

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, D.C. 20555-0001

January 31, 2002

**NRC REGULATORY ISSUE SUMMARY 2002-03:  
GUIDANCE ON THE CONTENT OF MEASUREMENT UNCERTAINTY  
RECAPTURE POWER UPRATE APPLICATIONS**

Addressees:

All holders of operating licenses for nuclear power reactors, except those that have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

Intent:

The U.S. Nuclear Regulatory Commission (NRC) is issuing this regulatory issue summary (RIS) to provide guidance to addressees on the scope and detail of the information that should be provided to NRC for reviewing measurement uncertainty recapture power uprate applications. This RIS does not transmit any new requirements, and does not require any specific action or written response.

Background:

Measurement uncertainty recapture power uprate applications request that the NRC amend the operating license for a plant to increase core thermal power by a value less than 2 percent of the licensed power level. Licensees typically achieve such uprates by implementing enhanced techniques for calculating reactor power. This involves the use of state-of-the-art devices that reduce the degree of uncertainty associated with measuring feedwater flow and, in turn, allow for more accurate power calculations.

The June 1, 2000, rulemaking regarding Appendix K to Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 50) allowed licensees to use a power uncertainty of less than 2 percent in loss-of-coolant accident analyses. In so doing, the rulemaking facilitated the staff's reviews of these power uprate applications. ***When not accompanied by other requests or changes***, applications for power uprates that are based on improved feedwater measurement techniques should have a limited effect on plant analyses and equipment. When licensees submit applications for this type of power uprate, the staff intends to focus its review on the affected areas. (For purposes of this guidance, "affected areas" are those areas for which existing analyses of record do not bound plant operation at the proposed power level and, as a result, new analyses or evaluations should be performed to provide a basis for operation at the proposed power level. Similarly, "affected equipment" includes equipment for

**ML013530183**

which existing analyses of record for capacities and/or design, actual design, and/or operational or licensing functional requirements should be modified to support operation at the proposed power level.)

The NRC staff has typically completed its review of measurement uncertainty recapture power uprate applications in 6 to 8 months. The duration of the staff's review strongly depends on the quality and completeness of licensees' applications and the staff's needs for additional information. The duration of staff reviews of quality 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 reflect the use of approved flow measurement devices and do not include other requests or changes.*** If a power uprate application includes other requests or changes, the staff will apply the agency's existing timeliness goals for completing its review of the application (i.e. completing reviews of 95 percent of licensing applications within 1 year and 100 percent within 2 years.)

#### Issue Summary:

When licensees submit measurement uncertainty recapture power uprate applications, the staff intends to use the following general approach for their review:

- In areas (e.g., accident/transient analyses, components, systems) for which the existing analyses of record *do not bound* the plant operation at the proposed uprated power level, the staff will conduct a detailed review.
- In areas (e.g., accident/transient analyses, components, systems) for which the existing analyses of record *do bound* plant operation at the proposed uprated power level, the staff will not conduct a detailed review.
- In areas that are amenable to generic disposition, the staff will utilize such dispositions.

In order to improve the efficiency of the staff's review, it is important for licensees to explicitly identify the areas that are—and are not—affected by the power uprate. To aid licensees in optimizing their measurement uncertainty recapture power uprate applications for staff review, the staff developed the guidance in Attachment 1 to this RIS. This guidance was previously issued in draft form via a meeting notice dated August 3, 2001 (Accession Number ML012140203 in the NRC's Agencywide Documents Access and Management System, ADAMS).

On August 23, 2001, the NRC held a public workshop to discuss the draft guidance. The staff evaluated feedback received during the workshop and modified the draft guidance based on this staff evaluation. Attachment 2 to this RIS summarizes the staff's evaluation of the feedback. Attachment 2 is organized by guidance section. This organization was utilized to simplify the use (cross-referencing) of the guidance. Licensees may wish to use Attachments 1 and 2 together to ensure that they clearly understand the staff's intent in the guidance.

For further guidance on the level of detail necessary for the staff's review, licensees may refer to the corresponding sections in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," the NRC's Standard Review Plan (SRP). The reference to the SRP was not intended to indicate that the SRP will be used in place of plant-specific licensing bases to assess the acceptability of an application. The SRP is referenced here solely to provide guidance regarding an appropriate level of detail; it is not intended that licensees need to conform to the guidance in the SRP. Applicability of the SRP to a plant is determined on a plant-specific basis, consistent with the licensing basis of the plant. In addition, where the NRC has approved a specific methodology (e.g., topical report) for the type of measurement uncertainty recapture power uprate being requested, licensees should follow the format prescribed for that specific methodology and provide the information called for in that methodology and the NRC's letter and safety evaluation approving the methodology.

The staff will update the attached guidance as necessary to reflect lessons learned from staff reviews. The staff may use the NRC's Web site to post updates and other information related to power uprates. Licensees are encouraged to notify the staff of areas where they believe efficiencies may be gained (e.g., areas where generic dispositions are possible).

#### Backfit Discussion:

This RIS provides guidance on the scope of information and level of detail that licensees should provide in measurement uncertainty recapture power uprate applications to facilitate staff review. This guidance is predicated on the experience gained from recent staff reviews of these applications. The guidance provided in this RIS does not impose new or modified staff requirements. In addition, this RIS neither uniquely prescribes a way to comply with the regulations nor requires any action or written response. Therefore, this RIS does not constitute a backfit under 10 CFR 50.109 and the staff did not perform a backfit analysis.

#### Federal Register Notification:

A notice of opportunity for public comment was not published in the *Federal Register* because this RIS is informational and does not represent a departure from current regulatory requirements and practice.

Paperwork Reduction Action Statement:

This RIS does not request any information collection.

If you have any question concerning this matter, please contact the person listed below.

