Progress Energy

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

Ref: 10CFR50.90

August 4, 2009
3F0809-01

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

Subject: Crystal River Unit 3 – License Amendment Request #304, Revision 1
Emergency Diesel Generator Voltage and Frequency Limits Revision

Dear Sir:

Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc, hereby submits License Amendment Request (LAR) #304, Revision 1. The proposed LAR will revise the Crystal River Unit 3 (CR-3) Improved Technical Specifications (ITS) Surveillance Requirements (SR) SR 3.8.1.2, SR 3.8.1.6, and SR 3.8.1.10 to restrict the voltage and frequency limits for all Emergency Diesel Generator (EDG) starts. The steady state voltage limits will be revised to be more restrictive (plus or minus 2 percent of the nominal voltage) to accurately reflect the appropriate calculation and the way the plant is operated and tested. The steady state frequency limits will be revised to be more restrictive (plus or minus 1 percent for all EDG starts) to ensure compliance with the plant design bases and the way the plant is operated. Additionally, SR 3.8.1.6 will be revised to clarify that the 10 second start verifies the capability of the EDG to pick up load, and is not the steady state condition. These changes will ensure that the EDGs are capable of supplying power, with the correct voltage and frequency, to the required electrical loads.

Currently, the voltage and frequency limits are being administratively controlled under the provisions of NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications That Are Insufficient to Assure Plant Safety," since the current ITS voltage limits were determined to be non-conservative.

The frequency limit change is the result of an industry issue where the limits established in Regulatory Guide (RG) 1.9, Revision 3, "Selection, Design, and Qualification of Diesel-Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants," were determined to not have any plant specific calculational basis for all conditions and events. The RG guidance is the basis for the current limits in the CR-3 ITS.

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

A001
NRR

FPC requests approval of this LAR by November 30, 2009, with a 60 day implementation period. This will permit implementation of the amendment subsequent to restart from CR-3 Refueling Outage 16, scheduled to end December 19, 2009.

Regulatory commitments identified in this LAR are captured in Attachment E.

The CR-3 Plant Nuclear Safety Committee has reviewed this request and recommended it for approval.

If you have any questions regarding this submittal, please contact Mr. Dan Westcott, Supervisor, Licensing and Regulatory Programs at (352) 563-4796.

Sincerely,

Jon A. Franke
Vice President
Crystal River Nuclear Plant

JAF/par

Attachments:
- A. Description of the Proposed Change, Background, Justification for the Request, Determination of No Significant Hazards Consideration, and the Environmental Assessment
- B. Proposed Technical Specification Page Changes Strikeout and Shadowed Text Format
- C. Proposed Technical Specification Page Changes Revision Bar Format
- D. Proposed Revised Bases Pages (For Information Only) Strikeout and Shadowed Text Format
- E. List of Regulatory Commitments

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

**STATE OF FLORIDA**

**COUNTY OF CITRUS**

Jon A. Franke states that he is the Vice President, Crystal River Nuclear Plant for Florida Power Corporation, doing business as Progress Energy Florida, Inc.; 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.

Jon A. Franke
Vice President
Crystal River Nuclear Plant

The foregoing document was acknowledged before me this 4th day of August, 2009, by Jon A. Franke.

Signature of Notary Public
State of Florida

CAROLYN E. PORTMANN
Notary Public - State of Florida
My Commission Expires Mar 1, 2010
Commission # DD 524380
Bonded By National Notary Assn.

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

Personally Known ✓ -OR- Produced Identification _____

# FLORIDA POWER CORPORATION

# CRYSTAL RIVER UNIT 3

# DOCKET NUMBER 50-302/LICENSE NUMBER DPR-72

# LICENSE AMENDMENT REQUEST #304, REVISION 1

# ATTACHMENT A

# DESCRIPTION OF THE PROPOSED CHANGE, BACKGROUND, JUSTIFICATION FOR THE REQUEST, DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION, AND THE ENVIRONMENTAL ASSESSMENT

# DESCRIPTION OF THE PROPOSED CHANGE BACKGROUND, JUSTIFICATION FOR THE REQUEST, DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION, AND THE ENVIRONMENTAL ASSESSMENT

## 1.0 DESCRIPTION OF PROPOSED CHANGE

The proposed change would revise the Crystal River Unit 3 (CR-3) Improved Technical Specifications (ITS) Surveillance Requirements (SRs) as follows:

SR 3.8.1.2 is being revised to verify that on a slow start from standby conditions, the Emergency Diesel Generator (EDG) will come up to a voltage $\geq$ 4077 V and $\leq$ 4243 V. The frequency will also be revised to 60 $\pm$ 1% Hz as this SR verifies that the EDG will start in slow speed and eventually reach steady state conditions for voltage and frequency, and does not reflect plant response to accident conditions. A new note will be added to the SR that states that when a modified start is used, the required frequency may be obtained automatically or manually or through a combination of the two.

SR 3.8.1.6 is being revised to verify that each EDG starts from a standby condition and achieves:
a. in $\leq$ 10 seconds, voltage $\geq$ 3744 V, and frequency $\geq$ 58.8 Hz, and
b. steady state voltage $\geq$ 4077 V and $\leq$ 4243 V and steady state frequency $\geq$ 59.4 Hz and $\leq$ 60.6 HZ. This change follows the guidance but does not adopt Technical Specification Task Force (TSTF) Traveler 163, Revision 2, "Minimum Versus Steady State Voltage and Frequency."

