
INSPECTION PROCEDURE 71004

POWER UPRATE

PROGRAM APPLICABILITY: 2515

71004-01 INSPECTION OBJECTIVES

01.01 To verify the most risk-significant aspects of the following when applicable:

- a. That tests and experiments not described in the FSAR and changes to the facility or procedures as described in the UFSAR for power uprate were evaluated in accordance with 10 CFR 50.59 as appropriate. (02.03 a & e)
- b. That the licensee took the required actions to alleviate or prevent the affects of new or likely initiating events, in accordance with the license amendment or NRC safety evaluation (SE), that were due to changes such as higher core power densities, increased flow in primary or secondary systems including their interfacing systems, and the synergistic effects of multiple initiating events (e.g., higher primary flow rates coupled with greater fuel burnup leading to a higher probability for irradiation-induced side affects). (02.03 g)
- c. That plant modifications for power uprate are in accordance with licensing and design bases, licensee commitments, and the FSAR. (02.03 a, b, & c)
- d. That mitigating systems can initiate and perform their safety function in accordance with the time lines in new accident analyses, acceptance tests for plant modifications for power uprate, and applicable surveillance tests. (02.03 b & c)
- e. That individual components in mitigating systems that were altered or replaced can perform their intended safety function. (02.03 a, b, & c)
- f. That new operator actions (normal, abnormal, and emergency) for power uprate are administered procedurally and have an appropriate basis. Appropriate training should be provided to operators on the new procedures. (02.03 d)
- g. That the licensee monitors changes, in accordance with NRC SE, made on systems and their effects on those systems and interfacing systems including potential problems that are slow in developing and issues that could not be immediately tested (e.g., erosion corrosion or flow accelerated corrosion). (02.03 f)

01.02 To perform this inspection procedure for power uprates greater than 7.5% of current licensed thermal power, including those implemented in phases (i.e. the first power increase is less than 7.5%, but the total increase will be greater than 7.5%). Partial or complete implementation of this inspection procedure should be considered for power uprates less than 7.5% of current licensed thermal power.

71004-02 INSPECTION REQUIREMENTS AND GUIDANCE

02.01 Sample Selection. The samples selected should be inspected per the referenced baseline inspection procedures, except for those covered by this inspection procedure and IP 49001, and be risk-informed through focus on items concerning new integrated plant response characteristics, new operator procedures, and plant safety during any required tests.

- a. Select safety evaluations for modification or tests, related to the cornerstones, that are required for power uprate from the following:
 1. Changes to facility as described in UFSAR
 2. Changes to procedures as described in UFSAR
 3. Tests or experiments not described in UFSAR
- b. Select risk significant plant modifications from those implemented for the power uprate. Risk significant modifications may include by the following:
 1. Modifications which impact Emergency Core Cooling System (ECCS) initiation, or the ability of an ECCS system to mitigate an event.
 2. Modifications which could contribute to the initiation of an event following installation.
 3. Modifications which implement new equipment set points on risk significant equipment.
 4. Modifications which caused unexpected problems when installed at another plant.
- c. Select mitigating systems or components modified for power uprate for which surveillance testing or startup testing will be performed.
- d. Select integrated plant evolutions (e.g. power changes) being conducted by the licensee at the uprated power level, and observe operator actions.
- e. Review the testing portion of the approved license amendment or the NRC SE and select major tests to be monitored and evaluated (e.g. turbine load reject trip, runback, Main Steam Isolation Valve (MSIV) closure from full power, or Loss of Offsite Power).
- f. Choose risk-significant concerns identified by licensee's flow accelerated corrosion (FAC) and erosion corrosion programs which could be exacerbated by power uprate changes or evolutions.
- g. Obtain a copy of the NRC SE and review section 4.0, "Regulatory Commitments" and section 5.0, "Recommended Areas for Inspection" for any licensee actions. In addition, review any license conditions related to the power uprate.

02.02 Inspection Plan. Develop a site specific inspection plan to select and review appropriate aspects of a power uprate. The resident inspection office (RIO) and regional staff should work closely together to identify areas for inspection, and to discuss the resources required to perform the inspections. A regional extended power uprate (EPU)

point of contact should be identified by regional management early in the process. This individual should be contacted for assistance in developing the inspection plan.