**/RA/**

William D. Beckner, Program Director  
Operating Reactor Improvements Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Technical contact: Mohammed A. Shuaibi, NRR  
301-415-2859  
E-mail: [mas4@nrc.gov](mailto:mas4@nrc.gov)

**Attachments:**

1. Guidance on the Content of Measurement  
Uncertainty Recapture Power Uprate Applications
2. Evaluation of Feedback Received During the Public  
Workshop on August 23, 2001 (Arranged by Guidance Section)
3. List of Recently Issued NRC Regulatory Issue Summaries

Paperwork Reduction Action Statement:

This RIS does not request any information collection.

If you have any question concerning this matter, please contact the person listed below.

**/RA/**

William D. Beckner, Program Director  
Operating Reactor Improvements Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Technical contact: Mohammed A. Shuaibi, NRR  
301-415-2859  
E-mail: [mas4@nrc.gov](mailto:mas4@nrc.gov)

Attachments:

1. Guidance on the Content of Measurement  
Uncertainty Recapture Power Uprate Applications
2. Evaluation of Feedback Received During the Public  
Workshop on August 23, 2001 (Arranged by Guidance Section)
3. List of Recently Issued NRC Regulatory Issue Summaries

Distribution:

PUBLIC  
RIS File

ADAMS ACCESSION NUMBER: ML013530183

\*See previous concurrence

OFFICE	PDIII-1	TECH ED	PDIII-1	LPD3	D:DLPM
NAME	MShuaibi*	PPoccio*	BReckley	SBajwa*	JZwolinski*
DATE	11/01/2001	10/17/2001	11/01/2001	11/05/2001	11/06/2001
OFFICE	OGC	D:DE	D:DSSA	(A)SC:RORP	PD:RORP:DRIP
NAME	BWeisman*	JStrosnider*	GHolahan*	TKoshy	WDBeckner
DATE	12/19/2001	12/19/2001	12/18/2001	01/30/2002	01/31/2002

**OFFICIAL RECORD COPY**

## **GUIDANCE ON THE CONTENT OF MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE APPLICATIONS**

### **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 implementing this technique. This description should include:
  - A. Identification (by document title, number, and date) of the approved topical report on the feedwater flow measurement technique
  - B. A reference to the NRC's approval of the proposed feedwater flow measurement technique
  - C. A discussion of the plant-specific implementation of the guidelines in the topical report and the staff's letter/safety evaluation approving the topical report for the feedwater flow measurement technique
  - D. The dispositions of the criteria that the NRC staff stated should be addressed (i.e., the criteria included in the staff's approval of the technique) when implementing the feedwater flow measurement technique
  - E. A calculation of the total power measurement uncertainty at the plant, explicitly identifying all parameters and their individual contribution to the power uncertainty
  - F. Information to specifically address the following aspects of the calibration and maintenance procedures related to all instruments that affect the power calorimetric:
    - i. maintaining calibration
    - ii. controlling software and hardware configuration
    - iii. performing corrective actions
    - iv. reporting deficiencies to the manufacturer
    - v. receiving and addressing manufacturer deficiency reports
  - G. A proposed allowed outage time for the instrument, along with the technical basis for the time selected
  - H. Proposed actions to reduce power level if the allowed outage time is exceeded, including a discussion of the technical basis for the proposed reduced power level

**II. Accidents and transients for which the existing analyses of record bound plant operation at the proposed uprated power level**

1. A matrix that includes information for each analysis in this category and addresses the transients and accidents included in the plant's updated final safety analysis report (UFSAR) (typically Chapter 14 or 15) and other analyses that licensees are required to perform to support licensing of their plants (i.e., radiological consequences, natural circulation cooldown, containment performance, anticipated transient without scram, station blackout, analyses to determine environmental qualification parameters, safe shutdown fire analysis, spent fuel pool cooling, flooding):
  - A. Identify the transient or 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 either have been previously approved by the NRC or were conducted using methods or processes that were previously approved by the NRC
  - 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. Accidents and transients for which the existing analyses of record do not bound plant operation at the proposed uprated power level**

1. This section covers 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 (i.e., radiological consequences, natural circulation cooldown, containment performance, anticipated transient without scrams, station blackout, analyses for determination of environmental qualification parameters, safe shutdown fire analysis, spent fuel pool cooling, flooding).
2. For analyses that are covered by the NRC approved reload methodology for the plant, the licensee should:
  - A. Identify the transient/accident that is the subject of the analysis
  - B. Provide an explicit commitment to re-analyze the transient/accident, consistent with the reload methodology, prior to implementation of the power uprate

- C. Provide an explicit commitment to submit the analysis for NRC review, prior to operation at the uprated power level, if NRC review is deemed necessary by the criteria in 10 CFR 50.59
  - D. Provide a reference to the NRC's approval of the plant's reload methodology
3. For analyses that are not covered by the reload methodology for the plant, the licensee should provide a detailed discussion for each analysis. The discussion should:
- A. Identify the transient or accident that is the subject of the analysis
  - B. Identify the important analysis inputs and assumptions (including their values), and explicitly identify those that changed as a result of the power uprate
  - C. Confirm that the limiting event determination is still valid for the transient or accident being analyzed
  - D. Identify the methodologies used to perform the analyses, and describe any changes in those methodologies
  - E. Provide references to staff approvals of the methodologies in Item D. above
  - F. Confirm that the analyses were performed in accordance with all limitations and restrictions included in the NRC's approval of the methodology
  - G. Describe the sequence of events and explicitly identify those that would change as a result of the power uprate
  - H. Describe and justify the chosen single-failure assumption
  - I. Provide plots of important parameters and explicitly identify those that would change as a result of the power uprate
  - J. Discuss 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
  - K. Discuss the results and acceptance criteria for the analysis, including any changes from the 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. For components that are bounded by existing analyses of



record, the discussion should cover the type of confirmatory information identified in Section II, above. For components that are not bounded by existing analyses of record, a detailed discussion should be provided.

