POLICY ISSUE
INFORMATION

July 9, 2001 SECY-01-0124

FOR: The Commissioners

FROM: William D. Travers
Executive Director for Operations

SUBJECT: POWER UPRATE APPLICATION REVIEWS

PURPOSE:

To provide the Commission with the status of staff activities associated with power uprate reviews. The staff is also providing responses to the staff requirements memorandum (COMNJD-01-0001 - Power Uprate Applications) dated May 24, 2001.

SUMMARY:

The staff has assigned power uprate applications a high priority. The staff considers power uprate applications among the most significant licensing actions and is, therefore, conducting power uprate reviews on accelerated schedules. The current schedules for reviews of power uprate applications (plant-specific applications and generic topical reports) do not unnecessarily delay licensees' plans for implementing such uprates. The staff has conducted a survey of licensees to better understand licensee plans for submitting future power uprate applications and expects 46 power uprate applications over the next 5 years. Planned power uprates are expected to result in an increase of about 4870 megawatts thermal (MWt) or approximately 1600 megawatts electric (MWe) in power level. Sufficient resources are currently available to complete the technical evaluation of power uprate applications. The staff will utilize the existing Planning, Budgeting, and Performance Management (PBPM) process to ensure that sufficient resources will be available to complete power uprate reviews in a way that does not unnecessarily delay licensees' plans for implementing such uprates. The staff is evaluating the power uprate application review processes to improve the effectiveness and efficiency of these processes and is considering issuing lessons learned reports, enhancing management

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oversight, and/or developing power-uprate-specific performance measures. The staff will communicate information related to power uprates (e.g., lessons learned, process improvements, and guidance) with external stakeholders. Plans include using one or more of the following methods for this communication: NRC external website, regulatory information summaries (RISs), Advisory Committee on Reactor Safeguards (ACRS) public briefings, and public workshops. The staff will continue to inform the Commission of the status and progress of power uprate reviews through updates to the Chairman's Tasking Memorandum (CTM).

BACKGROUND:

Power uprates can be classified in three categories: (1) measurement uncertainty recapture power uprates, (2) stretch power uprates, and (3) extended power uprates. Measurement uncertainty recapture power uprates are on the order of 1.5 percent and are achieved by implementing enhanced techniques for calculating reactor power. This involves the use of state-of-the-art feedwater flow measurement devices that reduce the degree of uncertainty associated with feedwater flow measurement and in turn provide for a more accurate calculation of power. The recent rulemaking to 10 CFR Part 50, Appendix K, which allowed licensees to use a power uncertainty less than 2 percent in loss-of-coolant accident analyses, facilitated these reviews. Stretch power uprates are typically on the order of 7 percent and usually involve changes to instrumentation setpoints. Stretch power uprates do not generally involve major plant modifications. This is especially true for boiling-water reactor (BWR) plants. In some limited cases where plant equipment was operated near capacity prior to the power uprate, more substantial changes may be required. Extended power uprates are usually greater than stretch power uprates and are expected to be submitted for increases as high as 20 percent. Extended power uprates usually require significant modifications to major balance-of-plant equipment such as the high pressure turbines, condensate pumps and motors, main generators, and/or transformers.

Licensees have been applying for and implementing power uprates since the 1970s as a way to increase the power output of their plants. The staff has been conducting power uprate reviews since then and has completed 57 such reviews. See Table 1, "Approved Power Uprates" (Attachment 1). Table 1 shows that, to date, the staff has approved measurement uncertainty recapture power uprates for 4 units, stretch power uprates for 50 units, and extended power uprates for 3 units. Figure 1, "Power Capacity Increase" (Attachment 2), shows the cumulative increase in power that resulted from the power uprates listed in Table 1. This data shows that, to date, an equivalent of approximately two nuclear power plant units (approximately 1000 MWe each) has been gained through implementation of power uprates at existing plants.