SR 3.8.1.10.c.3 is being revised to verify that on an actual or simulated loss of offsite power signal, in conjunction with an actual or simulated Engineered Safeguard (ES) actuation signal, the EDG auto-starts from a standby condition and achieves steady state voltage $\geq$ 4077 V and $\leq$ 4243 V.

SR 3.8.1.10.c.4 is being revised to verify that on an actual or simulated loss of offsite power signal, in conjunction with an actual or simulated ES actuation signal, the EDG auto-starts from a standby condition and achieves steady-state frequency $\geq$ 59.4 Hz and $\leq$ 60.6 Hz.

SR 3.8.1.8 is <u>not</u> being revised in this License Amendment Request (LAR) as this SR verifies the capability of the EDG to recover from a load rejection. This condition is discussed in Regulatory Guide (RG) 1.9, "Selection, Design, and Qualification of Diesel-Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants," Revision 3, Regulatory Position C.1.4, and a distinction is made in the allowed EDG response between accepting a large load and a load rejection. The intent of SR 3.8.1.8 is to verify that: the EDG does not trip on large load loss, is sufficiently recovered to continue to accept the remaining load blocks within the required timeframe, and is not a verification of the steady state voltage and/or frequency.

## 2.0 BACKGROUND

Most plants undergoing a conversion to ITS incorporated the RG 1.9, Revision 3, values of voltage and frequency limits since these limits were incorporated into the Standard Technical Specifications (STS) NUREG-1430, "Standard Technical Specifications, Babcock and Wilcox Plants." The current CR-3 ITS values for EDG steady state voltage (minimum and maximum) are not based on the voltages used in the CR-3 specific calculations and therefore, do not, in all cases, support the Final Safety Analysis Report (FSAR) and Enhanced Design Basis Document (EDBD) requirements for transient voltages and frequencies and maximum Kilowatts (kW) loading for the EDGs.

During the Component Design Basis Inspection at several plants, the NRC raised a concern about frequency limits as specified in the plant's Technical Specifications (TS). The concern was that a pump may operate at the lower frequency limit when required for emergency service, which is acceptable per TS acceptance criteria, but it is not demonstrated by calculation or testing at the lower frequency limits. Testing is normally performed at the nominal voltage and frequency of 4160 V and 60 Hz. Analysis has not been performed to demonstrate the capability at the frequency high and low limits.

The impacts of voltages or frequencies that are too high or too low include the following:

- Voltage too low would cause the EDG loads to not operate correctly. Additionally, this could cause increased motor current which may cause some motor loads to trip on overcurrent.

- Voltages too high would be an impact on resistive load kW and reduce available EDG margin.

- Frequency too high would affect motor load kW and it could require motors to operate in or above the motor service factor.

- Frequency too low would negatively impact pump motor speed, affecting pump flow and motor operated valve stroke times.

CR-3 has determined that the values in the CR-3 ITS are non-conservative for steady state operation. The existing CR-3 ITS steady state voltage limits are based on 4160 V Class-1E bus limits. The maximum limit of 4400 V is based on 110% of the Class-1E motor voltage rating of 4000 V. The minimum voltage limit of 3933 V is the second level under voltage relay degraded voltage setpoint. This limit was established for when the grid supplies the Engineered Safeguards (ES) busses.

New frequency limits based on EDG capability were evaluated after industry operating experience indicated that the existing steady state frequency limits may not be adequate for all conditions and events. In other words, the EDG may not be able to support the electrical loads or parameters (flow rates and valve stroke times may not meet requirements) if the EDG is allowed to operate at the extremes of the allowed frequency range. The current CR-3 ITS frequency range is plus or minus 2% (58.8 Hz to 61.2 Hz).

An engineering evaluation was performed that indicates the new CR-3 ITS limits will be acceptable with respect to load performance. The engineering evaluation demonstrated that a decrease in EDG frequency of 1% would not prevent the safety-related pumps from performing their design functions. Sufficient differential pressure and flow would be developed to assure the accident analyses minimums would be provided. Additionally, no safety-related motor operated valves would exceed their maximum allowed stroke time if the EDG frequency was reduced by 1% which would cause the valve to open slower. The evaluation also demonstrated that an increase in frequency, as an impact on available kW, would not prevent the EDG or the required ES components from performing their design function. Administrative limits have been established for the minimum and maximum frequencies (plus or minus 1%) on EDG start testing to ensure operability of the supported equipment.

Similarly, plant specific calculations have been performed that demonstrate EDG operability based on administrative voltage limits that are found in current plant surveillance procedures. Calculations use a minimum voltage of 98% and a maximum voltage of 102% of nominal steady state voltage (4160 V). Voltage limits of 98% and 102% support the EDBD and updated FSAR statements concerning EDG transient voltage and frequency limits during block loading and EDG kW loading limits. The EDBD and FSAR transient voltage and frequency limits are based on RG 1.9, Revision 3.

The limits used to define when the EDG is "started" for the ten second EDG start requirement will be 90% voltage (3744 V) and 98% frequency (58.8 Hz). These values are based on Regulatory Guide 1.9, Revision 3, Section C.1.4 which addresses voltage and frequency recovery during EDG block loading prior to the next load block being applied to the EDG. The CR-3 ready matrix relays are set at 90.8% voltage and 98% frequency. This change follows the guidance of, but will not adopt in its entirety, TSTF-163, Revision 2, "Minimum Versus Steady State Voltage and Frequency."

