POLICY ISSUE
INFORMATION

November 3, 2003 SECY-03-0190

FOR: The Commissioners

FROM: William D. Travers
Executive Director for Operations

SUBJECT: STATUS REPORT ON POWER UPRATES

PURPOSE:

To provide the Commission an update on the status of power uprate activities and inform the Commission that the staff intends to reduce the frequency of power uprate status reports from semiannual to annual following the May 2004 status report.

SUMMARY:

Since the last status update of May 2, 2003, the staff has made progress in reviews of plant-specific power uprates, stayed abreast of operating experience with potential effects on power uprate reviews, made progress in completing the review standard for extended power uprates (EPUs), continued to monitor performance related to the effectiveness and efficiency measures established for power uprate reviews, kept the Advisory Committee on Reactor Safeguards (ACRS) and other stakeholders informed of power uprate activities, and continued to look for ways to improve the power uprate process. Details of the staff's progress is provided in this memorandum. In summary, the staff has

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- conducted an inspection of Exelon's evaluation of the cause and repair of the steam dryer damage at Quad Cities Unit 2
- engaged General Electric Nuclear Energy (GENE) and the Boiling Water Reactor Owner's Group (BWROG) to stay abreast of generic activities related to the steam dryer damage at Quad Cities Unit 2 and determine the need for regulatory action
- completed an evaluation of the public comments received on draft Review Standard (RS)-001, "Review Standard for Extended Power Uprates"
- briefed the ACRS on draft RS-001 and received endorsement from the committee to proceed with issuing the final version of RS-001
- obtained agreement from the ACRS on a new approach for determining when ACRS would review power uprates
- approved seven plant-specific power uprates
- provided clarification to GENE and boiling-water reactor (BWR) licensees of the appropriate use of GENE topical reports in support of power uprates
- made a presentation on the Nuclear Regulatory Commission's (NRC's) power uprate program to the Vermont State Nuclear Advisory Panel (VSNAP)
- surveyed licensees regarding future power uprates
- projected resource needs for future work on power uprates
- continued the use of periodic reports to monitor milestones and hours expended on individual power uprate reviews and to monitor and trend overall program performance
- met with the Institute of Nuclear Power Operations and discussed experience with power uprates
- provided monthly inputs to Congressional reports
- maintained the NRC's power uprate Web site

The staff is preparing a summary of the results of its review of requests for additional information (RAIs) issued during the review of several EPUs and will make this summary available to internal and external stakeholders by the end of 2003. In addition, the staff plans to seek endorsement from the Committee to Review Generic Requirements (CRGR) and finalize and issue RS-001 by the end of 2003. The staff is continuing to follow operational issues to identify any impacts on power uprate reviews. The staff is also continuing to monitor its performance related to reviewing power uprates to identify areas for further improvement.

The staff intends to reduce the frequency of its status reports from semiannual to annual.

BACKGROUND:

Power uprates are categorized based on the magnitude of the power increase and the methods used to achieve the increase. Measurement uncertainty recapture (MUR) power uprates result in power level increases that are less than 2 percent and are achieved by implementing enhanced techniques for calculating reactor power. Stretch power uprates typically result in power level increases that are up to 7 percent and do not generally involve major plant modifications. EPUs result in power level increases that are greater than stretch power uprates and usually require significant modifications to major plant equipment. The NRC has approved EPUs for increases as high as 20 percent.

The staff provided its last update by a memorandum dated May 2, 2003. This memorandum summarizes the staff's accomplishments and challenges since the last update. The staff will continue to keep the Commission informed of the status of power uprate activities by providing status reports and by other means as appropriate. This status report is generated in response to a staff requirements memorandum dated February 8, 2002.

DISCUSSION:

Power Uprate Applications

Approved Power Uprates

This status update covers power uprates approved since May 2, 2003 (Attachment 1). During this period, the staff approved power uprates for seven nuclear power plant units, resulting in a combined increase of 349 megawatts thermal (MWt) or about 116 megawatts electric (MWe). This brings the total number of power uprates approved since 1977 to 99, resulting in a combined increase of approximately 12414 MWt or 4138 MWe to the nation's electric generating capacity.

