

## **POLICY ISSUE INFORMATION**

January 12, 2005

SECY-05-0013

FOR: The Commissioners

FROM: Luis A. Reyes  
Executive Director for Operations

SUBJECT: SEMIANNUAL UPDATE OF THE STATUS OF NEW REACTOR LICENSING  
ACTIVITIES AND FUTURE PLANNING FOR NEW REACTORS

PURPOSE:

This paper informs the Commission of the staff's new reactor licensing activities since the issuance of SECY-04-0117, "Semiannual Update of the Status of New Reactor Licensing Activities," dated July 9, 2004, and describes upcoming planning challenges associated with an increased interest in licensing activities.

BACKGROUND:

In SECY-01-0188, "Future Licensing and Inspection Readiness Assessment," dated October 12, 2001, the staff assessed its technical, licensing, and inspection capabilities, and described enhancements to support new reactor licensing. The staff also committed to give the Commission semiannual updates of the status of new reactor licensing activities.

Attachment 1 describes recent design certification review activities, early site permit (ESP) review activities, pre-application activities for new reactor designs, and supporting infrastructure

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development. Interactions with stakeholders, including international and intergovernmental activities, are also discussed.

Recent developments within the U.S. and abroad have increased attention on the possible licensing and construction of new reactors. The Department of Energy's recent announcement of a cost sharing program in support of a combined license (COL) demonstration project for the development of a COL application in the U.S., as well as the commitment of two European nations to build new reactors over the next several years, has elevated the interest of nuclear vendors and electric generating companies. As a result, there is an increased number of requests for regulatory interactions which could lead to one or more applications for new licenses. The staff is actively engaged in discussions with various stakeholders to identify possible unanticipated resource challenges affecting both current and reasonably foreseeable budgets. The staff will continue to give higher priority to activities that could culminate in the submission of one or more COL applications consistent with current planning and budgetary assumptions.

#### DISCUSSION:

##### Status of New Reactor Licensing Activities

The staff has completed a number of activities since the last status update paper and continues work on several key regulatory products in connection with new reactor licensing. Notable accomplishments include the completion of the technical review of the Westinghouse Advanced Plant 1000 (AP1000) design certification application on September 13, 2004, and continued progress on the review of the ESP applications filed by Dominion Nuclear North Anna, LLC (Dominion), for the North Anna ESP site, by Exelon Generation Company, LLC (Exelon), for the Clinton ESP site, and by System Energy Resources, Inc. (SERI), a subsidiary of Entergy Corporation, for the Grand Gulf ESP site.

On October 27, 2004, the staff issued the pre-application safety assessment report (PASAR) for the Atomic Energy of Canada, Limited (AECL) Technologies Inc. Advanced CANDU Reactor 700 (ACR-700). During a public meeting on August 17, 2004, the NRC staff discussed the process and expectations for a design certification application. The NRC staff emphasized that testing and the results of those tests were an important part of any design certification application that would be submitted to satisfy the requirements of 10 CFR 52.47. During the meeting the NRC stated that the overall review schedule will be issued after receipt of the design certification application and that the review would likely take between 42 and 60 months.

The staff is continuing the pre-application review for the General Electric (GE) Economic and Simplified Boiling-Water Reactor (ESBWR). By letter dated November 19, 2004, GE formally notified the staff of their intent to submit an application for design certification of the ESBWR in June 2005. GE requested that the design certification be completed in 30 months. The NRC responded by letter dated December 7, 2004, and reiterated that design certification reviews are estimated to range from 42 to 60 months depending on the complexity and uniqueness of the design, efforts completed during the pre-application phase, whether policy issues need to be addressed, availability of NRC resources, and the priority assigned to the review.

The staff is addressing regulatory infrastructure issues to support the above and additional anticipated reviews. As resources allow, the staff is also working on long-lead-time

infrastructure issues in order to facilitate the review of non-light-water reactors (non-LWRs). Detailed status updates of all new reactor activities can be found in Attachment 1.

Two items of note during this update period include the status of the staff's effort associated with the Title 10, Part 52, of the Code of Federal Regulations (10 CFR Part 52) rulemaking activity and the staff's progress in resolving the treatment of operational programs in the licensing process (i.e., Programmatic Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)).

#### 10 CFR Part 52 Rulemaking

The staff has proposed a rulemaking to revise 10 CFR Part 52 based on lessons learned during 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). Due to the nature of the comments received and the extent of the changes necessary to address the comments, the staff plans to forward a revised proposed rule package, rather than a final rule, to the Commission by May 31, 2005. The staff has extended the schedule for completing the Part 52 proposed rule package, mainly as a result of the deferral of a significant portion of the staff's work on the Part 52 rulemaking to support higher priority work on other rulemakings: Part 2 (Hearing Process), Part 20 (Controlling Disposition of Solid Materials), § 50.69 (Risk-Informing Special Treatment Requirements), § 50.46 (ECCS), and § 50.48 (Fire Protection Manual Actions). In addition, the staff continues to make progress on a technology-neutral, risk-informed and performance-based regulatory framework for new reactor licensing.