## 3.0 JUSTIFICATION FOR THE REQUEST

The EDGs at CR-3 are designed to supply emergency power to specific safety-related electrical loads on a loss of offsite power (LOOP) condition. Some loads have to be stripped from the electrical bus prior to the EDG output breaker closing to protect the EDG from an overload condition. Due to the manner in which the loads are sequenced onto the bus, specific EDG voltage and frequency limits have been established, for transient and steady state operation, to ensure the EDG will be able to perform its function and the loads will be able to perform their functions. Proper limits should have been incorporated into the CR-3 ITS and used to verify operability of the EDGs.

NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications That Are Insufficient to Assure Plant Safety," states that the discovery of an inadequate TS value is considered a degraded condition under Generic Letter 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability." Administrative controls are an acceptable short term corrective action, along with a license amendment request submittal, to resolve the condition in a timely manner. Administrative controls have been established at CR-3 for both the voltage limits and frequency limits. This LAR requests that these more restrictive values be incorporated into the CR-3 ITS.

CR-3 plant specific calculations E91-0026, Revision 3, "EGDG-1A Scenario Based Loading, Voltage Dips, Frequency Dips, and Transient Motor Starting Analysis," and E91-0027, Revision 3, "EGDG-1B Scenario Based Loading, Voltage Dips, Frequency Dips, and Transient Motor Starting Analysis," were issued in 1997 to regain / demonstrate design margins in the electrical distribution systems. Part of the effort was to address minimum / maximum EDG voltages and the impact to EDG loading and performance. The calculations used 4160 V plus or minus 2% for the evaluations. At that time, the surveillance test procedures were revised with administrative limits conservatively more restrictive than the ITS limits for EDG voltage during steady state operation. However, at that time it was not identified that an ITS revision was required.

Calculations demonstrate that the voltage and frequency dips resulting from a motor starting during initial block loading and manual loading events are less than 25% and 5%, respectively. Voltage and frequency recover, within 3 seconds of all motor starting events, to within 10% and 2% respectively when EDG voltage and frequency are within the ITS steady state limits prior to motor starting.

The initial dip limits of 25% for voltage and 5% for frequency during the start of each load block were taken from RG 1.9, Revision 3. The recovery limits of 10% for voltage and 2% for frequency, within 60% of the time between each load block start (3 seconds), were also taken from RG 1.9, Revision 3.

The loads to the EDG are added in six load blocks (load steps) that are separated from each other by 5 seconds. Ten (10) seconds are allowed for the EDG to start, come up to speed and provide adequate voltage and frequency and thereby provide a permissive (ready matrix) to close the EDG output breaker to its respective ES bus.

A review of EDG surveillance test results for voltage was performed from 2002 to the present. The conclusion is that the administrative voltage limits have been satisfied for each test with the exception of when a hardware problem existed. Maintaining the steady state voltage limits within plus or minus 2% of 4160 V has not been a significant challenge.

Additionally, EDG loading calculations were reviewed to ensure adequate margin exists between the various EDG ratings and the worst case loading profiles. There are eight large pumps on the "A" side and seven on the "B" side which constitute the majority (greater than 75%) of the loading on each EDG. These pumps are Make-Up Pump MUP-1A/1B/1C, Decay Heat Pump DHP-1A/1B, Building Spray Pump BSP-1A/1B, Raw Water Pump RWP-2A/2B, Raw Water Pump RWP-3A/3B, Service Water Pump SWP-1A/1B, Decay Heat Closed Cycle Cooling Pump DCP-1A/1B and Emergency Feedwater Pump EFP-1.

The following table depicts the loading of the accident, non accident and Appendix R fire related scenarios evaluated at the voltage and frequency extremes of 1.02 per unit voltage, 1.01 per unit frequency and steady state kW loading for large pumps which is based on actual field kW testing which includes field kW testing measurement uncertainties. In determining the effects of frequency and voltage variation on motors and EDG loading, the guidance of IEEE Standard 666-1991, "IEEE Design Guide for Electric Power Service Systems for Generating Stations," Section 11, Table 11.6, was used. The EDG loading at voltage extremes, frequency extremes and loading that includes measurement uncertainties for large pumps were determined

separately. The final results shown below were obtained by combining the loading obtained at voltage extremes, frequency extremes and loading that includes measurement uncertainties for large pumps with the nominal (base) case loading using the Square Root of the Sum of Squares (SRSS) methodology.

