Progress Energy

Crystal River Nuclear Plant
Docket No. 50-302
Operating License No. DPR-72

Ref: 10 CFR 50.90

January 10, 2003
3F0103-06

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Crystal River Unit 3 - Response to Request for Additional Information, Proposed License Amendment Request, "Emergency Diesel Generator Allowed Outage Time Extension" (TAC No. MB5616)

References:
1. FPC to NRC letter, dated July 3, 2002, Crystal River Unit 3 - License Amendment Request #257, Revision 0, "Emergency Diesel Generator Allowed Outage Time Extension"
2. NRC to FPC letter, dated August 22, 2002, Request for Additional Information, Proposed License Amendment Request, Emergency Diesel Generator Allowed Outage Time Extension (TAC No. MB5616)

Dear Sir:

During a meeting with the NRC staff on September 3, 2002, and through the Request for Additional Information (RAI) (Reference 2), the NRC staff raised questions with Progress Energy's (PE's) License Amendment Request #257 (Reference 1). The primary issue involves the capability to provide a source of alternate AC power during Emergency Diesel Generator (EDG) maintenance. PE intends to make such a source available, but needs additional time to perform studies of the options available to provide this capability. PE will notify the NRC of the method for providing alternate AC power during EDG maintenance by February 27, 2003. The attachment to this letter provides PE's response to the other RAI questions in Reference 2.

In Reference 1, PE requested that this amendment request be approved by April 1, 2003. Due to the change in scope and the additional engineering and modifications involved, PE requests that the amendment be issued by August 1, 2003. This timeframe would permit reducing the scope of the outage-based EDG maintenance and permit PE to perform some or all of the EDG maintenance in the next operating cycle.

New regulatory commitments are listed in Attachment B.

A001

Progress Energy Florida, Inc.
Crystal River Nuclear Plant
15760 W. Powerline Street
Crystal River, FL 34428

If you have any questions regarding this submittal, please contact Mr. Sid Powell, Supervisor, Licensing and Regulatory Programs at (352) 563-4883.

Sincerely,

Dale E. Young

Dale E. Young
Vice President
Crystal River Nuclear Plant

DEY/pei

Attachment A: Response to Request for Additional Information
Attachment B: List of Regulatory Commitments

xc: Regional Administrator, Region II
Senior Resident Inspector
NRR Project Manager

STATE OF FLORIDA

COUNTY OF CITRUS

Dale E. Young states that he is the Vice President, Crystal River Nuclear Plant for Progress Energy; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission the information attached hereto; and that all such statements made and matters set forth therein are true and correct to the best of his knowledge, information, and belief.

Dale E. Young

Dale E. Young
Vice President
Crystal River Nuclear Plant

The foregoing document was acknowledged before me this 10th day of January, 2003, by Dale E. Young.

Janet Schroeder

Signature of Notary Public
State of Florida

JANET SCHROEDER
MY COMMISSION # DD 128063
EXPIRES: June 20, 2006
Bonded Thru Notary Public Underwriters

(Print, type, or stamp Commissioned Name of Notary Public)

Personally Known ✓ -OR- Produced Identification ______

PROGRESS ENERGY

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50 - 302 / LICENSE NUMBER DPR - 72

ATTACHMENT A

LICENSE AMENDMENT REQUEST #257, REVISION 0
Emergency Diesel Generator Allowed Outage Time Extension

Response to Request for Additional Information

Response to Request for Additional Information

NRC Request:

1. The NRC question 1 requested information on what method of alternate AC power would be made to ensure defense in depth was maintained during emergency diesel generator (EDG) maintenance.

Progress Energy (PE) Response:

PE is planning to provide alternate AC power during EDG maintenance outages. The method of providing this alternate AC will be the topic of a followup submittal that will be made by February 27, 2003.

NRC Request:

2. Discuss and provide information on the reliability and availability of offsite power sources relating to the proposed change. The discussion should include duration, cause, date and time of each loss-of-offsite power (partial or complete) event.

PE Response:

There have been a number of events where offsite power was lost to one or more Engineered Safeguards (ES) busses at Crystal River Unit 3 (CR-3). These events are summarized in Table 1. In most cases, offsite power was available from another offsite source from the 230 kV switchyard. In some cases, if the ES bus was being adequately supplied by the EDG, offsite power was not restored to the ES bus for several hours to ensure all impacts of the transients were addressed. For those events where offsite power was available, it was assumed that the ES busses could have been reenergized from offsite power in approximately two minutes. The two-minute timeframe corresponds to the actual time taken to restore a deenergized bus from offsite power during the June 29, 1989 event at CR-3. Except for the two recent events (July/August 2002), all the loss of offsite power events involving the 230 kV switchyard occurred prior to the addition of both the Offsite Power Transformer (OPT) (1990) and the Backup Engineered Safeguards Transformer (BEST) (1993). Both the OPT and BEST are capable of supplying either or both ES busses. Prior to these switchyard improvements, offsite power was provided to CR-3 by the Unit 3 startup transformer and a connection to the Unit 1 and 2 startup transformer.

