Niagara Mohawk

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June 21, 1999
NMP1L 1440

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

RE: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Subject: ***Request for Additional Information Regarding Proposed Amendment on Thermal-Hydraulic Stability, Nine Mile Point Nuclear Station, Unit No. 1 (TAC No. MA4218)***

Gentlemen:

By letter dated November 16, 1998, Niagara Mohawk Power Corporation (NMPC) submitted an application to change the Nine Mile Point Unit 1 (NMP1) Technical Specifications. These changes were proposed to provide reasonable assurance that coupled neutronic/thermal-hydraulic instabilities were detected and suppressed in the NMP1 reactor. By letter dated May 10, 1999, the NRC requested additional information regarding our November 16, 1998 Application. The Attachment to this letter provides this information.

Sincerely,

Richard B. Abbott

Richard B. Abbott
Vice President Nuclear Engineering

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RBA/JMT/kap
Attachment

xc: Mr. H. J. Miller, NRC Regional Administrator
Mr. S. S. Bajwa, Section Chief PD-I, Section 1, NRR
Mr. G. K. Hunegs, NRC Senior Resident Inspector
Mr. D. S. Hood, Senior Project Manager, NRR
Mr. John P. Spath
NYSERDA
286 Washington Avenue Ext.
Albany, NY 12203-6399
Records Management

ATTACHMENT

ATTACHMENT

REQUEST FOR ADDITIONAL INFORMATION
REGARDING PROPOSED TECHNICAL SPECIFICATION CHANGE
CORE THERMAL-HYDRAULIC STABILITY
NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT NUCLEAR STATION, UNIT NO. 1
DOCKET NO. 50-220

QUESTION

Reactor Systems Branch

1. *Provide a schematic showing the approved ELLLA region versus the power/flow restriction region. Describe the relationship in terms of the necessity of the increment of 2% for the upper APRM flow-biased neutron flux scram setting and 7% for APRM rod block trip settings. Justify that these proposed TS changes are still within the approved ranges of the NMP1 stability long-term solution II proposed in GENE-A13-00360-02.*

Response 1:

Enclosure 1 to this Attachment provides a schematic showing the Extended Load Line Limit Analysis (ELLLA) region versus the power/flow restriction region.

Our November 16, 1998 submittal proposed essentially two changes to the Nine Mile Point Unit 1 (NMP1) Technical Specifications (TSs). Specifically, changes were proposed to the APRM flow-biased neutron flux scram and rod block settings in the high flow region and low flow region of the power/flow map. In the high flow region of the power/flow map, Niagara Mohawk Power Corporation (NMPC) proposed a 2% increase and 7% increase in the analytical flow-biased scram and control rod block limits, respectively. This increase was proposed to allow plant operation in the previously approved ELLLA region.

NMP1 is currently restricted from full use of the ELLLA region of the power/flow map because of the setpoints for the flow-biased rod block. The setpoint methodology used assigns a penalty to account for drift of the power and flow measuring instruments. This penalty reduces the as-left setpoints of the rod block which causes it to fall into the allowable ELLLA region. Consequently, NMP1 is forced to operate at higher core flows to avoid rod block alarms. Full use of the ELLLA region will allow for optimum core power distributions throughout the operating cycle and a gain in cycle energy. Operation in the ELLLA region was approved by Amendment No. 92 dated March 24, 1987.

The current values of the APRM flow-biased neutron flux scram and rod block settings are 120% and 110%, respectively (i.e., a 10% margin between the scram and rod block settings currently exists). Prior to our November 16, 1998 TS Application, an analysis had been performed to support a 2% increase in the APRM flow-biased scram analytical limit. Accordingly, a new scram limit of 122% is proposed. Regarding the control rod block setting, calculation demonstrated that a 5% margin between the scram and rod block limits was acceptable (i.e., 122%-5%=117%). The proposed control rod block setting of 117% represents the 7% increase from the current value of 110%.

In the low flow region of the power/flow map, more conservative TS APRM flow-biased scram and control rod block setpoints were proposed. The scram value calculated will limit the oscillation magnitude assuring that the plant MCPR safety limit value is not exceeded. As shown on the attached schematic, the APRM flow-biased setpoints are based on GENE-A13-00360-02.

