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FPL

FLORIDA POWER & LIGHT COMPANY

L-84-180
7-25-84

Office of Nuclear Reactor Regulation
Attention: Mr. S.A. Varga, Chief
Operating Reactors Branch #1
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Turkey Point Units 3 & 4
Docket Nos. 50-250 and 50-251
Auxiliary Power Upgrade
Responses to NRC Questions

Dear Mr. Varga:

As outlined by NRC letter dated June 25, 1984 and referenced by FPL Letter L-84-157 dated June 22, 1984, attached is FPL's responses to specific questions concerning the Turkey Point Power Upgrade.

Very truly yours,

J.W. Williams, Jr.
Group Vice President
Nuclear Energy

JWW/RWG/law

Attachment

A001 1/1

NRC Question 1

Additional information and factors which could effect overall system reliability and the likelihood of unit(s) trips as the result of the modifications.

FPL Response to Question 1

The fault trees modeled the proposed C bus modification and allowed for quantification of the reliability of the proposed design. The results of the analysis demonstrated that the C bus is slightly more reliable as a source of normal 4kV power than the A or B busses. The C bus provides an additional reliable electrical tie to the switchyard.

The factors affecting plant trip frequency and the reliability of the 4kV system are complex and difficult to quantify precisely. The following provides a discussion of these factors.

If either the A or B 4kV bus is lost the plant will trip due to loss of the associated reactor coolant pump(s). The dominant 4kV bus failure modes are bus and transformer faults. Generic data (IEEE STD-493, 1980) indicates failure frequencies of:

	Failure Rate Per Service Year
A Bus	1.6×10^{-2}
B Bus	1.4×10^{-2}
Main Transformer	1.3×10^{-2}
Auxiliary Transformer	1.3×10^{-2}
	$\Sigma = 5.6 \times 10^{-2}$

On the average, generic data would suggest one trip due to loss of a 4kV bus about every 17 or 18 years, or 2 to 3 trips during the unit's 40 year service life. About 400 reactor trips are assumed to occur over the service life of the plant for design evaluation purposes. Accordingly less than 1% of the design number of trips would be expected to occur from a 4kV (A or B) bus loss.

Turkey Point Plant operating experience supports these predictions. Units 3 and 4 have accumulated 23 years of service during which time 177 trips have occurred at power (92 for Unit 3, 85 for Unit 4). No A or B bus or transformer faults have resulted in reactor trip. The following bus-related trips have happened:

1) Undervoltage on 4kV Bus—cause unknown (Unit 4, 98% Power, 6-28-74)

2) Inadvertent actuation of 3A Startup Transformer Breaker overcurrent relay (no fault existed) resulting in lockout of 3A 4kV Bus (Unit 3, 100% Power, 5-19-82)

Including these, then about 1% of actual Turkey Point trips could be attributed to the A and B 4kV system. It can be concluded that loss of the A or B bus is not a significant contributor to the frequency of plant trip.

The proposed C bus does not alter the design with regard to A and B bus related trips when the A and B busses are supplied from their normal power supply. However, it does reduce the likelihood of trip due to loss of the A or B busses. The reduced probability of trip occurs for two reasons, namely;

- The C bus modification reduces the load on the A bus by about 35% and on the B bus by about 25%. The transfer of loads to the C bus reduces the operating stress on A and B bus components. This results in an increase in equipment reliability and a decrease in the likelihood of trip due to equipment malfunction.

- Undervoltage (U.V.) relays, designed to protect against low bus voltage conditions, will initiate a plant trip when actuated. The C bus load transfer results in higher bus voltages for a given grid voltage. Thus, the C bus increases the margin between the operating voltage and the U.V. relay setpoint thereby reducing the likelihood of plant trip due to U.V. relay actuation.

The switchyard modifications proposed have improved the availability of power supply to the A and B busses from the standby power supply as follows:

- The addition of OCB 52/6B allows isolation of Northeast Bus faults thereby increasing the availability of the Unit 3 startup transformer.