- A. This discussion should address the following components:
  - 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 (NSSS interface systems, safety-related cooling water systems, and containment systems)
  - vi. steam generator tubes, secondary side internal support structures, shell, and nozzles
  - vii. reactor coolant pumps
  - viii. pressurizer shell, nozzles, and surge line
  - ix. safety-related valves
- B. The discussion should identify and evaluate any changes related to the power uprate in the following areas:
  - i. stresses
  - ii. cumulative usage factors
  - iii. flow induced vibration
  - iv. changes in temperature (pre- and post-uprate)
  - v. changes in pressure (pre- and post-uprate)
  - vi. changes in flow rates (pre- and post-uprate)
  - vii. high-energy line break locations
  - viii. jet impingement and thrust forces
- C. The discussion should also identify any effects of the power uprate on the integrity of the reactor vessel with respect to:
  - i. pressurized thermal shock calculations
  - ii. fluence evaluation
  - iii. heatup and cooldown pressure-temperature limit curves
  - iv. low-temperature overpressure protection
  - 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 changes related to the power uprate with regard to component inspection and testing programs and erosion/corrosion programs, and discuss the significance of these changes. If the changes are insignificant, the licensee should explicitly state so.

- F. The discussion should address whether the effect of the power uprate on steam generator tube high cycle fatigue is consistent with NRC Bulletin 88-02, "Rapidly Propagating Fatigue Cracks in Steam Generator Tubes," February 5, 1988.

V. **Electrical Equipment Design**

- 1. A discussion of the effect of the power uprate on electrical equipment. For equipment that is bounded by the existing analyses of record, the discussion should cover the type of confirmatory information identified under Section II, above. For equipment that is not bounded by existing analyses of record, a detailed discussion should be included to identify and evaluate the changes related to the power uprate. Specifically, this discussion should address the following items:
  - A. emergency diesel generators
  - B. station blackout equipment
  - C. environmental qualification of electrical equipment
  - D. grid stability

VI. **System Design**

- 1. A discussion of the effect of the power uprate on major plant systems. For systems that are bounded by existing analyses of record, the discussion should cover the type of confirmatory information identified under Section II, above. For systems that are not bounded by existing analyses of record, a detailed discussion should be included to identify and evaluate the changes related to the power uprate. Specifically, this discussion should address the following systems:
  - A. NSSS interface systems for pressurized-water reactors (PWRs) (e.g., main steam, steam dump, condensate, feedwater, auxiliary/emergency feedwater) or boiling-water reactors (BWRs) (e.g., suppression pool cooling), as applicable
  - B. containment systems
  - C. safety-related cooling water systems
  - D. spent fuel pool storage and cooling systems
  - E. radioactive waste systems
  - F. Engineered safety features (ESF) heating, ventilation, and air conditioning systems

VII. **Other**

1. A statement confirming that the licensee has identified and evaluated operator actions that are sensitive to the power uprate, including any effects of the power uprate on the time available for operator actions.
2. A statement confirming that the licensee has identified all modifications associated with the proposed power uprate, with respect to the following aspects of plant operations that are necessary to ensure that changes in operator actions do not adversely affect defense in depth or safety margins:
  - A. emergency and abnormal operating procedures
  - B. control room controls, displays (including the safety parameter display system) and alarms
  - C. the control room plant reference simulator
  - D. the operator training program
3. A statement confirming licensee intent to complete the modifications identified in Item 2. above (including the training of operators), prior to implementation of the power uprate.
4. A statement confirming licensee intent to revise existing plant operating procedures related to temporary operation above “full steady-state licensed power levels” to reduce the magnitude of the allowed deviation from the licensed power level. The magnitude should be reduced from the pre-power uprate value of 2 percent to a lower value corresponding to the uncertainty in power level credited by the proposed power uprate application.
5. A discussion of the 10 CFR 51.22 criteria for categorical exclusion for environmental review including:
  - A. A discussion of the effect of the power uprate on the types or amounts of any effluents that may be released offsite and whether or not this effect is bounded by the final environmental statement and previous Environmental Assessments for the plant.
  - B. A discussion of the effect of the power uprate on individual or cumulative occupational radiation exposure.

VIII. **Changes to technical specifications, protection system settings, and emergency system settings**

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

- 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 that support and/or are affected by change

**EVALUATION OF FEEDBACK RECEIVED  
DURING THE PUBLIC WORKSHOP ON AUGUST 23, 2001  
(ARRANGED BY GUIDANCE SECTION)**

**GENERAL**

- G.1. Terms like “affected,” “bounded,” “change,” and “needed to be modified” should be defined. The definitions should clarify the NRC’s need for information related to assumptions, inputs, and outputs of analyses. A threshold should be established for these terms to determine when detailed information and NRC review is required.**

“Affected”

The guidance has been revised to clarify the staff’s intent in using the word “affected.” The following clarification has been added:

*For purposes of this guidance, “affected areas” are those areas for which existing analyses of record do not bound plant operation at the proposed power level and, as a result, new analyses or evaluations should be performed to provide a basis for operation at the proposed power level. Similarly, “affected equipment” includes equipment for which existing analyses of record for capacities and/or design, actual design, and/or operational or licensing functional requirements should be modified to support operation at the proposed power level.*

“Bounded”

The term “bounded” is used to refer to areas where the existing analyses of record establish continued acceptability of operation at the proposed uprated power level without the need for re-analysis.

“Change”

When used in reference to analyses, the word “change” means a revision or modification of existing analyses of record using different inputs, assumptions, or methods than were used in the existing analyses of record.