In addition to plant-specific power uprate applications, General Electric Nuclear Energy (GENE) has submitted four topical reports (one in 1990, one in 1991, one in 1995, and one in 1996) in which it proposed guidelines to be followed by BWR licensees in the preparation and submittal of power uprate applications. These topical reports covered stretch and extended power uprates up to a 20-percent increase in power level. The staff has reviewed and approved these topical reports. The use of topical reports has many benefits. Specifically, it provides a template that standardizes licensee applications for power uprate submittals, improves the quality of licensees' submittals, and provides focus for staff technical review. This also leads to fewer requests for information during the staff's reviews of plant-specific applications and a more efficient review by the staff.

DISCUSSION:

Plant-Specific Applications Under Review

Table 2, "Power Uprate Submittals Currently Under Staff Review," (Attachment 3), provides a summary and the status of the power uprate submittals currently under staff review. The staff has 17 applications for power uprates under review. Of these, nine are for measurement uncertainty recapture power uprates, while six are for extended power uprates greater than or equal to 15 percent. The remaining two include one for 4.5 percent and one for 7.5 percent. The staff has assigned these reviews a high priority. Sufficient resources exist to complete the technical evaluation of these power uprate applications on a schedule that does not unnecessarily delay licensees' plans for implementing them. The staff will continue to inform the Commission of the status of these power uprate applications through updates to the CTM.

The six requested power uprates that are greater than or equal to 15 percent are first of a kind from the perspective of the requested increase in power level. These include a 15-percent power uprate for Duane Arnold (this is in addition to a 4.1-percent power uprate that was approved in 1985), 17-percent power uprates for Dresden Units 2 and 3, 17.8-percent power uprates for Quad Cities Units 1 and 2, and a 20-percent power uprate for Clinton. Some external stakeholders have expressed interest in the staff's review of these applications. The staff has ensured that key stakeholders are kept informed of the staff's efforts related to these reviews. The staff will continue to keep stakeholders informed of new power uprate applications by following established agency policies and guidance consistent with the requirements of 10 CFR 50.91 and 50.92 for notifying stakeholders of power uprate amendment applications. Other communication methods will also be implemented as described below.

Expected Future Plant-Specific Applications

On April 2, 2001, the staff issued Nuclear Regulatory Commission RIS 2001-08, "OPERATING REACTOR LICENSING ACTION ESTIMATES." In this RIS, the staff requested, on a voluntary basis, information related to future submittals of licensing actions for fiscal years 2001 and 2002. The staff also specifically requested licensees to identify, by brief title, those licensing actions that are expected to entail complex reviews, including power uprate requests. In addition, the staff conducted a survey of all licensees in June 2001 to obtain information regarding the industry's future plans related to power uprate applications. This survey targeted projections for the size and schedule of power uprate submittals over the next 5 years. Table 3, "Expected Future Submittals for Power Uprates" (Attachment 4), provides a summary of the results of this survey. This table indicates that licensees plan to submit 46 power uprate applications in the next 5 years. Of these, 15 are expected to be of the extended power uprate type (4 to 6 per year for the next 3 years), 3 are expected to be of the stretch power uprate type (1 per year for the next 3 years), and 27 are expected to be of the measurement uncertainty recapture power uprate type (10 to 15 per year for the next 2 years). One licensee did not report a size for the expected uprate. The sizes reported for the stretch and extended power uprates may also include measurement recapture uncertainty. Based on the information provided, planned power uprates are expected to result in an increase of about 4870 MWt or approximately 1600 MWe. The staff will utilize the information provided in response to the RIS and survey for planning and allotting resources for power uprate reviews and to assure the staff's readiness and availability to perform the technical reviews for these applications when they arrive.

The staff has assigned power uprate reviews a high priority. The staff considers power uprate applications among the most significant licensing actions and is, therefore, conducting power uprate reviews on accelerated schedules. The staff's current schedules for reviews of power uprate applications do not unnecessarily delay licensees' plans for implementing these uprates. For future applications, the staff will work with licensees to establish schedules that are mutually agreeable. The staff will continue to utilize the existing PBPM process to ensure that sufficient resources are available for completing power uprate application reviews consistent with the established schedules. In addition, the staff will continue to keep the Commission informed of new applications for power uprates by including them on the CTM.

