Florida Power
CORPORATION

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

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
Diesel Generator Room Air Temperature

Dear Sir:

Florida Power Corporation (FPC) previously provided information concerning diesel generator combustion air temperatures and their relation to diesel generator ratings. In discussion with the NRC Staff, the need for additional information was identified concerning the diesel generator room air temperature. Therefore, the following information is being provided in response.

A diesel generator room air temperature analysis was performed using the micro-computer program TSAP (Thermal System Analysis Program). Using this program a model of the generator room was constructed taking into consideration the major heat loads and heat sinks in the room. The walls, floor, and ceiling are the most significant heat sinks, and they were modeled to include the conditions on their outside surfaces. A temperature profile that oscillated between 76.2°F and 95.0°F on a 24-hour cycle was used for outside air. Manufacturer's data was used to obtain the variation of temperature for each component as room temperature varied.

Initial temperatures for the walls and room contents were taken as that implied by steady state condition before the diesel engine starts (109°F diesel generator room temperatures) assuming outside air temperature is fixed at the average value of 85°F. The transient was started at approximately 9:30 a.m., which is the time the outdoor temperature has ascended to 85°F, and covered an elapsed time of 62 to 134 hours which encompassed at least 3 temperature peaks. The 85°F temperature was chosen as the start since this is the average value that results in an initial steady state room temperature of 109°F (before the diesel generator is started). If the analysis was started at 95°F outside air, the room would be

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slightly higher than the 111.8°F shown below for two fan operation with the combustion air branch duct installed. The combustion air would still be at 95°F.

Calculations were performed for the following cases:

1) One fan operating with existing HVAC air supply ductwork.

2) Two fans operating with existing HVAC air supply ductwork.

3) One fan operating with combustion air branch duct installed.

4) Two fans operating with combustion air branch duct installed.

The results of the calculation for the four cases are presented below:

Existing HVAC System (un-modified)

| # Fans Operating | Outside Air Temperature (°F) | Diesel Generator Room Air Temperature (°F) | Combustion Air Temperature (°F) |
|---|---|---|---|
| 1 | 95.0 | 111.8 | 111.8 |
| 2 | 95.0 | 106.6 | 106.6 |

Combustion Air Branch Duct Installed

| # Fans Operating | Outside Air Temperature (°F) | Diesel Generator Room Air Temperature (°F) | Combustion Air Temperature (°F) |
|---|---|---|---|
| 1 | 95.0 | 119.5 | 103.2 |
| 2 | 95.0 | 111.8 | 95.0 |

Due to the possibility of the combustion air exceeding 105°F with the existing HVAC ductwork/system (as indicated in the results above), FPC decided to implement a modification to the HVAC ductwork. This modification is safety-related and was designed to meet seismic category I criteria. The modification will add a branch duct take-off from the existing ventilation main supply duct and related duct supports. The branch duct will supply outside air to a point near the diesel generator combustion air intake filters to ensure that the combustion air temperature does not exceed 105°F. This modification will be performed for both diesel generator rooms.

The design of the modification was based on two fan operation. As a result, the splitter damper installed in the branch duct to allow flow adjustment will be set for two fan operation. However, the analysis has shown that with a two fan damper setting, 1 fan will still supply air (which would now mix with room air due to reduced flow) at an acceptable temperature. Two fan operation was chosen to assure that

the room temperatures were maintained as low as reasonably possible. Since the new branch duct will bypass 15,000 CFM of air directly to the combustion air inlet, additional air flow is needed to maintain the lower room temperatures.

During previous testing of the diesel generators with two fan operation without the branch ductwork installed, one fan would trip off. A subsequent review found that this trip occurred due to the thermal overload on the fan motors. The original motor overload setting were determined utilizing a measured full load current of 22.4 amps with one fan running. Since two fans were now being run at the same time, causing increased fan discharge pressure and thus increased fan motor loads, the measured full load current was now 25.2 amps. By raising the temperature compensator adjuster from 100% to 115%, the trip current setting was increased to approximately 27.3 amps. This is permissible by the National Electric Code Article 430.34, which states that the maximum trip current setting is 130% of name plate motor full load amps.

The motors/fans have been subsequently run without tripping. Also, during pre-modification flow testing, it was noted that filters of a higher efficiency than required were installed. This may have contributed to the fan tripping. Lower efficiency filters have been ordered and will be installed prior to completion of the modification. Once the modification is complete the additional airflow through the branch duct will decrease the back pressure in the main duct, which should also help ensure reliable fan operation.

Should you have any questions, please do not hesitate to contact this office.

Sincerely,

Rolf C. Widell, Director
Nuclear Operations Site Support

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