When used in reference to equipment capacities, the word “change” refers to analyses and design (analyses contain margin and are more conservative than actual design). The following example illustrates the NRC’s intent. Existing analyses can show that a component is adequate for operation at the current (lower) power level. Re-analysis can demonstrate that the same component is adequate for operation at the uprated (higher) power level. In this case, the design was always adequate, but the analyses were revised to demonstrate continuing adequacy. Thus, the word “change” refers to the difference in capacities determined by the old and new analyses. If the actual design was modified (e.g., pump impeller modifications), the word “change” would also include the difference in design.

When used in reference to analysis results and acceptance criteria, the word “change” means any difference between the values of the existing analysis of record and the re-analysis performed to support the power uprate.

When used in reference to certain operational parameters (e.g., flow rate, temperature, pressure), the word “change” means any difference between the value of the parameter before and after the power uprate.

When used in reference to procedures or programs, the word “change” refers to any difference between the procedures or programs used before the power uprate and those that would be used following the power uprate.

#### “Needed to be Modified”

The phrase “needed to be modified” was initially used in the heading to Sections II. and III. As a result of this comment, the staff has replaced the headings of these sections, follows:

- “II. Accidents and transients for which the existing analyses of record bound plant operation at the proposed uprated power level”
- “III. Accidents and transients for which the existing analyses of record do not bound plant operation at the proposed uprated power level”

#### Establishing A Threshold

The staff does not believe that the use of a threshold is consistent with the type of information being requested. Modifications to inputs and assumptions of analyses can mask the actual change in magnitude of the effect of the power uprate. Therefore, if an analysis is modified, the staff needs information for that analysis regardless of the magnitude of the change or the effect of the change.

#### General Note

The guidance focuses on areas where the “change” or “effect” that results from implementing the power uprate is not bounded by the existing analyses of record. The staff believes that this focus should considerably reduce the areas where detailed information and review will be necessary.

### **G.2. For plants that were licensed prior to the standard review plan (SRP), what method should be used to justify the power uprate (plant-specific or SRP method)? If the licensee implements a method from the SRP (as indicated in the guidance), would the NRC consider that a change in commitment?**

An assumption used in estimating the reduction in the time required to review measurement uncertainty recapture power uprate applications was that a licensee would not change its licensing-basis methods. This is important because a change of method would require additional review, which may take longer than estimated for the review of

the measurement uncertainty recapture power uprate. However, if a licensee chooses to implement a new method of analysis in order to justify the requested power uprate and the NRC approves the licensee's application on the basis of the new analysis, the new analysis and results will become part of the licensing basis for the plant.

The staff believes that this question arose because of the reference to the SRP in the draft guidance. The reference to the SRP was initially used to indicate the level of detail of technical information required for NRC review. The reference to the SRP was not intended to indicate that the SRP will be used in place of plant-specific licensing bases to assess the acceptability of an application.

As a result of this feedback, the wording in the guidance was revised to more clearly indicate that the reference to the SRP is used as guidance for the level of detail necessary for review. The revised wording clearly states that licensees need not conform to the guidance of the SRP.

**G.3. What are the bounds of 10 CFR 50.59 for installation and use of flow elements? What is the threshold for the NRC's review of changes (e.g., installation, crediting improved accuracy in analyses, increasing power level)?**

Guidance for the implementation of 10 CFR 50.59 is provided in NRC Regulatory Guide 1.187, "Guidance for implementation of 10 CFR 50.59, Changes, Tests, and Experiments," dated December 2000 (which endorses Revision 1 of NEI 96-07, "Guidelines of 10 CFR 50.59 Evaluations," dated November 2000).

**G.4. Clarify the level of detail that should be provided for items not affected.**

The staff has not identified detailed information needs for items that are not affected by the power uprate. The appropriate level of detail for items that are not affected is covered by Section II of the draft guidance, which includes explicit confirmatory statements rather than detailed technical information.

**G.5. Consistent with approved methods, Chapter 15 analyses should be deferred to the next affected reload and should not be required to be submitted with power uprate applications. What justification and supporting information should be provided in order to defer Chapter 15 analyses to the next affected reload?**

Some licensees may be able to implement the measurement uncertainty recapture power uprate part way through a cycle and prior to the "next reload." Chapter 15 analyses may not be deferred to a date after implementation of the power uprate. All Chapter 15 analyses must be current and representative of plant operation at the proposed power level prior to implementation of the power uprate. However, because of the small power increase associated with measurement uncertainty recapture power uprate (less than two percent), the small impact of such an uprate on accident and transient analyses, and the fact that the increase is within the pre-uprate uncertainty in power measurement, analyses that are explicitly included in the methodology for reloads need not be submitted with the power uprate application for NRC review. However, this approach is only appropriate when (1) the accident or transient is one that is covered by

the reload methodology, (2) the methodology and acceptance criteria used for performing the analyses have explicitly been approved by the staff for the accident or transient being considered, and (3) the changes to and results of the analyses meet the criteria in 10 CFR 50.59 for no prior NRC review. Section III of the guidance has been revised to reflect this change.

**G.6. What plant-specific information should be provided for implementation of approved methods?**

For the flow instrument, the licensee should provide information regarding all parameters and their individual contributions to the power uncertainty in order to eliminate requests for additional information.

For other methods, the answer to this question is specific to the method and is generally identified in the guidance.

**G.7. Previous analyses that have been approved should be allowed as a credible source to justify changes (e.g., grid stability). What information should be provided to take credit for previous analyses? What information should be provided if the previous analyses were submitted for a different plant than the one under review?**

The draft guidance allows the use of previous analyses that the NRC has approved for the plant under review as a credible source to justify changes. Licensees may take credit for such analyses when they were conducted in a manner that bounds plant operation at the proposed uprated power level. Section II of the guidance addresses the staff's information needs as they relate to accident and transient analyses. Other sections in the guidance (i.e., Sections IV., V., and VI.) refer licensees to Section II. for the appropriate level of information related to items that are not affected by the proposed power uprate.