#### Treatment of Operational Programs in the COL Process

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 staff to complete its work on the information necessary for the COL application for each of the programs for which the staff had previously assumed ITAAC would be required (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.

In a November 9, 2004, public meeting with the Nuclear Energy Institute (NEI) and other external stakeholders to discuss COL application issues, the staff discussed a proposed approach to fully describe an operational program in a COL application and address operational programs which will not be implemented prior to the issuance of a combined license. This approach proposes that the COL application should include final safety analysis report (FSAR)-level information for operational programs and, where necessary, supplemental information to fully describe these programs (the May 14, 2004, SRM states that "fully described should be understood to mean that the program is clearly and sufficiently described in terms of the scope and level of detail to allow a reasonable assurance finding"). Commitments regarding implementation of those programs that were not implemented when the COL is issued will be captured through license conditions, which is similar to the process used in license renewal. The staff intends to continue holding public meetings with NEI and other external stakeholders to discuss the information needed to fully describe each of the operational programs listed

above, as well as the remaining operational programs listed in SECY-02-0067, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for Operational Programs (Programmatic ITAAC)."

By letter dated September 15, 2004, NEI forwarded its latest proposal regarding the remaining outstanding issues associated with Emergency Planning (EP) ITAAC. The staff and NEI held a public meeting on November 9, 2004, to discuss NEI's proposed EP ITAAC. The NRC staff is preparing a written response to the NEI letter.

#### External Influences and Future Planning

The strategic plan lists new reactor activities as one area in which external influences will play a key role in the Agency's ability to achieve its strategic goals. Notable events include the Department of Energy's awards for participation demonstration projects for licensing new nuclear plants. In addition, NEI has requested additional effort to resolve generic COL issues to support early business decisions by prospective COL applicants. Lastly, Framatome ANP, Inc. (Framatome) and Pebble Bed Modular Reactor (PBMR) (Pty) Ltd. have submitted letters to the staff indicating their interest in pre-application interactions and design certification for their respective reactor designs.

Three consortia have received Department of Energy (DOE) awards in response to a November 2003 solicitation of interest for participation demonstration projects for licensing new nuclear plants. The first consortium consists of Dominion Resources, AECL Technologies Inc., Hitachi America, and Bechtel. 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 November 4, 2004, DOE announced that this consortium had received one of its Nuclear Power 2010 program awards. Based on current information, the staff plans to budget resources for the review of a possible COL application in FY 2007. However, several industry trade press articles have indicated a COL application for a facility may be submitted as soon as mid-calendar year (CY) 2006.

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. TVA has stated that it will decide whether to file a COL application following completion of the study in April 2005.

The third consortium, NuStart Energy Development LLC (NuStart), consists of nine energy companies and two nuclear reactor vendors. The energy companies are Constellation Generation Group, Duke Energy, Electricité de France (EDF) International North America, Entergy Nuclear, Exelon Generation, Florida Power & Light Company, Southern Company, Progress Energy, and TVA. The nuclear reactor vendors are Westinghouse Electric Company, LLC (Westinghouse), and GE. On April 26, 2004, this consortium submitted a proposal to DOE to demonstrate the NRC process for licensing the construction and operation of new nuclear power plants. The consortium is considering Westinghouse's AP1000 design and GE's ESBWR design. The Bellefonte site is one of several sites being evaluated by the consortium.

On November 4, 2004, DOE announced an award to NuStart. NuStart plans to select a final reactor technology and a proposed site by 2007. By letter dated December 7, 2004, NuStart stated that the consortium will be submitting at least one COL application in 2008. The letter also stated that they would be initiating pre-application discussions in early 2007. The letter further stated that NuStart may elect to submit two COL applications, one for each of the two technologies.

Since November 2004, there has been an increased level of interaction between the nuclear industry and the staff focusing on future plans for pre-application interactions, design certifications and COL applications. The staff has held several meetings with NEI and external stakeholders to discuss resolution of generic issues associated with COL applications. In a public meeting on December 8, 2004, NEI informed the NRC staff about industry's plans for new licensing activities for FY 2006, and how the NRC's licensing priorities correspond to these industry plans. NEI stated that up to 3 COL applications could be submitted in the late 2007 to 2008 timeframe. They stated that their COL application guidance would be submitted shortly and requested NRC endorsement by August 2005, assuming resolution of all outstanding generic COL issues in 2005. The NEI guidance, NEI 04-01, was formally submitted on December 21, 2004, to the NRC for review and comment. NEI stated that prospective COL applicants would be hesitant to move forward on COL pre-application activities until the new Part 52 rules were in place. NEI recognized that, once the 10 CFR Part 52 rulemaking was completed, the guidance would have to be revised.

In its letter dated December 2, 2004, Framatome informed the NRC staff of its intent to initiate pre-application discussions regarding the EPR reactor design. Framatome indicated that it wishes to start these interactions with the staff in FY 2005. Additional information regarding its pre-application plans is expected in February 2005. Framatome projects submittal of a design certification application for the EPR design in 2008.