- a. The inspection staff should review IP 71004 soon after the power uprate application is submitted by the licensee. The associated NRC SE should be reviewed as soon as it is available (the RIO should keep in close communication with the NRR project manager to obtain a copy). The purpose of the review is to identify changes in plant hardware, integrated plant response characteristics, operator procedures, and margins to plant safety. Per section 4.1 of Review Standard RS-001, "Review Standard for Extended Power Uprates," the recommendations in the final SE do not constitute inspection requirements, but are provided to give the inspectors insight into important bases the NRC staff used for approving the EPU.
- b. Once the IP 71004 samples are selected, the inspection staff should identify the types of resources necessary to complete IP 71004, and an estimate of schedule dates. Some inspection dates will take place before power increases above the previously licensed power setpoint, whereas some inspection may need to occur during power ascension testing, and at the new licensing limit for rated power output. To the extent possible, inspectors should evaluate plant changes and major tests prior to their implementation to ensure that plant safety is maintained.
- c. Several samples are likely suited for resident inspector skills and may suffice for baseline IP samples, but the inspection plan should consider additional resources based on resident staff workload, and conflict with other foreseeable resident staff activities. The inspection staff should utilize the Reactor Program System (RPS) to identify team inspections that may be timely in supporting IP 71004 sample requirements. Component design basis inspection and permanent plant modification teams can support IP 71004. **All planned team inspections that are selected to support completion of IP 71004 sample requirements shall be annotated as such in RPS. The designation should be done in such a way as to make inspectors and management aware of the link between the specific inspection and the associated power uprate.**
- d. Once the IP 71004 samples and resources have been identified, the inspection staff shall provide the inspection plan to the regional EPU point of contact. The sample inspection plan, provided as Attachment 2, is a recommended example. The regional EPU point of contact will review the inspection plan for IP 71004 requirements and will work with the Division of Reactor Safety (DRS) schedulers to assign all necessary resources outside of the resident inspector staff. All DRS activities should be entered into RPS.
- e. The Division of Reactor Projects (DRP) branch chief for the affected plant will review the inspection plan and request Regional Administrator approval to perform IP 71004. Approval should be obtained in conjunction with the mid-cycle or end-of-cycle reviews. This inspection procedure should be implemented when a licensee submits an amendment request for a power uprate.
- f. The DRP branch chief and RIO will track completion of IP 71004. Attachment 2, Table 1 is a sample that may be used to ensure inspection requirements will be completed, and necessary coordination obtained.

02.03 Inspection

- a. For samples selected in subsection 02.01 a implement IP 71111.17, IP 71111.18, or IP 71111.21. In IP 71111.21, the inspection sample selection evaluates the impact of extended power uprates on safety analysis margins. Some inspection will

take place before power increases above the previously licensed power setpoint, whereas testing of some modifications, power ascension testing, and integrated system testing will not be conducted until the original licensing limit for rated power output is exceeded, and the new licensing limit for rated power output approached and even reached.

