August 3, 2001

MEMORANDUM TO: Claudia Craig, Section Chief, Section 1
Project Directorate III
Division of Licensing Project Manager
Office of Nuclear Reactor Regulation

FROM: Mohammed Shuaibi, Project Manager, Section 1 ***/RA/***
Project Directorate III
Division of Licensing Project Manager
Office of Nuclear Reactor Regulation

SUBJECT: FORTHCOMING PUBLIC WORKSHOP RELATED TO DRAFT GUIDANCE FOR MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATES

DATE & TIME: Thursday, August 23, 2001
1:00 p.m. to 4:30 p.m.

LOCATION: U.S. Nuclear Regulatory Commission
Two White Flint North (TWFN)
11545 Rockville Pike, TWFN Auditorium
Rockville, Maryland

PURPOSE: To discuss the attached draft guidance developed by the NRC staff for licensees' use in preparing applications for measurement uncertainty recapture power uprates and to obtain feedback on the draft guidance.

PARTICIPANTS: Participants from the NRC include members of the Office of Nuclear Reactor Regulation (NRR).

NRC/NRR	STAKEHOLDERS
B. Sheron	All Interested
S. Bajwa	
M. Shuaibi, et al.	

Attachment: Draft Guidance for Submitting Measurement Uncertainty Recapture Power Uprate Applcations

CONTACT: Mohammed A. Shuaibi, NRR
(301) 415-2859

August 3, 2001

MEMORANDUM TO: Claudia Craig, Section Chief, Section 1
Project Directorate III
Division of Licensing Project Manager
Office of Nuclear Reactor Regulation

FROM: Mohammed Shuaibi, Project Manager, Section 1 ***/RA/***
Project Directorate III
Division of Licensing Project Manager
Office of Nuclear Reactor Regulation

SUBJECT: FORTHCOMING PUBLIC WORKSHOP RELATED TO DRAFT GUIDANCE FOR MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATES

DATE & TIME: Thursday, August 23, 2001
1:00 p.m. to 4:30 p.m.

LOCATION: U.S. Nuclear Regulatory Commission
Two White Flint North (TWFN)
11545 Rockville Pike, TWFN Auditorium
Rockville, Maryland

PURPOSE: To discuss the attached draft guidance developed by the NRC staff for licensees' use in preparing applications for measurement uncertainty recapture power uprates and to obtain feedback on the draft guidance.

PARTICIPANTS: Participants from the NRC include members of the Office of Nuclear Reactor Regulation (NRR).

NRC/NRR	STAKEHOLDERS
B. Sheron	All Interested
S. Bajwa	
M. Shuaibi, et al.	

Attachment: Draft Guidance for Submitting Measurement Uncertainty Recapture Power Uprate Applcations

CONTACT: Mohammed A. Shuaibi, NRR
(301) 415-2859

DISTRIBUTION:
See attached list

Accession No. **ML012140203**

OFFICE	PDIII-1/PM	PDIII-1/LA	PDIII-1/SC	PDIII-1/D
NAME	MShuaibi	RBouling	SBajwa for CCraig	SBajwa
DATE	8/3/01	8/3/01	8/3/01	8/3/01

OFFICIAL RECORD COPY

NOTICE OF AUGUST 23, 2001 MEETING

DISTRIBUTION:

PUBLIC
PDIII-1 Reading*
OGC
ACRS
BSheron
JZwolinski
MKing
SBajwa
CCraig
RBouling*
MShuaibi*
TMarsh
JRosenthal
GGeorgier
CGrimes
Pkuo
WBeckner
BZalcman
KSWest
MMalloy
RDenning
GTracy
DTrimble
KGibson
VOrdaz
WDean
MJohnson
DCoe
TQuay
DThatcher
DDorman
GCwalina
ERaphael
EAdensam
JClifford
HBerkow
REmch
RCorreia
AMendiola
SRichards
RGramm
SDembek
JHannon
GHubbard
EWeiss
JWermiel
RCaruso
FAtkstulewicz
RBarrett
MRubin
MReinhart
WBateman
KWichman
ESullivan
EImbro
DTerao
KManoly
JCalvo
EMarinos
CHolden
Receptionist (OWFN and TWFN)*
PMNS
OPA