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 November 11, 2004, PBMR (Pty) Ltd. proposed a schedule for pre-application interactions beginning with a planning phase (phase 1) from November 2004 through June 2005 followed by phase 2, which would consist of technical exchange on key issues and documentation of NRC positions, from July 2005 through December 2006. Lastly, PBMR (Pty) Ltd. discussed its schedule, which is intended to enable the company to submit a design certification application for the PBMR design in early 2007.

#### CONCLUSIONS:

New reactor licensing activities are currently focused on reviewing applications for design certification and ESPs and on preparing for a COL application. The staff continues to develop the technical infrastructure needed to complete these reviews and the regulatory infrastructure that will make the licensing process more efficient and effective in the future. The staff will also continue to reach out to all stakeholders to ensure openness in these activities. Future planning assessments have identified several challenges associated with the expectations of the industry for short design review schedules, multiple pre-application reviews and COL applications. In addition to the expected near-term applications, the staff has identified

challenges associated with regulatory preparedness for Generation 4 Designs (e.g., PBMR). Specifically, the staff will need to develop appropriate technical and regulatory capabilities, both for internal staff and our contractors, to accommodate the review of these advanced technologies.

#### RESOURCES:

Agency resources assigned to new reactor licensing activities appear sufficient to complete work planned during the FY 2005-2006 budget cycles. The budget for New Reactor Licensing for FY 2005 is \$13,210K in contract support and travel and 104 FTE. The FY 2006 budget request for New Reactor Licensing is \$13,980K in contract support and travel and 104 FTE. To develop budget estimates for FY 2005-2006, the staff considered information and experience gained in pre-application reviews, along with application schedule information provided by prospective applicants. However, recent communications from additional applicants indicate that the Agency will need to prioritize work to focus on regulatory products and infrastructure elements that are aligned towards national goals. This planning focus may not meet the needs or expectations of applicants pursuing longer term licensing activities or seeking NRC approval to facilitate deployment of advanced reactor designs abroad. Specifically, the staff may defer the design certification review of reactor designs such as the PBMR, IRIS and EPR until such time that these designs are clearly aligned with a domestic partner. However, the staff will continue to engage with prospective applicants through pre-application interactions, and will remain cognizant of international activities associated with advanced reactors as part of the knowledge management process.

In the FY 2006 budget process, highest priority for new reactor licensing resources were given to activities in support of COL applications. Therefore, the staff will focus on certifying the AP1000 design, completing the ESP reviews, and reviewing the ACR-700 and ESBWR designs. The staff will give lower priority to various other design certification and pre-application activities that the staff does not expect to be referenced in potential COL applications in the foreseeable future. Based on the prioritization discussed above, the existing FY 2006 budget estimate does not support a significant level of effort on these lower priority reviews regardless of their visibility or the desires of the prospective applicants. Additional funding of these activities will be considered during the FY 2007 budget process.

The Commissioners

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COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objection.

**/RA/**

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for Operations

Attachment: Semiannual Update of the Status of New  
Reactor Licensing Activities - December 2004

The Commissioners

- 7 -

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Attachment: Semiannual Update of the Status of New  
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**Semiannual Update of the Status of  
New Reactor Licensing Activities**

**December 2004**

**INTRODUCTION**

This attachment to the December 2004 update of the status of new reactor licensing activities summarizes the status of the Advanced Plant 1000 (AP1000) design certification review, the early site permit (ESP) reviews, pre-application activities for other reactor plant designs, regulatory infrastructure development, and stakeholder interactions.

**DESIGN CERTIFICATION**

Upcoming applications to certify the Advanced CANDU Reactor 700 (ACR-700) and Economic and Simplified Boiling-Water Reactor (ESBWR) reactor designs are expected to require considerably 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 nine years. About \$5.5 million was expended on contractor activities, including testing required for the AP600 review. The AP1000 review has taken 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 ACR-700 or ESBWR, so a higher level of effort is anticipated for these reviews than for the AP1000 review.

**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 Nuclear Regulatory Commission (NRC) staff issued its design certification review schedule on July 12, 2002, establishing the milestones and target dates for the review.

On June 16, 2003, the AP1000 draft safety evaluation report (DSER) was issued with 174 open items. The staff issued the final safety evaluation report (FSER) and FDA on September 13, 2004. It may be possible to complete the final design certification rule earlier than the scheduled date of December 2005, since the final AP1000 design control document (DCD) was submitted on time on September 7, 2004. As the cover letter to the FSER stated, completion of the rulemaking will depend on the extent of any post-FSER design changes warranting NRC staff review, any additional regulatory requirements codified prior to the completion of the design certification rulemaking, and potential impacts of other high-priority agency review activities. The staff provided the final schedule for the remainder of the design certification process when the FSER is issued. The milestones and their target due dates are listed below.