By contrast, without a detailed review of plant-specific differences, it would be difficult for the NRC to determine that previously approved analyses bound plant operation for a plant other than the one for which the analyses were originally submitted. The time to conduct such a review may be longer than estimated for reviewing measurement uncertainty recapture power uprate applications; therefore, in the interest of improving the efficiency of the review process, the guidance does not address this option.

As stated in the draft guidance, the NRC encourages licensees to notify the staff of areas where they believe efficiencies may be gained (e.g., areas where generic dispositions are possible). When doing so, licensees should provide a technical basis for their proposal.

**G.8. Clarify the term "NRC approved." Does this mean explicit approval or is implicit approval sufficient? What are examples of NRC approvals?**

There are several types of methods and processes used by licensees to perform analyses to support licensing applications. One type is an NRC approved method or



process. This type is one where a licensee proposes a method or process for conducting certain types of analyses and receives explicit approval from the NRC to use the method or process. An example of this type is a method used for conducting 10 CFR 50.46 loss-of-coolant accident analyses. When a request for approving such a method is received, the staff conducts a detailed review of the method for acceptability. If the method is found acceptable, the staff issues its findings in a safety evaluation. The safety evaluation may also include limitation and/or restrictions on the use of the method. This is an example of a method approved by the NRC.

Another type of method or process used by licensees to perform analyses to support licensing applications are methods and processes that have not been explicitly approved by the NRC. Examples of these methods and processes include some of those used by licensees for dose consequence calculations or containment related calculations. When applications are based on these types of methods or processes, the staff conducts its review by performing independent analyses and/or by confirming the bounding nature of the assumptions, inputs, and results of the licensee's analyses. These methods and processes are not considered methods or processes approved by the NRC. The NRC's approvals of results provided in plant-specific applications utilizing these methods do not constitute an NRC approval of the method itself.

**G.9. The draft guidance is not clear with respect to the risk information that may be appropriate to support the application.**

The NRC has generically determined that measurement uncertainty recapture power uprates have an insignificant impact on plant risk. Therefore, no risk information is requested to support such applications.

**G.10. The NRC should provide guidance on the use of "baseline" vs. "uprate" analyses.**

"Baseline analyses" are those that describe the operation of the plant at the current licensed power level. The guidance document specifically identifies the staff's information needs for the power uprate, including the information needs related to "uprate" analyses.

**G.11. The guidance should reference previously issued safety evaluations for similar power uprates.**

The NRC plans to post a Web site for power uprates. This Web site will identify all approved, pending, and anticipated power uprate applications. Licensees can easily identify approved measurement uncertainty recapture power uprate applications by visiting this Web site, which the staff will periodically update to include new information (e.g., new approvals) related to power uprates.

**G.12. The term "affected" should be replaced with "bounded by existing analysis or design."**

The proposed phrase does not accurately capture the staff's intent in using of the word "affected." See the response to G.1. For a clarification of what the staff intends by the use of the word "affected".

**G.13. It is not clear what is meant by the word “change.”**

See response to G.1.

Note that the guidance focuses on areas where the change that results from implementing the power uprate is not bounded by the existing analyses of record. The staff believes that this focus should considerably reduce the areas where detailed information and review will be needed.

**G.14. Under several sections, the specific guidance requests matrices covering items that experience no change. The NRC should provide model matrices to clarify the information needs for each section.**

Use of matrices may not be appropriate for Sections IV., V., and VI. For those sections, instead of matrices, the licensee should provide a discussion covering the items in Section II. The guidance has been revised to reflect this.

For Section II., licensees could develop and use a matrix and accompanying narrative similar to the following example:

For the accidents and transients included in the following matrix, the requested uprate in power level continues to be bounded by the existing analyses of record for the plant. In addition, the NRC has previously approved some of these analyses, while others were conducted using methods or processes that the NRC has previously approved. The manner of approval (analysis approval or use of approved method) is indicated in the NRC Approval column, with a reference to the document in which the approval was conveyed.

Accident/Transient	FSAR Section	Validity of Bounding Event Determination	Assumed Power Level	NRC Approval
Main Steam Line Break	15.1.5	Remains Valid	102%	Analyses approved by Reference 9
Turbine Trip	15.2.3	Remains Valid	102%	Analyses approved by Reference 16
LOCA	15.6.5	Remains Valid	102%	Method of Ref. 3 Approved by Ref. 4

**SECTION I.:**

- I.1. For Item I.1.A., when an approved methodology is used, the licensees should only have to state that an approved methodology was used. In this case, a description of the methodology should not be necessary. When the licensee deviates from an approved methodology, the licensee should describe the deviation.**

An assumption used in estimating the reduction in the time to review measurement uncertainty recapture power uprate applications was that a licensee's application would be based on an approved methodology. This is important because a new methodology or a change to an approved methodology would require additional review, which may take longer than estimated for the review of the measurement uncertainty recapture power uprate.

When a licensee bases its application on an approved methodology with no deviations, there is no need to describe the methodology. In this case, the licensee should reference the methodology by document title, number, and date. Item I.1.A. has been revised to reflect this change in guidance.

When a licensee implements an approved methodology but deviates from certain elements of the approved methodology, or when a licensee implements a new methodology, the licensee should provide a detailed description of the deviations or new methodology for NRC review. Such deviations will likely extend the time for NRC review.

**I.2. For Item I.1.E., plant-specific calorimetric uncertainty calculations are dependent upon the technique used. What level of detail is appropriate for NRC staff review (full calculation or a summary description)?**

The staff recognizes that the calculations depend on the technique used. However, licensees should provide detailed, plant-specific calculations that identify all parameters and their individual contributions to the power uncertainty, rather than summary descriptions, to preclude requests for additional information.