NEDO-32465-A, Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications, will be added to TS 6.9.1.f, Core Operating Limits Report. TS 6.9.1.f lists those documents which describe the analytical methods used to determine core operating limits. MCPR operating limits will be reviewed each reload which will assure the setpoint derived in GENE-A13-00360-02 will prevent the MCPR safety limits from being exceeded.

Question:

2. *Describe the relationship between the supporting document, NEDC-32696P, and the proposed TS changes. Since this topical report has not been submitted to the NRC for review/approval, explain why you believe it can, nevertheless, be used to support the proposed license amendment.*

Response:

As noted in our TS submittal, NMP1 is an Option II plant in which the existing quadrant-based APRMs are capable of initiating a reactor scram due to reactor instabilities. However, plant-specific analysis (i.e., GENE-A13-00360-02) indicated a change to the APRM flow-biased neutron flux scram would be required to limit the oscillation magnitude and limit the change in Critical Power Ratio (CPR). To facilitate this change and the other proposed TS changes, a more complex trip card was required. NMPC selected a card similar to the FCTR cards described in NEDC-32339-A, Supplement 2, "Reactor Stability Long-Term Solution: Enhanced Option I-A Solution Design."

As noted in our submittal, Attachment C, Page 2 of the Introduction, and our letter dated October 21, 1998, as of September 22, 1998, the APRM analog trip biased units were replaced with new digital FCTR cards under 10CFR50.59 and are currently capable of initiating a scram in the event of reactor instabilities. NEDC-32696P, Reactor Stability Long Term Solution: Option II Solution Design, was prepared by GE to evaluate the differences between the FCTR cards used for the Enhanced Option I-A solution option and the cards used for Option II at NMP1 and to document their acceptability. As indicated in NEDC-32696P, the card design is based on the previously NRC approved E1A FCTR card design and the card design differences allow the Option II FCTR card to be enveloped by the E1A solution design safety evaluation report. The discussion of NEDC-32696P was provided in the Introduction section of our application only to provide a historical perspective on the installation of the FCTR cards which was performed under 10CFR50.59. In summary, NEDC-32696P documented the review of the physical aspects of the new FCTR card for use at NMP1 and to support installation under 10CFR50.59, but was not used to support the proposed changes to TSs.

Question:

3. *Provide the technical basis for changing the channel accuracy in the TS from 2% to +2%/-1.9%. Discuss the significance of this new expression of uncertainty with respect to the reactor power operation.*

Response:

NMPC requested that General Electric Nuclear Energy (GENE) recalculate the APRM flow-biased trip setpoints for implementing the Stability Long-Term Solution Option II Design and to allow plant operation in the ELLLA region. In response, GENE performed an APRM setpoint calculation per NEDC-31336, GE Instrument Setpoint Methodology, Class III October 1986, which determined the allowable values and trip setpoints for both the flow-biased scram and flow-biased rod block trip unit functions. Once the setpoints were determined, the scram rod block curves were "burned" into the memory chips of the FCTR cards. However, a discrepancy in the calculation required that NMPC either replace the memory chips or take a penalty in channel accuracy. NMPC elected to take a penalty in the tolerance allowed by TS (i.e., the 2% allowance) between APRM channel readings and the power value calculated by heat balance during reactor operation, which is then used to make adjustments to the APRM channel. This decision was determined by NMPC to be acceptable since the TS allowed difference between the APRM channel and rated thermal power is one of the uncertainty values used in the APRM channel calibration setpoint calculation for Stability Long-Term Solution-Option II at NMP1.

This penalty to APRM channel accuracy has no impact on the power operation of the reactor. A channel accuracy tolerance of -1.9% is more conservative than -2% because it reduces the margin of error that the APRM trip setpoint can be in the negative direction. Therefore, it reduces the probability that reactor power will be above the APRM trip setpoint (i.e., with a channel calibration tolerance of -2%, reactor power can actually be at 102% of the trip setpoint when the APRM channel detects 100%. With a channel accuracy tolerance of -1.9%, reactor power will be at 101.9% of its setpoint when the APRM channel reading is 100%). Additionally, when the technicians perform gain adjustments to the APRM channels, the tolerances allowed by procedure at NMP1 are limited to no greater than +2%/-0%. This procedural control provides additional assurance that the APRM trip setpoints always remain enveloped by the instrument calibration calculation that is documented in the design and licensing basis for NMP1, which in turn, ensures that the TS limits will not be exceeded.