AP1000 Milestone	Target Date
Issue initial requests for additional information (RAIs), not including security and safeguards issues	September 30, 2002 (complete)
Westinghouse response to the RAIs	December 2, 2002 (complete)
Staff informs Westinghouse of RAI status	February 28, 2003 (complete)
Issue draft safety evaluation report	June 16, 2003 (complete)
Westinghouse to provide responses to all open items, and the NRC staff to determine whether these responses are acceptable	March 31, 2004 (April 29, 2004, actual)
Westinghouse submits Revision 14 of the AP1000 design control document	September 7, 2004 (complete)
Issue final safety evaluation report	September 13, 2004 (complete)
Issue final design approval	September 13, 2004 (complete)
Complete design certification rulemaking	December 2005

The staff is continually assessing the resources needed to support the AP1000 design certification. Thus far, the resource estimates have been consistent with the estimates given in SECY-01-0188.

Adjustments to the resource requirements are made using the staff's planning, budgeting, and performance management (PBPM) process, with consideration of other agency needs and priorities.

### **COMBINED LICENSE (COL)**

Three consortia have received Department of Energy (DOE) awards in response to a November 2003 solicitation of interest for participation demonstration projects for licensing new nuclear plants. The solicitation indicated that a decision would be made in mid-calendar year (CY) 2004. However, DOE's response for two of the three consortia was not announced until early fiscal year (FY) 2005.

The first consortium consists of Dominion Resources, AECL Technologies Inc., Hitachi America, and Bechtel. 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 November 4, 2004, DOE announced that this consortium had received one of its Nuclear Power 2010 program awards. The schedule for the submission of the ACR-700 design certification was delayed six months because of the slippage in the announcement of the DOE award.

Based on current information, the staff plans to budget resources for the review of a possible COL application in FY 2007. However, industry trade journals are indicating that a COL application for the facility may be submitted as soon as mid-CY 2006.

The second consortium consists of the Tennessee Valley Authority (TVA), Toshiba, General Electric (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. Following completion of the study in April 2005, TVA will decide whether to file a COL application.

The third consortium, NuStart Energy Development LLC (NuStart), consists of nine energy companies and two nuclear reactor vendors. The energy companies are Constellation Generation Group, Duke Energy, Electricité de France (EDF) International North America, Entergy Nuclear, Exelon Generation, Florida Power & Light Company, Southern Company, Progress Energy, and TVA. The nuclear reactor vendors are Westinghouse Electric Company, LLC (Westinghouse), and GE. On April 26, 2004, this consortium submitted a proposal to DOE to demonstrate the NRC process for licensing the construction and operation of new nuclear power plants. The consortium is considering Westinghouse's AP1000 design and GE's ESBWR design. The Bellefonte site is one of several sites being evaluated by the consortium. On November 4, 2004, DOE announced an award to NuStart. NuStart plans to select a final reactor technology and a proposed site by 2007. By letter dated December 7, 2004, NuStart stated that they will be submitting at least one COL application in 2008, and anticipates initiation of pre-application discussions in early 2007. NuStart may elect to submit two COL applications, one for each of the two technologies, depending on the outcome of their site selection efforts and the availability of funding. NuStart stated in their letter that they will provide the NRC with its detailed plans and schedule by November 1, 2005. Depending on NuStart's plan and schedule, if a COL application references the ESBWR technology, the staff may need to accelerate its ESBWR design certification review schedule.

### **EARLY SITE PERMITS (ESPs)**

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

The staff developed Review Standard (RS)-002 "Processing Applications for Early Site Permits," to provide guidance to staff reviewers on the process for reviewing an ESP application. On May 3, 2004, RS-002 was issued after Commission's review and approval. It provides detailed direction for managing and conducting ESP reviews and expands upon existing regulatory guidance.

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 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 to intervene in the SERI ESP application proceeding; consisting of 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 on 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, 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. Mandatory hearings and hearings on contested issues are expected to be held beginning in late 2005, after completion of the staff's review for the three ESP applications. Each ASLB is working out details of timing and conduct of the hearings.

In the process of performing the reviews of the three ESP applications, the staff has identified several generic issues. While the staff had worked with stakeholders prior to ESP application submittal to identify and resolve possible review issues, the first-of-a-kind nature of these reviews resulted in additional issues surfacing during the detailed reviews of the applications.

One issue that arose during review of the applications is associated with "major features" of emergency plans. The regulations in 10 CFR 52.17(b) allow an ESP applicant several options regarding submittal of emergency planning information. An applicant must identify physical characteristics unique to the proposed ESP site that could pose significant impediments to the development of emergency plans. In addition, an applicant must describe contacts and arrangements made with local, State, and Federal government agencies with emergency planning responsibilities. An applicant may, in addition, propose major features of the emergency plans that can be reviewed and approved by NRC in consultation with the Federal Emergency Management Agency (FEMA), in the absence of complete and integrated emergency plans. The staff met with the Nuclear Energy Institute (NEI) on issues related to: (1) the level of regulatory finality associated with emergency plan major features approved in an ESP; (2) industry concerns regarding the staff's guidance for review of major features in ESP submittals; and (3) the level of detail of staff evaluation of existing elements of established emergency preparedness programs relevant to and provided (or incorporated by reference) in ESP applications (typically associated with nearby operating reactors). The staff has set forth its position on these matters in a letter to NEI dated November 9, 2004. NEI has requested a meeting with the staff in January 2005 to discuss industry reaction to this letter. Resolution of these issues will contribute to the staff's review of the three pending ESP applications.