Ongoing Reviews of Power Uprates

The staff is currently reviewing power uprates for four nuclear power plant units (two MUR power uprates, one stretch power uprate, and one extended power uprate) (Attachment 2). These power uprates would result in a combined increase of an additional 477 MWt or 159 MWe to the nation's electric generating capacity, if approved. Consistent with all of the staff's efforts related to power uprates, the staff has assigned the review of these power uprates high priority.

Expected Power Uprates

In June 2003, the staff conducted a survey of all licensees to obtain information regarding their plans for submitting power uprates over the next 5 years (Attachment 3). Based on this survey and information obtained since the survey, licensees plan to request power uprates for 28 nuclear power plant units over the next 5 years. If approved, these power uprates would result in an increase of about 5659 MWt or about 1886 MWe. Based on the results of the June 2003 survey and the models the staff developed for reviewing power uprates, approximately 36 full-time equivalent staff will be used for reviewing the power uprates expected over the next 5 years. These resources are budgeted and the staff does not anticipate any need for additional resources for power uprate reviews.

Operating Experience Related to Power Uprates

Damage of Steam Dryer at Quad Cities Unit 2

In June 2002, approximately 3 months following implementation of a 17.8-percent EPU, Quad Cities Unit 2 experienced an increase in the moisture content of the steam provided by the reactor to drive the turbine. In July 2002, Exelon (the licensee for Quad Cities Unit 2) shut down the plant, identified cracking in the steam dryer as the cause of the increased moisture content, repaired the steam dryer, and returned the unit to power operation at the EPU

power level. The steam dryer does not perform an accident-mitigating role or safety function, but is required to maintain its structural integrity. Approximately 10 months following restart of Quad Cities Unit 2 from an outage to repair the steam dryer, the plant experienced a similar increase in the moisture content of the steam. Based on previous experience with increased moisture content, Exelon shut down the plant and performed inspections of the steam dryer. Upon inspecting the steam dryer, Exelon identified cracks in several locations of the steam dryer. In both cases, the licensee identified high-cycle fatigue as the cause of the cracking. The staff conducted a special inspection of Exelon's activities related to the second incident. The staff's inspection focused on Exelon's efforts to identify the cause of the damage and repair the steam dryer. In addition, because Exelon had not completed its root-cause evaluation at the time of the inspection, it committed to keep Quad Cities Unit 2 at pre-EPU power levels until the root-cause evaluation is completed and presented to the NRC staff. On July 25, 2003, Exelon and GENE presented their determination of the cause of the cracking, repairs performed on the steam dryer, and planned actions to return the unit to the EPU power level. Following the July 25 meeting, the NRC staff held several additional discussions with Exelon and GENE to better understand their analyses. Based on the understanding gained from the inspection, the July 25 meeting with Exelon and GENE, and the discussions following the meeting, the staff had no objections to Exelon's plans to return the plant to the authorized EPU power level.

The staff has determined that the steam dryer failure at Quad Cities Unit 2 is not an immediate safety concern. Nevertheless, the staff has continued to closely monitor industry's generic response to this failure. GENE issued Services Information Letter (SIL) No. 644, "BWR/3 Steam Dryer Failure," on August 21, 2002, to inform its customers of the first steam dryer failure and Supplement 1 to SIL No. 644, "BWR Steam Dryer Integrity," on September 5, 2003, to inform its customers of the second steam dryer failure. Both of these documents provided recommendations for monitoring steam dryer performance to ensure that steam dryer degradation is promptly identified. The staff issued Information Notice (IN) 2002-026, "Failure of Steam Dryer Cover Plate after a Recent Power Uprate," on September 11, 2002, to inform licensees of the first failure and Supplement 1 to IN 2002-026, "Additional Failure of Steam Dryer after a Recent Power Uprate," on July 21, 2003, to inform licensees of the second failure. In addition, the staff has reviewed GENE SIL No. 644, Supplement 1, and provided comments to the BWROG on the technical evaluation and recommendations contained in the SIL. The staff is planning to meet with the BWROG, the Boiling Water Reactor Vessel and Internals Project, and GENE in November 2003 regarding the SIL and industry's overall response to the experience with steam dryer cracking. The staff will consider its regulatory options based on industry's generic response.

