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LICENSING TOPICAL REPORT

CONSTANT PRESSURE POWER UPRATE

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IMPORTANT NOTICE REGARDING CONTENTS OF THIS REPORT

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ABSTRACT

GE has previously developed and implemented Extended Power Uprate. Based on the Extended Power Uprate experience, GE has developed an approach to uprate reactor power that maintains the current plant reactor dome pressure. By performing the power uprate with no pressure increase, the effect on the plant safety analyses and system performance is reduced, thus allowing for a more streamlined process.

This report provides a systematic disposition of the engineering assessments required to support a Constant Pressure Power Uprate. These dispositions include generic assessments that are based on both analysis and experience with Extended Power Uprate projects previously provided through specific plant submittals.

To further ease future NRC reviews, a prescribed approach to be used for each plant-specific power uprate submittal is also provided. Future plant specific submittals of Constant Pressure Power Uprate will include a plant specific document based on the approach prescribed herein consistent with the dispositions documented in this report.

1.0 INTRODUCTION

Previously, General Electric (GE) submitted a set of generic guidelines to be met and a general approach to be followed for plants that extended reactor thermal power up to 120% of their original licensed thermal power. These guidelines and subsequent evaluations were based on the assumption that the maximum operating reactor pressure also would be increased. These guidelines and evaluations, together with associated Nuclear Regulatory Commission (NRC) position and Safety Evaluation Reports, are provided in References 1 and 2 (ELTR 1/2) and have been applied to all extended power uprate submittals since their NRC approval.

Subsequent to the submittal of these licensing topical reports for approval, GE has developed a different approach to uprating reactor power. This approach maintains the current plant maximum operating reactor pressure. The power uprate with no pressure increase has been utilized at several plants and will be pursued for most of the future power uprate applications. GE's current experience base with power uprate is provided in Table 1-1. By performing the power uprate with no pressure increase, there is a substantially smaller effect on the plant safety analysis and system performance. This constraint allows a more streamlined approach to power uprate analyses and evaluations.

The purpose of this Licensing Topical Report (LTR) is to document the approach to be followed and provide the basis for future Constant Pressure Power Uprate (CPPU) applications. The overall approach has been streamlined consistent with the constant pressure assumption.

Changes to the plant licensing and design basis necessary to support the licensing of the power uprate will be reported and justified in a plant specific power uprate submittal. The plant specific submittal will include changes to the analysis basis methodology identified in References 1 and 2 unless this methodology is revised by this report. Applicable new methods that are approved by the NRC independent of this LTR may be used after this approval is received.

Because of the reduced effect of a CPPU on many safety evaluations, a number of generic evaluations are provided to support the plant specific submittals. In addition, some generic assessments from References 1 and 2 can be utilized because they bound the effect of the CPPU approach. This report provides the results of these evaluations, assessments, and dispositions for NRC approval, thus simplifying the plant-specific NRC review required for each new CPPU submittal.

To further simplify future NRC reviews of plant-specific CPPU submittals, the format of the Power Uprate Safety Analysis Report (PUSAR) to be used for each plant-specific CPPU submittal will be based on the format of this report. The PUSAR is based on the above assumptions and includes consideration of the evaluations, assessments, and dispositions provided in this report. Any deviations from the bases and evaluations provided in this report

will be included and justified in the plant specific submittal. The level of information to be provided for each plant-specific submittal and the format for providing that information will be consistent with past extended power uprate submittals. However, for those analyses and evaluations that are generically dispositioned in this report, the plant-specific PUSAR is only required to provide the basis for the generic dispositions and confirm the applicability of these generic dispositions for the specific plant application.

In this LTR, the acronym for an assessment or equipment name is typically provided with the first use of the name (a table of acronyms is provided in the Appendix).

1.1 REPORT APPROACH

The report sections correspond to those previously used on plant-specific, extended power uprate submittals. Each of the evaluations included in those submittals has been reviewed and assigned one of the two disposition categories:

- Generic assessment
- Plant-specific evaluation

Each top level section of this report begins with a summary disposition table for all of the principal evaluations included in the section. A principal evaluation is a thermal-hydraulic, nuclear, mechanical (e.g., vessel integrity), or system design (e.g., ECCS) analysis or evaluation that is potentially limiting with respect to safety considerations relative to power uprate. Each principal evaluation is included in a separate subsection, which includes a table with the following information:

- Evaluation topic
- Primary effect of CPPU on topic
- Disposition category for the assessment

The justification of the categorization is included after the table. This justification includes current experience with extended power uprate and the basis for the disposition, as applicable.

The technical dispositions are contained in Sections 2 through 10. General information has also been provided in Section 11 to support utility licensing documentation required for the plant-specific CPPU submittal. This general information provides a template to the utility for development of the environmental report, plant technical specification changes, and significant hazards assessment. This information is provided for use by the utility, and NRC review is only requested for the level of detail presented. The utility may elect to reference some or all of the information given in Section 11 in the documentation supporting the plant-specific licensing CPPU submittal.