Another issue that arose following submittal of the applications involves 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 staff had not previously reviewed this methodology and informed the applicants that the choice to use this method could result in a delay in completion of the staff's seismic reviews for their respective ESP applications. Dominion subsequently elected to rely on the staff approved methodology in the regulatory guide and revised its application accordingly. Exelon elected to continue to rely on the new methodology. The staff informed Exelon that this will likely delay issuance of the staff's FSER by three months because of the need for the staff to review the new methodology in addition to reviewing Exelon's implementation of that methodology for the Clinton ESP site. The schedule for the FSER and resulting impact on the overall ESP schedule will be reevaluated after Exelon provides this additional information. Nonetheless, the staff intends to issue the DSER for Exelon on the current schedule.

The staff has also experienced some delays in completion of the environmental reviews required by 10 CFR Part 52. In the case of Dominion's application, the applicant was more than two months late in fully responding to the staff's RAIs. The staff was able to compress its schedule by one month to partially compensate for this delay, but a one-month review schedule slip was required. Then on July 15, 2004, Dominion submitted a major revision to its environmental report. Ultimately, these factors led to an additional one-month schedule slip in completion of the staff's environmental review of Dominion's application. Because the staff reviewers are largely the same for all three applications, this has resulted in a delay of two months in completion of the environmental reviews of the Exelon and Entergy ESP applications as well. These delays are not expected to impact the overall ESP schedules.

Major remaining schedule milestones for the staff's review of the three applications are shown in the table below. These dates are the most recent published dates, and they reflect the previously discussed delays in completion of all three environmental reviews. They do not, however, reflect delays in completion of the seismic review for the Exelon application which cannot be determined until the applicant provides additional information. In all cases, the mandatory hearing and Commission decision processes are assumed to require a total of 12 months after completion of the staff's safety and environmental reviews.

ESP Milestone	Dominion North Anna	Exelon Clinton	SERI Grand Gulf
Draft environmental impact statement (EIS) issued to EPA	<del>10/14/04</del> 12/10/04 C	<del>12/27/04</del> 3/04/05 T	<del>2/25/05</del> 4/29/05 T
Draft safety evaluation report (SER) issued	12/20/04 C	2/10/05 T	4/7/05 T
Final EIS issued	<del>6/16/05</del> 8/12/05 T	<del>8/25/05</del> 10/21/05 T	<del>10/21/05</del> 12/23/05 T
Final SER issued	6/16/05 T	8/25/05 T	10/21/05 T

C - Complete  
T - Target

Crossed out dates are from last update

## **PRE-APPLICATION ACTIVITIES**

The most significant factor affecting resources and schedules for the ACR-700 and ESBWR applications is the quality of the applicant's submittal and whether it is supported by sufficient testing and by research and development where necessary. The level of effort is also affected by the nature and significance of the differences in these designs 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 regulatory requirements will take more time and effort to review.

Early in the planning process the 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 these reviews. Planning for the upcoming applications emphasize 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 staff is developing tools to assist with composing 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 and 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 and proposed that the pre-application review be conducted in three phases. During Phase 1, GE and the staff discussed the scope, schedule, and resource estimate for the pre-application review. Phase 2 of the pre-application review included assessment of the technical basis for passive safety systems and the analysis methodology for loss-of-coolant accidents (LOCAs). Phase 3 of the pre-application review will include a continuation of the methodology review for transients including Anticipated Transients Without Scram (ATWS) and will address selected topics related to the design certification application.

In support of Phase 2 of the pre-application review, GE submitted topical reports regarding the ESBWR test and analysis program description, the ESBWR test program, the SBWR test program, the qualification of the TRACG computer code analysis method, the application of the TRACG code to the ESBWR design, ESBWR scaling, and the ESBWR design description. On August 19, 2004, based on the staff's review of these submittals and GE's response to the staff's RAIs, the staff issued a safety evaluation (SE) regarding the application of the TRACG computer code for ESBWR LOCA analyses (nonproprietary version, ML043000285). The staff concluded in the SE that TRACG, including the methodology for applying the code to the ESBWR, is an acceptable evaluation model for ESBWR LOCAs and that TRACG is acceptable for referencing during the design certification review of the ESBWR, provided the conditions specified in the safety evaluation are met.

On October 8, 2004, GE submitted information related to the application of the TRACG code for ESBWR anticipated operational occurrences (AOOs). GE submitted its topical report regarding

the application of TRACG to ESBWR Thermal-Hydraulic Stability on December 9, 2004, and plans to submit a topical report regarding the application of TRACG to ESBWR ATWS for staff review. These submittals will be reviewed by the staff during Phase 3 of the pre-application review being performed in FY 2005.