Generic Methodologies Under Review

The staff is currently reviewing one topical report submitted by GENE related to measurement uncertainty recapture power uprates. This topical report was submitted on July 11, 2000. In this topical report, GENE provided a methodology to apply a reduced reactor thermal power uncertainty for 10 CFR Part 50, Appendix K, and Regulatory Guide 1.49 analyses. The staff is currently reviewing this topical report and plans to complete its review by the end of the year.

The staff was also reviewing a topical report submitted by GENE related to extended power uprates. This topical report was submitted on March 19, 2001. In this topical report, GENE proposed a streamlined approach for licensees to use in preparing and submitting extended power uprate applications. Because of the combination of (1) the magnitude of power uprates that this topical report would apply to (up to a 20-percent increase in power), (2) the limited experience in reviewing power uprates of this magnitude, and (3) the magnitude of reduction in the amount of information to be provided by licensees as proposed in the topical report, the staff was challenged in its review of this report. The staff conducted a meeting with GENE in June 2001 to discuss preliminary feedback on this topical report. As a result of the staff's feedback, GENE requested that the staff place the review of this topical report on hold. Per GENE's request, the staff plans to meet with GENE again in July 2001 to discuss the topical report further.

The staff believes that generic topical reports provide a means to standardize plant-specific applications for staff reviews. Standardization and improvements in the quality of licensee submittals can significantly improve the efficiency of the staff's review. Therefore, the staff has assigned high priority to topical reports related to power uprates. The staff evaluations for both topical reports can be accomplished within existing budget resources allocated for reviewing vendor topical reports. The staff will continue to keep the Commission informed of the status of these reviews through updates to the CTM.

Review Processes

To date, reviews of measurement uncertainty recapture power uprate applications have been accomplished in 6 to 8 months. Based on the staff's current understanding of the scope and depth of review, the staff is evaluating ways to reduce the review duration. The staff believes that sufficient experience in this area has been gained to allow for such improvement. The staff is currently evaluating the scope of review and specific information required to make a regulatory decision. The staff plans to share the results of this effort with licensees. The goal of this effort is to provide guidance to the industry in developing standardized power uprate applications. The staff believes that standardization of licensees' submittals, improvements in the quality of licensees' submittals, and more focused reviews by the staff could reduce the review duration considerably. If changes in addition to those directly resulting from the power

uprate are requested in the power uprate applications, reviews of these additional changes may require extra time for review. The effort described above will ensure that the staff's reviews of measurement uncertainty recapture power uprates are conducted in the most effective and efficient manner.

In safety evaluations approving generic methodologies for power uprates, the staff had estimated that the reviews of extended power uprate applications would require up to 18 months. The staff is currently scheduling the reviews of extended power uprate applications for completion in less than 12 months. This includes approximately 2 months for ACRS coordination and review. As was noted earlier, the staff is currently reviewing extended power uprate applications of increases that are greater than or equal to 15 percent for six units. The staff will incorporate any improvements identified during these reviews into the current power uprate review process. In addition, following completion of these reviews, the staff will review the existing processes, in light of the latest experience, to identify other areas where efficiencies may be gained.

The staff is evaluating the power uprate application review processes to improve the effectiveness and efficiency of these processes. The staff is considering issuing lessons learned reports, enhancing management oversight, and/or developing power-uprate-specific performance measures. The staff also plans to hold a public workshop following completion of the Duane Arnold, Quad Cities 1 and 2, and Dresden 2 and 3 extended power uprate reviews to share lessons learned from these reviews with our stakeholders. The staff will also solicit stakeholder input on the staff's review of these applications and ideas for improving the review process. Guidance similar to that discussed above for the measurement uncertainty recapture power uprates may also be issued for extended power uprates.

