UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 10 TO FACILITY OPERATING LICENSE NO. NPF-41

AND AMENDMENT NO. 5 TO FACILITY OPERATING LICENSE NO. NPF-51

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

PALO VERDE NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2

DOCKET NOS. STN 50-528 AND STN 50-529

1.0 INTRODUCTION

By letter dated July 23, 1986, as supplemented by letters dated August 26 and September 26, 1986, the Arizona Public Service Company (APS) on behalf of itself, the Salt River Project Agricultural Improvement and Power District, Southern California Edison Company, El Paso Electric Company, Public Service Company of New Mexico, Los Angeles Department of Water and Power, and Southern California Public Power Authority (licensees), requested a change to the Technical Specifications for the Palo Verde Nuclear Generating Station, Units 1 and 2 (Appendices A to Facility Operating Licenses NPF-41 and NPF-51, respectively). The application requests that Tables 2.2-1 and 3.3-2 of the Technical Specifications for each unit be revised to change the setpoints involved with the Low Reactor Coolant Flow (LRCF) reactor trip function to values which are still bounded by current safety analyses so that process noise can be accommodated without tripping the reactors.

2.0 DISCUSSION

Table 2.2-1 of the Technical Specifications for Palo Verde, Units 1 and 2, includes trip setpoints for three parameters, i.e., RATE, FLOOR, and BAND (or STEP), which constitute the LRCF trip function. The response time for the LRCF trip function is included in Table 3.3-2 of the Technical Specifications.

The LRCF trip function provides primary protection for a Reactor Coolant Pump (RCP) sheared shaft event. In this event, the reduction in Reactor Coolant System (RCS) flow causes a reduction in the differential pressure across the primary side of the affected steam generator. The LRCF trip function uses a Rate Limited Variable Setpoint module to initiate a reactor trip based on a differential pressure input signal from the steam generator.

Under steady state conditions, the trip setpoint will stay below the differential pressure input signal by the trip function parameter BAND. During a transient, the trip setpoint will move away from the decreasing differential pressure input signal to try and maintain the separation defined by BAND. The rate of decrease of the trip setpoint is fixed by the trip function parameter RATE. If the rate of decrease of the differential pressure input signal is greater than RATE, a trip will occur when the differential pressure input signal eventually equals the trip setpoint. The minimum value that the trip setpoint can have is defined by the trip function parameter FLOOR.

The setpoint calculation uses a combination of the BAND, RATE, and FLOOR trip function parameters to provide the protection required. The trip function parameter FLOOR is used to provide protection for the sheared shaft event whenever the Steam Generator differential pressure is less than or equal to 22.5 psid. The trip BAND function parameters and RATE are used to provide protection for this event whenever the Steam Generator differential pressure is greater than 22.5 psid.

The LRCF trip function has four channels, and trip signals generated by any two of these channels will result in a reactor trip. The licensees state that because of process noise in the sensor impulse lines, the current settings for the LRCF trip function have caused Palo Verde, Units 1 and 2, to experience pre-trip alarms and channel trips. Actual reactor trips due to this trip function were experienced at Palo Verde, Unit 1 on July 12, 1986 and, again, on August 30, 1986.

As a result of the above problems, the licensees have requested the following changes to the setpoint limits shown on Table 2.2-1 for the LRCF trip function:

	Current Value	Proposed Value
RATE	$\leq$ 1.05%/sec (0.238 psi/sec)	$\leq$ 0.115 psi/sec
FLOOR	$\geq$ 52.2% (15.68 psid)	$\geq$ 11.9 psid
BAND	$\leq$ 40.0% (8.988 psid)	$\leq$ 10.0 psid

In addition, the licensees have requested that the response time shown on Table 3.3-2 for this function be changed from 0.65 seconds to 0.58 seconds.

In support of this request for amendments, the licensees provided information regarding the assumptions used in the analysis of record for the sheared shaft loss-of-flow event and the relationship of these assumptions to the measured values at the plant.

3.0 EVALUATION

The sequence of events for a postulated RCP sheared shaft accident at Palo Verde is based on a reactor trip occurring (reactor trip breakers open) 1.2 seconds after event initiation. For determining the previous setpoints for the

LRCF trip, the licensees had assumed a one-second process response time for LRCF, from the time the process reaches the trip setpoint to the time the reactor trip breakers open. Based on the calculated reactor coolant flow coastdown for a RCP sheared shaft event, the flow would decay to 90% of full flow in less than 0.2 seconds. Therefore, the setpoints for the LRCF trip had been based on the 90% flow value to ensure a reactor trip prior to 1.2 seconds.