- b. For samples selected in subsection 02.01b implement IP 71111.17, or IP 71111.18; and perform IP 71111.07 for heat exchangers in mitigating systems included in samples selected. Concentrate on changes to systems within the identified cornerstones for this IP, e.g., RHR system, ECCS systems, or secondary systems with changes that may adversely impact primary systems plant safety. The following list is provided to focus the inspector on changes within specific risk significant areas:
 1. Changes that impact ability of an ECCS to initiate or perform its mitigating function.
 2. Changes that introduce a new initiator (e.g. higher core power densities; increased flow in primary, secondary, or their interfacing systems; and synergistic effects).
 3. Setpoint changes on equipment. This includes the effects on design margins, instrument inaccuracy assumptions, accident analysis assumptions, and operator responses.
 4. Higher flow rates in primary systems, ECCS, or secondary systems which challenge risk-significant systems. Focus on verifying the flow rates and whether the licensee is analyzing the long term effects and adopting a means to monitor those effects in accordance with NRC SE. Preferably the inspector should witness an actual flow test when verifying flow rates but the review of flow test results is acceptable.
 5. Changes that impact the integrity of barriers, e.g. higher flow rates in a primary or secondary system which increases flow-accelerated corrosion on internal piping surfaces and vibration at specific support points which then results in increased likelihood of leaks.
 6. Changes which result in higher flow rates internal to the core/inside the reactor vessel, which can cause components to degrade/fail due to flow induced/acoustic vibrations. Licensees should be aware of industry experience regarding these issues, analyze impacts of EPU on reactor vessel components, and monitor vibrations/structural integrity of vessel components.
 7. Changes that impact heat exchanger performance.
 8. Modifications to balance of plant systems or components that could increase the likelihood of an initiating event (such as a loss of offsite power, a reactor trip, or a reactor trip without heat sink).
- c. For post-modification, post-maintenance, or surveillance tests conducted by licensee for mitigating systems or radiation barriers included in samples for subsections 02.01b and c, implement IP 71111.17, IP 71111.18, IP 71111.19, or IP 71111.22. Focus on those surveillance tests that affect core or containment cooling, higher flow rates in primary system or an ECCS, etc.

- d. Witness initial power ascension after implementing changes for power uprate and observe operator actions for samples selected for subsection 02.01d in accordance with IP 71111.20. Also as appropriate use IP 71111.11 under requalification training as a means to observe plant evolutions. The inspector should focus on those operator actions that affect risk-significant mitigating systems or radiation barriers. The inspector may also observe any modified operator actions for BOP systems that may initiate plant transient events.
- e. Witness or review test results of any major plant tests including MSIV closure. A partial test may consist of verifying the operation of control and protective circuitry for either a turbine load reject or loss of offsite power test without actually putting the plant through an actual transient or actually demonstrating excess decay heat removal. Useful inspection guidance dependent on test conditions may be found in MC 2514 and specific IPs 72580 and 72582 for PWRs and IPs 72514 and 72517 for BWRs. The inspector should evaluate the major test procedures, prior to their being performed, to ensure the test can be conducted. The inspector should also witness or review the results of any power ascension tests to ensure that the licensee correctly predicted plant response, and charge that effort to this IP (IP 71004). The NRC SE will provide guidance on major test details like installation of sensors, requisite plant conditions, and prescribed actions. Additional guidance may be obtained from MC 2514.
- f. For samples selected in subsection 02.01f, implement IP 49001 to review the licensee's erosion and FAC programs, as required, and charge that effort to this IP (IP 71004). The concerns selected can be from BOP systems if they are risk significant. If there are concerns from multiple systems, then select the one that is the most risk significant so that estimated resources for this sample will be approximately 25 hours. For assistance in selecting samples, inspectors may refer to the FAC section of the NRC SE (section 2.1.6 for Pressurized Water Reactors, and section 2.1.8 for Boiling Water Reactors).
- g. For samples selected in subsection 02.01g, verify that licensee has taken all required actions to address the effects of new or more probable initiating events as stated in license amendment, licensee commitments, or in the NRC SE, and charge that effort to the most applicable baseline IP or to this IP (IP71004) if necessary. The inspector merely confirms the sample items to verify that the licensee has performed the required actions. The inspector should not repeat the initial analysis, or the evaluation of the NRC staff.

02.04 Identification and Resolution of Problems. Verify that the licensee is identifying problems related to power uprate, at an appropriate threshold, and entering them in the corrective action program (CAP). For a selected sample of problems documented in the CAP (focusing mainly on mitigating systems), verify that the licensee has appropriately resolved the technical concerns and regulatory requirements. See Inspection Procedure 71152, "Identification and Resolution of Problems," for additional guidance.

71004-03 DOCUMENTATION

Issues will be documented as required by IMC 0612 in the integrated inspection report for the time period when the inspection occurred. Because IP 71004 integrates several baseline and other inspection procedures, the inspection scope is key in recording the NRC effort to complete IP 71004. The scope should accurately describe the activities inspected consistent with the inspection plan.