| **Loading Scenario** | **EDG Alignment** | **Steady State Load kW** | **Tech Spec / Manual Loading Limit (kW)** | **EDG 200 Hour Rating Limit (kW)** |
|---|---|---|---|---|
| Large Break Loss of Coolant Accident (LB LOCA), Auto connected + Essential Manual Loading | EGDG-1A | 3237.6 | 3300 | 3400 |
| LB LOCA, Auto connected + Essential Manual Loading | EGDG-1B | 3263.2 | 3300 | 3400 |
| Seismic Event, no ES, Natural Circ cool down, Manual Loading | EGDG-1A | 3328.2 | 3375 | 3400 |
| Seismic Event, no ES, Natural Circ cool down, Manual Loading | EGDG-1B | 2942.5 | 3375 | 3400 |
| Natural Circ cool down, no ES, Manual Loading | EGDG-1C aligned to "A" Train | 3147.2 | 3375 | 3400 |
| Natural Circ cool down, no ES, Manual Loading | EGDG-1C aligned to "B" Train | 3234.6 | 3375 | 3400 |
| LOOP + Appendix R fire + spurious ES. EDG loading following ES load sequencing | EGDG-1A | 2810.6 | 3400 | 3400 |
| LOOP + Appendix R fire + spurious ES. EDG loading following ES load sequencing | EGDG-1B | 2887.6 | 3400 | 3400 |
| LOOP + Appendix R shutdown , no ES, core cooling via OTSG | EGDG-1A | 2953 | 3400 | 3400 |
| LOOP + Appendix R shutdown, no ES, core cooling via Decay Heat Removal | EGDG-1B | 3025.6 | 3400 | 3400 |
| Appendix R cross tie worst case Manual Loading, Fire in Control Complex CC-108-102, CC-124-111, core cooling via DHR | EGDG-1B | 3279.6 | 3375 | 3400 |

The conclusions of the above tabulation are as follows:

1. For accident scenarios, the EDG loading is less than the Technical Specification basis and SR 3.8.1.11 lower limit of 3300 kW and is also less than the upper limit of 3400 kW of the EDG 200 hour rating. The 200 hour rating envelopes the EDG accident duration analyzed time of 7 days (168 hours).

2. For non accident scenarios, including Appendix R fire scenarios where the fire is not in the Control Room, the loading is applied manually from the Control Room and the loading is less than the manual loading limit of 3375 kW (EDG 200 hour rating upper limit of 3400 kW - 25 kW uncertainty of the control board kW meter).

3. For an Appendix R fire in the Control Room, requiring shutdown from outside the Control Room, the EDG 200 hour rating upper limit of 3400 kW is used because there is no kW meter at the Remote Shutdown (RSD) Panel that the Operator can use for load management. For this scenario, it is analytically demonstrated by the above described calculations that subsequent to transferring the control over to the RSD Panel when the Operator applies loads, the loading remains below the EDG 200 hour rating limit of 3400 kW.

During a fire event in the Control Room that requires shutdown from outside the Control Room, CR-3 Abnormal Operating Procedure AP-990, "Shutdown From Outside The Control Room," is followed. This procedure requires that, prior to evacuating the Control Room, the Operator must transfer control over to the RSD Panel. Transferring control to the RSD Panel removes automatic functions for the Pressurizer Heaters, Pressurizer Spray, and Engineered Safeguards. Per AP-990, depending on the intensity of the fire, the Operator performs orderly shutdown actions, some prior to leaving the Control Room and some after leaving the Control Room from the RSD Panel. There are manual actions identified in AP-990 which ensures that the EDG load does not exceed its rating.

The fast EDG starts verify that the EDG is capable of performing its design function in the time frame assumed in the accident analyses. The fast start final speed is only dependent on the governor setting and accuracy. This also holds true for an ES actuated (emergency) fast start. The fast start is representative of the conditions and start signals that would occur in an emergency, either loss of power on the associated ES bus or an ES actuation. Therefore, when the as-left setting is restored to the nominal frequency, the next start will be acceptable with regards to EDG frequency. A review of the last three years of surveillance testing verifies this capability. The EDG will be left at the nominal 60 plus or minus 0.1 Hz at the completion of the required EDG testing.

On a fast start, the EDG voltage and frequency will overshoot and undershoot while converging on the steady state conditions. The overshoot for voltage and frequency has been observed to approach 114% and 106% respectively. The undershoot for voltage and frequency has been observed to approach 94% and 98% respectively. This period of oscillation has been determined to last greater than ten seconds, although the EDG is capable of picking up and carrying load at or before ten seconds. The EDG ready matrix relay will signal that the EDG is capable of picking up load at 90.8% voltage and 98% frequency and is essentially a permissive for the EDG breaker to close. The EDGs have repeatedly demonstrated that they are capable of picking up load within ten seconds.

SR 3.8.1.6 is being revised to recognize the potential for the voltage and frequency to be outside the steady state values at the instantaneous measurement (ten seconds) without having to consider the EDG inoperable. The voltage and frequency limits for the fast start surveillance transient portion will match those of the ready matrix. This change follows the guidance but does not adopt TSTF 163, Revision 2, "Minimum Versus Steady State Voltage and Frequency." Surveillance 3.8.1.6 also has provisions for steady state conditions, and the EDG must also achieve the more restrictive steady state acceptance criteria or the EDG will not satisfy surveillance requirements, and have to be declared inoperable.

Slow EDG starts are performed monthly to ensure continued operability of the EDG, but do not create the same amount of wear as an emergency start. The tests verify that the EDG has all necessary support systems available, and is capable of providing power to the required safety-related motors and pumps and, once up to rated voltage and frequency, can supply power to all required loads. The slow speed start is not representative of any design basis accident and will not be utilized during the response to an actual demand for the EDG to supply emergency power.