*Hard Copy

DRAFT GUIDANCE FOR SUBMITTING MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE APPLICATIONS

Power uprate applications and reviews are complex and involve many areas of licensee and staff expertise. In the Nuclear Regulatory Commission (NRC), the following Office of Nuclear Reactor Regulation (NRR) technical branches are, to varying degrees, involved in power uprate reviews: Plant Systems Branch, Reactor Systems Branch, Probabilistic Safety Assessment Branch, Mechanical & Civil Engineering Branch, Materials & Chemical Engineering Branch, Electrical and Instrumentation & Controls Branch; Operator Licensing, Human Performance, and Plant Support Branch; Equipment Quality and Performance Branch; and Generic Issues, Environmental, Financial, and Rulemaking Branch. These branches are in addition to the Office of the General Counsel and Division of Licensing Project Management Staff who has overall responsibility for coordinating reviews with the NRR technical branches. Some power uprate reviews (i.e., those for extended power uprates) may also involve other NRC offices and advisory committees such as the Office of Nuclear Regulatory Research (RES) and the Advisory Committee on Reactor Safeguards (ACRS).

Measurement uncertainty recapture power uprates are on the order of 1.5 percent and are achieved by implementing enhanced techniques for calculating reactor power. This involves the use of state-of-the-art feedwater flow measurement devices that reduce the degree of uncertainty associated with feedwater flow measurement and in turn provide for a more accurate calculation of power. The recent rulemaking to 10 CFR Part 50, Appendix K, which allowed licensees to use a power uncertainty less than 2 percent in loss-of-coolant accident analyses, facilitated these reviews. Applications for power uprates based on improvements in feedwater measurement techniques (i.e., measurement uncertainty recapture power uprates), **when not accompanied by other requests or changes**, should be limited in their effect on plant analyses and equipment. When applications for this type of power uprate are received, the staff intends to focus its review on areas (e.g., analyses and equipment performance) are affected. Therefore, in order to improve the efficiency of the staff's review process for power uprate applications of this type, it is important for licensees to explicitly identify which areas are affected by the power uprate and which areas are not.

When a measurement uncertainty recapture power uprate application is received, the staff intends to follow the following general approach for its review:

- For areas (e.g., accident/transient analyses, components, systems) that the licensee indicates are affected by the requested power uprate, the staff will conduct a detailed review.

- For areas (e.g., accident/transient analyses, components, systems) that the licensee states that the requested uprate in power level is bounded by the existing NRC-approved analyses of record for the plant, the staff will not conduct a detailed review.

- For areas that are amenable to generic evaluations by the staff, such evaluations will be used.

ATTACHMENT

As indicated above, in areas where the requested power uprate affects plant analyses and equipment, the staff will perform a detailed review of these effects to determine if the proposed changes maintain an adequate level of safety. Specific guidance for licensees with respect to the scope of information needed by the staff in order to complete its reviews of these areas is provided below. For further specific guidance on the technical information needed to support the areas identified below and are affected by the power uprate, the licensee should refer to the appropriate sections in the Standard Review Plan. In addition, where a specific methodology (e.g., topical report) has been approved by the NRC for the type of measurement uncertainty recapture power uprate being requested, licensees should follow the format in the topical report and provide the information called for in the approved methodology and the NRC letter and safety evaluation approving the methodology. For areas where the licensee finds that the requested uprate in power level is bounded by the previously approved analyses of record for the plant, the licensee should explicitly state their findings in the submittal and provide a reference for the NRC's previous approval.

Measurement uncertainty recapture power uprate reviews have typically been completed in 6 to 8 months. The duration of the staff's review is strongly dependent on the quality and completeness of licensees' applications and the staff's needs for additional information. The duration of staff reviews of quality applications that are submitted consistent with the guidance provided in this document (i.e., applications for which the staff does not need additional information in order to complete its review) could be reduced by 2 to 3 months. **These time estimates are for applications that are based on approved flow measurement devices and that are not accompanied by other requests or changes**. If other changes are included in the application for the power uprate, the staff will apply the Agency's existing timeliness goals for completing review of the application. The existing timeliness goals are to complete reviews of 95 percent of licensing applications within 1 year and 100 percent within 2 years.