Several loss of offsite power (LOOP) events occurred in 1993 while the plant was shutdown and aligned to the 500 kV switchyard. Backfeed from the 500 kV switchyard is not available during power operations although it is capable of powering either or both ES buses during shutdown.

Events that occurred in this configuration cannot occur during unit operation because offsite power is provided only from the 230 kV switchyard during power operations.

Only one event has occurred where offsite power could not have been restored to both ES busses within approximately two minutes. The March 27, 1992 event would have required approximately 20 minutes to restore power from the Units 1 and 2 startup transformer due to relay failures. The two recent events of a partial loss of offsite power were caused by damage to the OPT cables. In order to prevent recurrence of these failures, the cables have been replaced from the OPT to the west berm termination enclosure (approximately 1200 feet) and the lightning protection has been enhanced.

Table 1: List of Loss of Offsite Power Events

Date/Time	Duration * (h:mm)	Power level or Mode	Description of Event
06/16/81 23:40	0:02	100%	Lightning strike to CR-3 startup transformer. Power was available from theUnit 1 and 2 startup transformer throughout the event. (LER 81-033-00)
02/28/84 10:39	5 seconds	74%	Lightning arrester failed on Unit 1 fossil plant causing Unit 3 startup transformer to deenergize for 5 seconds resulting in a Unit 3 trip. (LER 84-003-00)
10/16/87 21:19	0:02	Mode 6	A Plant worker inadvertently grounded an input of the Unit 3 startup transformer with a metal pole. EDG energized the required bus. Offsite power was available from Units 1 and 2 startup transformer throughout the event.
06/16/89 13:25	0:02	12%	Personnel error on switchyard circuit breaker test switch. EDGs started and carried both ES Busses. Offsite power was available to both busses at all times. (LER 89-023-00)
06/29/89 20:15	0:02	Mode 3	Electrical storm caused fault in 230 kV switchyard. One EDG was out-of-service. Remaining EDG started and carried its ES Bus. The bus with inoperable EDG was restored from offsite power in two minutes. (LER 89-025-00)
03/27/92 13:08	0:20	98%	Voltage spike occurred during troubleshooting of DC to AC inverter tripping offsite power transformer. Both EDGs powered ES busses. (LER 92-001-00)

(Continued)

Table 1: List of Loss of Offsite Power Events

Date/Time	Duration * (h:mm)	Power level or Mode	Description of Event
03/13/93 06:26	0:02	Mode 5	While on backfeed from 500 kV switchyard through the auxiliary transformer, a storm caused a loss of the switchyard supply to the main step-up and auxiliary transformers. Offsite power was available to both ES Busses through the 230 kV switchyard throughout the event.
03/17/93 10:50	0:02	Mode 5	Arcing from salt deposits on switchgear deposited during the 03/13/93 storm caused the 230 kV switchyard to deenergize. Power was available from the 500 kV switchyard via backfeed through the auxiliary transformer throughout the event.
03/29/93 01:51	0:02	Mode 5	While on backfeed to 500kV switchyard, the breaker for the main step-up and auxiliary transformers opened. Power was available to both ES busses from the 230 kV switchyard throughout the event. (LER 93-002-03)
04/08/93 18:03	0:02	Mode 5	While on backfeed to 500kV switchyard, the breaker for the main step-up and auxiliary transformers opened. Power was available to both ES busses from the 230 kV switchyard throughout the event. (LER 93-004-00)
06/17/02 10:48	0:02	100%	Failure of Offsite Power Transformer cables, during a lightning storm, deenergized one ES bus. The EDG powered the bus as required. No plant trip or transient occurred. Offsite power was available to both ES busses from the Backup ES transformer throughout the event. (LER 02-001-00)
07/20/02 16:45	0:02	100%	Failure of Offsite Power Transformer cables, due to water intrusion to the cabling, deenergized one ES bus. The EDG powered the bus as required. No plant trip or transient occurred. Offsite power was available to both ES busses from the Backup ES transformer throughout the event. (LER 02-001-00)

* duration until both ES buses could be powered by an offsite source (whether used or not).

NRC Request:

3. As an SBO commitment, the licensee for CR3 committed to maintain an EDG target reliability of 0.975. Address the reliability and unavailability of the EDG in the last few years and when EDG AOT is extended to 14 days. Also, discuss the impact of AOT extension on EDG unavailability per the Maintenance Rule.

PE Response:

The availability and reliability of the CR-3 EDGs are monitored and recorded under several industry recognized performance indicator programs. However, for purposes of ensuring compliance with the Station Blackout (SBO) coping analyses, specific procedural requirements apply. The governing CR-3 procedure is PT-354, "EDG Reliability And Unavailability Program." The procedure directs quarterly review of EDG reliability and unavailability for comparison to selected target values, with exceedence trigger values taken from NUMARC 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors," Appendix D, and NRC Regulatory Guide (RG) 1.155, "Station Blackout." The procedure is used to ensure that CR-3's SBO Coping Assessment is maintained, and to formalize documentation of those quarterly reviews. The most recent completed evolution of the procedure was in Third Quarter 2002. Summarizing the results, there have been no failures in the past 20 demands, one failure in the past 50, and three in the past 100 demands. The period covered by the 100 start demand window includes March 18, 1999 through September 30, 2002. The unavailability for the three-quarter period ending September 30, 2002 is 0.73%. The EDG Reliability program records unavailability for a calendar year, however the WANO and NRC Reactor Oversight Program (ROP) Performance Indicators (PIs) and the Maintenance Rule program record rolling multiple year averages. The three-year average unavailability reported under the ROP PI for the period ending September 30, 2002 is approximately 2.2%. This is roughly 0.7% higher than typical, due to a 345 hour T/2 Fault Exposure impact reported in conjunction with a July 5, 2001 start failure event. The typical three-year average, in the absence of such a fault exposure impact, is approximately 1.5%. It should be noted that the fault exposure impact would not be included under present reporting guidelines, and is not included under the Maintenance Rule definition. In summary, there have been only three EDG failures in the past four years, and the three-year average unavailability performance has met the established/committed goals, even with the T/2 Fault exposure.

The allowed outage time (AOT) extension is not expected to adversely impact the actual unavailability performance of the system. This is because the EDGs will experience the same out-of-service time with more of the unavailability while the unit is at power and less during outages. A small increase in unavailability under the Maintenance Rule is expected. This projected increase is due to the fact that the off-line inspections are not reportable under the Maintenance Rule, provided they are performed during a window when the train is not required (only one EDG is required while shutdown in Modes 5 and 6). When the AOT extension is granted, the work normally performed during refueling outages will be relocated outside the outage windows. The duration of the unavailability is not expected to change, but reportability under the Maintenance Rule will. As a result, reported two-year averaged Maintenance Rule unavailability will increase by approximately 1%. However, this is an accounting change only, and actual out-of-service time is not expected to change as a result of the AOT extension. Other industry recognized unavailability performance indicators make an allowance for exception to recording the EDG inspection unavailability, whether or not it is performed on-line. Therefore, these other indicators will not be affected by the AOT extension.

Industry data shows that on-line LOOP events occur less frequently than off-line LOOP events, due to switchyard service work typically performed during outages which temporarily interrupts access to some of the normally available off-site sources. Relocating the EDG inspections to the on-line schedule will have a positive impact on nuclear safety for that reason. Also, since the work will be coordinated with other on-line EDG work, there is potential for a reduction to actual EDG out-of-service time over a two-year average, without reduction in scope of maintenance.

NRC Request:

4. The staff believes that certain compensatory measures are needed during the extended EDG AOT to assure safe operation of the plant. Provide a discussion of how you would address each condition listed below as related to CR3.

a. Voluntary entry into a limiting condition of operation (LCO) action statement to perform preventive maintenance should be contingent upon a determination that the decrease in plant safety is small enough and the level of risk is acceptable for the period and is warranted by operational necessity, and not by convenience.

b. Removal from service of safety systems and important non-safety equipment should be minimized during the extended outage of the EDG.

c. Component testing or maintenance that increases the likelihood of a plant transient should be avoided. Plant operation should be stable during the extended outage of the EDG.

PE Response:

a. As stated in PE submittal, dated July 3, 2002, Attachment E:

> CR-3 will perform procedure CP-253, "Power Operation Risk Assessment and Management" which requires both a deterministic and probabilistic evaluation of risk for the performance of all maintenance activities. This procedure uses the Level 1 PSA model to evaluate the impact of maintenance activities on core

> damage frequency. CR-3 will not plan any maintenance that results in "Higher Risk" (Orange Color Code) during extended EDG maintenance.

This statement was presented as a regulatory commitment. Entry into the extended action would only be done to perform necessary maintenance that requires greater than 72 hours and would not be used for operational or scheduling convenience. PE considers that scheduling Preventive Maintemance (PM) and inspections online offers safety and reliability improvements by allowing use of the most qualified in-house technicians to perform the work and having the focus of the entire organization on this single activity. This is in contrast to EDG maintenance during a refueling outage where resources and organizational attention are spread across multiple diverse activities simultaneously.

b. In PE submittal, dated July 3, 2002, Attachment E, the following was stated about systems that have been determined to be of higher risk significance during EDG maintenance:

> ECCS equipment, emergency feedwater, control complex cooling and auxiliary feedwater (FWP-7 and MTDG-1) will be designated administratively as "protected" (no planned maintenance or discretionary equipment manipulation).

In addition, as stated above in 4.a, the risk evaluation model considers both safety and non-safety related risk significant systems.

The above provisions were provided as a regulatory commitments to ensure that impact on both safety and non-safety related equipment would be minimized during EDG extended maintenance.

c. As stated in PE submittal dated July 3, 2002, Attachment E:

> Prior to initiating a planned EDG outage, CR-3 will verify the availability of offsite power to the 230 kV switchyard and ensure that the capability to power both ES busses is available from each of the two ES offsite power transformers (OPT and BEST).
>
> No elective maintenance will be scheduled in the switchyard that would challenge the availability of offsite power to the ES busses.

Both of the above provisions were provided as regulatory commitments to assure that reliability of the offsite power supply is optimized and the potential for plant transients would be minimized during EDG extended maintenance.