Since it is possible for an EDG to operate at frequencies other than 60.0 Hz and still remain operable, an evaluation was performed to determine the impacts of frequency extremes on plant equipment. The consequences of operating the EDG at the extremes of the proposed ITS frequency limits were evaluated and the conclusion is that the increase or decrease in speed for a 1% change in frequency is well within the ITS over speed limit and will have no impact on the EDG itself.

The consequences of EDG operation at the extremes of the proposed ITS frequency limits on safe shutdown equipment were also evaluated. The conclusions are stated below.

> Increased brake horsepower from a 1% frequency increase was evaluated against the motor nameplate rating and the service factor horsepower rating. All safe shutdown related motors were found acceptable. The Building Spray pumps and the electric motor driven Emergency Feedwater pump (EFP) may operate above the nameplate service factor rating which may lead to a slight decrease in the qualified life of the motor. Aging analysis calculations support the above conclusion.
>
> The increase in locked rotor amps (LRA) resulting from a 1% decrease in EDG frequency was evaluated for its effect on safety-related motor control centers (motor feeder breaker magnetic only settings) and switchgear (motor feeder breaker instantaneous trip device settings). These settings were found to be acceptable. The following devices did not meet standard conservative criteria but were found acceptable with further evaluation:
>
> Low Head injection flow control valves
> Reactor Building Air Handling Fans in fast speed
> Control Complex Chillers

The meter and calibration inaccuracies of the instrumentation that will be utilized in steady state testing and calibration have been accounted for by establishing the as-left and as-found values for EDG steady state voltage and frequency such that the proposed ITS limits will not be exceeded. Specifically, test equipment meters were chosen that could be used to measure both voltage and frequency. For the voltage limits, the values in the vendor manuals (Reference Accuracy, Temperature Effect, and Calibration Tolerance) were used to determine the total measurement and test equipment error (M&TE), and then combined with the total EDG error (potential transformers, voltage regulators, and M&TE) to obtain the total error. The total error was then subtracted from the ITS upper limit and added to the ITS lower limit to arrive at the maximum and minimum voltages that will ensure the ITS limits are not exceeded. The as-left and as-found values are derived from these values using the Square Root of the Sum of Squares methodology. A similar process was performed to determine the as-left and as-found values for the frequency parameter.

### 3.1 Conclusion

The EDG provides emergency power to specific safety-related equipment in a specific range of voltage and frequency to ensure the equipment will function as designed, providing the required flows and time responses. The present voltage limits were developed based on early limits established for offsite voltages and incorporated into the CR-3 ITS. Calculations, to regain/demonstrate design margin, were later performed that utilized a plus or minus 2% tolerance for EDG voltage, and administrative limits were incorporated into the surveillance procedures for the EDGs.

The current frequency limits were directly taken from RG 1.9, Revision 3, and incorporated into the CR-3 ITS. No site specific calculations were performed to verify the required loads would function during worst case electrical conditions during a design or licensing basis event. Administrative limits were incorporated into surveillance procedures to account for and envelop meter uncertainties. Evaluations have been performed that demonstrate load equipment functionality with the more restrictive steady state frequency limits. Surveillance test results also demonstrate that the EDGs are capable of operating in a more restrictive frequency tolerance band. Administrative controls are in place to ensure the EDG testing procedures use the more restrictive steady state frequency acceptance limits of 60 plus or minus 0.6 Hz.

The administrative controls will ensure that the EDG remains within the more restrictive limits and maintains the initial conditions for the accident analyses assumptions until this LAR is implemented.

## 4.0 NO SIGNIFICANT HAZARDS CONSIDERATION

Florida Power Corporation (FPC) has evaluated the proposed License Amendment Request (LAR) against the criteria of 10 CFR 50.92(c) to determine if any significant hazards consideration is involved. FPC has concluded that this proposed LAR does not involve a significant hazards consideration. The following is a discussion of how each of the 10 CFR 50.92(c) criteria is satisfied.

*(1) Does not involve a significant increase in the probability or consequences of an accident previously evaluated.*

The LAR proposes to provide more restrictive voltage and frequency limits for the Emergency Diesel Generators (EDGs) steady state operation. The voltage band is going from a range of greater than or equal to 3933 V but less than or equal to 4400 V, to greater than or equal to 4077 V but less than or equal to 4243 V. The proposed limits are plus or minus 2% around the nominal safety-related bus voltage of 4160 V. The Frequency Limits are going from a 2% tolerance band to a 1% tolerance band around the nominal frequency of 60 Hz (59.4 Hz to 60.6 Hz) for all starts of the EDGs, at steady state conditions. For fast starts, the voltage and frequency limits at less than or equal to ten seconds will be consistent with the EDG ready matrix setpoints (90.8% voltage and 98% frequency) to allow for the overshoot and undershoot condition that exists while the voltage and frequency values converge on steady state conditions.

The EDGs are a safety-related system that functions to mitigate the impact of an accident with a concurrent loss of offsite power. A loss of offsite power is typically a significant contributor to postulated plant risk and, as such, onsite AC generators have to be maintained available and reliable in the event of a loss of offsite power event. The EDGs are not initiators for any analyzed accident, therefore; the probability for an accident that was previously evaluated is not increased by this change. The revised, voltage and frequency limits will ensure the EDGs will remain capable of performing their design function.

The consequences of an accident refer to the impact on both plant personnel and the public from any radiological release associated with the accident. The EDG supports equipment that is supposed to preclude any radiological release. More restrictive voltage and frequency limits for the output of the EDG restores design margin, and provides assurance that the equipment supplied by the EDG will operate correctly and within the assumed timeframe to perform their mitigating functions.