Based on the results of the survey, the staff does not expect many stretch power uprate applications over the next 5 years (the staff expects about one per year). In contrast, the staff expects between 10 to 15 applications per year over the next 2 years for measurement uncertainty recapture power uprates, and 4 to 6 applications per year over the next 3 years for extended power uprates. Therefore, staff efforts for improving the power uprate application and review processes will initially focus on measurement uncertainty recapture power uprates and extended power uprates. However, efficiencies gained in these areas will also be utilized to improve the stretch power uprate review process.

The staff has considered issuing a Standard Review Plan (SRP) section to provide guidance for NRC staff conducting power uprate reviews. An SRP section could serve to standardize staff reviews of power uprate applications and could also be used by licensees to ensure that appropriate and sufficient information is included in their submittals. The staff evaluated this approach in light of existing guidance and the latest information available in the power uprate arena.

In late 1995 and 1996, the staff responded to concerns identified by the Union of Concerned Scientists (UCS) associated with the Maine Yankee Power Plant. One of the staff actions which followed was the formation of the Maine Yankee Lessons Learned Task Group. The task group examined several power uprate reviews against then-current practice and determined that an SRP section for power uprates was needed to guide the staff in reviewing computer codes and to ensure consistency in power uprate reviews.

The staff is in the process of implementing the recommendation that an SRP section for computer codes be issued. However, the staff determined that an SRP section was not needed for ensuring consistency in power uprate reviews. The staff has chosen an alternative termed a "template review." The "template review" essentially identifies all areas the staff will evaluate. By utilizing the "template review" the staff's reviews have been made uniform.

The determination that an SRP section is not needed for ensuring consistency in power uprate reviews was based on several factors as described below. For BWR plants, the NRC has approved GENE topical reports that provide guidance related to the analyses and information required to support power uprate reviews by the staff. The approved methodologies were implemented in an application for a power uprate for the Monticello plant (Monticello was considered the lead plant for these topical reports). All lessons learned identified from the efforts by the Maine Yankee Lessons Learned Task Group were addressed in the review and safety evaluation for the power uprate for Monticello. In addition, the staff evaluated the Monticello power uprate application in accordance with Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," to confirm that the impact on risk was acceptable. Use of probabilistic risk assessments is highly beneficial as it can be used to assess the integrated effect of plant changes related to the power uprate and other significant plant modifications on plant risk.

While similar topical reports do not currently exist for pressurized-water reactor (PWR) plants, a power uprate application from the Farley plant was reviewed during 1997 and 1998. This application review underwent scrutiny similar to that given to the Monticello application to ensure that all lessons learned identified by the Maine Yankee Lessons Learned Task Group were implemented. The safety evaluation for the Farley power uprate addressed the concerns identified in the lessons learned report. Therefore, because of the completeness of the safety evaluations for the Monticello and Farley plants, the staff has used these safety evaluations as templates for future reviews of power uprates for BWR and PWR plants, respectively. The staff believes that this approach, which consists of the use of template safety evaluations, approved GENE topical reports, and existing SRP sections, is the most effective and efficient way to ensure that future power uprate reviews are consistent.

The staff is investigating ways to modify the power uprate review process to make it more effective and efficient. Therefore, the review process may go through several changes. As the review process for power uprate applications remains dynamic, the staff believes that developing an SRP section for power uprate reviews at this time is premature and not cost effective. For the near term, and in light of the template review process established by the staff for power uprate applications, the staff does not believe that development of an SRP section for power uprates is necessary. However, the staff will reevaluate this at a later date.

Communication Plan

The staff will communicate information related to power uprates (e.g., lessons learned, process improvements, and guidance) with external stakeholders. The staff plans to use one or more of the following methods for this communication: NRC external website, RISs, ACRS public briefings, and public workshops. The staff plans to conduct a public workshop on power uprates after completing reviews of the Duane Arnold, Quad Cities 1 and 2, and Dresden 2 and 3 extended power uprate applications. During this workshop, the staff will share lessons learned from the reviews of these applications with our external stakeholders and potential applicants for extended power uprates. The staff will also solicit stakeholder input on process improvements. The staff will also utilize the RIS process, when appropriate, to provide information and guidance related to power uprates to licensees. These communication strategies can be accomplished within existing budget resources.