- The addition of OCB 52/4B allows isolation of faults associated with the fossil unit's startup transformer, thereby increasing the availability of the Northeast Bus.

Thus when the Unit 3 startup transformer is supplying Unit 3's A and B busses, the likelihood of a unit trip is reduced by the C bus modification.

The C bus modification introduces the loss of the C bus as an event that may be associated with a unit trip. Generic data for C bus transformer and bus faults suggest a frequency of 1.2×10^{-2} losses of C bus per service year. The loss of C bus results in a unit runback because of the loss of a feedwater pump. If the runback is successful, then there has been no increase in the likelihood of trip as a result of the proposed modification. If the runback fails, then the likelihood of trip at most has increased from about 5.6×10^{-2} for the A and B busses to 6.8×10^{-2} for the A, B and C busses. (This assumes the probability of unsuccessful runback is unity.) The latter figure still represents less than 1% of the design number of trips. Thus even if it were assumed that turbine runback following loss of a C bus was always unsuccessful, generic data suggests no substantive change in the likelihood of trip due to the presence of the C bus.

In summary:

- The C bus modification reduces the likelihood of plant trip due to a loss of the nuclear safety related A and B busses.

- There is some small increase in the likelihood of plant trip due to a loss of the non safety related C bus "and" a failure of the plant to successfully runback.

The improvement in nuclear safety related bus availability is considered to result in an overall safety benefit to the facility. The following advantages of the C bus design reinforce this conclusion:

- o Addition of Switchyard OCB's;

  (i) improves separation of normal and alternate offsite power supply to all units,

  (ii) improves separation between fossil and nuclear units,

  (iii) enhances the ability to maintain the switchyard during power operation, i.e. improves reliability.

- o An additional tie from the cranking DG's to the Nuclear 4.16 kV busses allows a more direct re-energization of the 4.16 kV busses in the event of station blackout;

- o Removal of equipment from the nuclear safety related A and B busses;

  (i) improves the plant's ability to operate various combinations of equipment simultaneously without encountering undervoltage difficulties or limitations,

  (ii) eliminates the necessity of administratively controlling bus loading,

  (iii) reduces the short circuit loading of the safety switchgear and motor control centers,

  (iv) improves separation of safety and non-safety equipment power supplies.

- o Since there are fewer non-safety loads required to be shed from the safety busses upon loss of offsite power, the bus shedding reliability increases as well as the reliability of the Diesel Generator Feeder Breaker circuitry.

- o C bus provides the capability to accommodate future load growth designed to improve the units' reliability and availability (e.g. Condensate Polishing System).

- o Additional battery capacity for non-safety related loads is provided by the C-battery. Also, some non-safety loads (Aux Oil pumps) have been transferred to the C-battery.

NRC Question 2

Provide additional description and details on the alternate feeds from safety and non-safety related busses to individual loads to assure adequate separation and isolation of redundant safety busses.

FPL Response to Question 2

Under the Auxiliary Power Upgrade, alternate power feeds to several components were transferred to the new C-Bus. The C-bus modification did not alter the separation and isolation protection provided for in the existing licensed design. The original power supply design allowed for this equipment to be transferred from the non-vital section of an MCC to the non-vital section of another MCC. With the Auxiliary Power Upgrade, this transfer is now to a non-vital MCC powered from the non-vital C-Bus. The following components receive their normal power from the non-vital section of MCC 3A (4A) and their alternate power from MCC NV3B (NV 4B), which is now powered from the new C-Bus:

Main Transformer 3X01 (4X01) Cooling Equipment
Auxiliary Transformer 3X02 (4X02) Cooling Equipment
Startup Transformer 3X03 (4X03) Cooling Equipment

These loads are isolated from the safety bus by two existing safety-grade circuit breakers in series. These two breakers were provided as part of the original plant design and will open on an overload condition and isolate these non-safety loads from the safety bus thus preventing any adverse effects on the vital bus. These two breakers (load and tie breaker) are located in MCC 3A (4A) and were not altered under the Auxiliary Power Upgrade modifications.