This document will be updated periodically to reflect lessons learned from reviews. Licensees are strongly encouraged to notify the staff of areas where they believe efficiencies may be gained (e.g., areas where generic dispositions are possible).

SPECIFIC GUIDANCE

I. Feedwater flow measurement technique and power measurement uncertainty

1. A detailed description of the plant-specific implementation of the feedwater flow measurement technique and the power increase gained as a result of the implementation of this technique. This description should include:

   A. A description of the proposed method for feedwater flow measurement
   B. A reference to the NRC approval for the proposed feedwater flow measurement method
   C. A discussion of the plant-specific implementation of the guidelines in the topical report and staff letter/safety evaluation approving the topical report for the method of Item A above
   D. The licensee's dispositions of the criteria that the NRC staff stated should be addressed when a licensee implements the feedwater flow measurement method of Item A above. These criteria are those included in the staff approval of the method.
   E. A calculation of the total power measurement uncertainty at the plant, explicitly identifying all parameters and their individual contribution to the power uncertainty

II. Accident/transient analyses that did not have to be modified to support the requested uprate

1. A matrix which includes information for each analysis in this category. The matrix should cover the transients and accidents included in the plant's Updated Final Safety Analysis Report (UFSAR) (typically chapter 14 or 15) and other analyses that are required to be performed by licensees to support licensing of their plants (e.g., radiological consequences, natural circulation cooldown, containment performance, anticipated transient without scram, station blackout, analyses for determination of environmental qualification parameters, safe shutdown fire analysis, spent fuel pool cooling, flooding). The matrix should:

   A. Identify the transient/accident that is the subject of the analysis
   B. Confirm and explicitly state that:
      (i) the requested uprate in power level continues to be bounded by the existing analyses of record for the plant,
      (ii) the analyses of record have either been previously approved by the NRC or were conducted using methods or processes previously approved by the NRC, and
      (iii) the analyses of record are not changed by the requested power uprate
   C. Confirm that bounding event determinations continue to be valid
   D. Provide a reference to the NRC's previous approvals discussed in Item B above

III. Accident/transient analyses that had to be modified to support the requested power uprate

1. A detailed discussion for each analysis in this category. The discussion should cover the transient and accident analyses that are included in the plant's UFSAR (typically chapter 14 or 15) and other analyses that are required to be performed by licensees to support licensing of their plants (e.g., radiological consequences, natural circulation cooldown, containment performance, anticipated transient without scram, station blackout, analyses for determination of environmental qualification parameters, safe shutdown fire analysis, spent fuel pool cooling, flooding). The discussion should:

   A. Identify the transient/accident that is the subject of the analysis
   B. Identify the important analyses inputs and assumptions
      i. Provide the values for inputs and assumptions used in the existing analysis of record
      ii. Provide a reference to existing licensing documentation (e.g., UFSAR) where the information of Item i above is located
      iii. Provide the values for inputs and assumptions appropriate for use in the analysis for the uprated condition and a justification for the bounding nature of these values
   C. Provide a description and justification of the limiting event determination for the transient/accident being analyzed
   D. Identify the methodologies used to perform the analyses and any changes in methodology
   E. Provide references to staff approvals of the methodologies in Item C above
   F. Confirm that the analyses were performed in accordance with all limitation/restrictions included in the NRC's approval of the methodology
   G. Provide a description of the sequence of events
   H. Provide a description of the chosen single-failure assumption and a justification for this choice
   I. Provide the values of important inputs or assumptions used in the analysis, including justifications
   J. Provide plots of important parameters
   K. Provide a discussion of any change in equipment capacities (e.g., water supply volumes, valve relief capacities, pump pumping flow rates, developed head, required and available net positive suction head (NPSH), valve isolation capabilities) required to support the analysis
   L. Provide a discussion of the results and acceptance criteria for the analysis and any changes in results or acceptance criteria from previous analysis

IV. Mechanical/Structural/Material Component Integrity and Design

1. A discussion of the effect of the power uprate on the structural integrity of major plant components. The discussion should include a matrix similar to Item II above for components that experience no change as a result of the requested power uprate. A detailed discussion should be provided for each component that experiences a change as a result of the requested power uprate.