1.1.1 Generic Assessments

Generic assessments are those safety evaluations that can be dispositioned for a group or all BWR plants by:

- A bounding analysis for the limiting conditions,
- Demonstrating that there is a negligible effect due to CPPU, or
- Demonstrating that the required plant cycle-specific reload analyses are sufficient and appropriate for establishing the CPPU licensing basis.

Bounding analyses may be based upon either a demonstration that previous pressure increase power uprate assessments provided in Reference 1 or 2 are bounding or upon specific generic studies provided for the CPPU. For these bounding analyses, the current CPPU experience is provided along with the basis and results of the assessment. If the generic assessment is fuel design dependent, this assessment is applicable only to GE/GNF fuel designs up through GE 14, analyzed with GE methodology. The effect of CPPU on future GE/GNF fuel designs is addressed during the assessment of the new fuel design consistent with the requirements of Reference 3. If another vendor fuel design is considered as part of the power uprate, fuel design dependent generic assessments will be separately evaluated and justified.

For those CPPU assessments having a negligible effect, the current CPPU experience plus a phenomenological discussion of the basis for the assessment is provided. Reference 1 or 2 is referenced if the information in these reports supports the conclusion of negligible effect. Any plant system design that falls outside of the current experience base for a generic analysis will be addressed in the plant-specific submittal.

Some of the safety evaluations affected by CPPU are fuel operating cycle (reload) dependent. Reload-dependent evaluations require that the reload fuel design, core loading pattern, and operational plan be established so that analyses can be performed to establish core operating limits. The reload analysis demonstrates that the core design for CPPU meets the applicable NRC evaluation criteria and limits documented in Reference 3.

No plant can implement a power uprate unless the appropriate reload core analysis is performed and all criteria and limits documented in Reference 3 are satisfied. Otherwise, the plant would be in an unanalyzed condition. Based on current requirements, the reload analysis results are documented in the Supplemental Reload Licensing Report (SRLR), and the applicable core operating limits are documented in the plant-specific Core Operating Limits Report (COLR).

Generic dispositions for reload analysis assessments are described in the appropriate sections of this report. For these assessments, a phenomenological discussion of the effect of CPPU on the expected analysis results is provided along with the relative experience base and reference to supporting information provided by either Reference 1 or 2.

The applicability of the generic assessments for a specific plant application will be evaluated. The plant-specific submittal will either document the successful confirmation of the generic assessment or provide a plant specific evaluation, consistent with Section 1.1.2, if the applicability assessment is unsuccessful.

1.1.2 Plant-Specific Evaluation

Plant-specific evaluations are assessments of the principal evaluations that are not addressed by the generic assessments described in Section 1.1.1. The relative effect of CPPU on the plant-specific evaluations and the methods used for their performance are provided in this report. Where applicable, the assessment methodology is referenced. If a specific computer code is used, the name of this computer code is provided in the subsection. If the computer code is identified in Reference 1, 2 or 3, these documents are referenced rather than the original report.

The plant-specific evaluations will be reported in the plant specific submittal consistent with the level of detail of previous extended power uprate submittals or as indicated in this report.

1.2 EFFECT OF CPPU

1.2.1 Operating Domain

The upper bound of the operating domain is defined by the current MELLLA/MEOD upper boundary. The MELLLA/MEOD upper boundary is extended up to the new 100% core power value. A typical power/flow map for the power uprate conditions is shown in Figure 1-1.

1.2.2 Nuclear and Thermal-Hydraulic Evaluations

The change in the power level will affect the plant steady-state heat balance. The plant-specific submittal will include a summary of steady-state parameters based on the plant-specific CPPU heat balance.

Experience has demonstrated that CPPU may have an effect on thermal-hydraulic safety analyses. Several of the thermal-hydraulic safety analyses can be performed on a generic basis, and the results are documented in this report. The remaining thermal-hydraulic safety analyses require plant-specific evaluations. The plant-specific evaluation or applicability confirmation will be provided in the plant-specific submittal, as applicable.

Energy requirements for power uprate are met by an increase in bundle enrichment, an increase in reload batch size, and/or changes in fuel loading pattern to maintain the desired plant operating cycle length. The power distribution in the core is established to achieve increased core power while satisfying the core operating limits.

1.2.3 Mechanical Evaluations

The primary effects that require evaluation for mechanical components are an increase in fluence, reactor internal pressure differences (RIPDs), flow and temperature.

1.2.4 System Evaluations

Experience has demonstrated that the effect of CPPU on Nuclear Steam Supply System (NSSS) and Balance Of Plant (BOP) systems is system dependent.

Table 1-1

GE Power Uprate Experience

Plant	Stretch/Extended Power Uprate	Uprate Power (~ % OLTP)	Reactor Dome Pressure Increased
Duane Arnold	SPU	105	Yes
Cofrentes	SPU	105	Yes
Hatch - 1, 2	SPU	105	Yes
Susquehanna - 1, 2	SPU	105	Yes
WNP-2	SPU	105	Yes
Limerick - 1, 2	SPU	105	Yes
Peach Bottom - 2, 3	SPU	105	Yes
Fermi 2	SPU	105	Yes
FitzPatrick	SPU	105	Yes
Brunswick - 1, 2	SPU	105	Yes
NMP-2	SPU	105	Yes
Browns Ferry - 2, 3	SPU	105	Yes
River Bend	SPU	105	Yes
KKM	EPU	114	Yes
KKL	EPU	117	Yes
Laguna Verde - 1, 2	SPU	105	No
LaSalle - 1, 2	SPU	105	No
Perry	SPU	105	No
Hatch - 1, 2	EPU	113	No
Monticello	EPU	106	No
Cofrentes *	EPU	110	No
Duane Arnold *	EPU	120	No
Dresden - 2, 3 *	EPU	117	No
Quad Cities - 1, 2 *	EPU	117	No
Clinton *	EPU	120	No
Brunswick - 1, 2 *	EPU	120	No
Browns Ferry 2, 3 *	EPU	120	No

* In progress.