Until the proposed Crystal River Unit 3 (CR-3) Improved Technical Specifications (ITS) EDG voltage and frequency limits are approved by the NRC, administratively controlled limits have been established in accordance with NRC Administrative Letter 98-10 to ensure all EDG mitigation functions will be performed, per design, in the event of a loss of offsite power. These administrative limits have been determined as acceptable and have been incorporated into the surveillance test procedures under the provisions of 10 CFR 50.59. Periodic testing has been performed with acceptable results. Since EDGs are mitigating components and are not initiators for any analyzed accident, no increased probability of an accident can occur. Since administrative limits will ensure the EDGs will perform as designed, consequences will not be significantly affected.

(2) *Does not create the possibility of a new or different kind of accident from any accident previously evaluated.*

Administrative voltage limits were established using verified design calculations and the guidance of NRC Administrative Letter 98-10. These administrative limits will ensure the EDGs will perform as designed. No new configuration is established by this change. The administrative limits for the EDG frequency were determined to be sufficient to account for measurement and other uncertainties.

The proposed amendment will place the administrative limits into the CR-3 ITS. The more restrictive voltage and frequency limits will provide additional assurance that the EDG can provide the necessary power to supply the required safety-related loads during an analyzed accident. The proposed ITS voltage and frequency limits restore the EDG capability to those analyzed by Engineering calculation. No new configuration is established. Therefore, no new or different kind of accident from any previously evaluated can be created.

(3) *Does not involve a significant reduction in a margin of safety*

The LAR proposes to provide more restrictive steady state voltage and frequency limits for the EDGs. The change in the acceptance criteria for specific surveillance testing

provides assurance that the EDGs will be capable of performing their design function. Previous test history has shown that the new limits are well within the capability of the EDGs and are repeatable. The "as-left" settings for voltage and frequency will be adjusted such that they remain within a tight band and this ensures that the "as-found" settings will be in an acceptable tolerance band.

The proposed ITS limits on voltage and frequency will ensure that the EDG will be able to perform all design functions assumed in the accident analyses. Administrative limits are in place to ensure these parameters remain within analyzed limits. As such, the proposed change does not involve a significant reduction in a margin of safety.

## 5.0 ENVIRONMENTAL IMPACT EVALUATION

10 CFR 51.22(c)(9) provides criteria for and identification of licensing and regulatory actions eligible for categorical exclusion from performing an environmental assessment. A proposed amendment to an operating license for a facility requires no environmental assessment if the amendment changes a requirement with respect to use of a facility component within the restricted area provided that (i) the amendment involves no significant hazards consideration, (ii) there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite, and (iii) there is no significant increase in individual or cumulative occupational radiation exposure.

Florida Power Corporation (FPC) has reviewed this License Amendment Request (LAR) and has determined that it meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22, no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of the proposed license amendment. The basis for this determination is that for this amendment:

(i) The proposed license amendment does not involve a significant hazards consideration, as described in the significant hazards evaluation.

(ii) As discussed in the Justification for the Request and the No Significant Hazards Consideration, this change does not result in a significant change or significant increase in the release associated with any Design Basis Accident. The CR-3 ITS voltage and frequency steady state acceptance criteria will become more restrictive and will match the limits that currently reside in plant surveillance procedures. Likewise, there will be no significant change in the types or a significant increase in the amounts of any effluents released offsite during normal operation.

(iii) The proposed amendment does not have any impact on EDG unavailability or performance characteristics. The testing frequency has not changed and the time required to perform the testing is not increased. The EDGs are contained in non radioactive areas of the plant, so no exposure concerns exist. Therefore, the proposed LAR does not result in a significant increase to the individual or cumulative occupational radiation exposure.

## 6.0 APPLICABLE REGULATORY REQUIREMENTS/CRITERIA

10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 17, "Electric Power Systems," states that an onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that: (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences, and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.

10 CFR 50.36, "Technical Specifications," paragraph (c)(3), "Surveillance Requirements," specifies that surveillance requirements are requirements relating to test, calibration, or inspection to assure the necessary quality of systems and components is maintained, that facility operations will be within safety limits, and that the limiting conditions for operation will be met. The revision to the voltage and frequency limits for the EDG is not in conflict with the 10 CFR 50.36 requirements. The proposed changes do not adversely impact the ability of the EDGs to function as designed and do not impact conformance to the applicable General Design Criteria for Nuclear Power Plants, 10 CFR 50, Appendix A. Therefore, the proposed changes are consistent with all applicable regulatory requirements or criteria.

