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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 57 TO FACILITY OPERATING LICENSE NO. DPR-66

DUQUESNE LIGHT COMPANY

OHIO EDISON COMPANY

PENNSYLVANIA POWER COMPANY

BEAVER VALLEY POWER STATION, UNIT NO. 1

DOCKET NO. 50-334

Introduction

License Amendment No. 52 for Beaver Valley Unit 1 granted a temporary waiver of the accuracy requirements on the analog control rod position instrumentation (RPI) during modes 3, 4, and 5. This amendment, which included compensatory requirements during the period of the waiver, expires September 1, 1982. Separately, the question of accuracy requirements in these shutdown modes was raised on Sequoyah Unit 1. Technical Specifications for both these plants require that the RPI's have an accuracy of $\pm$ 12-steps in these modes, which, due to temperature effects, is beyond the current design capability of the equipment. To achieve compliance, the licensees presently must either calibrate the instruments when changing from the operating modes (i.e., 1 and 2) to the shutdown modes or must preclude operation in the shutdown modes with the shutdown banks withdrawn.

Background

The analog RPI system is typically calibrated at hot zero-power plant conditions, when the average reactor coolant system is on the order of 540°F. Subsequent to such a calibration the system is required to maintain an accuracy of $\pm$ 12-steps (i.e., 5%) during plant startup and power operations. In this regime, the temperatures do not vary outside a relatively narrow operating band (540-600°F).

When the plant temperature is substantially lower (during the plant shutdown modes), the analog RPI system accuracy does not satisfy the $\pm$ 12 step value without recalibration. At Beaver Valley, errors of about 60 steps have been noted at a reactor coolant system temperature of about 350°F.

Evaluation

During the operating modes (i.e., plant startup and power operations), safety considerations such as rod insertion limits and rod misalignment limits, which limit power peaking, dictate that accurate and reliable analog RPI channels be operable. However, during the shutdown modes, consideration of power peaking factors is not significant. During the shutdown modes, the primary safety considerations are shutdown margin and inadvertent criticality.

Shutdown margin calculations take into account factors such as Xenon and Smarianium poison concentrations, fuel load, fuel burnup, and boron concentrations. For the purposes of calculating shutdown margin, the position of the control rods is of no significance because all withdrawn rods (except the highest-worth single rod) are assumed to become fully inserted due to reactor scram action. Therefore, we conclude that accuracy rod position information has no impact upon shutdown margin calculations.

In the shutdown mode, the licensee is also required to maintain the reactor in a sub-critical condition with $k_{eff} \leq 0.99$ in order to prevent inadvertent criticality. Operationally, this is accomplished by means of inserted control rods and boron concentration.

If the licensee were required to demonstrate a $\pm$ 12-step accuracy before any rods (shutdown banks or control banks) may be withdrawn, he would be forced either to recalibrate the RPI's for "cold" shutdown or to maintain the rods fully inserted. The requirement to double calibrate (both for "cold" and "hot" conditions) is unnecessary and could lead to a reduction in safety in that it introduces more opportunities for miscalibration problems. Plant operation in the shutdown modes with the shutdown banks of control rods withdrawn is a mode of operation which many licensees prefer and view as safer than having all rods fully inserted.

With a sufficient boron concentration the required sub-criticality can be maintained with some of the control rods withdrawn. Therefore the RPI need only be accurate enough to indicate which rods are fully inserted and which are not, so long as all withdrawn rods are assumed to be fully withdrawn.

Based on our review we find that the safety considerations of adequate shutdown margin and adequate sub-criticality can be accommodated via other controls and that a requirement to maintain a 12-step accuracy for the analog indicators is therefore not necessary. We have determined that for the shutdown modes, the demand counters and the analog indicators are sufficient to identify those rods which are fully inserted. Within the constraint that any rod that is not fully inserted, shall be considered to be fully withdrawn, for the purposes of determining the minimum required boron concentrations, the analog rod position indicators may be considered to be operable in the shutdown modes without satisfying the 12-step accuracy. An acceptable Technical Specification 3.1.3.3, and related pages, are attached.

Environmental Consideration

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated, does not create the possibility of an accident of a type different from any evaluated previously, and does not involve a significant reduction in a margin of safety, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor:

Mr. J. T. Beard

Date: September 7, 1982