On October 12 and 13, 2004, the staff held a public meeting with GE to kick off Phase 3. GE presented its approach to several technical and regulatory issues, including the proposed use of design acceptance criteria (DAC) for piping, instrumentation and control, and human factors engineering; issues related to site parameters including seismic high frequency exceedance and tornado wind speed; possible need for exemptions to regulations such as general design criterion (GDC) 38; requirements for 72 hour capability of safety systems; issues related to probabilistic risk assessment and severe accident analysis; issues related to the form and content of the DCD; and design certification review schedule considerations and impacts. Additional dialogue is expected in these areas in the coming months.

By letter dated November 19, 2004, GE formally notified the staff of its intent to submit an application for design certification of the ESBWR in June 2005. GE requested the NRC to make the ESBWR design certification review a priority and to complete the design certification within 30 months to support utility desires to submit a COL application in 2008, and to support DOE's Nuclear Power 2010 initiative. The staff has previously communicated an estimated schedule for design certification reviews of 42 to 60 months (including rulemaking) in SECY-01-0188, "Future Licensing and Inspection Readiness Assessment," dated October 12, 2004. A schedule for the ESBWR design certification review will be published after an application is received and accepted for review.

GE's letter also confirmed its plan to submit additional pre-application submittals regarding the application of the TRACG code to ESBWR for ATWS in January 2005, and to support resolution of specific issues related to the submittal of the design certification application including the use of design acceptance criteria.

### **Advanced CANDU Reactor 700 (ACR-700)**

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 have features similar to pressurized-water reactor (PWR) designs in the United States.

The ACR-700 will also have features that make it significantly different from operating CANDU reactors. The ACR-700 utilizes light water as the coolant in the fuel channels, whereas operating CANDU reactors utilize 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 reactor core will be smaller than in operating CANDU reactors with fewer fuel channels.

The staff has used a multi-phased approach to conduct the ACR-700 pre-application review. At present, 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 by October 27, 2004, with the issuance of the pre-application safety assessment report (PASAR) (ML042110074).

The main objectives of the ACR-700 pre-application review have been met. The pre-application review of the preliminary design of the ACR-700 allowed the staff to identify technical and regulatory issues early and determine whether it was possible to successfully complete the standard design certification review. On the basis of the review of the materials submitted by AECL, including responses to RAIs, the staff determined that the applicant will need to study a number of technical issues in more detail to reach satisfactory conclusions for design certification. The staff expects that the review and evaluation of the ACR-700 design will be more challenging, will use more resources, and take longer than the review of a typical light-water reactor design. Nonetheless, based on the information provided, the staff is confident at this time that AECL can satisfactorily address the issues identified during the pre-application review.

The staff briefed the Advanced Reactor Steering Committee (ARSC) (discussed later in this attachment) on September 13, 2004, on the major issues identified in the ACR-700 PASAR including the staff's recommendation to adopt a probabilistic event selection for the ACR-700 risk-informed reactor accident classification scheme, a mechanistic fission product source term, and the staff's recommendation to evaluate the acceptability of using Canadian design codes and standards if American Society of Mechanical Engineers Code (ASME Code) requirements are not applicable or need to be supplemented. The results of the preliminary design coolant void reactivity (CVR) analysis, the application of core damage frequency guidelines to address limited core damage accidents (LCDAs) and severe core damage accidents (SCDAs), and the fuel design certification process for the ACR-700 CANFLEX fuel was presented. The ARSC recommended an information SECY be developed which summarizes the results of the pre-application review to prepare the Commission for the review of the ACR-700 design certification application.

The staff briefed the Advisory Committee for Reactor Safeguards (ACRS) on October 7, 2004, on the issues identified in the PASAR and requested a letter on the ACRS assessment of the ACR-700 design and whether a design certification review could be successfully completed. On October 14, 2004, the ACRS issued a letter on the review of ACR-700 pre-application safety assessment report. The ACRS agreed with the staff's assessment of the issues reviewed during the pre-application phase and identified issues which were of most interest to them. These issues were thermal hydraulics, reactor kinetics, probabilistic risk assessment, severe accidents, long-term cooling, software, materials, fire protection, and on-line refueling.

By letter dated October 1, 2004, AECL stated that the submittal date for the ACR-700 design certification application would be delayed (the target date was March 31, 2005). The delay was attributed to a delay in receipt of DOE's response to Dominion Energy's proposal for the North Anna COL Project. AECL explained that once DOE's position was known, the ACR-700 project schedule would be reviewed and a new submittal date for the application would be determined. AECL requested continued NRC engagement in the pre-application process during the proposed transition phase and stated it remained committed to proceeding with the ACR-700 design certification process. The new list of focus topics of the transition phase include:



reactor physics codes and CVR, evaluation models for design basis accidents, fuel, safety analysis, thermal/hydraulics, and Class 1 pressure boundary. Now that the awards have been made, the NRC staff is awaiting a new proposed schedule from AECL.

The October 1, 2004, letter also outlines AECL's objectives for the transition phase, which is the period of time between the pre-application period and the design certification review. The letter also discussed the objectives for the remainder of the pre-application period, including the resolutions of the issues identified during Phase 2 of the pre-application review, which are critical to achieving a quality submittal of the ACR-700 design certification application by AECL.