NRC Request:

5. The purpose of the requested amendment is to allow an increased outage time during plant power operation for performing EDG inspection, maintenance, and overhaul, which would include disassembly of the EDG. EDG operability verification after a major maintenance or overhaul may require a full-load rejection test. If a full-load rejection test is performed at power, the following should be addressed:

a. Describe the typical and worse-case voltage transients on the 4160-V safety buses as a result of a full-load rejection.

b. If a full-load rejection test is used to test the EDG governor after maintenance, provide assurance that an unsafe transient condition on the safety bus (i.e., load swing or voltage transient) due to improperly performed maintenance or repair of a governor would not occur.

c. Using maintenance and testing experience on the EDG, identify possible transient conditions caused by improperly performed maintenance on the EDG governor and voltage regulator. Discuss the electrical system response to these transients.

d. Provide the tests to be performed after the EDG overhaul to declare the EDG operable and provide justification of performing those tests at power.

PE Response:

a. The CR-3 Improved Technical Specifications (ITS) does not require a full-load rejection test as part of normal ITS SR or as part of post-maintenance EDG testing. ITS SR 3.8.1.8 requires the rejection of the single largest load, which for CR-3 is bounded by a load of 750 kW. Since no single normally operating load is this large, CR-3 trips three pumps simultaneously, whose combined load is greater than 750 kW, to simulate the largest single load. Following EDG governor maintenance, the single largest load rejection is simulated by establishing an EDG load of 800 kW from the grid, and then opening the output breaker. In this way, EDG response is kept from impacting the voltage and frequency of the safety-related bus.

Following the rebuilding of the EDGs in Refueling Outage 12 (R12 – October 2001), the worst case frequency swing during the rejection of the single largest load was 3.17% (EGDG-1A, Fmax=61.8, Fmin=59.9). EGDG-1B had a frequency swing of 3.0%. The overspeed protective device is a mechanical overspeed trip mechanism. The design basis establishes the minimum allowable trip setpoint value of 1005 revolutions per minute (RPM). This correlates to a lowest feasible trip threshold of 67.0 Hz (at 1005 RPM). Using the maximum observed frequency noted during the induced transients above (61.8 Hertz (Hz) peak frequency), the corresponding engine/generator rotating speed would be 927 RPM. Comparing this speed to the minimum allowable overspeed trip setpoint of 1005 RPM reflects a minimum margin of 78 RPM (5.2 Hz) to the minimum allowed trip set-point (i.e., 1005 RPM minus 927 RPM = 78 RPM). Overspeed trip tests conducted during 12R demonstrated that the actual trip setpoints are well in excess of the 1005 minimum (EGDG-1A tripped at 1030, EGDG-1B tripped at 1022 RPM). This demonstrates that the as-built actual margin is at least 95 RPM (6.33 Hz). In terms of frequency, based on an expected maximum frequency swing of approximately 3.7%, there is a margin of 6.2% to the actual overspeed trip. (e.g., actual trip setpoint is 9.9% over-frequency). Therefore, frequency swings due to load rejection testing have not challenged the EDG operating range or caused inadvertent engine trips.

The two most recent EDG Governor replacements were April 1994 (EGDG-1A, during R9) and April 1996 (EGDG-1B, during R10). A summary of the results of these tests is as follows:
For EGDG-1A, the minimum voltage for the load rejection test voltage was 4340.39 volts, with a maximum of 4491.94 volts, and stabilization at (or near) 4382.83 volts within 3 seconds of the rejection. The waveform is a critically damped waveform, with one high swing, one low swing, and then stabilization. The frequency response plot shows a minimum frequency of 60.0 Hz, with a maximum of 61.5 Hz. At 4 seconds following the rejection, the plot shows frequency decreasing through 60.7 Hz, stabilizing at approximately 60.29 Hz within 10 seconds of the rejection. The frequency response waveform is overdamped, with a single swing high, followed by an asymptotic approach to the stabilized value of 60.29 Hz.

For EGDG-1B, the minimum voltage for the load rejection test was 3982.85 volts, with a maximum of 4243.52 volts, a swing back up to approximately 4146.53 volts within 3 seconds of the rejection, followed by one additional (smaller) swing, and finally, stabilization at (or near) 4116.22 volts within 10 seconds of the rejection. This voltage response waveform is an under-damped waveform, with three swings in each direction, gradually truncating to the stabilized value of 4116.22 volts, slightly higher than the initial value of 4091.97 volts. The frequency response plot shows a minimum frequency of 59.95 Hz, with a maximum of 61.3 Hz. At 4 seconds following the rejection, the plot shows frequency at approximately 60.3 Hz. The frequency response is a slightly under-damped form, with two upward swings and two downward swings. Frequency stabilizes at the conclusion of the second downward swing at a value of approximately 60.3 Hz. It should be pointed out, that though the waveform is under-damped, the frequency variation does not decrease below 59.95 Hz at any point during the transient.

b. Though full load rejections are not performed, the concern would be applicable for partial load rejections as well, and is addressed. The post governor replacement load rejection test is performed by opening the output breaker. Any irregular EDG governor response to a load rejection performed in this manner cannot impact the safety bus because the EDG is separated electrically from the bus upon opening the breaker.

c. The CR-3 EDG maintenance and test history provides assurance that EDG rebuilds, governor replacement and voltage regulator maintenance can be performed without incurring transients on the ES bus. The EDG governors are replaced on a 10-year interval. The replacement governors are refurbished units from a factory authorized service center. Utilizing factory trained service personnel at a factory authorized service facility minimizes the potential for assembly errors. This provides reasonable assurance of correct assembly, and correct initial coarse adjustments. However, the introduction of some internal or external failure is possible, including assembly and tuning errors. The question posed assumes erroneous maintenance and asks for consideration of what the range of possible results may be.