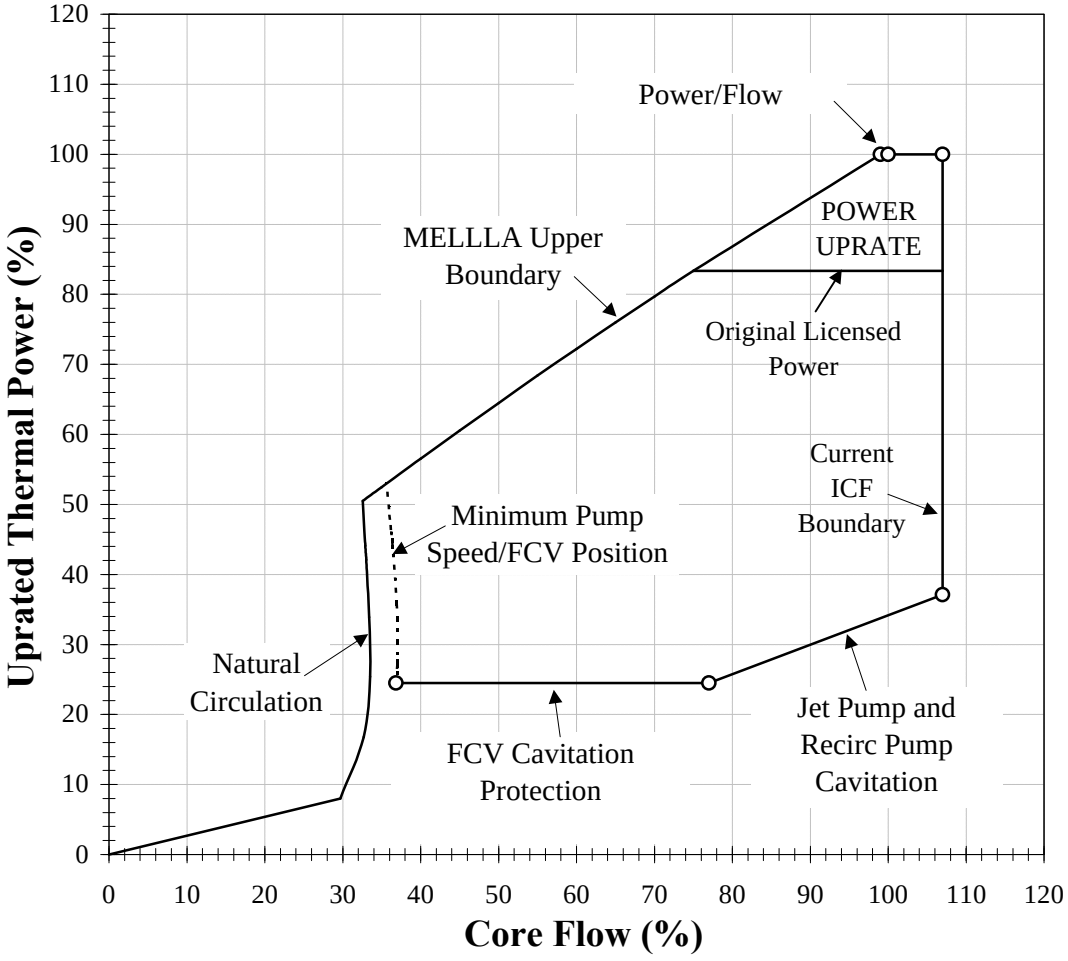

Figure 1-1. Typical CPPU-Based Power Uprate Power/Flow Map

2.0 REACTOR CORE AND FUEL PERFORMANCE

Principal evaluations associated with the Reactor Core and Fuel Performance have been reviewed and assigned one of the two disposition categories:

- Generic assessment
- Plant-specific evaluation

The applicability of the generic assessments for a specific plant application will be evaluated. The plant-specific submittal will either document the successful confirmation of the generic assessment or provide a plant-specific evaluation if the applicability assessment is unsuccessful. The plant-specific evaluations will be reported in the plant-specific submittal consistent with the level of detail of previous extended power uprate submittals.

3.0 REACTOR COOLANT AND CONNECTED SYSTEMS

Principal evaluations associated with the Reactor Coolant and Connected Systems have been reviewed and assigned one of the two disposition categories:

- Generic assessment
- Plant-specific evaluation

The applicability of the generic assessments for a specific plant application will be evaluated. The plant-specific submittal will either document the successful confirmation of the generic assessment or provide a plant-specific evaluation if the applicability assessment is unsuccessful. The plant-specific evaluations will be reported in the plant-specific submittal consistent with the level of detail of previous extended power uprate submittals.