Based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

# FLORIDA POWER CORPORATION

# CRYSTAL RIVER UNIT 3

# DOCKET NUMBER 50-302/LICENSE NUMBER DPR-72

# LICENSE AMENDMENT REQUEST #304, REVISION 1

# ATTACHMENT B

# PROPOSED TECHNICAL SPECIFICATION PAGE CHANGES

# STRIKEOUT AND SHADOWED TEXT FORMAT

SURVEILLANCE REQUIREMENTS

| | SURVEILLANCE | FREQUENCY |
|---|---|---|
| SR 3.8.1.1 | Verify correct breaker alignment and indicated power availability for each required offsite circuit. | 7 days |
| SR 3.8.1.2 | ----------NOTES----------<br>1. Performance of SR 3.8.1.6 satisfies this SR.<br>2. All EDG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading.<br>3. A modified EDG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.6 must be met.<br>4. When a modified EDG start is used, the required frequency may be obtained automatically or manually or through a combination of the two.<br>----------<br>Verify each EDG starts from standby conditions and achieves steady state voltage ≥ ~~3933~~ 4077 V and ≤ 4243 ~~4400~~ V, and frequency ≥ ~~58.8~~ 59.4 Hz and ≤ ~~61.2~~ 60.6 Hz. | 31 days |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.8.1.6 | ----------NOTE----------<br>All EDG starts may be preceded by an engine prelube period.<br>----------<br><br>Verify each EDG starts from standby condition and achieves:<br>a. in ≤ 10 seconds voltage ≥ 3744 V and frequency ≥ 58.8 Hz, and<br>b. steady state voltage ≥ 4077 V and ≤ 4243 V and steady state frequency ≥ 59.4 Hz and ≤ 60.6 Hz | 184 days |
| SR 3.8.1.7 | Verify manual transfer of AC power sources from the normal offsite circuit to the alternate offsite circuit. | 24 months |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| SURVEILLANCE | FREQUENCY |
|---|---|
| SR 3.8.1.10 ----------NOTES----------<br>1. All EDG starts may be preceded by an engine prelube period.<br><br>2. This Surveillance shall not be performed in MODES 1, 2 or 3. However, credit may be taken for unplanned events that satisfy this SR.<br><br>3. Only required to be performed prior to entry into MODE 3.<br>----------<br><br>Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ES actuation signal:<br><br>a. De-energization of emergency buses;<br><br>b. Load shedding from emergency buses;<br><br>c. EDG auto-starts from standby condition and:<br><br>1. energizes permanently connected loads in ≤ 10 seconds,<br><br>2. energizes auto-connected emergency loads through load sequencing relays,<br><br>3. achieves steady-state voltage ≥ ~~3933~~ 4077 V and ≤ ~~4400~~ 4243 V,<br><br>4. achieves steady-state frequency ≥ ~~58.8~~ 59.4 Hz and ≤ ~~61.2~~ 60.6 Hz, and<br><br>5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes. | 24 months |

(continued)

# FLORIDA POWER CORPORATION

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# LICENSE AMENDMENT REQUEST #304, REVISION 1

# ATTACHMENT C

# PROPOSED TECHNICAL SPECIFICATION PAGE CHANGES

# REVISION BAR FORMAT

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.8.1.1 | Verify correct breaker alignment and indicated power availability for each required offsite circuit. | 7 days |
| SR 3.8.1.2 | ----------NOTES----------<br>1. Performance of SR 3.8.1.6 satisfies this SR.<br>2. All EDG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading.<br>3. A modified EDG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.6 must be met.<br>4. When a modified EDG start is used, the required frequency may be obtained automatically or manually or through a combination of the two.<br>----------<br>Verify each EDG starts from standby conditions and achieves steady state voltage $\geq$ 4077 V and $\leq$ 4243 V, and frequency $\geq$ 59.4 Hz and $\leq$ 60.6 Hz. | 31 days |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| | SURVEILLANCE | FREQUENCY |
|---|---|---|
| SR 3.8.1.6 | ----------NOTE----------<br>All EDG starts may be preceded by an engine prelube period.<br>----------<br><br>Verify each EDG starts from standby condition and achieves:<br>a. in ≤ 10 seconds voltage ≥ 3744 V and frequency ≥ 58.8 Hz, and<br>b. steady state voltage ≥ 4077 V and ≤ 4243 V and steady state frequency ≥ 59.4 Hz and ≤ 60.6 Hz | 184 days |
| SR 3.8.1.7 | Verify manual transfer of AC power sources from the normal offsite circuit to the alternate offsite circuit. | 24 months |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.8.1.10 | ----------NOTES----------<br>1. All EDG starts may be preceded by an engine prelube period.<br><br>2. This Surveillance shall not be performed in MODES 1, 2 or 3. However, credit may be taken for unplanned events that satisfy this SR.<br><br>3. Only required to be performed prior to entry into MODE 3.<br>----------<br><br>Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ES actuation signal:<br><br>a. De-energization of emergency buses;<br><br>b. Load shedding from emergency buses;<br><br>c. EDG auto-starts from standby condition and:<br><br>1. energizes permanently connected loads in ≤ 10 seconds,<br><br>2. energizes auto-connected emergency loads through load sequencing relays,<br><br>3. achieves steady-state voltage ≥ 4077 V and ≤ 4243 V,<br><br>4. achieves steady-state frequency ≥ 59.4 Hz and ≤ 60.6 Hz, and<br><br>5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes. | 24 months |

(continued)

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# DOCKET NUMBER 50-302/LICENSE NUMBER DPR-72