The staff will develop detailed resource requirements and a schedule for the ACR-700 design certification after receiving a complete design certification application from AECL. The resource requirements and schedule will consider the complexity and uniqueness of the design, focus topics and issues resolved during the pre-application phase, whether policy issues need to be addressed, the availability of NRC resources, and the priority of the review.

### **International Reactor Innovative and Secure (IRIS)**

On September 3, 2004, Westinghouse submitted a topical report on the phenomena identification and ranking table (PIRT) for the IRIS small-break-loss-of-coolant accident (SBLOCA). Westinghouse developed this report while planning the IRIS experiments and analyses and has requested that the NRC review the PIRT. The NRC staff is discussing this review with Westinghouse.

### **Framatome ANP Activities**

In its letter dated December 2, 2004, Framatome informed the NRC staff of its intent to initiate pre-application discussions regarding the EPR reactor design. The EPR is a large (4300 MWt) pressurized water reactor with active safety systems. Site preparation for construction of an EPR is underway at the Olkiluoto site in Finland, while EDF has chosen the Flamanville site in France for construction of its first EPR. Framatome indicated that it wishes to start pre-application interactions with the staff in FY 2005. Additional information regarding its pre-application plans is expected in February 2005. Framatome projects submittal of a design certification application for EPR in 2008.

There have been no interactions between Framatome and the NRC staff regarding the SWR-1000 reactor design. Future updates will omit this topic until there have been additional interactions between Framatome and NRC.

### **Gas Turbine Modular Helium Reactor (GT-MHR)**

The General Atomics Company (GA) GT-MHR design is an approximately 300 MWt helium reactor design based on high-temperature gas-cooled reactor (HTGR) technology. The GT-MHR design uses helium to cool ceramic-coated fuel particles contained in fuel compacts inserted in graphite fuel elements.

There have been no formal interactions between GA and the NRC staff regarding the GT-MHR in the last 12 months. GA has informally told the staff it plans to terminate GT-MHR

pre-application review interactions with the NRC and refocus its gas reactor design and development effort on the Very High Temperature Reactor (VHTR) project. NRC has asked GA to formally inform the NRC, via letter correspondence, of its decision to terminate GT-MHR pre-application interaction activities.

### **Pebble Bed Modular Reactor (PBMR)**

The PBMR is a 110 MWe modular high-temperature helium-cooled reactor. By letter dated February 18, 2004, PBMR (Pty) Ltd. notified the NRC that it intends to apply for design certification of the PBMR once it has completed enough of the detailed design for a PBMR demonstration plant to be built in South Africa. In the letter, PBMR (Pty) Ltd. asked to initiate discussions with the NRC to plan the scope and content of a PBMR pre-application review. PBMR (Pty) Ltd. asked to have a management meeting with NRC to discuss the PBMR project and the basis for its request to begin pre-application interactions with the NRC in advance of a PBMR design certification application. 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. The discussion topics included the progress of the PBMR program in South Africa, the schedule for PBMR development programs in South Africa and the U.S., proposed PBMR technical topics for pre-application discussions, the interests of U.S. and foreign utilities in the PBMR, and coordination of planning activities between PBMR (Pty) Ltd. and NRC.

By letter dated November 11, 2004, PBMR (Pty) Ltd. provided a detailed discussion of the objectives, key issues, and schedule envisioned for the PBMR pre-application effort as described to the staff in a public meeting on November 3, 2004. They proposed a schedule for pre-application interactions beginning with a planning phase (Phase 1) from November 2004 through June 2005 followed by Phase 2, which would consist of technical exchange on key issues and documentation of NRC positions, from July 2005 through December 2006. Lastly, PBMR (Pty) Ltd. discussed its schedule, which is intended to enable the company to submit a design certification application for the PBMR design in early 2007. The NRC staff plans to evaluate the scope, schedule and needed resources for both the PBMR pre-application interactions and the PBMR design certification review work in the context of the NRC's planning, budgeting, and performance management process.

## **REGULATORY INFRASTRUCTURE**

### **10 CFR Part 52 Update**

The staff has proposed a rulemaking to revise 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). Due to the nature of the comments received and the extent of the changes necessary to address them, the staff plans to forward a revised proposed rule package, rather than a final rule, to the Commission by May 31, 2005. The staff has had to extend the schedule for completing the Part 52 proposed rule package as a result of

the deferral of a significant portion of the staff's work on the Part 52 rulemaking to support higher priority work on other rulemakings, namely, Part 2 (Hearing Process), Part 20 (Controlling Disposition of Solid Materials), § 50.69 (Risk-Informing Special Treatment Requirements), § 50.46 (ECCS), and § 50.48 (Fire Protection Manual Actions).