Section 4OA5, "Other," of the report should contain all IP 71004 samples that were completed, regardless of an associated baseline inspection procedure. The idea is to maintain a single inspection report entry point for all IP 71004 samples within section 4OA5. Those IP 71004 samples that also suffice for baseline inspection samples should be documented in the applicable section of the integrated inspection report, and referenced in section 4OA5. For example, a surveillance inspection activity should be primarily documented in section 1R22, "Surveillance Testing." Meanwhile, the activity should also be listed in section 4OA5 as a sample performed for IP 71004; and refer the reader to section 1R22 for more information on the details of the surveillance inspection activity.

Separately, once it has been verified that all IP 71004 sample requirements have been completed and recorded, consistent with the inspection plan, a summary of the inspection activities should be provided in section 4OA5 of the integrated inspection report. The summary should include a description of each sample, the inspection procedure used to inspect the sample, and the applicable inspection report(s) the samples were documented in. The intent is to provide a roadmap to all inspection reports that document power uprate-related inspection activities.

Findings associated with the performance of IP 71004 (including those identified through a referenced baseline procedure) should include the words "power uprate" (preferably in the title) in order to facilitate tracking and trending efforts.

71004-04 RESOURCES ESTIMATE

The estimated resource expenditure for this inspection procedure is 32 to 64 hours. This does not include the baseline inspection effort referenced by this procedure. Approximately 100-150 hours are expected to be credited towards baseline inspections as part of the normal conduct of those procedures. These estimates are provided for planning purposes only, and should not be viewed as requirements.

This inspection procedure integrates the results of several baseline inspection procedures being performed under the established risk-informed baseline inspection program and that are related to plant modifications and testing associated with an approved increase in licensed reactor power. Most inspection activities for a power uprate should be conducted within the normal resource constraints of the baseline procedures being implemented. The types of samples selected for those baseline procedures should be as stated in this inspection procedure. Whenever possible, the sample size stated in that particular baseline procedure should be adhered to on an annualized basis.

The intent is not to redirect baseline inspection efforts, but to complete the requirements of this inspection procedure concurrently when possible. Every effort should be made to schedule baseline inspection procedures that have a frequency of greater than annually to coincide with the licensee's EPU activities. However, scheduling of such inspections, and the allotment of required resources, remains the discretion of regional management.

This inspection should be performed by inspectors (e.g., engineering specialists) knowledgeable in the affected subject areas.

71004-05 COMPLETION STATUS

Inspection of the minimum number of samples required to demonstrate that power uprate can be achieved in a safe manner will constitute completion of this procedure in the RPS.

That minimum sample size consists of at least one sample, if available, of each of the following: licensee safety evaluations; plant modifications; post-modification, post-maintenance, or surveillance tests; integrated plant evolutions; risk-significant concerns for FAC and erosion corrosion programs; licensee actions for addressing new or likely initiating events for power uprate; and any of the major integrated tests conducted by licensee to verify the safety functions of systems affected by power uprate.

71004-06 REFERENCES

NRC Inspection Manual Part 9900, "10 CFR 50.59 Changes, Tests, and Experiments"

IP 49001, "Inspection of Erosion/Corrosion Monitoring Programs"

IP 71111.07, "Heat Sink Performance"

IP 71111.11, "Licensed Operator Requalification Program"

IP 71111.17, "Evaluations of Changes, Tests, or Experiments and Permanent Plant Modifications"

IP 71111.18, "Plant Modifications"

IP 71111.19, "Post Maintenance Testing"

IP 71111.20, "Refueling and Other Outage Activities"

IP 71111.21, "Component Design Bases Inspection"

IP 71111.22, "Surveillance Testing"

IP 71152, "Identification and Resolution of Problems"

IP 72514, "Startup Test Procedure Review Turbine TrIP/Generator TrIP"

IP 72517, "Startup Test Procedure Review: Loss of Offsite Power (Group A & B)"

IP 72580, "Power Ascension Test Procedure Review Turbine TrIP or Generator TrIP"

IP 72582, "Power Ascension Test Procedure Review: Loss of Offsite Power (Group A & B)"

MC 2514, "Light Water Reactor Inspection Program Startup Testing Phase"

MC 2514, Appendix A, "Startup Test Program Inspection Procedures"