A. Components covered under this topic are:

i. Reactor vessel, nozzles, and supports
ii. Reactor core support structures and vessel internals
iii. Control rod drive mechanisms
iv. Nuclear Steam Supply System (NSSS) piping, pipe supports, branch nozzles
v. Balance of plant (BOP) piping
vi. Steam generator shell, nozzles, and tubes
vii. Reactor coolant pumps
viii. Pressurizer shell, nozzles and surge line
ix. Safety-related valves

B. The discussion should identify any power-uprate-related changes in the following areas, and provide an evaluation of the changes:

i. Stresses
ii. Cumulative usage factors
iii. Flow induced vibration
iv. Changes in temperature
v. Changes in pressure
vi. Changes in flow rates
vii. High energy line break locations
viii. Jet impingement and thrust forces

C. The discussion should also identify any power-uprate-related effects on the reactor vessel integrity with respect to:

i. Pressurized thermal shock calculations
ii. Fluence evaluation
iii. Heat-up and cooldown pressure-temperature limit curves
iv. Low temperature overpressure projection
v. Upper shelf energy
vi. Surveillance capsule withdrawal schedule

D. The discussion should identify the code of record being used in the associated analyses and any changes to the code of record

E. The discussion should identify any power-uprate-related changes to component inspection and testing programs and erosion/corrosion programs

V. <u>Electrical Equipment Design</u>

1. A discussion of the effect of the power uprate on electrical equipment design. The discussion should include a matrix similar to Item II above for equipment that experience no change as a result of the requested power uprate. A detailed discussion should be provided for all equipment that experiences a change as a result of the requested power uprate.

A. Items covered under this topic are:

i. Main generator
ii. Switchyard
iii. Isolated phase bus ducts
iv. Main power transformers
v. Unit auxiliary or unit station service transformer
vi. Startup or system station service transformer
vii. Large loads and cable
viii. Emergency diesel generators
ix. Protective relay settings
x. Direct Current (DC) systems
xi. Station blackout equipment

B. The discussion should identify any power-uprate-related changes or effects in the following areas, and provide an evaluation of the changes.

i. Capacities and Ratings
ii. Loads
iii. Voltages
iv. Short circuit values
v. Environmental qualifications
vi. Grid stability

VI. System Design

1. A discussion of the effect of the power uprate on major plant systems. The discussion should include a matrix similar to Item II above for systems that experience no change as a result of the requested power uprate. A detailed discussion should be provided for each system that experiences a change as a result of the requested power uprate.

A. Systems covered under this topic are:

i. NSSS interface systems for pressurized water reactors (PWRs) (e.g., main steam, steam dump, condensate, feedwater, auxiliary/emergency feedwater); NSSS systems for boiling water reactors (BWRs) (e.g., suppression pool cooling)
ii. Containment systems
iii. Safety-related cooling water systems
iv. Spent fuel pool storage and cooling systems
v. Radioactive waste systems
vi. Heating, ventilation, and air conditioning systems

B. The discussion should identify any power-uprate-related changes and provide an evaluation of the changes.

VII. Other

1. A discussion of the effect of the power uprate with respect to:

   A. Changes in emergency and abnormal operating procedures
   B. Changes to risk-important operator actions sensitive to power uprate, including any effects of the power uprate on the time available for operator actions
   C. Changes to control room controls, displays, and alarms
   D. Changes on the safety parameter display system
   E. Changes to the operator training program and the control room simulator

2. A brief discussion of the changes (if any) to the test program associated with the proposed uprate.

3. A discussion of the power level assumed in the Final Environmental Statement (FES) for the subject unit(s). If the power level assumed in the FES does not bound the proposed power level associated with a power uprate amendment, information to support an environmental assessment (EA) should be submitted.

VIII. Changes to technical specifications, protection system setting, and emergency system setting

1. A detailed discussion of each change to technical specifications, protection system settings, and/or emergency system settings needed to support the power uprate. The discussion should include:

   A. A description of the change
   B. Identification of analyses affected by and/or supporting the change
   C. Justification for the change including the type of information discussed in Section III above for any analyses affected by and/or supporting the change.