COORDINATION:

This paper has been coordinated with the Office of Nuclear Regulatory Research. The Office of the Chief Information Officer has reviewed this paper and has no objection. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections. The Office of the General Counsel has reviewed this paper and has no legal objection.

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Attachments:
1. Table 1 - Approved Power Uprates
2. Figure 1 - Power Capacity Increase
3. Table 2 - Power Uprate Submittals Currently Under Staff Review
4. Table 3 - Expected Future Submittals for Power Uprates

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*Previously concurred

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TABLE 1 - Approved Power Uprates[1,2]

NO.	PLANT	% UPRATE	MWt	YEAR APPROVED	TYPE[3]
1	Calvert Cliffs 1	5.5	140	1977	S
2	Calvert Cliffs 2	5.5	140	1977	S
3	H. B. Robinson	4.5	100	1979	S
4	Millstone 2	5	140	1979	S
5	Fort Calhoun	5.6	80	1980	S
6	St. Lucie 1	5.5	140	1981	S
7	St. Lucie 2	5.5	140	1985	S
8	Duane Arnold	4.1	65	1985	S
9	Salem 1	2	73	1986	S
10	North Anna 1	4.2	118	1986	S
11	North Anna 2	4.2	118	1986	S
12	Calloway	4.5	154	1988	S
13	TMI-1	1.3	33	1988	S
14	Fermi 2	4	137	1992	S
15	Vogtle 1	4.5	154	1993	S
16	Vogtle 2	4.5	154	1993	S
17	Wolf Creek	4.5	154	1993	S
18	Susquehanna 1	4.5	148	1994	S
19	Susquehanna 2	4.5	148	1994	S
20	Peach Bottom 2	5	165	1994	S

[1]Through June 2001

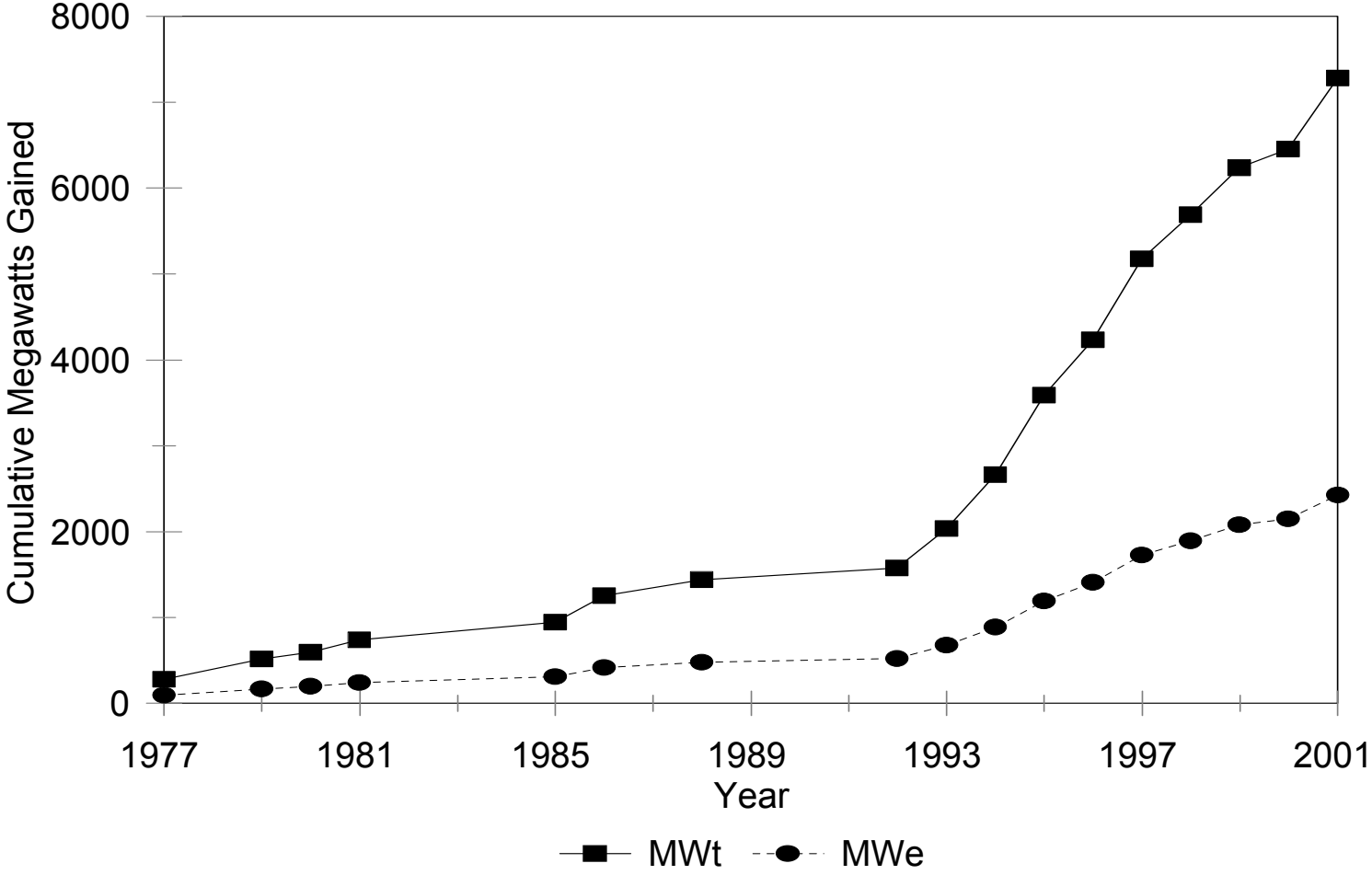
[2]Capacity Recapture Power Uprates for Provisional Operating License Plants are not included in this table. These are Haddam Neck uprate of 24% in 1969, Oyster Creek uprate of 14% in 1971, Palisades uprate of 15% in 1977, Ginna uprate of 17% in 1984, Maine Yankee uprate of 10% in 1989, and Indian Point 2 uprate of 11% in 1990.