Review Standard RS-001, "Review Standard for Extended Power Uprates"

END

ATTACHMENT 1

Revision History for IP 71004

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
NA	05/09/06	Revision history reviewed for the last four years	NA	NA	NA
NA	05/09/06	<u>IP 71004</u> (Power Uprate) has been revised to indicate that Component Design Bases inspections (IP 71111.21) are used to evaluate the impact of extended power uprates on safety analysis margins. New inspection guidance for evaluating higher flow rates internal to the core and inside the reactor vessel, which can cause components to degrade or fail due to vibrations.	None	NA	ML061240247
NA	07/01/08 CN 08-019	<u>IP 71004</u> (Power Uprate) has been revised to address concerns identified during the OIG 2007 audit of the Power Uprate process by providing guidance on planning, tracking, and documenting completion of IP 71004. In addition, previously provided guidance was moved to Section 02, "Inspection Requirements and Guidance," and referenced baseline procedures were changed to reflect the 2007 ROP realignment.	None	NA	ML081680243

NA	02/02/09 CN 09-004	<u>IP 71004</u> (Power Uprate) has been revised to require all IPs related to power uprates to be clearly designated as such in RPS.	None	NA	N/A
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Attachment 2

Example EPU Inspection Plan

Background:

In month, year, the NRC accepted a power uprate license amendment application from licensee for plant name. The proposed amendment will increase the thermal power output of plant name from xxxx megawatts thermal (MWt) to xxxx MWt, which is an increase of approximately xx percent. The power level increase is considered an extended power uprate (EPU), and is within the scope of Inspection Procedure 71004, "Power Uprate." It is projected that plant name will implement the EPU in month, year, following NRC approval of the license amendment. To facilitate the power increase, licensee has installed, or plans to install the following modifications:

Modifications and expected schedule dates.

Inspection Requirements:

NRC Inspection Procedure 71004, "Power Uprate," requires several samples for inspection. Table 1 provides an inspection schedule. Some inspection samples will be determined following a review of the NRC Safety Evaluation Report which is projected to be issued in month, year.

Resource Recommendations:

As shown in Table 1, the inspection activities for IP 71004 will be an integrated effort utilizing the resident staff, DRS specialists, and inspection teams. Table 1 lists the minimum required inspection activities, as well as a recommendation as to who should perform those inspections. The resource expenditure for IP 71004 is 32 to 64 hours, without regard to the number of units at a site and does not include the baseline inspection effort. Approximately 100-150 hours are expected to be credited towards baseline inspection procedures.

Regional Administrator Approval

Approval to perform this procedure occurred at the mid-cycle/end-of-cycle review
Dated _____.

TABLE 1

Inspectable Area	Inspection Procedure to be Used	Inspection to be Performed by	Minimum Inspection Samples per IP 71004 and/or NRC SE	Projected Inspection Hours	Notes
1. Safety Evaluations	71111.17, 71111.18, or 71111.21	DRS Permanent Mods Team (if timely) or DRS inspector	71004: 1 safety eval (Section 02.01.a.) NRC SE: x (Section 5.x)	Charged to 71111.17, managed by DRS team lead/inspector consistent w/baseline	(Example) 50.59 inspection team scheduled for 7/16/2008. XXGS should provide list of completed safety evaluations and NRC team should pick two EPU related safety evaluations for inspection. The XXGS CDBI team scheduled for 10/2007 will sample components with low margin that may be affected by EPU. EOP and abnormal operating procedure changes for new operator actions or time lines are suggested samples. Operator actions are described in several sections of the NRC SER and section 2.11 is devoted to Human Performance. LICENSEE plans to have completed changes to Operations procedures by 2/15/2008. COMPLETE.
2. Plant Modifications	71111.17 or 71111.18 with 71111.07	DRS Permanent Mods Team (if timely) or DRS inspector	71004: 1 plant mod (Section 02.01.b.) NRC SE: x (Section 5.x)	Charged to 71111.17, managed by DRS team lead/inspector consistent w/baseline	(Example) Mods inspection team scheduled for 7/16/2008. COMPLETE.
3. Post-Maintenance or Surveillance Tests	71111.17, 71111.18, 71111.19, or 71111.22	Resident staff	71004: 1 PMT or ST (Section 02.01.c.) NRC SE: x (Section 5.x)	Charged to 71111.19 or 71111.22 Baseline estimates: Att 19 3.5hrs/sample Att 22 6hrs/sample	(Example) Residents will inspect STs during plant startup. PMTs on RFP upgrade recommended. Residents will review SER in June, 2008 for recommendations. Applies to mitigating systems or barriers. Update: NRC SER will not be available until late 2008 or early 2009. Residents plan to complete this section during RFX in October 2008.