Although actual maintenance has not resulted in large voltage or frequency swings, CR-3 evaluated the potential for these events to occur due to improper maintenance. The EDG governor controls the fuel rack. A malfunctioning governor could drive the fuel rack to zero, full open, or anywhere between. It could also oscillate at any frequency, with peak amplitudes anywhere between the no fuel and full fuel positions. Each of these three possibilities will be assumed on a case-by-case basis below, and probable engine/generator/bus responses addressed.

Case #1: Initial start following maintenance

For post maintenance testing following governor replacement, the EDG is to be slow started, manually. This is accomplished by placing a control switch located on the control board in the main control room to the "manual" position. An electric motor located on the governor reduces the speed setting of the governor to its idle speed setting (500 RPM). This represents the first opportunity for a malfunction. The motor and limit switches and associated hardware could malfunction, resulting in a variety of alternative setpoints, different from that expected. And it will be assumed for this discussion that those erroneous conditions will not be discovered prior to initiating the manual start demand. The consequences of this are invisible to the safety bus. In the extreme examples, the engine would either not start due to a setpoint that is too low, or start and proceed to an over-speed condition due to too high a setpoint. The start-fail scenario and the over-speed scenario culminate in a termination of the run. The mechanical over-speed trip device is a separate device from the governor and ensures the shutdown of the engine utilizing a spring to force the fuel rack to the no fuel position. In the less extreme cases, the malfunction would be evident in the engine idle speed, either steady at some erroneous value, or oscillating somewhere between the extremes. Again, all of these cases would be invisible to the safety bus, as the output breaker remains open during the slow speed start.

Case #2: Increasing to synchronous speed following a successful slow start

The control switch located on the main control board is to be switched from "manual" to "automatic", causing the governor's speed setting to be raised from the idle speed setting (500 RPM) to the synchronous RPM setting (900 RPM). This represents an opportunity for a maladjusted governor to evidence itself. If the high-speed setpoint is erroneous, or the associated components (motor, limit switch, cam) malfunction, the resulting setting could be incorrect. In the extreme case, the mechanical over-speed trip device would again take control and trip the engine taking the fuel rack to the no fuel position, ensuring successful shut-down. In the less extreme cases, the high speed setpoint would be observed, and corrected prior to proceeding, as would any noted instability, such as oscillations. Similar to the Case #1 examples, these potential malfunctions are invisible to the bus, as the output breaker would remain open until the synchronous speed setpoint is corrected.

Case #3: Open breaker operation within specifications, closed breaker, loaded control is irregular

The post-maintenance test (PMT) for governor replacement requires full load testing and single largest load rejection testing. The safety bus normal loading does not approach the load required to perform these tests, and the tests are performed by paralleling the EDG to the bus with the applicable off-site power supply. The PMT process would ensure that the governor was functioning properly prior to performing any testing that could impact the safety-related bus or ES loads.

Assuming the EDG starts normally, accelerates to the proper high-speed setpoint, and is stable, the unit will then be synchronized and paralleled to the bus. This represents the first opportunity for a governor malfunction to become apparent to the bus. The proceduralized steps for synchronizing the EDG are such that the EDG is configured to pick-up minimal load on breaker closure. The open breaker observations are adequate to assure that the speed setpoint is stable, and proper. Engine speed during synchronizing is the primary factor in determining the amount of load assumed by the EDG on breaker closure. So, the initial response is considered addressed by the actions above. Load is then gradually increased by causing the motor to gradually raise the governor speed setting. Since the engine/generator set is tied to the grid through the safety bus, the speed is maintained constant, based on the operating frequency of the bus/grid. The increased available power from the engine/generator is translated to increased load on the generator. While the governor's role remains the same, the operating point is different from that observed in the preceding cases. The relevant difference relates to the positioning of the fuel rack within the power operating range, as opposed to the no-load operating range, and the governor's response to the minor speed changes that result from load fluctuations, such as the single largest load rejection. In an extreme case, an unstable governor could cause the engine/generator to attempt to pick-up too much load, or pick-up load too quickly, or possibly dump load. In the less extreme scenarios, the governor could oscillate between the extremes, creating generator load fluctuations. These conditions are unlikely, due to the open-breaker observations, and the mechanical/hydraulic design of the governor. However, they could occur, and it will be assumed for discussion that they will.

With respect to the EDG, there is no difference between performing the tests with the plant on-line or off-line. The equipment is the same and the test conditions are the same. The same is true for the ES bus. The same exposures exist and the same protective measures are in place. The relevant differences are the connected loads and the plant operating conditions and, therefore, the potential significance of the proposed malfunctions. The potential bus effects would range from dead-bus to minor over-voltage conditions and from under frequency to over frequency conditions.