**I.3. The draft guidance does not identify what information related to instrument calibration procedures and processes should be provided. This information was provided in previous applications for power uprates.**

The staff's safety evaluations approving topical reports for the flow measurement technique identify the need for the information discussed in this comment (typically included as the first criterion). Therefore, this information is covered by Items I.1.C. and I.1.D. of the draft guidance. However, as a result of this comment, the staff has modified Section I to provide more explicit guidance on this area. The new Items under

Section I.F. identify the information that should be provided to address the following aspects of the licensee's maintenance procedures related to all instruments that affect the power calorimetric:

- i. Maintaining calibration
- ii. Controlling software and hardware configuration
- iii. Performing corrective actions
- iv. Reporting deficiencies to the manufacturer
- v. Receiving and addressing manufacturer deficiency reports

**I.4. How will the new instrument be used? Will it be used to calibrate existing instruments or will it be used in place of existing instruments?**

The answer to this question is plant-specific and up to individual licensees. The staff will review applications for either case.

**I.5. What should a licensee do when the instrument is out of service?**

Staff approvals of topical reports for the feedwater measurement technique identify what information is appropriate for addressing this comment (typically included as the first criterion). Therefore, this information is covered by Items I.1.C. and I.1.D. of the draft guidance. However, as a result of this comment, the staff has modified Section I. to provide more explicit guidance in this area.

Specifically, a licensee should propose an allowed outage time for the instrument, similar to the allowed outage times contained in the technical specifications for other equipment. If an approved allowed outage time is exceeded, the licensee should reduce the power level of the plant to ensure that it appropriately accounts for the uncertainty in the instrumentation being relied upon. Item I.1.G. and H. of the guidance now address the staff's information needs for this case.

**I.6. For Item I.1.E., should the licensee submit the full calculation for the total power measurement uncertainty or will a summary be sufficient?**

Licensees should provide detailed plant-specific calculations that identify all parameters and their individual contributions to power uncertainty, rather than summary descriptions, to preclude requests for additional information.

**I.7. Under Item I.1.E., what level of detail should be provided for the calculation of total power uncertainty? The level of detail should be similar to that provided in previous submittals. The information that is provided should also include a table summarizing instrument uncertainty values.**

Licensees should provide detailed plant-specific calculations that identify all parameters and their individual contributions to power uncertainty, rather than summary descriptions, to preclude requests for additional information. In addition, a table summarizing instrument uncertainty values as part of the calculation can be provided but such a table is not an adequate substitute for the calculation.

**SECTION II.:**

**II.1. For Item II.1.B.ii., the staff should clarify what it means by “methods or processes previously approved by the NRC.” In addition, how does the 10 CFR 50.59 process (an NRC-approved process) fit in?**

See response to G.8.

**II.2. Under II.1., why is Item C. needed?**

In some cases, analyses using conservative inputs for one event may have bounded the results of analyses using nominal or less conservative inputs for another event. When

the inputs to the analyses change, the level of conservatism in the bounding analysis may decrease. This could potentially lead to a change in the bounding nature of these analyses. Item II.1.C. ensures that the analyses for the events are handled appropriately in the event that a change in power level results in a change in the bounding event determination.

**II.3. Under Section II.1.B., either Item i. or Item iii. is sufficient. Why are Items i., ii., and iii. listed?**

The staff reviewed the guidance under Section II.1.B. and determined that items i. and iii. were redundant; therefore, the staff has deleted Item iii. However, Item ii. is still appropriate to ensure that the analyses being credited in the application have been approved by the NRC or were conducted using methods or processes that the NRC previously approved. Therefore, the original Items i. and ii. are retained in the guidance.

**SECTION III:**

**III.1. Is the accident/transient list provided in III.1. complete? If not, the NRC should provide further guidance on other areas that should be addressed.**

For measurement uncertainty recapture power uprate applications, the list provided in Item III.1 is complete. Therefore, the guidance is revised to use “i.e.” in place of “e.g.” to clarify this point. However, the list does not explicitly identify all accidents and transients covered by Section III. In some cases, the list groups a number of specific analyses under a type identifier. For examples, many accidents and transients are covered in Chapter 14 or 15 of updated final safety analysis reports. These accidents and transients are not identified individually. The statement “the transients and accidents included in the plant’s updated final safety analysis report (UFSAR) (typically Chapter 14 or 15)” is intended to include all such accidents and transients.

**III.2. Item III.1.B. requests information related to inputs and assumptions for accident and transient analyses. The request should pertain to inputs and assumptions that are affected by the power uprate, not all inputs and assumptions.**

For accidents and transients whose existing analyses of record bound plant operation at the proposed uprated power level, the draft guidance did not suggest that detailed information related to inputs and assumptions should be provided. The staff continues to believe that the confirmatory information provided under Section II. of the guidance is sufficient for these accidents and transients.

For accidents and transients for which the existing analyses of record do not bound plant operation at the proposed uprated power level, the staff considers it appropriate to review information related to inputs and assumptions used in the analyses. The staff recognizes that some of the requested information already exists in the UFSAR, but believes that explicitly including such information in the submittal would improve the efficiency of the staff’s review. In addition, to support the staff’s review of the analyses, licensees should not limit the information solely to the inputs and assumptions that change. To accept the licensee’s revised analyses, the staff will ensure that these

analyses bound plant operation at the uprated power level. The staff should be provided with sufficient information to determine that the revised analyses were performed correctly, in a manner that bounds proposed plant operation, and demonstrate compliance with the applicable acceptance criteria. For this review, the staff will evaluate the new analysis as a whole, not just the changes in certain parameters.

- III.3. Item III.1.B. in the specific guidance, which requests that applicants explicitly identify important analysis inputs and assumptions that change as a result of power uprate, appears redundant to Item III.1.I. The NRC should explain any differences intended by including them separately. (Note: Item designations refer to the draft specific guidance considered at the public workshop.)**

The staff agrees with this comment and the original Item III.1.I. has been deleted.