Abnormalities in Ultrasonic Flow Meter Instrumentation Readings

On August 28, 2003, Exelon informed the staff that it was reducing the operating power of Byron Units 1 and 2 by 32 MWe and 22 MWe, respectively. The decision was made following analysis of feedwater flow data derived from the Advanced Measurement and Analysis Group (AMAG) ultrasonic flow meters (UFMs) in use at Byron and Braidwood. The UFMs, which are marketed by Westinghouse, were used to adjust the feedwater flow rate indications from the venturi meters to compensate for possible venturi fouling during an operating cycle. Exelon reported that there were signal abnormalities from some of the UFMs, and on Byron 1, there were statistical differences between the total feedwater flow and the sum of the flows from the four individual feedwater lines. On September 1, 2003, the power at Braidwood Unit 2 was

reduced for similar reasons. Westinghouse issued Technical Bulletin (TB) 03-6 on September 5, 2003, to inform its customers of the abnormalities experienced at the Byron and Braidwood plants. TB 03-6 also provides recommendations for plants to monitor their instrumentation to promptly identify any such abnormalities at their plants. The staff met with Westinghouse on September 26, 2003, to discuss efforts Westinghouse has taken to identify the cause of these abnormalities. Westinghouse has not completed its root-cause evaluation of the problems, but currently believes that plant equipment near the instruments could have caused contamination in the signal, thus leading to incorrect readings by the flow meter. Westinghouse has also preliminarily concluded that this issue is limited to Byron and Braidwood. Based on current information, the staff does not believe that this issue poses an immediate safety concern. The staff is closely following this issue for Byron and Braidwood, as well as any implications on instrument installations for MUR power uprates.

Development of Review Standard for EPUs

The staff issued draft RS-001 for interim use and public comment on December 31, 2002. Issuance of draft RS-001 met a commitment the staff made in SECY-02-0106, "Review of ACRS Recommendation for the Staff to Develop a Standard Review Plan for Power Uprate Reviews," dated June 14, 2002. The public comment period for the draft review standard closed on March 31, 2003. The staff received three letters including 22 comments. Overall, the comments were supportive of the staff's efforts to provide guidance for EPUs. The comments highlighted industry concerns and suggestions related to several areas. These include:

- potential for using the guidance in RS-001 to impose new staff positions on licensees
- burden on licensees associated with providing certain information identified in RS-001
- potential impact of RS-001 on previously approved topical reports
- control of future changes to RS-001
- piloting initial use of RS-001
- use of RS-001 to define NRC management oversight of EPU application reviews
- future evaluation of efficiency gains resulting from RS-001
- establishing a standard application format for EPUs

A detailed summary of all the comments received is provided in Attachment 4.

The staff has modified RS-001, as appropriate, based on the comments. The staff plans to seek endorsement from the CRGR and finalize and issue RS-001 by the end of 2003. The staff is currently using RS-001 for the review of the Vermont Yankee 20-percent EPU. This is the staff's first use of RS-001. The staff will closely monitor the use of RS-001 for review of this application to identify any issues with its use.

Staff Performance vs. Established Goals

Established Goals

Maintaining safety remains the staff's highest priority when conducting power uprate reviews and the staff intends to take the time necessary to ensure that safety is maintained. The staff has established performance goals of 6 months and 960 staff hours for completing the review of an MUR power uprate application, 9 months and 1800 staff hours for completing the review of a stretch power uprate application, and 12 months and 3900 staff hours for completing the

review of an EPU application. The staff will ensure that the goal to maintain safety is not compromised in order to meet these timeliness and resource expenditure goals.