The EDG related protective relaying is in service during the tests which includes: Type 87DG; Generator Differential Current; Type 76, Field Over-current; Type 67DG, Reverse Power; Type 32; Overpower; Type 46DG; Negative Sequence; Type 51V; Generator Over-current; Type 64DG Generator Ground; and Type 51B and 51N ES Bus Fault Condition.

The request asked about the types of events that could result from governor malfunctions. Therefore, bus fault events, differential current events, field over-current events, negative sequence events, generator ground events, and similar events due to conditions external to the governor are not addressed here. The remaining relevant protective devices, which would be relevant under conditions stimulated by a malfunctioning governor, are Reverse Power and Generator Overpower protection. These two devices are adequate to successfully protect the bus loads for deleterious affects of the proposed malfunctioning governor.

If the governor were to experience a malfunction causing it to spontaneously cut back the fuel rack, the EDG would reduce load, and in the extreme case when the fuel were reduced sufficiently, the reverse power relaying would separate the EDG from the safety bus. This trip would leave the bus fed from only the normal off-site source. The less extreme cases would involve EDG load fluctuations between the protective relay setpoints, which would potentially cause minor voltage and frequency swings. Since these test conditions would be entered only for PMT testing, these potential bus affects would not be related to the protected opposite train. Continuing plant operations would not be dependant on the availability of end devices fed from the bus of the EDG under test. The potential effect on the end devices would be a factor of the extent of the transient. An analysis performed by PE Design Engineering (Engineering Change (EC) 50847) demonstrated that the estimated maximum extent of the postulated transient would not have harmful effects on the end devices.

If the governor were to experience a malfunction causing it to provide excess fuel, the engine would attempt to increase RPM. Being unable to increase the operating frequency of the grid, the EDG would eventually attempt to pick-up too much load, and in the extreme case, the overload protective relaying would trip the normal off-site sources that are paralleled to the EDG, leaving only the loads and the EDG connected. The overpower protective relays are set to actuate at 3498 kW with a time delay of 1500 milliseconds. In this scenario, the EDG and safety bus are separate from the grid, therefore, the bus is subject to any fluctuations the governor/generator could create. The load would be limited to the normal operating load of the ES bus. The voltage regulator, not subject to governor malfunctions, would control the voltage. But the frequency would be free to swing with the assumed malfunctioning governor. This could eventually lead to an over-speed trip, resulting in a dead bus. The frequency ceiling is limited by the mechanical over-speed trip device, which is set to actuate at approximately 1022 RPM. As discussed above, since these test conditions would be entered only for PMT testing, these potential bus affects would not be related to the protected train. Plant operations would not depend on the availability of end devices fed from the bus of the EDG under test. The potential effect to the end devices would be the extent of the transient. An analysis provided by Design Engineering (EC 50847) demonstrated that the estimated maximum extent of the postulated transient would not have harmful affects on the end devices.

d. The post maintenance tests to be performed following a routine inspection involve a 30 minute unloaded run, during which the engine is ramped from 500 RPM to 900 RPM in 100 RPM increments. During this evolution, Maintenance, Operations, and Engineering personnel remain in the engine room to observe the operation. If no concerns are identified, the PMT run is concluded with an overspeed trip test. This test is performed under no load conditions (i.e., the output breaker is not closed and the field flash is inhibited). This PMT run is transparent to the balance of plant, as the EDG is isolated from the safety bus during the test. If a governor replacement was performed, the EDG would be loaded to approximately 800 kW and then the output breaker would be opened to simulate the loss of single load event. Upon successful conclusion of the test, the engine is restored to its ES stand-by state, and then the normal SR 3.8.1.3, starting and loading of the EDG is performed. Following previous inspections, the maximum load test section of these procedures has been performed to satisfy SR 3.8.1.11, while demonstrating operability of the EDGs. However, the maximum load test is not required as a PMT for the routine inspections. It is expected that the practice of performing maximum load testing following inspections would continue when performing the inspections on-line. Again, not as an inspection PMT, but as a means to meet SR 3.8.1.11. Also, maximum load testing will be required in cases where governor replacements are involved.

NRC Request:

6. The licensee stated that CR3 will not initiate an EDG extended preventive maintenance outage if adverse weather, as designated by Emergency Preparedness procedures, is anticipated. Discuss how planning of the extended EDG maintenance considers the time needed to complete the extended EDG maintenance and the ability to accurately forecast weather conditions that are expected to occur during the maintenance. Discuss what, if any, contingency plans should be developed to restore the inoperable EDG in the event of unanticipated adverse weather or degraded grid conditions occurring that can significantly increase the probability of losing offsite electrical power.

PE Response:

CR-3 will consider factors such as grid and weather conditions prior to entering an extended EDG maintenance outage. CR-3 does not have specific guidelines or contingencies developed for extended EDG maintenance. Engineering judgment would be used on a case by case basis as to what alternative would be most expedient to restore the EDG to service. Weather related risks would be assessed prior to initiating extended maintenance and the timing of the maintenance window would be developed to ensure the maximum time possible is available for system restoration. Contingencies would be developed as appropriate at that time.