- III.4. The level of detail (e.g., plots of parameters, sequence of events) in Item III. of the specific guidance is excessive. It is not clear why this level of detail should be provided for transient/accident analyses.**

In evaluating this comment, the staff reviewed the information included under Section III. of the draft guidance. However, to accept a licensee's revised analyses, the staff will ensure that these analyses bound plant operation at the uprated power level. The staff should be provided with sufficient information to determine that the revised analyses were performed correctly, in a manner that bounds the proposed plant operation, and demonstrate compliance with the applicable acceptance criteria. For this review, the staff will evaluate the new analyses as a whole. Therefore, the staff believes that the information included under Section III. remains appropriate.

- III.5. Under III.1., why is Item B. needed? (Note: Item designations refer to the draft specific guidance considered at the public workshop.)**

In order to accept the licensee's power uprate application, the staff conducts reviews of accident and transient analyses that are affected by the proposed uprate. To accept the licensee's revised analyses, the staff will ensure that these analyses bound plant operation at the uprated power level. For this review, the staff will evaluate the changes made to the analyses, including changes in input parameters and assumptions.

- III.6. The level of detail (e.g., plots of parameters, sequence of events) in Item III. of the specific guidance is excessive. It is not clear why this level of detail should be provided. Information to be provided should focus on change only.**

See response to III.4.

- III.7. Under Section III., what level of detail is appropriate for Item F.?**

The licensee should identify the specific sections of the methodology report and NRC safety evaluations approving the methodology which contain the limitations and restrictions and confirm that the methods were utilized in a manner that is consistent

with all of the limitations and restrictions. The discussion does not need to restate all of the limitations and restrictions or provide the details of how they were met.

#### **SECTION IV:**

##### **IV.1. What information and level of detail is appropriate for non-safety-related balance of plant (BOP) systems and equipment?**

In general, the staff does not expect significant changes in the BOP systems for a measurement uncertainty recapture power uprate because the majority of the BOP systems are evaluated for a 102-percent power level. When this is true, licensees requesting a measurement uncertainty recapture power uprate should only confirm that the design-basis analysis of its BOP systems remains bounding for the proposed power increase. If, for any reason, a licensee finds it appropriate to perform a new analysis, such analysis should meet the commitments of the design-basis code of record and, if a computer program is used, it should be benchmarked against an NRC-approved computer code.

For this case, the licensee should (a) describe the analysis performed, (b) confirm that the analysis was performed in accordance with the design-basis code of record, and (c) discuss the changes in parameters and results of the analysis.

##### **IV.2. The NRC should clarify the statement regarding NRC-approved analyses (Item II.) in relation to BOP (Item IV.1.A.v.). BOP analyses may not have been approved by the NRC.**

Item IV.1.A.v refers to the BOP piping for which a re-analysis is usually not needed for measurement uncertainty recapture power uprates. However, if for any reason, a licensee finds it appropriate to perform a new detailed analysis, such analysis should meet the commitments of the design-basis code of record. If a computer program is used, it should be benchmarked against an NRC-approved computer code.

##### **IV.3. The draft guidance does not identify the information that should be provided related to pre- and post-uprate conditions (i.e., RCS temperature, pressure, etc.). This information was provided in previous applications for power uprates.**

With regard to Section IV of the guidance, the design parameters for pre- and post-uprate conditions (including RCS temperature, pressure, steam temperature, and steam flow rate) will provide the basis for the safety analysis. This information permits the staff to evaluate certain components for post-uprate conditions. The staff has modified the guidance to include a list of these parameters.

##### **IV.4. The draft guidance does not identify what information related to the steam generator secondary side internal support structure should be provided. This information was provided in previous applications for power uprates.**

This comment identifies an omission in the list of information needed under Section "Mechanical/Structural/Material Component Integrity and Design." Specifically, Section

IV.A.vi. includes an item applicable to steam generators, which the staff has modified to explicitly include secondary side internal support structures. In addition, Item IV.B. states that the discussion for each of the components covered should identify and evaluate any changes related to the power uprate in specific areas. One of the listed areas is cumulative usage factor (i.e., fatigue). Relative to steam generator tube fatigue, the staff has added Item IV.1.F. to clarify that the discussion should confirm that the effect of the power uprate on steam generator tube high cycle fatigue is consistent with NRC Bulletin 88-02, "Rapidly Propagating Fatigue Cracks in Steam Generator Tubes," dated February 5, 1988.

**IV.5. Under Item IV.C., more guidance should be provided related to pressure-temperature curves. Should licensees generate new pressure-temperature curves or can they justify other approaches (e.g., use of scaling factors)?**

Instead of generating new P-T curves, licensees may reduce the service period of their current curves ( in effective full-power years, EFPY) to account for measurement uncertainty recapture power uprates.

**IV.6. In Item D. of Section IV.1., it is not clear what is meant by "code of record."**

"Code of record" is the design code (e.g., ASME Section III, B31.1, etc.), including the specific edition that is recognized in the plant's licensing basis as the code that establishes the methods of analyses and acceptance criteria for the items of interest. Item IV.1.B. identifies the items of interest (e.g., stresses, cumulative usage factors, flow-induced vibration).

**IV.7. Under Section IV.1., the request for a matrix similar to Item II does not seem to be appropriate.**

The staff believes that use of matrices in areas for which the existing analyses of record remain bounding for the uprated conditions can improve the efficiency of the review. Nonetheless, the staff recognizes that the use of matrices may not be practical for some areas. For such areas, instead of a matrix, the licensee should provide a discussion covering the items in Section II. The guidance has been revised to reflect this.

