May 2, 1996

LICENSEE: Northern States Power Company (NSP)

FACILITY: Prairie Island Nuclear Generating Plant, Units 1 and 2

SUBJECT: MEETING WITH NSP TO DISCUSS 1% POWER UPRATE FROM INSTRUMENT ERROR REDUCTION

On April 24, 1996, the staff met with representatives from NSP and Excel Services to discuss a possible 1% power uprate of the Prairie Island units. Attachment 1 contains a list of meeting attendees. Representatives from NSP and Excel Services made presentations detailing the potential power uprate. Attachment 2 is a copy of the overhead slides used during the presentations.

The 1% power uprate is made feasible due to the installation of more accurate feedwater flow meters, which reduces the uncertainty in the core thermal power calculation by approximately 1%. The power uprate would require both a Technical Specification amendment and an exemption from a portion of 10 CFR Part 50, Appendix K. The licensee plans to submit its application to the NRC for review by December 1996.

Original Signed By: L. Tran

Beth A. Wetzel, Project Manager
Project Directorate III-1
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Docket Nos: 50-282, 50-306

Attachments: As stated

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DATE	5/2/96		5/2/96		5/2/96	

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MEETING SUMMARY DATED: May 2, 1996

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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H. Balukjian	NRC
C. Doutt	NRC
J. Ganiere	NRC
D. Vincent	NSP
T. Verbout	NSP
J. Regan	Corey-Regan Inc.
A. Winter	Excel Services
J. Harrison	Excel Services
J. Voss	Excel Services

ATTACHMENT 1

Prairie Island Nuclear Plant

1% Power Uprate
from
Instrument Error Reduction

Meeting Participants

• Tom Verbout	Northern States Power
• Dale Vincent	Northern States Power
• Jerry Voss	Excel Services
• Andy Winter	Excel Services
• John Harrison	Excel Services
• Jenny Regan	Corey Regan

Performance Changes

- Instrument Error Reduction
- Turbine upgrade
- Steam Generator Tube Performance

Regulatory Impact

- License Changes
  - » Rated Thermal Power
- Technical Specification Changes
- Specific Exemption
  - » 10CFR50 Appendix K

Appendix K

- 10CFR 50 Appendix K
  - » ". . . it shall be assumed that the reactor has been operating continuously at a power level at least 1.02 times the licensed power level (to allow for such uncertainties as instrument error) . . ."

Specific Exemption

- 10 CFR 50.12
  - » (a)(2)(ii) - not necessary
  - » (a)(2)(vi) - other material circumstance

Bases for Appendix K 102% Requirement

- 10 CFR 50 Appendix K History
- Regulatory Guide 1.49 History
- Licensing and Design Bases Review

Calorimetric Overview

- Purpose
- Present configuration and methods of calculation
- Instrument accuracy and its effect on calorimetric uncertainty
- Calorimetric results with previous configuration (w/o LEFM)
- Calorimetric Results with new configuration (w/LEFM)

Calorimetric Technical Methodology

- Determine equations used for obtaining thermal power
- Determine individual instrument uncertainties
- Combine instrument uncertainties using ISA-S67.04

Calorimetric Presentation (continued)

- Determine process errors and associated uncertainties
- Determine uncertainty of each process
- Determine corresponding thermal power error for each process uncertainty
- Combine thermal power errors to yield overall calorimetric uncertainty

Calorimetric Conclusion

- Based on the uncertainties associated with the calorimetric instruments and processes, it can be demonstrated that the calorimetric uncertainty is less than 0.5% of thermal power

Accuracy Analysis Methodology Feedwater Mass Flow by LEFM

Method of ASME PTC 19.1

- Define Measurement Process
- List Elemental Error Sources
- Estimate Elemental Errors
- Calculate Bias and Precision Errors for Each Parameter
- Propagate the Bias and Precision Errors
- Calculate Uncertainty

LEFM Error Sources

- Timing and electronic errors
- Geometry measurement
- Fluid property correlations
- Hydraulic profile measurement

ASME Power Test Code (PTC) 19.1, Part 1, 1985

- "Measurement Uncertainty, Instruments and Apparatus"
- Specifies procedures for evaluation of uncertainties and propagation of those errors to total uncertainties
- Method used for LEFM mass flow measurement uncertainty

LEFM Operation

- Ultrasonic transit time flow meter, repeatedly measures flow velocity by difference in transit time of upstream and downstream pulses
- Four chordal acoustic paths across flow metering section, transducers mounted in recessed wells
- Volumetric flow obtained by integrating across four acoustic paths, using profile factor