The timeliness and resource expenditure goals are predicated on licensees' submittals being consistent with established guidelines; licensees not including other non-power uprate related requests in their submittals; licensees' submittals not resulting in substantive RAIs; and licensees responding to RAIs within established schedules. In establishing the above goals, the staff recognized that in some cases, licensees' plans for implementing power uprates are more flexible than the numerical timeliness goals described above. As a result, the staff may meet its timeliness goals by either completing the reviews according to the numerical goals or by completing the reviews in time to support licensees' implementation schedules, whichever is longer. This flexibility allows the staff to better utilize its resources in a way to support other high priority activities.

Staff Performance

Six of the seven power uprates completed during the period covered by this status report were for MUR power uprates. Three of the six were completed within the staff's established timeliness goal of 6 months. Five of the six were completed within the staff's established goal of 960 staff review hours.

The Pilgrim MUR power uprate required just over 10 months and 1528 hours to complete. In its application for the Pilgrim power uprate, the licensee proposed changes to analysis methodologies used in several technical areas, including the use of a nonapproved code analysis methodology. Also, the licensee did not address all issues identified in Regulatory Issue Summary (RIS) 2002-03, "Guidance on the Content of Measurement Uncertainty Recapture Power Uprate Applications." As a result, the review of this application required additional time. In addition, the staff had changes in reviewers during the later part of the review of this application which also contributed to the delay and reduced the efficiency of the review. Nevertheless, the review was completed in time to support the licensee's planned implementation of the power uprate.

The Hatch Units 1 and 2 MUR power uprates required approximately 9 months to complete. The reviews were completed within the established goal for staff review hours. The staff delayed approval of the power uprates for Hatch Units 1 and 2 until questions related to the potential safety implications of the Quad Cities Unit 2 steam dryer failure for the Hatch units were addressed by the licensee. The licensee submitted this information on September 12, 2003, and the power uprates were approved on September 23, 2003.

The staff approved one stretch power uprate during the period covered by this status report. This was for a 2.9-percent power uprate for Palo Verde Unit 2. This review required over 21 months and over 2600 staff review hours to complete. This review did not meet established goals for several reasons: (1) review of this application started well before the staff established the effectiveness and efficiency measures described in SECY-02-0115, (2) the licensee indicated early in the review of this application that it did not need approval until the fall of 2003 and as a result the licensee did not respond to RAIs in time for the staff to complete its review in 9 months, and (3) late in the review of this application, the staff identified areas where additional information was needed resulting in further delays and a reduction in efficiency.

Nevertheless, the staff completed review of this power uprate in time to support the licensee's implementation schedule.

No EPUs were approved during the period covered by this status report.

The staff will continue to closely monitor power uprate reviews and keep the Commission informed of instances where the performance goals are not met.

Interaction With Internal And External Stakeholders

ACRS Briefings on RS-001

The staff briefed the ACRS Subcommittee on Thermal-Hydraulic Phenomena on RS-001 on August 19, 2003. The staff briefed the ACRS Full Committee on RS-001 on September 11, 2003. In its September 24, 2003, letter on RS-001, the ACRS provided its endorsement for the staff to issue RS-001 in final form and commended the staff.

ACRS Review of Stretch Power Uprates

The ACRS has historically reviewed all power uprates greater than 5 percent. On a case-by-case basis, the staff plans to request the ACRS to waive its review of stretch power uprates that are greater than 5 percent and that do not require major plant modifications. Conversely, the staff plans to invite the ACRS to review power uprates less than 5 percent that require major plant modifications. By memorandum dated October 9, 2003, the ACRS agreed to the new approach for determining when the staff would engage the ACRS regarding power uprate reviews.

The staff is currently reviewing a 6-percent power uprate request for Kewaunee. Because of the limited modification required for Kewaunee to achieve the 6-percent power uprate, the staff categorized this power uprate as a stretch power uprate. On the same basis, by memorandum dated September 16, 2003, the staff requested the ACRS to consider not performing an independent review of this application. By its October 9, 2003, memorandum, the ACRS agreed to not review the Kewaunee stretch power uprate.