The normal power feed to Rod Position Inverter 3Y03 (4Y03) was also transferred to the C-Bus and is now fed from MCC NV3C (NV 4C). The alternate source to this inverter is from the vital DC Control Center 3D01 (4D01). Under the original plant design, this load is isolated from the safety bus by two (safety and non-safety grade) circuit breakers in series. Likewise, the alternate power for the inverter 3Y03 (4Y03) output, which is from Lighting Panel LP317 (LP417), is also isolated from the vital bus by these same circuit breakers. These breakers are the inverter incoming breaker which is located in the Rod Position Inverter and the DC Control Center Breaker which is located in the DC Control Center. These two breakers will open on an overload condition to prevent any adverse effects on the vital bus and were not altered under the Auxiliary Power Upgrade modifications.

Based on the above, adequate separation and isolation exist between the safety and non-safety busses.

NRC Question 3

Discussion of other ongoing activities related to the electrical system including the turbine/reactor runback capability, degraded grid protection, Appendix R and other activities which could be impacted by the proposed design changes.

FPL Response to Question 3

FPL's quality improvement task team on turbine runbacks at Turkey Point Units 3 & 4 is studying ways to reduce spurious turbine runbacks and to enhance unit survivability (i.e., reducing the likelihood of reactor trips during turbine runbacks). Potential improvements may include restoring the power mismatch feature with auto rod in-motion only, deleting the nuclear flux-rate NIS runback, raising the dropped rod (RPI) runback preset power level, and changing the steam generator operating level setpoints to enhance unit survivability during a feed pump runback. Progress in some of these areas is dependent on analytical work currently being performed by Westinghouse.

The undervoltage relay settings, resulting from the degraded grid analysis for Turkey Point, are based on the safe heating characteristics of safety related loads which will experience the lowest terminal voltage with the lowest anticipated grid voltage. Since these relays are set based on the minimum safe voltage for the loads present, removing loads will not adversely affect the relay setpoints and will instead give further margin to the setpoints. Possible overvoltage conditions were analyzed assuming the safety busses were operating at one-half load with the maximum anticipated grid voltage. Since the C Bus modification removed significantly less than one-half load from these busses, the previous analysis remains valid.

Other on-going activities (e.g. Appendix R) which may be impacted by the Auxiliary Power Upgrade are being reviewed as part of a complete evaluation of all component loads transferred to the new power distribution system. This evaluation will determine acceptability of a C Bus Power supply to individual loads with regard to design, operation and regulatory commitments/requirements. Any power supply deficiencies identified during this load evaluation will be resolved and necessary modifications implemented.

NRC Question 4

Discussion of activities in the area of upgrading the existing Technical Specifications and considerations in the areas of Surveillance and Limiting Conditions of Operation (LCO) for the electrical system and its major components.

FPL Response to Question 4

FPL is in the process of implementing the guidance and philosophy of the Standard Technical Specification (STS) in the development of new site procedures. Where this program identifies STS requirements for existing plant equipment which exceeds the requirements of the current Turkey Point technical specifications, the appropriate requirement will be written in the upgraded procedures and a proposed amendment will be submitted as appropriate to request incorporation of the STS requirements as part of the overall "STS".

In the electrical power systems area, the plant specific design equipment will be formatted into LCOs in the STS format with the STS action statements and surveillance requirements used as they apply to plant specific equipment. Prior to determining the emergency diesel generator surveillance requirements to be used, FPL will review the suggestions of Generic Letter 83-30 (Deletion of STS Surveillance Requirement 4.8.1.1.2.d.6 for Diesel Generator Testing).

We currently anticipate a submittal of our proposed revision to the entire Technical Specifications in the summer of 1985 time frame. We will propose an implementation date which will allow sufficient time to complete the necessary procedures and training prior to the implementation date.