4.0 ENGINEERED SAFETY FEATURES

Principal evaluations associated with the Engineered Safety Features have been reviewed and assigned one of the two disposition categories:

- Generic assessment
- Plant-specific evaluation

The applicability of the generic assessments for a specific plant application will be evaluated. The plant-specific submittal will either document the successful confirmation of the generic assessment or provide a plant-specific evaluation if the applicability assessment is unsuccessful. The plant-specific evaluations will be reported in the plant-specific submittal consistent with the level of detail of previous extended power uprate submittals.

5.0 INSTRUMENTATION AND CONTROL

Principal evaluations associated with the Instrumentation and Control have been reviewed and assigned one of the two disposition categories:

- Generic assessment
- Plant-specific evaluation

The applicability of the generic assessments for a specific plant application will be evaluated. The plant-specific submittal will either document the successful confirmation of the generic assessment or provide a plant-specific evaluation if the applicability assessment is unsuccessful. The plant-specific evaluations will be reported in the plant-specific submittal consistent with the level of detail of previous extended power uprate submittals.

6.0 ELECTRICAL POWER AND AUXILIARY SYSTEMS

Principal evaluations associated with the Electrical Power and Auxiliary Systems have been reviewed and assigned one of the two disposition categories:

- Generic assessment
- Plant-specific evaluation

The applicability of the generic assessments for a specific plant application will be evaluated. The plant-specific submittal will either document the successful confirmation of the generic assessment or provide a plant-specific evaluation if the applicability assessment is unsuccessful. The plant-specific evaluations will be reported in the plant-specific submittal consistent with the level of detail of previous extended power uprate submittals.
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7.0 POWER CONVERSION SYSTEMS

Principal evaluations associated with the Power Conversion Systems have been reviewed and assigned one of the two disposition categories:

- Generic assessment
- Plant-specific evaluation

The applicability of the generic assessments for a specific plant application will be evaluated. The plant-specific submittal will either document the successful confirmation of the generic assessment or provide a plant-specific evaluation if the applicability assessment is unsuccessful. The plant-specific evaluations will be reported in the plant-specific submittal consistent with the level of detail of previous extended power uprate submittals.

8.0 RADWASTE AND RADIATION SOURCES

Principal evaluations associated with the Radwaste and Radiation Sources have been reviewed and assigned one of the two disposition categories:

- Generic assessment
- Plant-specific evaluation

The applicability of the generic assessments for a specific plant application will be evaluated. The plant-specific submittal will either document the successful confirmation of the generic assessment or provide a plant-specific evaluation if the applicability assessment is unsuccessful. The plant-specific evaluations will be reported in the plant-specific submittal consistent with the level of detail of previous extended power uprate submittals.

9.0 REACTOR SAFETY PERFORMANCE EVALUATIONS

Principal evaluations associated with the Reactor Safety Performance Evaluations have been reviewed and assigned one of the two disposition categories:

- Generic assessment
- Plant-specific evaluation

The applicability of the generic assessments for a specific plant application will be evaluated. The plant-specific submittal will either document the successful confirmation of the generic assessment or provide a plant-specific evaluation if the applicability assessment is unsuccessful. The plant-specific evaluations will be reported in the plant-specific submittal consistent with the level of detail of previous extended power uprate submittals.

10.0 OTHER EVALUATIONS

Principal evaluations associated with Other Evaluations have been reviewed and assigned one of the two disposition categories:

- Generic assessment
- Plant-specific evaluation

The applicability of the generic assessments for a specific plant application will be evaluated. The plant-specific submittal will either document the successful confirmation of the generic assessment or provide a plant-specific evaluation if the applicability assessment is unsuccessful. The plant-specific evaluations will be reported in the plant-specific submittal consistent with the level of detail of previous extended power uprate submittals.

11.0 LICENSING EVALUATIONS

This section addresses the evaluations in Chapter 11 of the current plant power uprate submittals except for plant unique items, which are dispositioned in Section 10. The licensing evaluations addressed in this section include:

- Effect on Technical Specifications
- Environmental Assessment
- Significant Hazards Consideration Assessment

11.1 EFFECT ON TECHNICAL SPECIFICATIONS

Implementation of CPPU requires revision of a number of the Technical Specifications. A list of Technical Specification changes will be included in the plant-specific submittal.

11.2 ENVIRONMENTAL ASSESSMENT

Each license amendment request will have its own environmental assessment. The following is generic input to this assessment for CPPU. Plant-specific assessments may reference all or a part of the following. These plant-specific assessments will accompany the plant-specific submittal.

The environmental effects of CPPU will be controlled at the same limits as for the current analyses. Normally, none of the present limits for plant environmental releases will be increased as a consequence of uprate. Nonradioactive environmental discharges increase very slightly due to CPPU. Liquid discharges may be slightly warmer and/or have small increases in dissolved and suspended solids. There is essentially no change in the non-radiological atmospheric releases.

CPPU has no significant effect on the nonradiological elements of concern, and the plant will be operated in an environmentally acceptable manner as established by the Final Environmental Statement. Existing Federal, State and local regulatory permits presently in effect will usually accommodate CPPU without modification. The makeup water sources requirements are not increased beyond the present Environmental Protection Plan. Effects to air, water, and land resources are nonexistent.

There may be very slight increases in the radionuclides released to the environment through gaseous and liquid effluents, but well within design and regulatory limits. This will be confirmed in the plant-specific submittal. The quantity of spent fuel will not be significantly affected by the uprate. The short-term radioactivity level will be slightly higher, but still below the previously established limits. The effect of CPPU will be insignificant, subject to the above confirmatory check, and the normal effluents and doses will remain well within 10CFR20 and 10CFR50, Appendix I limits.

For plants with a cooling tower, operation at CPPU will require slightly increased cooling tower makeup water flow due to expected changes in tower evaporation and potential system blowdown. Accordingly, intake velocities at the intake structure to the plant will change slightly.

The proposed CPPU does not require a change to the Environmental Protection Plan or constitute an unreviewed environmental question because it does not involve:

- A significant increase in any adverse environmental effect previously evaluated in the final statement, environmental effect appraisals, or in any decisions of the Atomic Safety and Licensing Board; or
- A significant change in effluents; or
- A matter not previously reviewed and evaluated in the documents specified above which may have a significant adverse environmental effect.

The evaluations also establish that CPPU qualifies for a categorical exclusion not requiring an environmental review in accordance with 10CFR51.22(c)(9) because it does not:

- Involve a significant hazard, or
- Result in a significant increase in the amounts of any effluents that may be released offsite; or
- Result in a significant increase in individual or cumulative occupational radiation exposure.

11.3 SIGNIFICANT HAZARDS CONSIDERATION ASSESSMENT

Each license amendment request will have its own significant hazards consideration assessment. The following is generic input to this significant hazards assessment for CPPU. Plant-specific assessments may reference all or a part of the following. These plant-specific assessments will accompany the plant-specific submittal.

Increasing the power level of nuclear power plants while maintaining the reactor pressure can be done safely within plant-specific limits, and is a highly cost effective way to increase the installed electricity generating capacity.

The power uprate submittal will provide all significant safety analyses and evaluations to justify increasing the licensed thermal power up to 120% of the Original Licensed Thermal Power (OLTP).

11.3.1 Modification Summary

An increase in electrical output of a BWR plant is primarily accomplished by generation and supply of higher steam flow to the turbine generator. Continuing improvements in the analytical techniques (computer codes and data) based on several decades of BWR safety technology, plant performance feedback, and improved fuel and core designs have resulted in a significant increase in the design and operating margins between calculated safety analysis results and the licensing limits. These available safety analysis improvements, combined with

the excess as-designed equipment, system and component capabilities, provide BWR plants the capability to increase their thermal power ratings with no significant increase in the hazards presented by the plant as approved by the NRC at the original license stage. An increase in the thermal power rating of up to 20% can be usually accomplished without major Nuclear Steam Supply System (NSSS) hardware modifications, and can be done with limited non-safety hardware modifications.

The plan for achieving higher power is to expand the power flow map by extending the standard Maximum Extended Load Line Limit Analysis (MELLLA) upper boundary and the maximum core flow line to the uprated power. However, there is no increase in the maximum core flow or operating pressure over the pre-uprate values. For CPPU operation, the plant already has or can readily be modified to have adequate control over inlet pressure conditions at the turbine, to account for the larger pressure drop through the steam lines at higher steam flow and to provide sufficient pressure control and turbine flow capability.

11.3.2 Discussions of Issues Being Evaluated

Plant performance and responses to hypothetical accidents and transients have been analyzed for a power uprate license amendment. This section summarizes the safety significant plant reactions to events analyzed for licensing the plant, and the potential effects on various margins of safety, and thereby concludes that no significant hazards consideration will be involved.

11.3.2.1 Uprate Analysis Basis

The CPPU safety analyses are based on a Regulatory Guide 1.49 power factor times the uprated power level, except for some analyses that are performed at nominal uprated power, either because the Regulatory Guide 1.49 power factor is already accounted for in the analysis methods or Regulatory Guide 1.49 does not apply (e.g., ATWS and SBO events).

11.3.2.2 Margins

The above CPPU safety analysis basis ensures that the power dependent margins prescribed by the Code of Federal Regulations (CFR) are maintained by meeting the appropriate regulatory criteria. NRC-accepted computer codes and calculational techniques are used for the evaluations that demonstrate meeting the acceptance criteria. Similarly, design margins specified by application of the American Society of Mechanical Engineers (ASME) design rules are maintained, as are other margin ensuring criteria used to judge the acceptability of the plant. Environmental margins are maintained by not increasing any of the present limits for releases.

11.3.2.3 Fuel Thermal Limits

The current fuel design limits will still be met at the uprated power level. Analyses for each fuel reload will continue to meet the criteria accepted by the NRC as specified in Reference 3 or otherwise approved in the Technical Specification amendment request. In addition, future fuel designs will meet acceptance criteria approved by the NRC.

11.3.2.4 Makeup Water Sources

The BWR design concept includes a variety of ways to pump water into the reactor vessel to deal with all types of events. There are numerous safety related and non-safety related cooling water sources. The safety related cooling water sources alone maintain core integrity by providing adequate cooling water. There are high and low pressure, high and low volume, safety and non-safety grade means of delivering water to the vessel. These means include at least:

- Feedwater and condensate system pumps
- Low pressure emergency core cooling system (LPCI & CS/LPCS) pumps
- High pressure emergency core cooling system (HPCI or HPCS) pump
- Reactor core isolation cooling (RCIC) pump
- Standby liquid control (SLC) pumps
- Control rod drive (CRD) pumps.

Many of these diverse water supply means are redundant in both equipment and systems.

CPPU does not result in an increase or decrease in the available water sources, nor does it change the selection of those assumed to function in the safety analyses. NRC-approved methods were used to evaluate the performance of the Emergency Core Cooling Systems (ECCS) during postulated loss-of-coolant accidents (LOCA).

CPPU results in an increase in decay heat and, thus, the core cooling time to reach cold shutdown requires more time. However, this is not a safety concern, and the existing cooling capacity can bring the plant to cold shutdown within an acceptable time span.

11.3.2.5 Design Basis Accidents

Design Basis Accidents (DBAs) are very low probability hypothetical events whose characteristics and consequences are used in the design of the plant, so that the plant can mitigate their consequences to within acceptable regulatory limits. For BWR licensing evaluations, capability is demonstrated for coping with the range of hypothetical pipe break sizes in the largest recirculation, steam, and feedwater lines, a postulated break in one of the ECCS lines, and the most limiting small lines. This break range bounds the full spectrum of large and small, high and low energy line breaks; and demonstrates the ability of plant systems to mitigate the accidents while accommodating a single active equipment failure in addition to the postulated LOCA. Several of the most significant licensing assessments are based on the LOCA and include:

- Challenges to Fuel (ECCS Performance Analyses) (Regulatory Guide 1.70 and SAR Section 6.3) in accordance with the rules and criteria of 10CFR50.46 and Appendix K where the limiting criterion is the fuel Peak Clad Temperature (PCT).
- Challenges to the Containment (Regulatory Guide 1.70 and SAR Section 6.2) wherein the primary criteria of merit are the maximum containment pressure calculated during the course of the LOCA and maximum suppression (cooling) pool

temperature for long-term cooling in accordance with 10CFR50 Appendix A Criterion 38.

- DBA Radiological Consequences (Regulatory Guide 1.70 and SAR Section 15) calculated and compared to the criteria of 10CFR100.

11.3.2.6 Challenges to Fuel

Emergency Core Cooling Systems are described in Section 6.3 of the plant Updated Final Safety Analysis Report (UFSAR). CPPU will have only a minor effect on the PCT consequences of a LOCA. The ECCS performance evaluation demonstrates the continued conformance to the acceptance criteria of 10CFR50.46. The licensing safety margin is not affected by CPPU. The increased PCT consequences for CPPU are insignificant compared to the amount by which the results are below the regulatory criteria. Therefore, the ECCS safety margin is not significantly affected by CPPU.

11.3.2.7 Challenges to the Containment

The CPPU peak values for containment pressure and temperature meet regulatory requirements and, therefore, confirm the suitability of the plant for operation at uprated power. The effect of CPPU on the conditions that affect the containment dynamic loads also meet requirements. Where plant conditions with CPPU are within the range of conditions used to define the current dynamic loads, current safety criteria are met and no further structural analysis is required. Otherwise, the structure was evaluated to ensure that the safety criteria are met. The change in short-term containment response is negligible. Because there is more residual heat with CPPU, the containment long-term response is slightly more severe. However, containment pressures and temperatures remain below their design limits following any DBA, and, thus, the containment and its cooling systems are judged to be satisfactory for CPPU operation.

11.3.2.8 Design Basis Accident Radiological Consequences

The magnitude of the potential radiological consequences is dependent upon the quantity of fission products released to the environment, the atmospheric dispersion factors and the dose exposure pathways. The atmospheric dispersion factors and the dose exposure pathways do not change. Therefore, the only factor that could influence the magnitude of the consequences is the quantity of activity released to the environment. This quantity is a product of the activity released from the core and the transport mechanisms between the core and the effluent release point. For most DBAs, the radiological releases under CPPU are expected to increase proportional to the core inventory increase.

The radiological consequences of LOCA inside containment, Main Steam Line Break Accident (MSLBA) outside containment, Instrument Line Break Accident (ILBA), Control Rod Drop Accident (CRDA) and Fuel Handling Accident (FHA) are reevaluated for CPPU. The radiological results for all accidents remain below the applicable regulatory limits for the plant, assuring that all radiological safety margins are maintained.

11.3.2.9 Anticipated Operational Occurrence Analyses

Anticipated Operational Occurrences (AOOs) are evaluated against the Safety Limit Minimum Critical Power Ratio (SLMCPR). The SLMCPR is determined using NRC-approved methods. The most limiting transient is slightly more severe when initiated from the uprate power level, and may result in a slightly larger change in CPR than that initiated from the current power level. The limiting transients are core specific and are analyzed for each reload fuel cycle. Licensing acceptance criteria will be met. Therefore, the margin of safety is not affected by CPPU.

11.3.2.10 Combined Effects

CPPU analyses use fuel designed to current NRC-approved criteria and the plant is operated within NRC-approved limits to produce more power in the reactor, and thus, increases steam flow to the turbine. NRC-approved design criteria are used to ensure equipment mechanical performance safety at uprated conditions. Scram frequency is maintained by small adjustments to reactor instrumentation. These adjustments are attributed to the small changes in the reactor operating conditions. DBAs are hypothesized to evaluate challenges to the fuel, containment and off-site dose limits. These challenges are evaluated separately in accordance with conservative regulatory procedures such that the separate effects are more severe than any combined effects. The off-site dose evaluation specified by Regulatory Guide 1.3 and SRP-15.6.5 provides a more severe DBA radiological consequences scenario than the combined effects of the hypothetical LOCA, which produces the greatest challenge to the fuel and/or containment. That is, the DBA, which produces the highest PCT and/or containment pressure, does not damage large amounts of fuel, and thus, the source terms and doses are much smaller than those postulated in conformance with Regulatory Guide 1.3 evaluations.

11.3.2.11 Non-LOCA Radiological Release Accidents

All of the other radiological releases discussed in Regulatory Guide 1.70 and UFSAR Chapters 11 and 15 are either unchanged because they are not power-dependent, or increase at most by the amount of the uprate.

11.3.2.12 Equipment Qualification

Plant equipment and instrumentation have been evaluated against the applicable criteria. Significant groups/types of the equipment have been justified for CPPU by generic evaluations. Some of the qualification testing/justification at the current power level was done at more severe conditions than the minimum required. In some cases, the qualification envelope did not change significantly due to power uprate. Where the qualification envelope changes, the equipment or instrumentation will be evaluated to assure their acceptability for the new environment.

11.3.2.13 Balance-of-Plant

Balance-of-Plant (BOP) systems/equipment used to perform safety related and normal operation functions have been reviewed for CPPU in a manner comparable to that for safety

related NSSS systems/equipment. This included, but was not necessarily limited to, all or portions of the main steam, feedwater, turbine, condenser, condensate, essential and non-essential service water, emergency diesel generator, BOP piping, and support systems.

11.3.2.14 Environmental Consequences

The environmental effects of CPPU will be controlled below the same limits as for the current power level. That is, none of the present environmental release limits are increased as a result of CPPU. A management procedure will be in place for all environmental limits with which the plant is presently required to comply. The current environmental release margins are thereby maintained.

11.3.2.15 Technical Specifications Changes

The Technical Specifications ensure that plant and system performance parameters are maintained within the values assumed in the safety analyses. That is, the Technical Specifications parameters (setpoints, allowable values, operating limits, etc.) are selected such that the actual equipment is maintained equal to or more conservative than the assumptions used in the safety analyses. Plant-specific Technical Specifications changes are provided with the plant-specific submittal. Proper account is taken for inaccuracies introduced by instrument drift, instrument accuracy, and calibration accuracy. This ensures that the actual plant responses at uprated condition are less severe than those represented by the safety analysis. Similarly, the Technical Specifications address equipment operability (availability) and put limits on equipment out-of-service (not available for use) times such that the plant can be expected to have at least the complement of equipment available to mitigate abnormal plant events assumed in the safety analyses. Because the safety analyses for CPPU show that the results are acceptable within regulatory limits, there is no undue risk to public health and safety. Technical Specifications changes consistent with the CPPU level are made in accordance with methodology approved for the plant and continue to provide a comparable level of protection as Technical Specifications previously issued by the NRC.

11.3.3 Assessment of 10CFR50.92 Criteria

10CFR50.91(a) states “At the time a licensee requests an amendment, it must provide to the Commission its analysis about the issue of no significant hazards consideration using the standards in §50.92.” The following provides this analysis for CPPU up to 120% of the original licensed thermal power.

1) Will the change involve a significant increase in the probability or consequences of an accident previously evaluated?

The increase in power level discussed herein will not significantly increase the probability or consequences of an accident previously evaluated.

The probability (frequency of occurrence) of DBA occurring is not affected by the increased power level, because the plant still complies with the regulatory and design basis criteria established for plant equipment (ASME code, IEEE standards, NEMA standards, Reg. Guide

criteria, etc.). An evaluation of the BWR probabilistic safety assessments concludes that the calculated core damage frequencies do not significantly change due to Constant Pressure Power Uprate (CPPU). Scram setpoints (equipment settings that initiate automatic plant shutdowns) are established such that there is no significant increase in scram frequency due to power uprate. No new challenge to safety-related equipment results from CPPU.