Clarification of GENE Topical Reports

Following meetings between the NRC staff, BWR licensees, and GENE related to future EPUs, it became apparent that a common understanding regarding the extent of NRC approval of GENE topical reports did not exist. Differences in understanding of these approvals led licensees to plan for submitting power uprate applications that would have been technically insufficient for staff review and, as a result, would have either been rejected by the staff or required significant RAIs and supplementary analyses to make them acceptable. In discussing these differences with GENE, the staff agreed to provide a clarification of the EPU review process and the relationship of certain GENE topical reports to this process. The staff issued a letter to GENE on June 25, 2003, in which the staff explained its understanding of (1) the applicability of the GESTAR analysis process to the fuel transition with EPUs, (2) application of the ELTR1/2 review method for a mixed core with non-GE fuel, (3) limitations of the constant pressure power uprate methodology, and (4) information necessary to justify acceptable

performance for a mixed core at the EPU level. Copies of this letter were also sent to all BWR licensees.

Presentation to VSNAP

On June 11, 2003, the staff made a presentation to the VSNAP regarding the process that the staff uses for reviewing EPUs. VSNAP is a State of Vermont panel of seven members that meets periodically and considers issues relating to present and future use of nuclear power in general, and of the Vermont Yankee Nuclear Power Station in particular. This panel advises the governor, general assembly, and agencies of the State of Vermont. VSNAP was considering the EPU for the Vermont Yankee plant for a certificate of public good and requested this briefing to gain a better understanding of the extent of safety review that the NRC staff conducts for these power uprate requests. The meeting included a presentation on the staff's review process, a question and answer session between VSNAP and the NRC staff, and comments from members of the public. The meeting was well attended by members of the public that were both in favor of and against the power uprate. A common theme among the members of the public that were opposed to the power uprate was a request for the staff to conduct an independent safety assessment of the Vermont Yankee plant similar to the one that was conducted for Maine Yankee. A common theme among members of the public in favor of the power uprate was their confidence in the NRC staff to conduct a thorough review and ensure that the power uprate is safe before granting it. The staff views meetings like this as important for meeting the agency's goal of increasing public confidence.

Assessment of Past RAIs

During the development of draft RS-001, the staff reviewed RAIs issued during the reviews of recently approved EPUs to ensure that RS-001 addressed the issues identified as a result of the staff's reviews of those EPUs. The staff believes that making the results of this summary available to licensees could aid them in preparing high quality applications. Therefore, the staff is preparing a summary of this review and plans to make it available to internal and external stakeholders. The staff has planned completion of this task for the end of 2003. This is the same as the planned date for finalizing RS-001.

International Activities

The staff is continuing dialogue with international regulatory counterparts related to power uprates. The staff plans to exchange additional information on power uprate safety reviews and operating experience with our international regulatory counterparts. The staff will use this information to ensure that its reviews of power uprates reflect the latest experience in this area.

Challenges

As more experience is gained, the staff will face challenges to consider the safety significance of any issues that may arise (e.g., Quad Cities Unit 2 steam dryer failure, Byron and Braidwood UFM reading abnormalities), the need for modifying its guidance for future reviews of power uprates, and the potential need to revisit prior reviews of power uprates. The staff is staying abreast of operating experience related to power uprates and will maintain a safety focus to ensure that review guidance is updated with experience.

The regulatory process for licensing plants involves approval of vendor generic topical reports and processes. Licensees use these approved topical reports and make necessary changes to reflect plant-specific conditions. It is difficult for the staff to anticipate these plant-specific changes in its approval of generic topical reports. This situation may lead to differences in understandings between licensees and the staff regarding applicability of the approved topical reports to the plant-specific conditions, and thus, the staff's finding may not be predictable. The staff's experience in the approval of GENE's topical report is an example of this situation. To minimize any impacts of such situations, the staff will continue to stay abreast of licensees' plans for future power uprates through pre-application meetings. These meetings have helped to identify interpretation issues in the past and the staff believes that they will continue to aid the staff and licensees in gaining a common understanding of the appropriate application of topical reports to power uprates.