The requested AOT would allow an EDG to be inoperable for 14 days. However, CR-3 does not intend to take an EDG out of service for that long a period of time. EDG rebuilds and governor replacements are expected to take between 4 and 7 days depending on work scope. The ability to forecast weather is much more reliable over a 4 to 7 day period than a 14 day period. The 14 day period is requested to provide time for contingencies and allow EDG outage planning, per CR-3 guidelines to plan work for only one-half the length of the AOT.

Although CR-3 is in an area that is potentially affected by hurricanes, the relatively slow approach of hurricanes affords time in which to take precautions or restore the EDG to operable status. CR-3 has adverse weather procedures in place to assure proper preparations are made in response to changing weather conditions. Following approval of the extended AOT, the current schedule would be to perform on-line EDG maintenance during the winter months, which have a much lower probability of encountering severe weather. CR-3 refueling outages are currently scheduled for the month of October, which has a higher potential for severe storms than the winter months. The increased AOT will allow us to schedule EDG maintenance during periods of lower weather-related risk.

NRC Request:

7. Discuss whether the licensee's Risk Management Procedures cover a comprehensive walk-down just prior to entering the period of reduced equipment availability (EDG extended maintenance on-line). Provide justification, as applicable, for not having a comprehensive walk-down.

PE Response:

Risk management procedures do not specifically address comprehensive walkdowns prior to reduced equipment availability. The CR-3 Maintenance Rule program evaluates and manages risks due to maintenance. For high significance maintenance activities, compensatory measures are developed. For the EDG extended maintenance, CR-3 concurs that a thorough walkdown of redundant electrical and mechanical systems would be appropriate. PE commits to performing such a walkdown prior to extended EDG maintenance.

NRC Request:

8. Describe the typical and worse-case voltage transients on the 4160 V safety buses as a result of a single largest post-accident load rejection (Surveillance Requirement (SR) 3.8.1.8).

PE Response:

Per ITS Bases 3.8.1.8, the largest load required to be rejected is 750 kW. However, equipment does not normally operate at its maximum accident loading. During performance of Surveillance Procedure SP-417, CR-3 rejects a Nuclear Services Closed Cycle Cooling pump (RWP-2A/B), a Decay Heat Closed Cycle Cooling pump (RWP-3A/B) and a Building Spray pump (BSP-1A/B) on the applicable train simultaneously to simulate and bound this load value. The following dynamic analyses were conducted to simulate these load rejection cases.

EGDG-1A

A database representative of a fully loaded EGDG-1A, automatically connected plus manually applied essential loads, was created for this analysis. The database was run using dynamic analysis Industrial Power System Time Simulation Software (ISIM). To account for the voltage regulator uncertainty of 4160 ± 60V, the EGDG-1A steady state voltage was set at 102%. (4243V), 23 volts above 4220 (4160+60) V. The higher steady state voltage (> 100%) results in higher percentage voltage and frequency overshoot and is conservative. Prior to the step load change transient, the loading on EGDG-1A was 3256 kW. This loading consisted of running motors and miscellaneous 480V loads. At time equal to 2 seconds, the step load change was created by simultaneously tripping the following motors: RWP-2A, RWP-3A, and BSP-1A. This caused an instantaneous drop in EGDG-1A loading from 3256 kW to 2268 kW (an instantaneous load drop of 988 kW). The 988 kW load rejection is greater than the 750 kW required by SR 3.8.1.8 and is conservative. The EGDG-1A dynamic frequency and voltage response plots are contained in Engineering change (EC 50847). The conclusions from these plots are discussed below:

When the step load change is applied, the frequency overshoots by 1.74% (61 Hz). This value is below the ITS SR 3.8.1.8 maximum allowed value of 66.75 Hz and is acceptable. Additionally, a 2% overshoot on EGDG-1A's 900 RPM synchronous speed equates to 18 RPM (i.e., to 918 RPM). The calculated acceptable overspeed setpoint range is 1005 to 1035 RPM. Per RG 1.9, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants," Revision 3, 75% of the difference between synchronous speed and minimum overspeed setpoint equates to 0.75*(1005-900)= 78.75 RPM, i.e. 978.75 RPM. Therefore, this frequency overshoot is acceptable, both from ITS as well as Electrical Calculations and RG 1.9 standpoint. After the first overshoot, all subsequent overshoots and undershoots are less than 2% which is acceptable per RG 1.9 and ITS SR 3.8.1.8 limits of 58.8 Hz to 61.2 Hz. Hence the frequency response of EGDG-1A was acceptable.

The initial voltage overshoot when the step load change occurs is 5.974% (4408.5 V). This voltage, although slightly above the 4000V ± 10% (4400V to 3600V) rating of motors fed from

ES "A" 4160V bus, is considered acceptable because the overshoot spike lasts for a fraction of a second. At 480V level where miscellaneous equipment is fed from ES MCCs, this overshoot voltage is well below the 528V level that is considered acceptable. Therefore, the voltage overshoot is acceptable for equipment fed from ES 480V switchgear and ES MCCs. Following the initial overshoot, the maximum voltage overshoot is well below the RG 1.9 and SR 3.8.1.8 requirements of 10% or less.