[3] TYPE-- S = Stretch; E = Extended; MU = Measurement Uncertainty Recapture

NO.	PLANT	% UPRATE	MWt	YEAR APPROVED	TYPE[3]
21	Peach Bottom 3	5	165	1994	S
22	Limerick 2	5	165	1995	S
23	WNP2	4.9	163	1995	S
24	NMP2	4.3	144	1995	S
25	Hatch 1	5	122	1995	S
26	Hatch 2	5	122	1995	S
27	Surry 1	4.3	105	1995	S
28	Surry 2	4.3	105	1995	S
29	Limerick 1	5	165	1996	S
30	Summer	4.5	125	1996	S
31	Turkey Point 3	4.5	100	1996	S
32	Turkey Point 4	4.5	100	1996	S
33	Palo Verde 2	2	76	1996	S
34	Palo Verde 3	2	76	1996	S
35	Brunswick 1	5	122	1997	S
36	Brunswick 2	5	122	1997	S
37	Fitzpatrick	4	100	1997	S
38	Browns Ferry 2	5	164	1997	S
39	Browns Ferry 3	5	164	1997	S
40	Farley 1	5	138	1997	S
41	Farley 2	5	138	1997	S
42	Monticello	6.3	105	1998	E
43	Hatch 1	8	205	1998	E
44	Hatch 2	8	205	1998	E
45	LaSalle 1	5	166	1999	S
46	LaSalle 2	5	166	1999	S
47	Perry	5	178	1999	S
48	Comanche Peak 2	1	34	1999	MU
49	River Bend	5	145	2000	S

NO.	PLANT	% UPRATE	MWt	YEAR APPROVED	TYPE[3]
50	Diablo Canyon 1	2	73	2000	S
51	Watts Bar	1.4	48	2001	MU
52	Byron 1	5	170	2001	S
53	Byron 2	5	170	2001	S
54	Braidwood 1	5	170	2001	S
55	Braidwood 2	5	170	2001	S
56	Salem 1	1.4	48	2001	MU
57	Salem 2	1.4	48	2001	MU

