April 10, 2000

Mr. Harold W. Keiser
Chief Nuclear Officer & President -
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Public Service Electric & Gas
Company
Post Office Box 236
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION, CHANGES TO TECHNICAL SPECIFICATIONS BASES PAGES (TAC NO. MA8569)

Dear Mr. Keiser:

In a letter dated March 29, 2000, the Public Service Electric and Gas Company provided to the U.S. Nuclear Regulatory Commission (NRC) several revised/new Technical Specification (TS) Bases pages for the Hope Creek Generating Station (HCGS). The following TS Bases pages were submitted: B 3/4 1-1 (revised), B 3/4 1-1a (new), and B 3/4 1-1b (new).

The NRC staff has reviewed the TS Bases changes and has no objection to the changes. The enclosed TS pages are being distributed for inclusion in the HCGS TSs.

Sincerely,

/RA/

Richard B. Ennis, Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosures: TS Pages B 3/4 1-1,
B 3/4 1-1a and B 3/4 1-1b

cc w/encls: See next page

Hope Creek Generating Station

cc:

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cc w/encls: See next page

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3/4.1.1 SHUTDOWN MARGIN

SHUTDOWN MARGIN (SDM) requirements are specified to ensure:

a. The reactor can be made subcritical from all operating conditions, transients, and Design Bases Events;

b. The reactivity transients associated with postulated accident conditions are controllable within acceptable limits; and

c. The reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

SDM can be demonstrated by using solely analytical methods or by performing a test. SDM can be measured only by performing a test. A "test" involves collecting data with the reactor at a specified condition or series of conditions. The primary purpose of a SDM Demonstration is to ensure that SDM is equal to or greater than the SDM Limit for a specific core exposure. The primary purpose of a SDM Measurement is to provide SDM in % delta k/k that can be used for: 1) ensuring that SDM is equal to or greater than the SDM Limit for a range of core exposures, 2) determining the need for additional SDM Measurements during the cycle, 3) providing a benchmark for the core design (design vs. actual SDM), and 4) providing a benchmark for potential future analysis of SDM for such events as control rods incapable of full insertion. This higher level of application requires that a SDM Measurement is determined from testing and not through solely analytical methods. Since a SDM Measurement satisfies the primary purpose of a SDM Demonstration, it can be considered a special type of SDM Demonstration.

All SDM Demonstrations involve some usage of analytical methods. The performance of tests lessens the usage of analytical methods, reduces uncertainty in the results, and thus requires a smaller SDM Limit needed to show adequate SDM. At one end of the spectrum is a series of local criticals where both SDM and the highest worth control rod are determined by test. Although this technique has the minimum uncertainty and thus has the smallest SDM Limit, it still uses analytical methods to determine the worth of all the other control rods. At the other end of the spectrum is usage of solely analytical methods prior to core verification. This technique has the maximum uncertainty and thus has the largest SDM Limit.

The SDM Limit must be increased if the highest worth control rod is determined solely analytically versus a test using the reactor (requires a series of local criticals). This higher limit accounts for uncertainties in the calculation of the highest worth control rod.

SDM is demonstrated to satisfy a variety of OPCON 5 surveillances at the beginning of each cycle and, if necessary, at any future entry to OPCON 5 during the cycle if the assumptions of the previous SDM Demonstration are no longer valid. In most situations, the SDM Demonstration will be based solely on analytical methods and a test will not be performed. If SDM is demonstrated by using solely analytical methods, then SDM must be adjusted to account for the associated uncertainties (excluding the uncertainties in the calculation of the highest worth control rod which are already accounted for in the higher SDM Limit). Prior to core verification, the SDM Limit must be increased due to the possibility of misloaded fuel assemblies.

SDM is measured before or during the first startup following core alterations (ex. fuel movement, control rod replacement), and, if necessary, at any future time in the cycle if a SDM Measurement indicates that the SDM Limit could be reached at a higher core exposure. SDM may be measured during an in-sequence control rod withdrawal or during local criticals. In either case, the measured SDM must be verified to be adequate prior to continuing plant operation.

SDM must be adjusted to cold, xenon-free conditions since these conditions provide a single reference point and are normally the most limiting conditions. The SDM Limit chosen for this reference point ensures that adequate SDM is maintained for all OPCONs.

With control rods incapable of being fully inserted, the reactivity impacts of these control rods must be accounted for in the determination of SDM. In addition to the loss of the worth of these control rods on a scram, the altered power distribution changes the worths of the remaining control rods. By definition, SDM normally does not address known rods that are incapable of full insertion and thus an increased allowance must be added. This verification may be conducted analytically with the necessary adjustments to account for the control rods plus any associated uncertainties.

Since core reactivity will vary during the cycle as a function of fuel depletion and poison burnup, SDM Measurements must also account for changes in core reactivity during the remainder of the cycle. If there is a core exposure during the remainder of the cycle at which the core reactivity is greater than the core reactivity as which SDM was measured, then the measured value must be reduced to predict SDM at this future core exposure. Therefore, to obtain the final SDM, the measured value must be reduced by the difference between the calculated maximum core reactivity over the remainder of the cycle and the calculated core reactivity at the core exposure at which SDM was measured. If the measured value satisfies the SDM limit but the final value does not satisfy the limit, then it will be necessary to schedule another SDM Measurement prior to reaching the core exposure at which the predicted SDM is equal to the SDM Limit.

When the core is designed, the target SDM is significantly above the SDM Limit. This conservancy accounts for uncertainties in the calculations and allows for the loading, startup, and operation of the reactor.

During OPCON 5, SDM ensures that the reactor does not reach criticality during core alterations (ex. fuel movement, control rod replacements). An evaluation covering each in-vessel fuel or control rod movement is required to demonstrate that SDM is maintained during these activities. This evaluation can be a step-by-step analysis, a bounding analysis, or a combination of these two methods. A step-by-step analysis checks SDM after each movement of a fuel assembly or control rod. A bounding analysis checks the most reactive configurations in a sequence to show acceptability of the entire sequence. All analyses must account for the associated uncertainties in the analytical methods. Prior to core verification, the SDM Limit must be increased due to the possibility of misloaded fuel assemblies. For fuel movement, spiral offload/reload sequences are inherently acceptable, provided the fuel assemblies are reloaded in the design configuration analyzed for the new cycle. The one-rod-out interlock is used to withdraw control rods one-at-a-time for post-maintenance testing, exercising, or other purposes. By demonstrating SDM, the shorting links do not have to be removed during these individual control rod withdrawals.

3/4.1.2 REACTIVITY ANOMALIES

Since the SHUTDOWN MARGIN requirement for the reactor is small, a careful check on actual conditions to the predicted conditions is necessary, and the changes in reactivity can be inferred from these comparisons of rod patterns. Since the comparisons are easily done, frequent checks are not an imposition on normal operations. A 1% delta k/k change is larger than is expected for normal operation so a change of this magnitude should be thoroughly evaluated. A change as large as 1% delta k/k would not exceed the design conditions of the reactor and is on the safe side of the postulated transients.