned corrective maintenance work, the allowed-outage-time (AOT) can be extended from 72 hours to 10 days, if a temporary emergency diesel generator (TEDG) is verified available and aligned for backup operation to the permanent plant EDG removed from service. The TEDG will be available prior to removing the permanent plant EDG from service for the extended preplanned maintenance work or prior to exceeding the 72-hour AOT for the extended unplanned corrective maintenance work. A Configuration Risk Management Program (CRMP) is implemented to assess risk of this activity when applying this ACTION. The TEDG availability is verified by: (1) starting the TEDG and verifying proper operation; (2) verifying 24 hour onsite fuel supply; and (3) ensuring the TEDG is aligned to supply power through a 4.16 kV non-safety bus to the 4.16kV safety bus. A status check for TEDG availability will also be performed at least once every 72 hours following the initial TEDG availability verification. The status check shall consists of: (1) verifying the TEDG equipment is mechanically and electrically ready for manual operation; (2) verifying 24 hour onsite fuel supply; and (3) ensuring the TEDG is aligned to supply power through a 4.16 kV non-safety bus to the 4.16kV safety bus. If the TEDG becomes unavailable during the 10 day AOT and cannot be restored to available status, the EDG AOT reverts back to 72-hours. The 72 hours begins with the discovery of the TEDG unavailability, not to exceed a total of 10 days from the time the EDG originally became inoperable.