Figure 1: Power Capacity Increase



ATTACHMENT 2

TABLE 2 - Power Uprate Submittals Currently Under Staff Review

NO	PLANT	% UPRATE	MWt	SUBMITTAL DATE	PROJECTED COMPLETION DATE	TYPE[1]
1	Susquehanna 1	1.4	48	10/30/00	7/6/01	MU
2	Susquehanna 2	1.4	48	10/30/00	7/6/01	MU
3	Hope Creek	1.4	46	12/01/00	7/30/01	MU
4	San Onofre 2	1.42	48	4/3/01	8/31/01	MU
5	San Onofre 3	1.42	48	4/3/01	8/31/01	MU
6	Shearon Harris	4.5	138	12/14/00	9/1/01	S
7	Duane Arnold	15.0	248	11/20/00	10/30/01	E
8	Beaver Valley 1	1.4	37	1/18/01	10/30/01	MU
9	Beaver Valley 2	1.4	37	1/18/01	10/30/01	MU
10	Dresden 2	17	430	12/29/00	11/30/01	E
11	Dresden 3	17	430	12/29/00	11/30/01	E
12	Quad Cities 1	17.8	446	12/29/00	11/30/01	E
13	Quad Cities 2	17.8	446	12/29/00	11/30/01	E
14	ANO2	7.5	211	12/19/00	12/19/01	S
15	Comanche Peak 1	1.4	47	4/5/01	12/31/01	MU
16	Comanche Peak 2	0.4	13	4/5/01	12/31/01	MU
17	Clinton	20	580	6/20/01	TBD	E

[1] TYPE -- S = Stretch; E = Extended; MU = Measurement Uncertainty Recapture

TABLE 3 - Expected Future Submittals for Power Uprates[1]

NO	PLANT	% UPRATE	APPROXIMATE SUBMITTAL DATE	TYPE[2]
1	Brunswick 1	15	July 2001	E
2	Brunswick 2	15	July 2001	E
3	South Texas 1	1.4	July 2001	MU
4	South Texas 2	1.4	July 2001	MU
5	Palisades	1.4	Fall 2001	MU
6	Crystal River 3	1	Fall 2001	MU
7	Waterford 3	1.7	September 2001	MU
8	Palo Verde 2	2.9	October 2001	S
9	Sequoyah 1	1.3	October 2001	MU
10	Sequoyah 2	1.3	October 2001	MU
11	Grand Gulf	1.7	January 2002	MU
12	Kewaunee	6	February 2002	S
13	River Bend	1.7	April 2002	MU
14	Browns Ferry 2	14	Spring 2002	E
15	Browns Ferry 3	14	Spring 2002	E
16	Point Beach 1	10.1	May 2002	E
17	Point Beach 2	10.1	May 2002	E
18	Beaver Valley 1	5-10	June 2002	E
19	Beaver Valley 2	5-10	November 2002	E
20	St. Lucie 1	8	2003	E

[1]The staff believes that applications for at least 22 units in addition to those identified in this table will be submitted for power uprates within the next 5 years (2 of the additional applications will be of the extended type, 1 will be of the stretch type, and 18 will be of the measure uncertainty recapture type [1 did not report the size of the uprate]). However, specific information related to those applications has not been disclosed. In addition, licensees are considering 11 additional power uprates. These are still being studied by the licensees and no decisions have been made. Licensee also reported that 48 units will not be requesting power uprates.

[2] TYPE -- S = Stretch; E = Extended; MU = Measurement Uncertainty Recapture

NO	PLANT	% UPRATE	APPROXIMATE SUBMITTAL DATE	TYPE[2]
21	St. Lucie 2	8	2003	E
22	Fort Calhoun	15-20	Late 2003	E
23	Grand Gulf	10-12	2004	E
24	Waterford 3	8-10	2004	E