<p>4. Integrated plant operations at the uprated power level</p>	<p>71004 with 71111.11 or 71111.20</p>	<p>Resident staff DRS staff to specifically review system vibration testing</p>	<p>71004: 1 integrated plant evolution (Section 02.01.d.) NRC SE: x (Section 5.x)</p>	<p>Charged to 71004, managed by RIO. 71004 estimated integrated resources are 32 to 64 hours without regard to the number of units at a site and all activities charged to 71004 should be managed by the RIO.</p>	<p>(Example) Witness power ascension activities above current rated thermal power. LICENSEE plans to have the IPTE for plant startup available by 4/2/2008. Residents will review IPTE and follow during execution. Involve DRS to verify LICENSEE has adequately evaluated system vibrations at the higher power levels. Update: This section will be executed in two portions. The first during power ascension following RFXX which will only be to CLTP of XXXX MWt. The second will be during spring 2008 when LICENSEE uprates from 100% to approx 115% of CLTP. This is due to delay in approval of EPU license amendment.</p> <p>DRS: Joe Inspector is the DRS POC and is inspecting FAC and vibration related issues associated with EPU. FAC work will be completed in RFXX. Vibration issues will be inspected in RFXX and during EPU power ascension activities in 2008. Action Req'd: DRS resources need to be reserved for this activity when LICENSEE communicates a set date.</p> <p>Residents will review the following documents and tests in reference to this row and rows 5 & 7: 1. DCP 80048085, Supp 19 "XXGS Extended Power Uprate Implementation & Power Ascension Test Plan" 2. ER-AA-2003, Rev. 5, "EPU System Performance & Monitoring Plans" 3. XXGS.OP-FT.ZZ-0004, Rev. 0, "Extended Power Uprate Power Ascension testing"</p>
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<p>5. Monitor major integrated tests</p>	<p>71004</p>	<p>Resident staff</p>	<p>71004: 1 major integrated test (Section 02.01.e.) NRC SE: x (Section 5.x)</p>	<p>Power ascension tests should be charged to 71004. Major integrated tests that do not also fall into power ascension tests should be charged to the most applicable baseline IP, or 71004 if necessary.</p>	<p>(Example) Residents will review NRC SER when available in June 2008. Update: LICENSEE submitted one integrated test procedure to the resident staff on 10/23/2008. Residents will review procedure and observe portions of the testing during power ascension in RFX and during EPU power ascension testing in spring 2009.</p>
<p>6. Flow accelerated corrosion and erosion corrosion program reviews</p>	<p>49001</p>	<p>DRS inspector</p>	<p>71004: 1 risk-significant concern for each program (Section 02.01.f) NRC SE: x (Section 5.x)</p>	<p>Charged to 71004, managed by RIO. 71004 estimated integrated resources are 32 to 64 hours without regard to the number of units at a site and all activities charged to 71004 should be managed by the RIO.</p>	<p>(Example) Coordinate with DRS to perform inspection. Action Req'd: DRS resources need to be reserved for this activity.</p>
<p>7. Licensee actions for new or more likely initiating events</p>	<p>71004</p>	<p>Resident staff</p>	<p>71004: 1 (Section 02.01.g) NRC SE: x (Section 5.x)</p>	<p>Charged to the most applicable baseline IP, or 71004 if necessary.</p>	<p>(Example) Residents to review SER in June 2008 to determine impact, if any. Residents will also review operator training in the simulator. Update: residents will review NRC SER when it becomes available. SER not available as of 10/23/2008.</p>