**SECTION V:**

**V.1. For grid stability, do licensees need to submit, summarize, or reference the calculations?**

Rather than provide grid stability calculations, licensees should describe the process that is used to ensure grid stability, including references to licensing commitments that would lead the licensee to assess the impact of the power uprate on grid stability.

**V.2. Many items identified under Section V.1.A. of the specific guidance do not appear to have a bearing on the NRC's review of power uprate applications (e.g., main generator, switchyard). Section V. should be eliminated.**



The staff has reviewed the items listed under the original Section V.1.A. and has concluded that information concerning emergency diesel generators and station blackout equipment contributes to the staff's review of measurement uncertainty recapture power uprate applications. The remainder of the list has been eliminated. However, the staff has added environmental qualification of electrical equipment and grid stability to the list. These additions were necessary in order to obtain licensees' confirmation that they have considered the impact of the power uprate on these systems/equipment with respect to the requirements for offsite and onsite electrical power systems (e.g., General Design Criterion (GDC) 17) and environmental qualification of electrical equipment (e.g., 10 CFR 50.49) and that they continue to meet the applicable requirements.

## **SECTION VI:**

### **VI.1. What information and level of detail should be provided for non-safety-related balance of plant (BOP) systems and equipment?**

The systems of interest are listed in Section VI. of the guidance. For those systems that are affected by the power uprate, the licensee should identify any power uprate related effects that resulted in either of the following conditions:

- a. increase in system or equipment loads requiring operational capacity (e.g., required cooling capacity, required pumping capacity) higher than that approved by the NRC before the uprate
- b. modification to the systems or equipment and/or the need for the system to operate in a manner different than the manner in which it was operated before the uprate (e.g., system configuration changes, modifications to pumps, modifications to heat exchanger)

For the BOP systems and equipment identified in Section VI. of the guidance that are not affected by the power uprate, the licensee should include, to the extent applicable, the information identified in Section II. of the guidance. This information should also include an explicit statement that these systems or equipment were not affected by the proposed power uprate.

### **VI.2. Under Item VI., it is not clear why a detailed discussion for each system that experiences a change should be provided. The focus of the discussion should be on the change.**

Section VI. states that the discussion should identify and evaluate any changes related to the power uprate. The guidance was not intended to request a detailed discussion concerning attributes of systems that are not affected by the power uprate. The guidance has been revised to further clarify this point.

### **VI.3. Item vi., under Section VI.1.A. requests information related to "heating, ventilation, and air conditioning systems." This item is very broad. It is obviously not intended to include the plant cafeteria. More specific wording or examples should be provided.**

On the basis of this comment, the original Item VI.1.A.vi. (new Item VI.1.F.) has been revised to specify “engineered safety features (ESF) heating, ventilation, and air conditioning systems.” The systems of interest for this item are those covered by Sections 6.4, 6.5.1, 9.4.1, 9.4.2, and 9.4.5 of the NRC’s Standard Review Plan.

## **SECTION VII:**

### **VII.1. Does Item VII.1.A. include severe accident management guidelines?**

The original Item VII.1.A. (new Item VII.2.A.) does not include severe accident management guidelines.

### **VII.2. It is not clear what is intended by “risk-important operator actions” in Item VII.1.B. of the draft guidance. What type of risk information should a licensee provide to support conclusions in this area?**

As a result of this comment, the staff reviewed the original Section VII.1. of the guidance. The staff’s intent in including this section was for the licensee to confirm that it (a) has identified and evaluated operator actions that are sensitive to the power uprate, including any effects of the power uprate on the time available for operator actions; (b) has identified all modifications to (i) emergency and abnormal operating procedures, (ii) control room controls, displays (including the safety parameter display system), and alarms, (iii) the control room plant reference simulator, and (iv) the operator training program that are necessary to ensure that the changes in operator actions do not adversely affect defense in depth or safety margins; and (c) will complete these modifications (including training of the operators) prior to implementation of the power uprate. The guidance has been revised to reflect this. The revised guidance does not include the term “risk-important operator actions.” Furthermore, the staff has not requested risk information in applications for measurement uncertainty recapture power uprates.

### **VII.3. Under Item VII., it is not clear why Item 1.E. (training program) is included.**

Without the information identified by the original Item VII.1.E. (now VII.2.D.), the staff may not be able to evaluate the effect of the power uprate on operator performance. Because of the size of the power uprates covered by this guidance (less than 2 percent), licensees should simply confirm that the training program and control room simulator will be updated to reflect the changes covered by this section prior to implementation of the power-uprates.

### **VII.4. Under Item VII., it is not clear what Item 2. means. If information for this item is appropriate, then the information should be provided at a high level.**

The staff reviewed the draft guidance and the original Item VII.2 has been deleted.

### **VII.5. The applicability of Item 2. under Section VII. to the measurement uncertainty recapture power uprates is not clear.**

The staff reviewed the draft guidance and the original Item VII.2 has been deleted.

LIST OF RECENTLY ISSUED  
NRC REGULATORY ISSUE SUMMARIES

Regulatory Issue Summary No.	Subject	Date of Issuance	Issued to
2002-02	Lessons Learned Related to Recently Submitted Decommissioning Plans and License Termination Plan	01/16/2002	All NRC licensees.
2002-01	Changes to NRC Participation in the International Nuclear Event Scale	01/14/2002	All NRC licensees and certificate holders.
2001-25	NEI-099-02, Revision 2, Voluntary Submission of Performance Indicator Data	12/12/2001	All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.
2001-24	Status of Receipt of NRC Mail Following the Closing of the Brentwood Postal Facility	12/06/2001	All NRC licensees
2001-23	Resetting Fault Exposure Hours for Safety System Unavailability Performance Indicators	12/03/2001	All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2001-22	Attributes of A Proposed No Significant Hazards Consideration Determination	11/20/2001	All holders of operating licenses for nuclear power reactors, including those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel