

Semiannual Update of the Status of New Reactor Licensing Activities

July 2005

INTRODUCTION

This attachment to the July 2005 update of the status of new reactor licensing activities provides a history of the status of the Advanced Plant 1000 (AP1000) design certification review, Economic Simplified Boiling-Water Reactor (ESBWR) design certification pre-application review, the early site permit (ESP) reviews, pre-application activities for other reactor plant designs, regulatory infrastructure development, and stakeholder interactions.

DESIGN CERTIFICATION

The application to certify the ESBWR reactor design was scheduled to be submitted in June 2005 and was delayed to August 2005. The review of this application is expected to require more resources than the AP1000 review. The three reactor design certifications completed in the 1990s (ABWR, System 80+, and AP600) required 65 to 120 full-time equivalent (FTE) per design for the staff's technical reviews over a period of about 9 years. About \$5.5 million was expended on contractor activities, including testing required for the AP600 review. The AP1000 review took advantage of the previous AP600 review, and the resource expenditures have been in line with the estimates given in SECY-01-0188, "Future Licensing and Inspection Readiness Assessment," dated October 12, 2001 (30 FTE and \$1.5 million). Similar precedents do not exist for the ESBWR, so a higher level of effort is anticipated for this review than for the AP1000 review. The review is expected to require 57 FTE and \$9.8 million over a period of 42 to 60 months, including rulemaking. The Atomic Energy of Canada Ltd. Technologies, Inc. (AECL), Advanced CANDU Reactor 700 (ACR-700) design was not submitted as planned in March 2005, and the resources were reprogrammed to other areas within the New Reactor Program and other NRC priorities.

Advanced Plant 1000 (AP1000)

On March 28, 2002, Westinghouse Electric Company, LLC (Westinghouse), submitted its application for final design approval (FDA) and standard design certification for the AP1000 design. The NRC staff issued the final safety evaluation report (FSER) and the FDA on September 13, 2004. The proposed design certification rule was published in the *Federal Register* on April 18, 2005 (70 FR 20062). As the cover letter to the FSER stated, completion of the rulemaking will depend on whether post-FSER design changes warrant NRC staff review, whether any additional regulatory requirements were codified prior to the completion of the design certification rulemaking, and potential impacts of other high-priority agency review activities. The NRC staff provided the final schedule for the remainder of the design certification process when the FSER was issued. The milestones and their target due dates are listed below.

| <u>AP1000 Milestone</u> | <u>Target Date</u> |
|--|-------------------------------|
| Issue final safety evaluation report | September 13, 2004 (complete) |
| Issue final design approval | September 13, 2004 (complete) |
| Complete design certification rulemaking | December 2005 |

COMBINED LICENSE (COL)

Three consortia have received U.S. Department of Energy (DOE) awards in response to a November 2003 solicitation of interest for participation in demonstration projects for licensing new nuclear plants.

The first consortium is led by Dominion Resources (Dominion), and now plans to utilize General Electric (GE) ESBWR technology. In mid-March 2004, this consortium submitted a proposal to DOE to demonstrate the NRC process for licensing the construction and operation of new nuclear power plants. This submittal was based on the ACR-700 design at the North Anna site. On January 14, 2005, Dominion announced that it had broken its original alliance with the AECL, opting instead for the GE ESBWR design. The ESBWR design certification application is expected to be submitted in August 2005. In April 2005, it was announced that the cost-sharing agreement between Dominion and DOE had been signed. Based on current information, the NRC staff has budgeted resources for the review of a possible COL application in FY 2007.

The second consortium consists of the Tennessee Valley Authority (TVA), Toshiba, GE, Bechtel, United States Enrichment Corporation (USEC), and Global Nuclear Fuel-Americas, LLC. This consortium submitted a proposal to DOE on April 23, 2004, to conduct a detailed study of the potential construction of a two-unit GE/Toshiba-designed advanced boiling water reactor (ABWR) nuclear plant at the Bellefonte site. On May 23, 2004, DOE announced that it will fund half of the \$4.25 million cost of the study. The feasibility study is scheduled to be completed in August 2005, and following completion of the study, TVA will decide whether to file a COL application.

On April 26, 2004, the third consortium, NuStart Energy Development, LLC (NuStart), submitted its proposal to DOE to demonstrate the NRC process for licensing the construction and operation of new nuclear power plants. On May 6, 2005, NuStart issued a press release stating that it had signed a cost-sharing agreement with DOE. NuStart is considering both Westinghouse's AP1000 design and GE's ESBWR design, one each for two potential sites. NuStart currently plans to select two sites by October of 2005, and plans to submit two COL applications in 2008.

On March 14, 2005, the NRC staff held a public meeting with Duke Energy Corporation (Duke) at NRC headquarters in Rockville, Maryland. The purpose of the meeting was to discuss planning currently being undertaken by Duke for the possible development of a COL application. Duke identified four possible COL application scenarios: certified design with a greenfield site; certified design with a previously characterized site; certified design with an existing site; and, noncertified design with a greenfield site. Duke is considering three reactor technologies: the GE ESBWR, the Framatome ANP EPR, and the Westinghouse AP1000. During the meeting,

Duke said they will select the site and reactor technology by the end of 2005. At this time, Duke has not made any additional statements to the NRC or the public as to the status of its COL project. Duke said they will actively engage the NRC in pre-application discussions in advance of a COL application in early 2008 if they proceed with the project.

In various trade publications, Progress Energy, the licensee for Shearon Harris, Brunswick, H. B. Robinson, and Crystal River, has stated that it is evaluating the building of a new nuclear plant. The NRC staff has not yet met with Progress Energy and has not received formal communication on this issue.

EARLY SITE PERMITS

The NRC staff received ESP applications in September and October 2003 from Dominion Nuclear North Anna, LLC (Dominion), for the North Anna site; from Exelon Generation Company, LLC (Exelon), for the Clinton site; and from System Energy Resources, Inc. (SERI), a subsidiary of Entergy Corporation, for the Grand Gulf site. The original schedules for receipt of the ESP applications were June, July, and August of 2003. All three applications were accepted for docketing in late 2003, and the NRC staff's safety and environmental reviews of the applications are in progress. The NRC staff held environmental scoping meetings at all three sites. In addition, the NRC staff has conducted quality assurance inspections and environmental and safety audits at all three sites as part of its review of the applications.

With regard to the ongoing ESP proceedings, *Federal Register* notices of hearing and opportunity to petition for leave to intervene were published for all three ESP applications. Subsequently, petitions to intervene were received on all three ESP applications. For the Dominion application, the petitioners were Blue Ridge Environmental Defense League, Nuclear Information and Resource Service (NIRS), and Public Citizen. The same groups petitioned for leave to intervene in connection with the Exelon ESP application, along with two other groups, the Environmental Law and Policy Center and the Nuclear Energy Information Service. Four organizations petitioned for leave to intervene in the SERI ESP application proceeding: the National Association for the Advancement of Colored People, Claiborne County, Mississippi Branch; NIRS; Public Citizen; and the Mississippi Chapter of the Sierra Club.

On March 22, 2004, the Chief Administrative Judge of the Atomic Safety and Licensing Board Panel established an Atomic Safety and Licensing Board (ASLB) for the proceedings. An initial prehearing conference was held June 21-23, 2004, for all three applications. On August 6, 2004, the ASLB issued rulings in each of the three proceedings, admitting portions of two environmental contentions in the North Anna proceeding, and one environmental contention in the Clinton proceeding and denying intervention in the Grand Gulf proceeding. Three separate ASLBs were then established in the three proceedings. The mandatory hearings are expected to begin in mid 2006. Each licensing board is working out the details of timing and conduct of the individual hearings.

In its review of the three ESP applications, the NRC staff has identified several generic issues. Although the NRC staff had worked with stakeholders prior to ESP application submittal to identify and resolve possible review issues, additional issues surfaced during the detailed reviews of the applications because of the first-of-a-kind nature of these reviews.

On the safety side of the reviews, one issue that arose during review of the applications is associated with emergency plans. In a March 28, 2005, letter to the NRC, the Nuclear Energy Institute (NEI) commented on the major features option of 10 CFR 52.17(b)(2)(i), stating that there is minimal value for an ESP applicant to pursue this option under the existing regulatory guidance. NEI discussed the need to update the regulatory guidance on the significant impediments approach, and commented on the NRC staff's proposal that an ESP application can contain complete and integrated emergency plans with combined license (COL) action items. This COL action item approach was discussed during a January 18, 2005, public meeting with NEI. The NRC staff's draft table of proposed COL action items was sent to NEI on April 14, 2005. These items were discussed with NEI during a public meeting on July 25, 2005. The NRC staff will provide a written response to NEI's March 28 letter, on the basis of discussions with NEI and other stakeholders and lessons learned from the ongoing ESP application reviews.

In consultation with the Federal Emergency Management Agency (FEMA), the NRC staff continues to review the major features of the emergency plans in the ESP applications for the North Anna, Clinton, and Grand Gulf ESP sites. The detailed findings will be given in the respective safety evaluations and will be reflected in the individual ESPs.

Another issue that arose during the review of the ESP applications is seismic analyses. Two of the three ESP applicants (Dominion and Exelon) initially submitted applications that contained a new "performance-based" methodology for determining the safe-shutdown earthquake ground motion for the site. The NRC staff had not previously reviewed this methodology and informed the applicants that using this method could delay completion of the NRC staff's seismic reviews for the ESP applications. Dominion subsequently decided to use the NRC staff-approved methodology in Regulatory Guide 1.165, "Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion," and revised its application accordingly. Exelon continued to use the new methodology. The NRC staff informed Exelon that this will likely delay issuance of the NRC staff's FSER by 3 months because the NRC staff will need to review the new methodology in addition to reviewing Exelon's implementation of that methodology for the Clinton ESP site. The NRC staff issued the DSER with open items for Exelon in accordance with the current schedule, requiring a supplemental DSER scheduled for August 26, 2005.

The supplemental DSER, which will summarize the results of the NRC staff's review of the suitability of the proposed Exelon ESP site in terms of the site's seismology and geology, was originally scheduled to be issued on May 31, 2005. However, because of the complexities associated with a first-of-a-kind review and the NRC staff's need to reach an agency-wide position regarding the use of this new methodology the NRC staff was unable to complete the supplemental DSER by May 31, 2005.

On the environmental side of the reviews, the NRC staff maintains an integrated environmental review schedule for the first-of-a-kind ESP applications concurrent with license renewal reviews, extended power uprate reviews, and other operating reactor licensing actions. This schedule assumed the ESP applicants would submit their applications on schedule and respond to information requests in a timely manner. The NRC staff sequenced the ESP applications reflecting applicants' fulfillment of schedule commitments and staggered the review schedules of the three ESP applications in an attempt to ensure (1) experience from the initial review

would be incorporated into the subsequent reviews, (2) review consistency, and (3) effective resource utilization. Consequently, the Exelon and SERI ESP review schedules partly depended on the successful execution of the Dominion ESP application review. In the fall of 2004, the NRC staff further modified the schedules to accommodate delayed responses from Dominion, including revisions to the application, and resolution of a number of first-of-a-kind issues that the NRC staff encountered. To minimize the impacts on Exelon and SERI reviews, the NRC staff reduced the schedule time between the reviews. The draft EISs for the Dominion, Exelon, and SERI applications were published in December 2004, March 2005, and April 2005, respectively.

The comment period for the Dominion ESP draft EIS ended on March 1, 2005. The NRC staff's public outreach efforts on the Dominion ESP application translated into over 300 people attending the public meeting on the draft EIS and more than 1300 people providing approximately 7000 comments on the draft EIS. This level of stakeholder participation from around the country and even foreign countries led the staff to determine that it cannot complete the final EIS by the target date and that additional resources and time are needed to consider the public comments and to complete the Dominion environmental review.

The staff issued the final safety evaluation report (FSER) for the North Anna ESP application on June 16, 2005, in accordance with the project schedule. Issuance of this FSER is an important milestone in the staff's review to determine whether Dominion's application meets the Commission's regulations. The Commission is expected to reach a final decision on the ESP application after reviewing the staff's FSER and EIS, along with a report from the NRC's independent Advisory Committee on Reactor Safeguards (ACRS) and the findings of an NRC Atomic Safety and Licensing Board in a hearing on the application. The meeting with the ACRS on the North Anna ESP application and the staff's FSER took place, as scheduled, on July 6, 2005.

The comment period for the Exelon ESP draft EIS ended on May 25, 2005. The number of substantive public comments for the Exelon ESP draft EIS is about one-half of the number received for Dominion, which is still significantly more than was expected. The number of public comments for the SERI ESP draft EIS are likely to be similar to the number received for Exelon.

The actions already taken to supplement resources on the Dominion review has had a cascading effect on the review schedule for the Exelon and SERI ESP applications, as common issues are being resolved and key members of the environmental review teams are being used on multiple ESP applications. The NRC staff expects that much of the experience gained from its review of the Dominion ESP application (e.g., comment responses, changes resulting from final internal review) will be applicable to the review of the Exelon and SERI ESP applications, and believes that the additional review time must be provided to incorporate the insights into the SERI and Exelon final EISs. As a result, the NRC staff is unable to complete its EISs for the Exelon and SERI ESP applications by their original target dates.

In SECY-05-0013, the staff indicated that the highest priority is to be given to ESPs expected to be referenced in COL applications. Based on our understanding of industry interest, the North Anna ESP site is the primary site being considered by the Dominion-led consortium for a COL application. The Grand Gulf ESP site is one of six sites under consideration by NuStart Energy Development LLC for a COL application. At this time, the staff is not aware of any COL under

consideration that would reference the Clinton ESP site. Therefore, the staff has determined that the SERI ESP application review will be given priority over the Exelon review. The final EISs for the Dominion, SERI, and Exelon applicants are scheduled to be issued on December 23, 2005, April 14, 2006, and July 28, 2006, respectively.

In addition to the change in review priority, the staff has implemented additional actions to mitigate schedule impacts. The staff has (1) developed a database of staff responses to generic issues in support of comment resolution for ESP environmental reviews, (2) moved license renewal work to a different contractor than the one presently supporting ESP reviews, to make additional contractor resources immediately available, and (3) adjusted the timing of and consolidated activities to perform more steps in parallel across project lines and reflect the actual level of stakeholder involvement.

The staff will take actions to accommodate further long-term improvements. These include: (1) recruiting additional environmental staff to deal with growth in the new reactor licensing arena, (2) obtaining contract support in addition to the multi-laboratory infrastructure in place, and (3) creating a new environmental review section. In addition, the staff is considering temporarily utilizing resources from the high-level radioactive waste disposal program, investigating potential infrastructure improvements, and incorporating lessons learned on the current ESP reviews into subsequent reviews to avoid future schedule delays.

Major remaining schedule milestones for the NRC staff's review of the three applications are shown in the table following this paragraph. These dates reflect the previously discussed delays in completion of all three environmental reviews, changes in the review priorities for the review of the SERI and Exelon applications, and the delay in the completion of the safety review of the new seismic methodology for the Exelon application. The crossed out dates are from the last update. In all cases, the mandatory hearing and Commission decision processes are assumed to require a total of 12 months after completion of the NRC staff's safety and environmental reviews.

| ESP Milestone | Dominion (North Anna) | SERI (Grand Gulf) | Exelon (Clinton) |
|--|--------------------------|-------------------------------------|-------------------------------------|
| Draft environmental impact statement (EIS) issued to EPA | 12/10/04 C | 04/29/05 T 04/21/05 C | 03/04/05 T 03/02/05 C |
| Draft safety evaluation report (SER) issued | 12/20/04 C | 04/07/05 C | 02/10/05 C |
| Supplemental draft SER issued | NA | NA | 08/26/05 T |

| ESP Milestone | Dominion (North Anna) | SERI (Grand Gulf) | Exelon (Clinton) |
|--|--------------------------|------------------------|------------------------|
| Final SER issued | 06/16/05 C | 10/21/05 T | 02/17/06 T 08/25/05 |
| Final EIS issued to EPA/NRC Notice of Availability Issued | 12/23/05 T 08/12/05 | 04/14/06 T 12/23/05 | 07/28/06 T 10/21/05 |

C - Complete
T - Target

Future ESPs

In a letter dated February 11, 2005, Southern Company stated that it was investigating the feasibility of preparing an ESP application for one of its sites. The letter further stated that although the final site had not been selected, Southern Company planned to submit an ESP application in the summer of 2006. Southern Company, along with Constellation Energy Group, has submitted proposals asking DOE for funds to evaluate an ESP application. In a July 26, 2005, letter, Southern Company informed the NRC that it is beginning ESP-related activities at the Alvin W. Vogtle Electric Generating Plant site near Waynesboro, Georgia. The NRC staff expects to begin pre-application discussions in the near future.

PRE-APPLICATION ACTIVITIES

The resources and schedule for reviewing the ESBWR application, and the potential applications for the EPR, Pebble Bed Modular Reactor (PBMR), International Reactor Innovative and Secure (IRIS), and Toshiba 4S ("Super Safe, Small, and Simple") designs, depend on the quality of the application and whether it is supported by sufficient testing and by research and development, where necessary. The level of effort is also affected by how different the new designs are when compared to previously certified or licensed designs, the extent of the applicant's test program, and whether policy issues need to be addressed. Applications which do not adequately demonstrate how the design meets the regulatory requirements will take more time and effort to review.

Early in the planning process the NRC staff takes steps to ensure that personnel with necessary skills are available to review the applications when they are received and that everyone understands the schedules and priorities for the review. Planning for the upcoming applications emphasized early and thorough identification of issues and the development of tools to maintain detailed status information on the hundreds of questions and issues expected to arise in the course of the reviews. The NRC staff is developing tools to help prepare safety evaluation report input, resulting in more consistent documents. These improvements will help accomplish the agency's goal of efficient, effective, realistic, and timely reviews.

Economic Simplified Boiling-Water Reactor (ESBWR)

The GE ESBWR is a 1550-MWe reactor that uses natural circulation for normal operation and has passive safety features. On April 18, 2002, GE requested a pre-application review of the

ESBWR. Since that time, the NRC staff has completed its review of the application of the TRACG thermal-hydraulic code to ESBWR loss-of-coolant accidents (ML043000285). The NRC staff is currently reviewing the application of the TRACG code to ESBWR anticipated operational occurrences (AOOs) and the application of TRACG to ESBWR thermal-hydraulic stability. GE plans to submit a topical report on the application of TRACG to ESBWR anticipated transient without scram (ATWS) in late August 2005.

GE plans to submit an application for certification of the ESBWR in August 2005. During the remainder of the pre-application review, NRC staff efforts will be focused on the continuing TRACG code reviews and interactions with GE regarding the content of the planned design certification application. Discussion topics include the proposed use of design acceptance criteria (DAC) for the ESBWR design, and GE's proposed classification of ESBWR abnormal events and selection of acceptance criteria.

The NRC staff held a public meeting on March 9, 2005, to discuss GE's proposed use of DAC for ESBWR piping. The NRC staff recommended that GE submit a formal request to use the piping DAC for the ESBWR. The NRC staff informed GE that the approval of piping DAC was subject to NRC staff review and would require Commission approval. On June 29, 2005, GE submitted a request for the use of DAC for piping, instrumentation and control, and human factors engineering. The staff is currently reviewing GE's request.

On January 28, 2005, the NRC staff held a public meeting to discuss GE's topical report NEDC-33175, "Classification of ESBWR Abnormal Events and Determination of their Safety Analysis Acceptance Criteria." Based on the initial staff feedback provided at the meeting, GE submitted NEDC-33175, Revision 1, on February 4, 2005. By letter dated June 2, 2005, the NRC staff provided comments on GE's proposal and requested additional information. GE provided additional information on June 29, 2005. The staff is currently evaluating GE's response. The expected outcome of this review is an agreement between the NRC staff and GE on the method for classifying ESBWR abnormal events and for selecting acceptance criteria.

To prepare for the ESBWR design certification review, the NRC staff is developing independent tools (e.g., TRACE, MELCOR computer codes, and PRA models) to help the NRC staff complete the technical evaluation of the ESBWR design. The NRC staff is also generating independent test data to support and evaluate these tools and to understand the important physical phenomena and processes for the ESBWR.

Advanced CANDU Reactor 700 (ACR-700)

After not submitting a design certification application for the ACR-700 in March 2005 as planned, AECL stated that it will focus on developing its 1200-MWe ACR design, in addition to the 750-MWe ACR-700 design. AECL will continue to work on licensing its designs in Canada, and hopes still to find a market for its larger reactor in Canada, the United States, China, the United Kingdom, etc. In their letter dated February 16, 2005, AECL stated that they planned to continue with the pre-application phase. AECL is currently not scheduled for submitting an application.

The ACR-700 is an advanced CANDU (Canada Deuterium Uranium) design that has horizontal fuel channels passing through a heavy-water moderator tank. As with other CANDU designs, the ACR-700 is designed to be refueled during power operation. The reactor system, coolant pumps, U-tube steam generators, and pressurizer of the ACR-700 are similar to those in pressurized-water reactor (PWR) designs in the United States.

The ACR-700 design also has features that make it significantly different from operating CANDU reactors. The ACR-700 uses light water as the coolant in the fuel channels, whereas operating CANDU reactors use heavy water. The ACR-700 is designed to have a negative void reactivity coefficient so that if boiling occurs in the fuel channels, the reactor power will decrease. The negative void coefficient for ACR-700 will be achieved by using slightly enriched uranium in the fuel and neutron-absorbing dysprosium elements in the fuel assemblies. Natural uranium fuel is used in operating CANDU reactors.

The NRC staff has used a multiphased approach for the ACR-700 pre-application review. Two phases have been completed. Phase 1, which consisted of a series of familiarization meetings to give the staff an overview of the advanced CANDU reactor design, was completed in July 2003. The Phase 2 review obtained more specific and detailed information about the ACR design. Phase 2 was completed in October 2004 with the issuance of the pre-application safety assessment report (PASAR) (ML042110074).

In their February 16, 2005, letter, AECL stated that their goal for Phase 3 of the pre-application review is to resolve long-lead issues identified in the PASAR prior to the submittal of an application for design certification of the ACR design. These issues include potential policy issues associated with limited core damage accidents, the acceptability of AECL's reactor physics computer codes, the acceptability of AECL's thermal-hydraulic computer code CATHENA and supporting scaling analyses, and CANDU-specific aspects of the ACR reactor coolant pressure boundary, including codes and standards and pressure tube technology. AECL also informed the NRC staff that it is evaluating the power level of the ACR design and that it believed the proposed pre-application topics can be reviewed independent of the power level of the design.

In support of Phase 3 of the pre-application review, on March 24, 2005, AECL submitted two topical reports, "Codes, Standards and Acceptance Criteria For ACR-700 Reactor Coolant Pressure Boundary and On-Line Fueling Components and Systems," and "ACR-700 Pressure Tubes Integrity." The staff conducted a public meeting on July 7, 2005, to discuss both reports and AECL's objectives. AECL plans to submit additional topical reports on the other proposed

Phase 3 topics in late 2005 and 2006.

AECL plans to apply for certification of the ACR design after Phase 3 of the pre-application review is completed. AECL will inform the NRC staff of its schedule for submitting a design certification (DC) application when its plans become more definite.

International Reactor Innovative and Secure (IRIS)

On February 22, 2005, the NRC staff met with representatives of Westinghouse to discuss the IRIS pre-application review. The topics discussed included Westinghouse's expectations for pre-application, the planned IRIS testing program and analyses, and Westinghouse's interest in reduced emergency planning requirements for IRIS. The NRC staff also discussed expectations for a future design certification application, emphasizing the need for a complete application, including required test results and analyses. Future meetings are expected after Westinghouse provides additional information regarding the IRIS test program and associated scaling analyses.

In an April 20, 2005, letter, the NRC staff informed Westinghouse that the IRIS pre-application review will be given a minimal level of support in 2005. This activity will not be given a high priority for NRC resources because Westinghouse has no clear alignment with a domestic power producer interested in deploying the design. Westinghouse was also asked to describe the information it plans to provide to support its proposed emergency planning so that the NRC staff can appropriately plan for and coordinate the review.

EPR

The EPR is a large pressurized-water reactor of evolutionary design, with a design output of approximately 1600-MWe. Design features include four 100 percent capacity trains of engineered safety features, a double-walled containment, and a "core catcher" for containment and cooling of core materials for severe accidents resulting in reactor vessel failure. The design does not rely on passive safety features. The first EPR is currently being constructed at the Olkiluoto site in Finland. Framatome also hopes to build EPRs at the Flamanville site in France, and has submitted a bid for EPR construction in China.

Framatome-ANP (Framatome) initiated pre-application discussions regarding the EPR reactor design with the NRC staff, in a February 8, 2005, letter. Framatome does not believe that EPR certification depends on any changes to regulations or Commission policy due to the similarity of the design to plants already licensed in the United States. The letter also stated that Framatome expects to submit a design certification application in late 2007. As discussed elsewhere in this attachment, Duke Power has stated that EPR is a candidate reactor design for a possible COL application.

During the first pre-application meeting held on March 24, 2005, Framatome provided an overview of the EPR design and project to the NRC staff. During the pre-application phase, Framatome expects to submit three topical reports for NRC staff review and to request meetings to address issues which may arise as it prepares its design certification submittal. Additional meetings are expected to take place in summer 2005.

The design to be submitted to NRC will be substantially the same as the design being marketed and built overseas. Authority for the submitted design will reside within the United States. Framatome is beginning to translate the EPR design into a U.S. framework, including design codes and standards, to conform to NRC regulatory requirements. This effort is expected to take about 3 years.

Framatome has informed the NRC staff that it seeks EPR certification to help market the design in the United States. NRC certification of the design is not considered a prerequisite for marketing the design in the rest of the world. In a May 4, 2005, letter, Constellation Energy stated that it is working with Framatome to license the EPR for potential future construction in the United States.

Pebble Bed Modular Reactor (PBMR)

On November 3, 2004, the NRC staff held a public meeting at NRC headquarters with PBMR (Pty) Ltd. to discuss its activities and plans and its request to begin PBMR pre-application interactions with the NRC. By letter dated April 11, 2005, the NRC staff informed PBMR (Pty) Ltd. that it expected to be able to support meetings in FY 2005 to discuss PBMR pre-application review planning activities but not substantial technical review activities. The letter stated that the level of NRC technical review that could be supported in FY 2006 and FY 2007 would depend on the priority of PBMR pre-application review activities in relation to other agency activities. The proposed schedule is intended to enable the company to submit a design certification application for the PBMR design in 2007. On June 30, 2005, the NRC staff conducted an initial public meeting with PBMR (Pty) Ltd. to discuss planning for a potential PBMR pre-application review. The objectives, scope, and schedule of an actual review in FY 2006 is to be consistent with NRC prioritized resource allocations for new reactor work.

Small Liquid-Metal Reactor for Galena, Alaska

The city of Galena, Alaska, has stated it is evaluating the possibility of building a small liquid-metal reactor to provide electrical power to the community. On February 2, 2005, the NRC staff met with the city manager and vice mayor to discuss the city's plans and NRC's reactor licensing process. The city is in the process of seeking funding for a series of papers on regulatory issues. The city also wants to explore obtaining an early site permit. Since the February 2, 2005 meeting, no further contact with the staff has been initiated.

The reactor design being evaluated is the Toshiba 4S, which has an output of about 10 MWe (approximately 30-MWt). The reactor has a compact core design, with steel-clad metal-alloy fuel. The core design does not require refueling over the 30-year lifetime of the plant. A three-loop configuration is used: a primary system (sodium cooled), an intermediate sodium loop between the radioactive primary system and the steam generators, and the water loop used to generate steam for the turbine. The basic layout is a "pool" configuration with the pumps and intermediate heat exchanger inside the primary vessel. Toshiba has not yet contacted the NRC regarding possible licensing of the 4S.

On February 14, 2005, the NRC staff met with representatives from the Yukon River Inter-Tribal Watershed Council (YRITWC) to discuss and answer questions on NRC's communication with tribal governments relative to the potential siting of a nuclear reactor in Galena. The YRITWC is

responsible for providing information to the tribes located along the Yukon River and being kept informed of issues relative to the tribes. The YRITWC also provides assistance to the tribal governments on activities such as developing emergency plans, addressing proposed energy options, writing grants, and sampling water. During the meeting, the YRITWC requested, on behalf of the tribes who could be potentially affected by, or would be interested in, the potential reactor in Galena, that NRC explore development of a formal tribal consultation protocol. This request was reiterated in a May 16, 2005, letter from YRITWC. The NRC staff provided an evaluation of this request and recommendations to the Commission in SECY-05-0121, "Request To Consider Developing a Formal Tribal Consultation Protocol," July 7, 2005.

REGULATORY INFRASTRUCTURE

10 CFR Part 52 Update

The Commission approved a rulemaking to revise Title 10 of the Code of Federal Regulations, Part 52 (10 CFR Part 52) based on lessons learned during the previous design certification reviews and on discussions with external stakeholders about the ESP and COL review processes. The proposed rule was published for comment in the *Federal Register* on July 3, 2003 (68 FR 40025). Because of the extent of the changes necessary to address the comments received, the NRC staff plans to forward a revised proposed rule package, rather than a final rule, to the Commission by October 31, 2005. In addition, the staff expects to publish draft rule language on the NRC public website in August 2005. The NRC staff has had to extend the schedule for completing the Part 52 proposed rule package as a result of higher priorities. NRC staff resources continued to be diverted to issuing regulatory products such as the AP1000 design certification and the draft safety evaluation reports for the North Anna and Clinton early site permits. In addition, higher priority rulemakings continue to divert Office of the General Counsel resources, including Part 2 (Hearing Process), Part 26 (Fitness for Duty), § 50.46 (ECCS), § 50.48 (Fire Protection Manual Actions), and § 50.55a (the Davis-Besse issue). Industry interest in new nuclear construction has increased significantly over the past few months, and interactions with individual applicants and NEI have identified additional issues that should be resolved in the Part 52 update. The scope of this update effort has expanded (to include substantial conforming changes to Title 10) during the NRC staff's interactions with stakeholders on ESPs, the construction inspection program, and the COL application guidance submitted by NEI. From a resource perspective, it is prudent to incorporate these lessons learned and identified issues into agency efforts to clarify Part 52. The NRC staff expects to receive multiple applications for additional ESPs and COLs in the 2006-2008 time frame, and clarifying Part 52 will help the NRC staff process the applications in an effective and efficient manner.

Construction Inspection Program (CIP) Development

The Construction Inspection Development Team has developed and issued Inspection Manual Chapter (IMC) 2502, "Pre-Combined License Phase," which formalizes the inspection scope and approach described in the 2004 construction framework document, NUREG-1789. All nine of the inspection procedures needed to implement this manual chapter were also issued. The inspection areas covered include all aspects of quality assurance (QA), licensee compliance

with limited work authorization (LWA 1 and 2) requirements during site preparation, and the inspection of first-of-a-kind (FOAK) engineering work.

The QA inspection procedures provide the guidance needed to evaluate the licensee's overall QA function during the application process, including the development of the licensee's QA manual and its implementing procedures, implementation of the QA function during the development of the COL application, and licensee control of contractors performing work in support of the application or fabricating long-lead-time components.

The environmental procedure provides the guidance needed to ensure that site preparation activity will be performed in accordance with the terms and conditions of the LWA for limiting the impacts of construction.

The FOAK engineering inspection procedure focuses on translating design commitments in a certified design to the detailed construction documents that will be used to build a plant. The FOAK inspection procedure will also be used to inspect engineering activities for any reactor design which has not been certified but is submitted as part of a COL application.

With the issuance of IMC 2502, the NRC staff established the inspection infrastructure needed to support the new reactor licensing application process. The two remaining inspection manual chapters needed to fully implement the construction inspection program, IMC 2503, "ITAAC Inspections," and IMC 2504, "Non-ITAAC Inspections," are under development and will be issued later this year. The NRC staff sponsored an industry/NRC workshop in May 2005 to support the development of IMC 2503. The workshop participants used sample inspection findings to discuss how to characterize and document the results of ITAAC-related inspections. The workshop results will be integrated into the revisions to the generic inspection procedures needed to implement IMC 2503 and IMC 2504 which will continue over the next 2 years. Revisions to inspection procedures needed to support the unique features of a specific design will begin when an applicant references a design.

Combined License Issues

NEI 04-01, Revision D, "Draft Industry Guideline for Combined License Applicants Under 10 CFR Part 52," was sent to the NRC in a letter dated December 21, 2004. The letter also included a revised list of generic COL issues that industry would like to resolve before receipt of the first COL application. The NRC staff continues to work with external stakeholders to identify and resolve COL issues. Some of these issues are being resolved by the CIP framework document and the 10 CFR Part 52 rulemaking. Others will be addressed through NEI 04-01 and public meetings between the NRC, NEI, and other external stakeholders. The remaining issues, which include modular plant licensing issues, will be addressed at a later date.

Regulatory Treatment of Operational Programs in the COL Process (formerly Programmatic ITAAC)

In a May 14, 2004, staff requirements memorandum (SRM) for SECY-04-0032, "Programmatic Information Needed for Approval of a Combined License Without Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)," the Commission directed the NRC staff to complete its work on the information necessary for the COL application for each of the programs for which the NRC staff had previously assumed ITAAC would be required (e.g., fire protection, training, quality assurance during operation, fitness for duty, access authorization, radiation protection, physical security, licensed operator, and reportability) and present its results to the Commission by December 31, 2005.

The NRC staff has held monthly meetings discussing NEI 04-01 between February and July 2005. In these meetings, the NRC staff has discussed 13 of the 14 operational programs originally identified in NEI's letter to the NRC dated May 14, 2001 (emergency planning, which has ITAAC, is discussed in another part of this document). The NRC and NEI have discussed the information needed to fully describe each of the operational programs listed in the May 14, 2001, letter. In addition, potential license conditions on the implementation of these operational programs have been discussed in the meetings. The NRC staff plans to report the results of its work and its interactions with external stakeholders to the Commission in a SECY paper by November 2005.

Emergency Planning (EP) ITAAC

The development of emergency planning (EP) ITAAC, including resolution of EP ITAAC-related issues with industry and other stakeholders, was completed in November 2004. EP ITAAC, which are an important aspect of licensing reactors under the new 10 CFR Part 52 process and were originally proposed in SECY-95-090, "Emergency Planning Under 10 CFR Part 52," dated April 11, 1995, consisted of a few preliminary illustrative EP ITAAC, modeled after the planning standards in NUREG-0654/FEMA-REP-1. The EP ITAAC present a first-of-a-kind example of programmatic ITAAC under 10 CFR Part 52 and reflect the collective efforts of NRC and the FEMA staff, industry, and other stakeholders and various lessons learned from previous design certification reviews. The EP ITAAC are generic and will be tailored by each COL applicant to its specific reactor design and emergency planning program requirements.

The EP ITAAC provide 9 emergency planning standards, including 8 of the 16 standards in 10 CFR 50.47(b) and 1 new EP ITAAC planning standard for implementing procedures. The EP ITAAC consist of 30 objective acceptance criteria that must be met prior to fuel load. This is consistent with the May 14, 2004, SRM for SECY-04-0032 in that the ITAAC are very narrow and encompass only matters that, by their nature, cannot be resolved before construction. Two of the more difficult EP ITAAC issues, which were resolved, dealt with reconciling various timing considerations and addressing aspects of offsite emergency planning that are beyond the licensee's control. The timing aspects involved the submission of detailed implementing procedures and completion of an exercise to test the integrated response capabilities. The offsite emergency planning aspects involved correcting any offsite exercise deficiencies.

On September 15, 2004, NEI sent the NRC staff a letter on its latest proposal for the remaining outstanding issues associated with EP ITAAC. The NRC staff and NEI held a public meeting on November 9, 2004, to discuss NEI's proposed EP ITAAC. As indicated above, the remaining outstanding EP ITAAC issues were resolved, and NRC staff provided a written response to the NEI letter on June 15, 2005 (ML0051390060), including a proposed final table of generic EP ITAAC. The table has been incorporated into NEI's draft guidance document NEI 04-01, Revision D, which the NRC staff is currently reviewing for possible endorsement.

During the November 9, 2004, public meeting, NEI questioned whether a new 44 CFR Part 350 review and approval by FEMA would be necessary for a new reactor that is constructed on an existing reactor site, whose plans have previously been approved by FEMA under the 44 CFR Part 350 process. FEMA responded in a January 14, 2005, letter that new FEMA approval would not be necessary, so long as the 10-mile size of the emergency planning zone (EPZ) was not increased, and no significant changes were necessary in State and local emergency plans.

COL Application Guidance

The executive summary of NEI 04-01, Revision D, states that the purpose of the draft guideline is to "provide the vehicle for regulatory discussion and resolution of key issues related to COL applications." The executive summary further states that "the industry's overall goal is to establish as much clarity and certainty as possible in the regulations and guidance related to the COL application and review process to support ongoing COL application initiatives under the Department of Energy's Nuclear Power 2010 Program." The guideline document is intended to provide COL application guidance on the following items: (1) form and content for Chapters 1 through 19 of the final safety analysis report, (2) identification of programs that need to be implemented prior to the issuance of a COL, (3) change control processes for design certification information, early site permits, and final safety analysis reports, and (4) a timeline for activities from the decision to apply for a COL to the issuance of the COL.

The NRC staff committed to provide 1st round comments on NEI 04-01, Revision D. Twenty-five NRC branch sections, in the Offices of Nuclear Reactor Regulation and Nuclear Security and Incident Response, are reviewing the document. The NRC staff expects to provide NEI with approximately 250 separate comments in multiple letters by early August 2005.

In parallel with the NRC review, the NRC staff has met with NEI monthly since February 2005 to provide early feedback such that NEI could consider these preliminary discussions in further development of NEI 04-01. In addition, separate meetings have been held or are being arranged to discuss special topics of interest. These include updates to the Standard Review Plan, Section 12.5, which addresses radiation protection, and Sections 17.1, 17.2, and 17.3, which address quality assurance during design, construction, and operation. General discussions on the elements needed for security design ITAAC will also be discussed separately in noticed safeguards meetings.

NEI has said it expects to address NRC comments, incorporate additional COL application and process guidance, and seek NRC endorsement of NEI 04-01, Revision 1, sometime in early 2006. NEI expects that the process for obtaining NRC endorsement of NEI 04-01 will be similar to the process which led to the NRC's endorsement of NEI 95-10, "Industry Guideline for

Implementing License Renewal,” in Regulatory Guide (RG) 1.188, “Standard Format and Content for Applications To Renew Nuclear Power Plant Operating Licenses.” NEI believes that such a schedule will support preparation and submittal of a COL application in the 2006-2007 timeframe.

The NRC staff told NEI that a decision on what guidance the NRC should provide to COL applicants has not been made at this time. In addition, the NRC could not fully endorse any type of guidance until the current 10 CFR Part 52 rulemaking has been finalized. The NRC staff plans to keep its external stakeholders fully informed on its intended path to provide COL application guidance. For example, the NRC staff held a preliminary planning meeting with Duke Energy Corporation on March 15, 2005, to discuss their plans for a COL application, including pre-application activities.

The NRC staff has budgeted resources to support these generic review activities for COLs. The resources may be revised, depending on the timing and the scope of the work involved.

Advanced Reactor Steering Committee (ARSC)

The ARSC, a joint Office of Nuclear Regulatory Research (RES)/NRR management team, continues to review activities associated with advanced reactor pre-application reviews, design certification reviews, and advanced reactor research infrastructure development. The steering committee, with the support of a technical advisory group (TAG), reviews research activities necessary to support design certification reviews, including the agency’s independent assessments of new reactor designs and the development of the technical bases for regulatory requirements. Recent ARSC meetings have focused on the NRC staff’s efforts to develop options and recommendations on two policy issues for new plant licensing, level of safety and integrated risk (see discussion below on Policy Issues for New Plant Licensing), and the review and approval of the ESBWR research plan.

Advanced Reactor Framework Development

The objective of the regulatory structure for new plant licensing is to provide a technology-neutral risk-informed and performance-based approach to enhance the effectiveness and efficiency of new plant licensing in the longer term (e.g., beyond the advanced designs currently in the pre-application stage).

A draft of the technology-neutral framework was provided to the Commission in SECY-05-0006, “Second Status Paper on the Staff’s Proposed Regulatory Structure for New Plant Licensing and Update on Policy Issues Related to New Plant Licensing,” January 7, 2005 (ML043560093), and released for public review and comment. The NRC staff determined that work to show the feasibility of a technology-neutral framework had been done in enough detail to start soliciting stakeholder input. A public workshop was held March 14-16, 2005, to discuss the policy and technical issues. Attendees expressed interest in similar workshops in the future as the framework is further developed and refined. The NRC staff has had several discussions with the ACRS (i.e., both the full committee and the subcommittee on future plant designs). The NRC staff plans to continue to regularly interact with the ACRS and external stakeholders.

Also in SECY-05-0006, the NRC staff said it would provide options and recommendations to the

Commission on level of safety and integrated risk to support the pre-application reviews for new reactors. The NRC staff has held discussions with the ACRS on these issues and solicited stakeholder input via public meetings and workshops. The NRC staff is considering the ACRS and other stakeholder feedback in assessing these issues. Options and recommendations on these two issues will be discussed in a paper which is currently being prepared.

SECY-05-0006 also discussed emergency planning issues for advanced or evolutionary reactors. The NRC staff solicited comments on whether changes should be made to the existing emergency preparedness regulations or guidance for the new reactor designs in the March 2005 workshop, where prospective new reactor designers and other stakeholders said that a reduction or elimination of emergency planning zones (EPZs) would be appropriate for certain designs, including the IRIS, GT-MHR, and PBMR. A reduction or elimination of the EPZs for advanced or evolutionary reactor designs would not be determined alone by a technical review of risk and possible offsite radiation exposures, since it would necessitate a change in Commission policy. The NRC staff is not currently considering a change to the size of the EPZs, but will continue to support the development of a technology-neutral licensing framework with respect to this issue. The NRC staff will consider this issue further if it is presented in a proposed rulemaking petition or as part of a licensing application.

High-Temperature Gas-Cooled Reactor (HTGR) Knowledge Management

The NRC staff's high-temperature gas-cooled reactor (HTGR) knowledge management (KM) efforts involve maintaining and updating the NRC staff's cognizance of domestic and international developments in safety-related aspects of HTGR technology, ensuring that the HTGR analysis tools developed are documented and retrievable for future use by the NRC staff, and preserving and transferring the knowledge gained from the NRC staff's earlier efforts on HTGR technology. An HTGR KM plan has been developed. The near-term objective of the plan is to develop HTGR information sources. The plan includes capturing critical internal and external HTGR information and establishing the capability to make the appropriate information available to cognizant NRC staff when and where it may be needed. The initial effort will involve identification of: domestic and international HTGR experts; HTGR technology information sources, including analytical tools, experimental data, analysis results, and national and international groups; and meetings involved in HTGR technical information exchange. These efforts will also address HTGR information taxonomy development, and identification of NRC HTGR knowledge gaps. A request for proposal has been issued to a DOE national laboratory to support HTGR KM activities. The DOE lab being solicited maintains expert staff currently involved in international committees and advisory boards related to HTGR technology development, standards, and applications.

RES and the Institut de Radioprotection et de Sûreté Nucléaire (IRSN) met in Rockville, Maryland, on March 8, 2005, to discuss areas and opportunities for technical information exchange in the Generation IV reactor area with a special focus on information exchanges on HTGR and VHTR (very high-temperature reactor technology). RES and IRSN agreed in principle that information (i.e., reports, analysis, etc.) will be exchanged in the area of advanced

HTGR designs. The meeting included initial discussions of specific safety research and design information that could be provided within the context of the existing technical exchange agreement.

Human Factors

The NRC staff sponsored a workshop in March 2004 to identify and preliminarily prioritize research issues related to the role of operators in advanced reactor systems. These research issues had been developed in a research project report, "Development of Insights Report on the Role of Human Performance in Advanced Reactors," which was sponsored by the NRC and prepared by Brookhaven National Laboratory (BNL). The NRC staff used the results of this report and the results of the 2004 workshop to develop an April 2005 technical letter report, "Insights into the Role of the Operator in Advanced Reactor Systems." As part of that effort, the NRC staff presented a program of future research on human factors in new reactors. The program will address the effects of automation on personnel performance, operations under degraded instrumentation and control and human-system interface conditions, staffing analysis methods and tools, advanced design and evaluation methods, and research facilities.

RES has a program to study the above issues, which will result in proposed review guidance for the licensing of the new technologies. Many of the issues and the related guidance will be reactor technology neutral, but some may be reactor or even site specific. Other issues and insights identified are omitted in the currently planned work because of their relationship to safety versus efficiency, perceived priority, and facility or resource availability. These omitted issues may need to be pursued later or by other entities (e.g., DOE, Electric Power Research Institute (EPRI), vendors, or the international community).

In a related effort, the NRC staff observes meetings of the EPRI/Utility Hybrid Human System Interface Working Group. This group meets periodically to evaluate the industry's need for additional guidance and research in the area of digital system upgrades for present nuclear power plants (NPPs) and future advanced reactors. As a result of input from this group, EPRI published "Human Factors Guidance for Hybrid Control Room and Digital Human-System Interface Design and Modification," November 2004. These guidelines also could serve as a basis for future guidance for new reactors. The NRC staff is also reviewing NEI guidance for the industry on developing applications for new reactors, including guidance on human factors topics.

In 2004, the NRC staff also published "Human Factors Engineering Program Review Model" (NUREG-0711, Rev. 2) and "Guidance for Assessing Exemption Requests From Nuclear Power Plant Licensed Operator Staffing Requirements Specified In 10 CFR 50.54 (m)" (NUREG-1791).

Structural and Seismic Accomplishments

RES is sponsoring a research program at BNL to develop a technical basis for the safety evaluation of deeply embedded and/or buried (DEB) structures proposed for advanced reactor designs (e.g., PBMR, GTMHR). The overall objective of this research is to investigate the applicability of existing seismic soil-structure interaction (SSI) computer codes to DEB structures and to recommend any necessary modifications to the computer codes. For the PBMR and GTMHR new reactor designs submitted to the NRC for preliminary review, the entire

reactor building and much of the steam generator building will be partially or completely embedded below grade. SSI effects and passive earth pressures for these types of deeply embedded structures will have a significant influence on the predicted seismic response of the plant structure and components. Research performed by foreign research and development (R&D) organizations and regulators will also be reviewed for applicability and to determine gaps where additional research is needed.

To obtain data and gain knowledge from research performed outside the United States, RES concluded negotiations in early FY 2005 on a cooperative agreement with Japan Nuclear Energy Safety Organization (JNES) in the area of seismic engineering. One of the projects to be studied by JNES under the cooperative agreement is the seismic behavior of deeply embedded structures where actual test models will be constructed at a U.S. coal mine location and subjected to artificial ground motions generated by blasting. The RES staff participated in a planning meeting for the proposed test in April 2005 and met again with JNES in May 2005.

Codes and Standards Development

On March 10 and 11, 2005, RES continued its participation in the quarterly meetings of the ANS 28 Subcommittee. The purpose of the ANS 28 Subcommittee is to prepare an ANS safety standard for modular HTGRs (i.e., "Nuclear Safety Criteria for the Design of Modular Helium-Cooled Reactor Plants"). The objective of the standard is to establish the nuclear safety criteria, functional performance, and design requirements of structures, systems, and components (SSCs) of modular gas reactor (MGR) plants consistent with established risk objectives. Thanks to NRC participation, the subcommittee developed the standard in a way that is compatible with the NRC's regulatory structure for new plant licensing (NUREG 3-2005, "Regulatory Structure for New Plant Licensing, Part I: Technology-Neutral Framework"). A major focus of the March 2005 subcommittee meeting was the development of an approach and process for a risk-informed classification scheme for modular HTGR SSCs. The ANS 28 Subcommittee working group expects to develop the first complete draft of the safety standard by the end of calendar year (CY) 2005.

ADDITIONAL STAKEHOLDER INTERACTIONS

Department of Energy

The new Idaho National Laboratory, which includes the research and development elements of what was previously INEEL plus ANL-West, began operations on February 1, 2005. NRC and DOE are discussing the renewal of the memorandum of understanding (MOU) on cooperative research between RES and the DOE Office of Nuclear Energy (NE), Science and Technology. The MOU expired in August 2004. NRC will seek to obtain access to research information as early as soon possible after the information is developed.

The NRC participates as an invited observer in meetings of the Nuclear Energy Research Advisory Committee (NERAC), which are held about twice a year. NERAC provides advice and guidance to NE, and has done much of the high-level planning for the civilian reactor program, for example as the roadmap documents for near-term deployment (NP 2010) and Generation IV. NRC staff attended the most recent meeting of NERAC in January 6, 2005, and will continue to monitor the activities of the organization.