

BWR OWNERS' GROUP

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NRC Project 691

BWROG-04016

May 7, 2004

US Nuclear Regulatory Commission

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**SUBJECT: *BWR OWNERS' GROUP EXTENDED POWER UPRATE (EPU) COMMITTEE
RESOLUTION OF EPU INDUSTRY CONCERN STATUS REPORT***

Attachment: Integrated Industry Schedule for Resolution of BWR Extended Power Uprate Issues

The purpose of this transmittal is to provide to the NRC staff the results and conclusions from the BWROG EPU Survey and evaluation of the INPO Power Uprate and Cycle Extension Database. In addition, an integrated industry schedule for resolution of BWR EPU issues is attached.

The BWROG has evaluated survey responses from 13 BWR plants that have significant operational experience at power levels greater than 105% of the original plant licensed power. As of February 2004, these plants had accumulated a total of 543 months of operating experience at extended power levels. This experience ranges from a low of 10 months up to a maximum of 130 months at a European BWR. The median operating experience at EPU for these BWR plants is 26 months.

The BWROG survey showed that EPU adversely impacted 2 BWR plants unplanned capability loss factor (UCLF) in the period immediately following implementation; whereas, the UCLF improved at 2 BWR plants following implementation of EPU. For the other 9 BWRs, the UCLF was not significantly affected by implementation of EPU.

The 13 BWRs surveyed reported a total of 17 component failures which were almost all related to flow-induced vibrations in main steam, feedwater, and EHC systems. Eight (8) of these failures involved steam dryer components at 4 BWR plants. Five (5) of the 13 plants reported no component failures that could be attributed to implementation of EPU. The other failures that were not related to flow-induced vibrations in main steam, feedwater, and EHC systems included:

- Seizure of stator cooling water pump (design issue for replacement larger pump with different coupling and seals)
- Reactor feed pump governor linkage galled not allowing speed feedback to reactor water level control (alternate pump experienced an identical failure pre-EPU)
- Main transformer sudden pressure relay (similar failures have been observed at other plants in the industry)

It is noted that implementation lessons learned captured from the BWROG EPU Survey will provide benefit to those plants that will implement EPU in the future.

The INPO Power Uprate and Cycle Extension Database contains 103 events for the time period from 1992 through January 2004. This database includes BWRs and PWRs, and power uprates from small measurement uncertainty uprates to extended power uprates. The BWROG screened these events and determined that power uprates directly or indirectly contributed to 52 events, which the BWROG grouped into the following categories:

- 15 due to vibration
- 18 due to instrument calibration problems
- 12 due to operational procedure deficiencies
- 5 due to pre-existing condition, installation errors, defective components, or miscellaneous
- 2 due to erosion / corrosion

The BWROG has determined that none of these events prevented plant shutdown or impacted ECCS capability; therefore, these events have not impacted plant safety.

The BWROG considers the events categorized as due to vibration and erosion / corrosion to be the focus of the EPU concerns due to the resulting component degradation / failure. These events include:

Vibration Events

- BWR-4 socket weld failure on GEZIP skid
- BWR-4 steam dryer damage
- BWR-3 steam dryer damage [4 events]
- BWR-4 recirc pump (vibration and improperly seated testable check valve)
- BWR-3 EHC turbine control valve accumulator leaks
- BWR-4 broken extraction steam line led to feedwater heater tube failures
- BWR-5 feedwater heater tube leaks
- BWR-4 degraded feedwater heater level control valve
- BWR-3 MSL drain line failure
- BWR-4 EHC system leaks
- BWR-4 EHC excessive vibration
- BWR-3 turbine stop valve pressure switches

Erosion / Corrosion

- BWR-4 feedwater heater wall thinning and tube support damage
- BWR-4 feedwater heater steam leak

Because of the high percentage of events caused by vibration, a vibration monitoring and evaluation information exchange meeting has been scheduled for June 2004. Lessons learned and recommendations derived from this meeting along with recommendations regarding erosion / corrosion issues will be documented in BWROG Extended Power Uprate recommendations and guidance.

Industry events for the remaining categories, while not desired or anticipated, are not unique to EPU nor caused by EPU operating parameters. However, applicable lessons learned from these events will be

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captured by the BWROG. It is noted that most of the remaining events were caused by inadequate calibrations or revised operational procedures.

In addition, the BWROG plans to formally include the lessons learned from the BWROG EPU Survey and the INPO Power Uprate and Cycle Extension Database in recommendations and guidance to assist those that have not yet implemented EPU.

The enclosed schedule describes the comprehensive ongoing industry activities that are expected to resolve EPU concerns. Please be aware that the schedule for most of this work is not being controlled by the BWROG and revisions to the scheduled completion dates may occur. In addition, some plants may pursue an accelerated schedule for resolving the industry issues on a plant-specific basis. If you desire to discuss this information in more detail, please contact the undersigned.

Very truly yours,



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Extended Power Uprate Integrated Schedule

BWR Owners' Group EPU Committee

Industry EPU Integrated Schedule
Revision 3

May 7, 2004

Exelon and GE - Evaluation for Extent of Condition

Task	Responsibility	Scheduled Completion
EPU Extent of Condition Evaluation for Dresden and Quad Cities	GE/Exelon	May 28, 2004
Modify GE Process for EPU Evaluations as Required	GE	June 2004

BWRVIP and GE Initiatives - Steam Dryer and Internals

Task	Responsibility	Scheduled Completion
Revision of SIL 644 to include more recent experience	GE	June 2004
Steam Dryer I&E Guidelines	GE/BWRVIP	Oct 2004 submittal
Validate a methodology for determining steam dryer loading using main steam acoustic circuit analysis and verification with scaled model testing and plant data	GE	Dec 2004
Revision of BWRVIP-06 including revised guidance for addressing loose parts	GE/BWRVIP	Sept 2004 submittal

BWROG Assessment of Industry Experience

Task	Responsibility	Scheduled Completion
Analysis of INPO Power Uprate and Cycle Extension Database	BWROG	Completed Feb 2004
BWROG EPU Survey summary and evaluation	BWROG	Completed March 2004
Best practices for steam dryer performance monitoring	BWROG	Sept 2004

BWROG Oversight of Industry Activities

Task	Responsibility	Scheduled Completion
Review EPU Extent of Condition Evaluation process and pilot for Dresden and Quad Cities	BWROG	Completed Feb 2004
Review EPU-related vulnerabilities for "Group 1" systems from EPU Extent of Condition Evaluation	BWROG	Completed April 2004
Review EPU Extent of Condition final recommendations	BWROG	June 2004
Conduct vibration monitoring and evaluation information exchange meeting and document lessons learned and industry recommendations	BWROG	July 2004

BWROG Oversight of Industry Activities

Task	Responsibility	Scheduled Completion
Issue letter to NRC summarizing results of BWROG EPU Survey, Evaluation of INPO Database, and Integrated Industry Plan	BWROG	Completed May 2004
Develop EPU implementation recommendations resulting from review of industry data and GE/Exelon extent of condition reviews for BWR owners	BWROG	July 2004
Review results of industry programs and BWROG recommendations with NRC management	BWROG	Ongoing