# LICENSE AMENDMENT REQUEST #304, REVISION 1

# ATTACHMENT D

# PROPOSED REVISED BASES PAGES
# (FOR INFORMATION ONLY)

# STRIKEOUT AND SHADOWED TEXT FORMAT

BASES

SURVEILLANCE REQUIREMENTS

The AC sources are designed to permit inspection and testing of all important areas and features, especially those that have a standby function. This is consistent with 10 CFR 50, Appendix A, GDC 18 (Ref. 8). Periodic component tests are supplemented by extensive functional tests during outages (under simulated accident conditions). Where the SRs for this LCO specify EDG voltage and frequency tolerances, the following is applicable. ~~The minimum steady state output voltage of 3033V is 94.5% of the nominal 4160V output voltage. This value allows for voltage drops to motors and other equipment dodn thtough the 120 V level where minimum operating voltage is usually specified as 85% to 90% of nameplate rating. The specified maximum steady state output voltage of 4400 V is equal to the maximum operating voltage specified for 4000V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 4000 V motors is no more than the maximum rated operating voltages. The specified minimum and maximum frequencies of the EDG are 58.8 Hz and 61.2 Hz, respectively. These values are equal to ± 2% of the 60 Hz nominal Frequency and are derived from the recommendations given in Regulatory Guide 1.9 (Ref. 3). Regulatory Guide 1.9 requirements are satisfied by monitoring the EDG output.~~ The specified steady state minimum and maximum voltage (4077 V - 4243 V) and frequency (59.4 Hz - 60.6 Hz) supports ES loads performing their design function and supports acceptable EDG loading. The specified voltage and frequency also support dynamic voltage and frequency dips resulting from motor starting being no greater than 25% and 5% respectively, and voltage and frequency recovering within 3 seconds to within 10% and 2% respectively. The steady state voltage and frequency values are derived from plant specific calculations. The voltage and frequency dip percentages and the recovery times and transient recovery percentages are derived from the recommendations in Regulatory Guide 1.9, (Ref. 3).

The limits used to define when the EDG is "started" for the ten second EDG start requirement will be 90% voltage (3744 V) and 98% frequency (58.8 Hz). These values are based on Regulatory Guide 1.9, Revision 3, July 1993, Section C.1.4 which addresses voltage and frequency recovery during EDG block loading prior to the next load block being applied to the EDG. The CR-3 ready matrix relays are set at 90.8% voltage and 98% frequency.

SR 3.8.1.1

This SR ensures proper circuit continuity for the offsite AC electrical power supply to the onsite distribution network and availability of offsite AC electrical power. The breaker alignment verifies that each breaker is in its

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.1 (continued)

correct position to ensure that distribution buses and loads are connected or are capable of being connected to their preferred power source, and that appropriate independence of offsite circuits is maintained. The 7 day Frequency is adequate since breaker position is not likely to change without the operator being aware of it and because its status is displayed in the control room.

SR 3.8.1.2 and SR 3.8.1.6

These SRs help to ensure the availability of the standby electrical power supply to mitigate DBAs and transients and to maintain the plant in a safe shutdown condition. To minimize wear on moving parts that do not get lubricated when the engine is not running, these SRs are modified by a Note (Note 2 for SR 3.8.1.2) to indicate that all EDG starts for these Surveillances may be preceded by an engine prelube period and followed by a warmup period prior to loading.

For the purposes of SR 3.8.1.2 and SR 3.8.1.6 testing, the EDGs are started from standby conditions. Standby conditions for an EDG means that the diesel engine coolant and oil are being continuously circulated and temperature is being maintained consistent with the manufacturer's recommendations.

SR 3.8.1.6 requires that, at a 184 day Frequency, the EDG starts from standby conditions and achieves required voltage and frequency within 10 seconds. The 10 second start requirement supports the assumptions of the design basis LOCA analysis in the FSAR, Chapter 14 (Ref. 5).

The 10 second start requirement is not applicable to SR 3.8.1.2 (see Note 3) when a modified start procedure is used. If a modified start is not used, the 10 second start requirement of SR 3.8.1.6 applies.

The monthly modified (slow) start of the EDG is to demonstrate that the EDG will run and achieve the required voltage and frequency (no start time requirement). A note that allows control of the speed (frequency) using automatic, manual, or a combination of the two mechanisms differentiates the slow start from the fast start, where adjustment of the speed setting for the governor to meet the test requirement frequency would not be appropriate. The fast start test assures the governor speed as-left setting from the last test and the governor time response performance are acceptable. The governor speed as-left setting is procedurally controlled regardless of whether the previous test was a fast start or a slow start. Control of the EDG frequency for the slow start can be from the EDG Speed Switch, the EDG Start Mode Select Switch, or the Speed Setting Knob located on the governor.

In addition to the SR requirements, the time for the EDG to reach steady state operation, unless the modified EDG start method is employed, is periodically monitored and the trend evaluated to identify degradation of governor and voltage regulator performance.

Since SR 3.8.1.6 requires a 10 second start, it is more restrictive than SR 3.8.1.2, and it may be performed in lieu of SR 3.8.1.2. This is the intent of Note 1 of SR 3.8.1.2.

(continued)

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# ATTACHMENT E

# LIST OF REGULATORY COMMITMENTS

**List of Regulatory Commitments**

The following table identifies those actions committed to by Florida Power Corporation (FPC) in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments. Please notify the Supervisor, Licensing and Regulatory Programs of any questions regarding this document or any associated regulatory commitments.

| Regulatory Commitments | Due Date/Event |
|---|---|
| Proposed Technical Specification limits for frequency and voltage will be administratively enforced until the license amendment is implemented. | Procedures are in place and will be maintained until the license amendment is implemented |