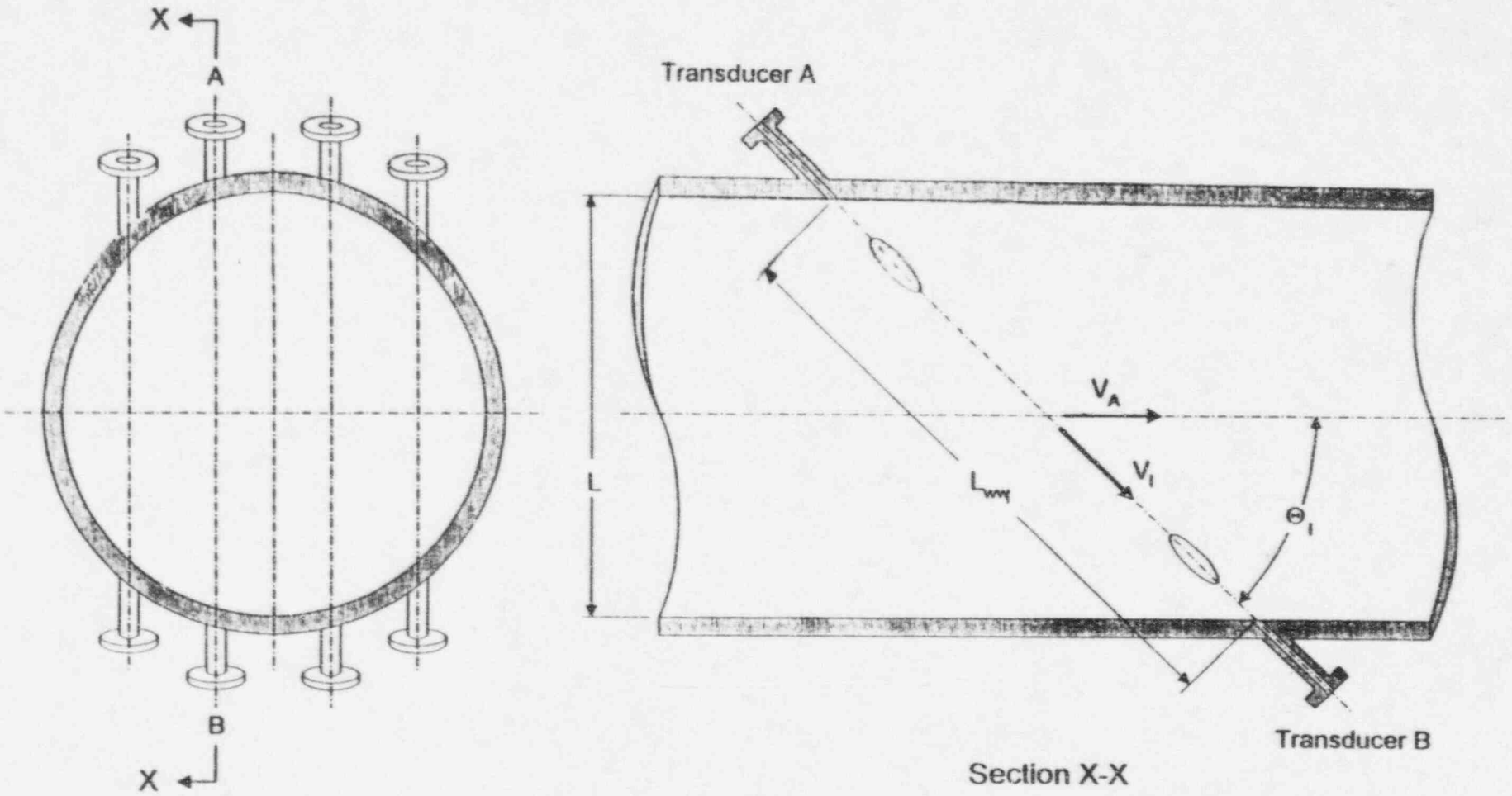

Figure 2. Acoustic Flowmeter Pipe Application — Typical Installation Geometry

LEFM Elemental Errors

- Pulse time of flight and differential measurement
- Pipe inner diameter
- Distance from path to pipe centerline
- transducer face-to-face path length
- Acoustic path angle
- Gaussian integration precision
- Fluid pressure precision
- Fluid temperature correlation
- Fluid density correlation
- Hydraulic profile factor measurement

PI 1% Uprate

Error Propagation

- Mass flow sensitivity coefficient calculated for each elemental error contribution by partial differentiation of flow algorithm
- Resulting errors combined by algebraic sum if dependent, by root-sum-square if independent

Error Propagation (continued)

- Mass flow accuracy calculated as percent of flow in each of two feed lines, then a percent of total feed mass flow, propagating errors algebraically or by RSS as appropriate

Results-LEFM Calculated Mass Flow Accuracy

- Two flow meters, one on each steam generator supply line
- Each meter accurate to +/- 0.59% mass flow in each line
- Total rated feedwater mass flow accuracy +/- 0.45%

Conclusions

- LEFM reduces calorimetric error
- PI submittal target - December 1995