The licensees' recent submittals indicated that the testing performed thus far has shown that the worst case process response time for the LRCF trip function has been approximately 0.35 seconds. In addition, the plant test procedure that is used to periodically verify this response time requires a response time of less than 0.5 seconds. Therefore, the licensees are proposing a response time of 0.58 seconds in the modified Technical Specifications Table 3.3-2, and they used this value to establish the new setpoints for the LRCF trip function. Based on a 0.58 seconds response time and using the same reactor coolant flow coastdown data previously used, the initiation of a trip signal at approximately 70 percent of full flow would still ensure, with sufficient conservatism, a reactor trip prior to 1.2 seconds into the postulated RCP sheared shaft accident.

The licensees' proposed value for the parameter FLOOR is lower than the present value. The proposed values for the parameters BAND and RATE are larger and smaller than present values, respectively.

The licensees derived the proposed value for the parameter FLOOR based on: (1) a response time of 0.58 seconds for the LRCF trip function, (2) data on reactor coolant flow coastdown following a reactor coolant pump sheared shaft accident, (3) an average measured value of 22.5 psid for the pressure differential across the steam generators at full flow, and (4) the maximum time delay of 1.2 seconds previously assumed in the Palo Verde safety analysis for a reactor trip following a sheared reactor coolant pump shaft accident. The derived value was then increased to account for calibration uncertainties, equipment inaccuracies, setpoint drift, and temperature effects. This evaluation resulted in an allowable value of 11.7 psid for the FLOOR parameter. An additional conservatism of 0.2 psid was included to obtain the new setpoint of 11.9 psid for the FLOOR parameter.

The value of the parameter BAND was selected at 11.0 psid to minimize interference from process noise. The value for BAND was then decreased to account for calibration uncertainties, equipment inaccuracies, setpoint drift, and temperature effects, resulting in a allowable value of 10.2 psid. This value was further reduced by 0.2 psid for added conservatism, to obtain the new setpoint of 10.0 psid for the BAND parameter.

The value for the parameter RATE was derived using data relating to a four reactor coolant pump coastdown event, resulting in an allowable value of 0.118 psi/sec. This rate was reduced to 0.115 psi/sec to obtain the new setpoint for the RATE parameter. This setpoint is conservative by a factor of 8 when used in conjunction with BAND for the sheared pump shaft accident analysis. The

value of RATE is sufficiently low to ensure a reactor trip before the FLOOR value is reached following a reduction in process flow due to a sheared pump shaft at full power. Therefore, the values for the parameters of FLOOR, BAND, and RATE, which are based, in part, on a measured pressure differential of 22.5 psid across the steam generators at full flow, are conservative for the required protective LRCF function.

Based on the above evaluation, the staff concludes that the licensees' proposed LRCF trip setpoints are acceptable. This acceptance is based on the determination that the new LRCF trip setpoints would still assure a reactor trip at appropriate times following a postulated RCP sheared shaft accident and that they are supported by the existing safety analysis for Palo Verde. In addition, the modified process response time of 0.58 seconds for the LCRF trip function is acceptable since it has sufficient conservatism with respect to actual test data of 0.35 seconds.

In their submittal, the licensees also indicated that the LRCF trip serves as a backup to the core protection calculation (CPC) trip function for a main steam line break accident with a concurrent loss of offsite power. However, the licensees have not provided, for staff review, the results of an analysis of such an accident using the proposed LRCF setpoints. Without this information, the staff could not conclude that the proposed setpoints of the LRCF trip would also protect against the main steam line break accident. Also, the licensees indicated that the setpoint values of the LRCF trip for the main steam line break accident with loss of offsite power were chosen such that a coolable core geometry is maintained. The staff does not consider this design criterion appropriate since the radiological consequences of such an accident may exceed the 10 CFR 100 guidelines even though coolable core geometry is maintained. The acceptable criteria for this accident is that the radiological consequences of the accident be within the limits of 10 CFR 100 guidelines. Based on the above considerations, the staff cannot conclude that the LRCF trip function also provides protection against a main steam line break accident outside containment with a concurrent loss of offsite power.

In its letter, dated August 26, 1986, the licensees stated that the primary protection for the main steam line break accident with loss of offsite power is provided by the CPCs. The licensees also stated that there are not any analyzed conditions that would result in the inability of the safety grade CPCs to provide the required protection for this event. Based on the above, the staff concludes that the LCRF trip function need not be considered as a licensing requirement for this event.

4.0 CONTACT WITH STATE OFFICIAL

The Arizona Radiation Regulatory Agency has been advised of the proposed determination of no significant hazards consideration with regard to this request for change to the Technical Specifications. No comments were received.

5.0 ENVIRONMENTAL CONSIDERATIONS

These amendments involve changes in the installation or use of facility components located within the restricted area. The staff has determined that the amendments involve no significant increase in the amounts of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued proposed findings that the amendments involve no significant hazards consideration, and there has been no public comment on such findings. Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR Sec. 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need to be prepared in connection with the issuance of these amendments.

6.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that (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 issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public. We, therefore, conclude that the proposed changes are acceptable.

Dated: October 7, 1986