Question:

Electrical & Instrumentation and Controls Branch

4. *Please supplement your submittal of November 16, 1998, to address the list of criteria in Supplement 2 of Topical Report NEDC-32339P-A, "Reactor Stability Long-Term Solution: Enhanced Option I-A, Solution Design." Specifically, confirm that the plant-specific environmental conditions (temperature, humidity, pressure, seismic, and electromagnetic compatibility) are enveloped by the E1A equipment environmental qualification values.*

Response:

As previously noted, NMP1 is an Option II plant in which the existing quadrant-based APRMs are capable of initiating a reactor scram due to reactor instabilities. However, plant-specific analysis (i.e., GENE-A13-00360-02) indicated a change to the APRM flow-biased neutron flux scram would be required to limit the oscillation magnitude and limit the change in CPR. To facilitate this change and the other proposed TS changes, a more complex trip card was required. NMPC selected a card similar to the FCTR card described in NEDC-32339-A for Option I-A plants.

As noted in our TS submittal and letter dated October 21, 1998, the APRM analog trip biased units were replaced with new digital FCTR cards under 10CFR50.59. As part of the modification process, it was confirmed that the card's environmental qualification values enveloped plant-specific environmental conditions (temperature, humidity, pressure, seismic, and electromagnetic compatibility).

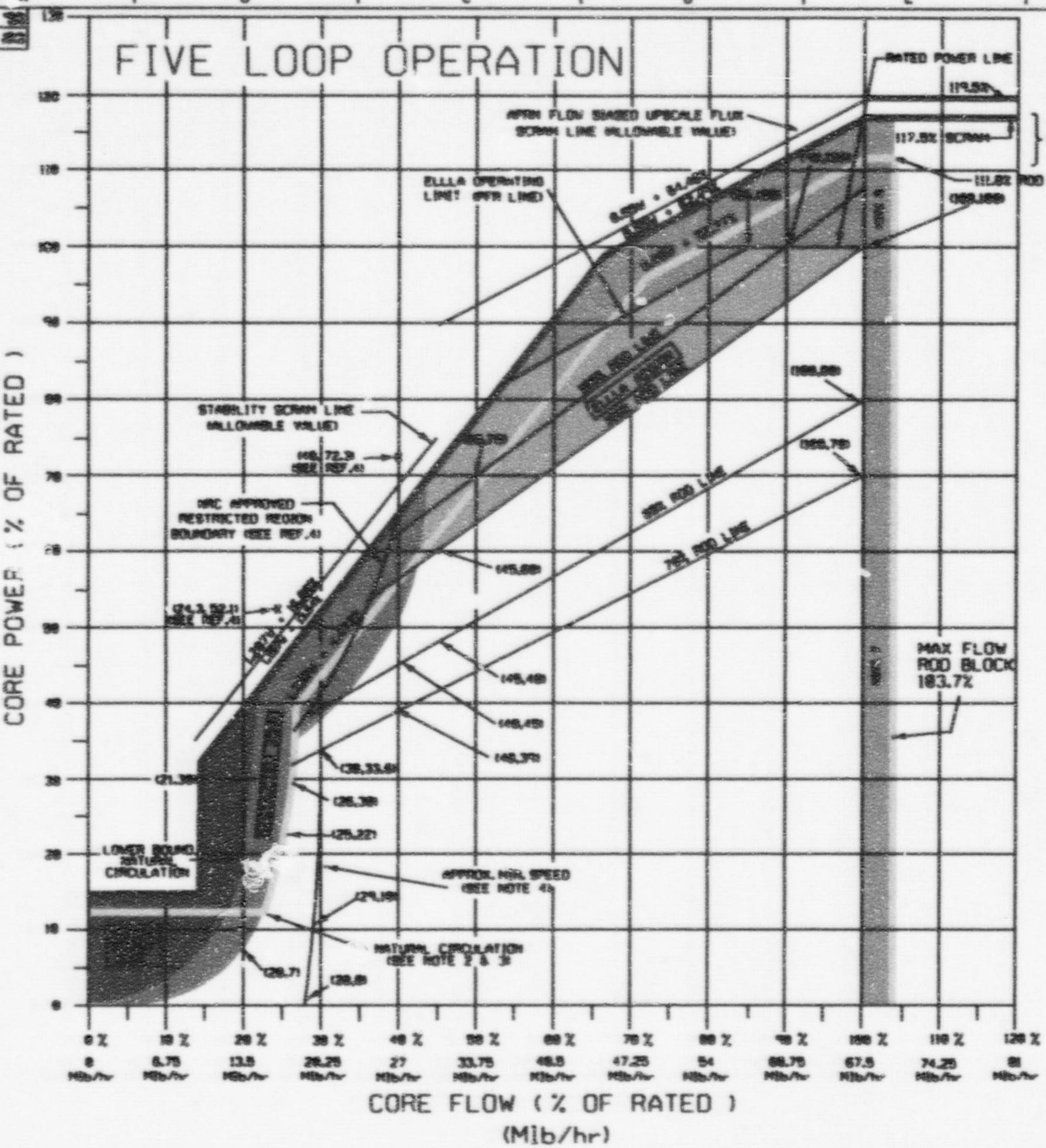
Question:

5. *Please clarify whether you intend to apply the "shakedown" period allowed for this equipment. (We note that the licensee for the Brunswick plant installed the E1A and needed to make plant-specific revisions to the equipment to prevent spurious trips and alarms.)*

Response:

As discussed in Responses 2 and 4, the equipment (i.e., the digital FCTR card) was installed as of September 22, 1998 and is currently capable of initiating a scram in the event of reactor instabilities. The cards have run satisfactorily since completion of this modification. No "shakedown" period is planned following implementation of this TS.

ENCLOSURE



NOTES:

1.) CORE POWER % RATED FORMULA FROM REF.1 SECT. 5.1.

$$\frac{\text{CORE POWER}}{\%\ \text{RATED}} = \frac{\text{ROD LINE}}{\%\ \text{RATED}} \times [\,0.2219 + (8.9714E\text{-}3)CF - (1.9886E\text{-}5)CF^2\,]$$

WHERE:
CF = CORE FLOW % RATED
RATED POWER = 1850 MWt
RATED CORE FLOW = 67.5 Mlb/hr

2.) 10% SPEED LINE IS APPROXIMATELY EQUIVALENT TO THE NATURAL CIRCULATION CURVE ABOVE 10% POWER.

3.) NATURAL CIRCULATION CURVES DERIVED IN REF 2. EQUATION 7.

$$Y = C_2 \frac{X^3 / X_n^2}{1 - X^2 / X_n^2}$$

WHERE: Y = POWER % RATED
X = RECIRCULATION FLOW % RATED
X_n = REFERENCE FLOW RATE = 31.138
C_2 = 0.8

4.) RECIRCULATION MASTER CONTROLLER MINIMUM SPEED (APPROX. 20% RATED SPEED)

5.) LOWER BOUND NATURAL CIRCULATION CURVE IS OBTAINED BY SUBTRACTING THE RECIRCULATION LOOP FLOW MEASUREMENT UNCERTAINTY, DERIVED IN REF. 3, FROM THE NATURAL CIRCULATION CURVE. (THE UNCERTAINTY IS 5% RATED FLOW IN THE 15%-20% FLOW RANGE).

6.) 100% MAX POWER LIMITATION T.S. OR ELLLA OPERATING LIMIT.

7.) FLOW ON A CONTINUOUS BASIS FROM ANY INDIVIDUAL PUMP SHOULD BE LIMITED TO 16.875 Mlb/hr PER PUMP. FOR 5 AND 4 LOOP OPERATION 100% RATED CORE FLOW IS ACHIEVABLE. DURING 3 LOOP OPERATION, 3 LOOPS AT 16.875Mlb/hr RESULTS IN 75% RATED CORE FLOW.

8.) ADDITIONAL SCRAM AND ROD BLOCK CURVE SETS ARE AVAILABLE (REFER TO SPECIFICATION E-133).

REFERENCES:

1.) GENE-770-31-1292 REV. 2
2.) GFXE-A12-000878-1 (NER-10-0009)
3.) NMPC CALC.: LA-FT-32-IA60AE/IA60A1-E1
4.) GENE-A13-00360-02

COLOR CODE:

- SCRAM LINE (NOMINAL TRIP SET POINT)
- ROD BLOCK LINE (NOMINAL TRIP SET POINT)
- MANUAL SCRAM ZONE
- RESTRICTED ZONE
- ELLLA REGION
- REFER TO NOTES 6 & 7

CRITICAL DRAWING