The changes in consequences of hypothetical accidents, which would occur from 102% of uprated power compared to those previously evaluated, are in all cases insignificant. The CPPU accident evaluations do not exceed any of their NRC-approved acceptance limits. The spectrum of hypothetical accidents and abnormal operational occurrences has been investigated, and shown to meet the plant's currently licensed regulatory criteria. In the area of core design, for example, the fuel operating limits such as Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) and Safety Limit Minimum Critical Power Ratio (SLMCPR) are still met, and fuel reload analyses will show plant transients meet the criteria accepted by the NRC as specified in Reference 3. Challenges to fuel (ECCS performance) are evaluated, and shown to still meet the criteria of 10CFR50.46 and Appendix K, and Regulatory Guide 1.70 SAR Section 6.3. Challenges to the containment have been evaluated, and the containment and its associated cooling systems meet 10CFR50 Appendix A Criterion 38, "Long Term Cooling", and Criterion 50, "Containment". Radiological release events (accidents) have been evaluated, and meet the guidelines of 10CFR100 Regulatory Guide 1.70 SAR Chapter 15 or plant-specific acceptance limits.

2) Will the change create the possibility of a new or different kind of accident from any accident previously evaluated?

As summarized below, this change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

Equipment that could be affected by CPPU has been evaluated. No new operating mode, safety related equipment lineup, accident scenario or equipment failure mode was identified. The full spectrum of accident considerations, defined in Regulatory Guide 1.70, has been evaluated, and no new or different kind of accident has been identified. CPPU uses already developed technology, and applies it within the capabilities of already existing plant equipment in accordance with presently existing regulatory criteria to include NRC-approved codes, standards and methods.

3) Will the change involve a significant reduction in a margin of safety?

As summarized below, this change will not involve a significant reduction in a margin of safety.

The calculated loads on all affected structures, systems and components have been shown to remain within their design allowables for all design basis event categories. No NRC acceptance criteria are exceeded. Only some design and operational margins are affected by CPPU. The margins of safety currently designed into the plant are not affected by CPPU. Because the plant configuration and reactions to transients and hypothetical accidents do not result in exceeding

the presently approved NRC acceptance limits, CPPU does not involve a significant reduction in a margin of safety.

11.3.3 Conclusions

A CPPU up to 120% of original licensed thermal power has been investigated. The method for achieving higher power is to slightly increase some plant operating parameters. The plant licensing challenges have been evaluated and it has been demonstrated that this uprate can be accommodated:

- Without a significant increase in the probability or consequences of an accident previously evaluated.
- Without creating the possibility of a new or different kind of accident from any accident previously evaluated.
- Without exceeding any presently existing regulatory limits or acceptance criteria applicable to the plant, which might cause a reduction in a margin of safety.

Having arrived at negative declarations with regards to the criteria of 10CFR50.92, this assessment concludes that a CPPU up to 120% of the original licensed thermal power described herein does not involve a Significant Hazards Consideration.

12.0 REFERENCES

1. GE Nuclear Energy, “Generic Guidelines for General Electric Boiling Water Reactor Extended Power Uprate”, NEDC-32424P-A, February 1999.

2. GE Nuclear Energy, ”Generic Evaluations of General Electric Boiling Water Reactor Extended Power Uprate”, NEDC-32523P-A, February 2000, Supplement 1, Volume I, February 1999, and Supplement 1, Volume II, April, 1999.

3. GE Nuclear Energy, ”General Electric Standard Application for Reactor Fuel”, NEDE-24011-P-A and NEDE-24011-P-A-US, (latest approved revision).

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APPENDIX
ACRONYMS

Acronym	Definition
ATWS	Anticipated Transient Without Scram
BOP	Balance of Plant
BWR	Boiling Water Reactor
CFR	Code of Federal Regulations
COLR	Core Operating Limits Report
CPPU	Constant Pressure Power Uprate
CRD	Control Rod Drive
CRDA	Control Rod Drop Accident
CS	Core Spray
DBA	Design Basis Accident
DC	Direct Current
ECCS	Emergency Core Cooling System
ELTR 1	NEDC-32424P-A (Reference 1)
ELTR 2	NEDC-32523P-A (Reference 2)
EPU	Extended Power Uprate
FHA	Fuel Handing Accident
GNF	Global Nuclear Fuel
HPCI	High Pressure Coolant Injection
HPCS	High Pressure Core Spray
IEEE	Institute of Electrical and Electronic Engineers
ILBA	Instrument Line Break Accident
LOCA	Loss-of-Coolant Accident
LPCI	Low Pressure Coolant Injection
LPCS	Low Pressure Coolant Spray
LTR	Licensing Topical Report
MAPLHGR	Maximum Average Planer Linear Heat Generation Rate
MELLLA	Maximum Extended Load Line Limit Analysis

Acronym	Definition
MEOD	Maximum Extended Operating Domain
MSLBA	Main Steam Line Break Accident
NEMA	National Electric Manufactures' Association
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
OLTP	Original Licensed Thermal Power
PCS	Pressure Control System
PCT	Peak Cladding Temperature
PUSAR	Power Uprate Safety Analysis Report
RCIC	Reactor Core Isolation Cooling
RIPDs	Reactor Internal Pressure Differences
RPC	Rod Pattern Controller
RTP	Rated Thermal Power
SAR	Safety Analysis Report
SBO	Station Blackout
SLC	Standby Liquid Control
SLMCPR	Safety Limit Minimum Critical Power Ratio
SPU	Stretch Power Uprate
SRLR	Supplemental Reload Licensing Report
SRP	Standard Review Plan
UFSAR	Updated Final Safety Analysis Report