In conclusion, the voltage and frequency transient response of EGDG-1A following an instantaneous load drop of 3256 kW to 2268 kW (an instantaneous load drop of 988 kW) was acceptable. The motor models and the Emergency Diesel Generator model used in the software have been field validated by previous testing and are representative of the actual equipment in the field. Also the results are in agreement with actual historical SP-417 results documented in response to request 5.a above.

EGDG-1B

A database representative of a fully loaded EGDG-1B, automatically connected plus manually applied essential loads, was created for this analysis. The database was run using dynamic analysis software ISIM. To account for the voltage regulator uncertainty of 4160 ± 60V, the EGDG-1B steady state voltage was set at 102% (4243V), 23 volt above 4220 (4160+60) V. The higher steady state voltage (>100%) results in higher percentage voltage and frequency overshoot and is conservative. Prior to the step load change transient, the loading on EGDG-1B was 3320 kW. This loading consisted of running motors and miscellaneous 480V loads. At time equal to 2 seconds, the step load change was created by simultaneously tripping the following motors: RWP-2B, RWP-3B, and BSP-1B. This caused an instantaneous drop in EGDG-1B loading from 3320 kW to 2344 kW (an instantaneous load drop of 976 kW). The 976 kW load rejection is greater than the 750 kW required by SR 3.8.1.8 and is conservative. The EGDG-1B dynamic frequency and voltage response plots are contained in Engineering change (EC 50847). The conclusions from these plots are discussed below:

When the step load change is applied, the frequency overshoots by 1.734% (61 Hz). This value is below the ITS SR 3.8.1.8 maximum allowed value of 66.75 Hz and is acceptable. Additionally, a 2% overshoot on EGDG-1B's 900-RPM synchronous speed equates to 18 RPM (i.e. to 918 RPM). The calculated acceptable overspeed setpoint range is 1005 to 1035 RPM. Per RG 1.9, 75% of the difference between synchronous speed and minimum overspeed setpoint equates to 0.75*(1005-900)= 78.75 RPM, i.e., 978.75 RPM. Therefore, this frequency overshoot is acceptable, both from ITS as well as Electrical Calculations and RG 1.9 standpoint. After the first overshoot, all subsequent overshoots and undershoots are less than 2% which is acceptable per RG 1.9 and ITS SR 3.8.1.8 limits of 58.8 Hz to 61.2 Hz. Hence the frequency response of EGDG-1B was acceptable.

The initial voltage overshoot when the step load change occurs is 6.038% (4411.2 V). This voltage, although slightly above the 4000V ± 10% (4400V to 3600V) rating of motors fed from ES "B" 4160V bus, is considered acceptable because the overshoot spike lasts for a fraction of a second. At 480V level where miscellaneous equipment is fed from ES MCCs, the overshoot voltage is well below the 528V level considered acceptable. Therefore the voltage overshoot is acceptable for equipment fed from ES 480V switchgear and ES MCCs. Following the initial overshoot, the maximum voltage overshoot is well below the RG 1.9 and SR 3.8.1.8 requirements of 10% or less.

In conclusion, the voltage and frequency transient response of EGDG-1B following an instantaneous load drop of 3320 kW to 2344 kW (an instantaneous load drop of 976 kW) was acceptable. The motor models and the Emergency Diesel Generator model used in the software have been field validated by previous testing and are representative of the actual equipment in the field. Also, the results are in agreement with actual historical SP-417 results documented in response to request 5.a above.

NRC Request:

9. Provide details of SR 3.8.1.11, including what is involved when performing this surveillance and why it is safe to perform it in Mode 1 or 2.

PE Response:

SR 3.8.1.11 requires that full load testing be performed for each EDG once per two-year interval. The test requires that the EDG be loaded above 3300 kW, but less than 3400 kW, for a minimum of 60 minutes. This requirement is also applicable in cases of governor replacement. The maximum load testing for CR-3 under this SR requires a one-hour run, in the range of 3300 kW to 3400 kW in the upper end of the 200-hour service rating. Therefore, this test does not significantly expend the EDG service life or challenge the capability of the engine. Performing this test online will not impact power operations or increase the probability of plant transients. The maximum power output of 3400 kW is insignificant to the size of the 230 kV grid and will not impact grid reliability. Therefore, there is no significant impact for performing this SR in Modes 1 or 2.

PROGRESS ENERGY

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50 - 302 / LICENSE NUMBER DPR - 72

ATTACHMENT B

LICENSE AMENDMENT REQUEST #257, REVISION 0
Emergency Diesel Generator Allowed Outage Time Extension

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Progress Energy (PE) in this document. Any other actions discussed in the submittal represent intended or planned actions by PE. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the Supervisor, Licensing and Regulatory Programs of any questions regarding this document or any associated regulatory commitments.

Commitment	Due Date
CR-3 will perform a comprehensive walkdown of redundant electrical and mechanical systems.	Prior to extended preplanned Emergency Diesel Generator maintenance
CR-3 will provide information on the method of alternate AC power that will be made available during EDG extended maintenance.	February 27, 2003