The staff continues to monitor its performance related to reviews of power uprates to identify areas for further improvement. The Office of Nuclear Reactor Regulation has recruited and continues to recruit new staff to fill positions being vacated by retirements. As a result, new staff is being teamed with more experienced staff for reviews of licensing actions, including power uprates. The staff believes such on-the-job training is important for maintaining the level of knowledge and experience needed by the office. However, this has created a challenge for the staff to meet its performance goals for power uprates. The staff will continue to look for ways to minimize the impact of on-the-job training on power uprate reviews while ensuring that adequate training is being provided to new staff.

Change to Frequency of Status Reports

In response to Commission direction, the staff has identified several measures to improve the effectiveness and efficiency of power uprate reviews. The development and implementation of these measures is now essentially complete and the program is considered mature. As a result, the staff believes that it is appropriate to reduce the frequency of power uprate status reports from semiannual to annual. Therefore, following the May 2004 status report, the staff will provide the Commission reports on the status of power uprates annually.

/RA/

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Attachments:
1. Table 1 - Power Uprates Approved Since May 2, 2003
2. Table 2 - Power Uprate Applications Currently Under Staff Review
3. Table 3 - Expected Power Uprate Applications
4. Summary of Public Comments on Draft RS-001

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4. Summary of Public Comments on Draft RS-001

*Previously concurred

OFFICE	PDIII-1/PM	PDIII-1/LA	TECH ED*	PDIII-1/SC	PDIII/D*	DLPM/D*	ADPT*	NRR/D*	EDO
NAME	MShuaibi	RBouling	PKleene	LRaghavan	WRuland	LMarsh	BSheron	JDyer	WTravers
DATE	10/22/03	10/21/03	09/23/03	10/22/03	10/03/03	09/29/03	10/07/03	10/07/03	11/3/03

ADAMS Accession Nos. ML032660398 (Memo)
ML032681193 (Attachment 4)
ML032681191 (Package)
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TABLE 1 - Power Uprates Approved Since May 2, 2003

NO.	PLANT	% UPRATE	MEGAWATTS THERMAL	APPLICATION DATE	APPROVAL DATE	TYPE[1]
1	D. C. Cook 2	1.66	57	11/15/2002	5/2/2003	MUR
2	Pilgrim	1.5	30	7/5/2002	5/9/2003	MUR
3	Indian Point 2	1.4	43	12/12/2002	5/22/2003	MUR
4	Kewaunee	1.4	23	1/13/2003	7/8/2003	MUR
5	Hatch 1	1.5	41	12/19/2002	9/23/2003	MUR
6	Hatch 2	1.5	41	12/19/2002	9/23/2003	MUR
7	Palo Verde 2	2.9	114	12/21/2001	9/29/2003	S

Power uprates approved since May 2, 2003, have added an additional 349 megawatts thermal or 116 megawatts electric to the nation's electric generating capacity.

[1] TYPE -- S = Stretch; MUR = Measurement Uncertainty Recapture

TABLE 2 - Power Uprate Applications Currently Under Staff Review

NO.	PLANT	% UPRATE	MEGAWATTS THERMAL	SUBMITTAL DATE	PROJECTED COMPLETION DATE	TYPE[1]
1	Palisades	1.4	35	6/3/2003	December 2003	MUR
2	Kewaunee	6	99	5/22/2003	February 2004	S
3	Fort Calhoun	1.6	24	7/18/2003	January 2004	MUR
4	Vermont Yankee	20	319	9/10/2003	September 2004	EPU

Power uprates currently under review could add an additional 477 megawatts thermal or 159 megawatts electric to the nation's electric generating capacity if approved.

[1] TYPE -- EPU = Extended Power Uprate; S = Stretch; MUR = Measurement Uncertainty Recapture

TABLE 3 - Expected Power Uprate Applications

Fiscal Year	Total Power Uprates Expected	MUR Power Uprates	Stretch Power Uprates	EPUs	Megawatts Thermal	Megawatts Electric
2004	14	3	3	8	3859	1286
2005	4	2	2	0	344	115
2006	5	4	0	1	528	176
2007	4	2	0	2	703	234
2008	1	0	0	1	225	75
TOTAL	28	11	5	12	5659	1886

MUR = Measurement Uncertainty Recapture; EPU = Extended Power Uprate