### **Construction Inspection Program (CIP) Development**

The CIP development team is in the process of issuing three inspection manual chapters that describe the various aspects of the program for inspection of new reactor construction under Part 52. Inspection Manual Chapter (IMC) 2502, "Pre-Combined Operating License Inspections," has been reviewed by the regional offices and is scheduled for issuance by the end of 2004. IMC 2502 describes the types and scope of the inspections to be done in support of the review of the COL application. The scope includes the first-of-a-kind engineering inspections to review design engineering activities that are not covered by the 10 CFR Part 52 design certification process. Two additional IMCs are currently in the review process and are scheduled for issuance in Spring 2005. IMC 2503, "ITAAC Inspections," will verify ITAAC and IMC 2504, "Non-ITAAC and Programmatic Inspections," will evaluate the licensee's operational programs. In addition, IMC 2504 will describe the inspections to support transition to operation, including inspections during the testing phase and inspections to ensure the new plant is ready to be monitored under the reactor oversight process for operating reactors.

The staff has made progress in developing an approach for overseeing nuclear component suppliers for new plant construction. The staff met several times with the Federal Aviation Administration (FAA) to discuss the FAA's use of "resource targeting," a method by which oversight and inspection resources are assigned to the suppliers whose components present the greatest potential risk to safe flight. The risk determination is made based on a multifaceted evaluation of a supplier's quality program and the component being fabricated. The staff has successfully adapted the FAA's "resource targeting" approach and plans to use it to identify which of the suppliers of components used in new reactor construction should be inspected. The CIP Development Team has briefed the Office of Nuclear Reactor Regulation (NRR) management on how NRC could use a resource-targeting approach to identify suppliers to be inspected and how this approach would improve the staff's ability to define the level of effort needed to oversee suppliers. However, the details of how supplier inspection and oversight will actually be accomplished remain to be defined. Additionally, the agency will need to evaluate staff expertise in NRR and the regions with respect to supplier inspection before assigning responsibility for overseeing suppliers.

The CIP development team continues to explore ways to efficiently but effectively inspect the construction of a new reactor. The success of the inspection program depends on ensuring that the most critical areas are inspected. The team has identified the need to consistently select the most significant ITAAC for inspection regardless of the design. Working with the Office of Nuclear Regulatory Research (RES), the team has prepared a statement of work for the development of a methodology that can be used by the Regions as they develop their inspection plan for a construction project. The methodology will select the most important ITAAC for inspection. Using a common methodology will provide the same level of assurance that the plants have been successfully constructed even if the inspection plan varies among projects. The staff expects to have one of the national laboratories complete the work in FY 2005.

### **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 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 staff to complete its work on the information necessary for the COL application for each of the programs for which the staff had previously assumed ITAAC would be required (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.

In a November 9, 2004, public meeting with the NEI to discuss COL application issues, the staff discussed a proposed approach to fully describe an operational program in a COL application and address operational programs which will not be implemented prior to the issuance of a combined license. This approach proposes that the COL application should include final safety analysis report (FSAR)-level information for operational programs and, where necessary, supplemental information to fully describe these programs (the May 14, 2004, SRM states that "fully described should be understood to mean that the program is clearly and sufficiently described in terms of the scope and level of detail to allow a reasonable assurance finding"). Commitments regarding implementation of those programs that were not implemented when the COL is issued will be captured through license conditions, which is similar to the process used in license renewal.

The staff intends to continue holding public meetings with NEI to discuss the information needed to fully describe each of the operational programs listed above, as well as the remaining operational programs listed in SECY-02-0067, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for Operational Programs (Programmatic ITAAC)." These include the remaining quality assurance operational programs, containment leak rate testing, maintenance rule, inservice inspection and inservice testing, and equipment qualification (emergency planning will have ITAAC and therefore will not be a subject of these meetings). The staff will identify the information needed to evaluate operational programs as part of the review of a COL application, recognizing that many of the programs will not be fully developed and implemented when a COL is issued. The staff plans to report the results of its work and its interactions with external stakeholders to the Commission in a SECY paper prior to December 31, 2005.

### Emergency Planning (EP) ITAAC

In SECY-04-0117, the staff stated that it had developed draft proposed EP ITAACs for a COL in consultation with the Department of Homeland Security/Federal Emergency Management Agency (DHS/FEMA). SECY-04-0117 noted that the staff had issued a letter proposing the EP ITAAC for comment and held a transcribed public workshop to discuss the EP ITAAC. Since the last semiannual update, the staff held meetings with the NEI on June 2 and July 30, 2004, to refine the proposed EP ITAAC. During the July 30, 2004, meeting the staff and NEI agreed on a resolution path for the majority of issues associated with finalizing the EP ITAAC. NEI sent the staff a letter, dated September 15, 2004, that contained NEI's latest proposal regarding the remaining outstanding issues associated with EP ITAAC. The staff and NEI held a public meeting on November 9, 2004, to discuss NEI's proposed EP ITAAC. The NRC staff will provide a written response to the NEI letter based on the discussion which occurred during the meeting, which resolved the outstanding issues.

In SECY-04-0117, the staff stated that it expected to develop a SECY paper for the Commission by the fall of 2004. The staff and industry interactions were very productive and led to a successful resolution of all EP ITAAC issues. Therefore, the staff will be including a section in the Programmatic ITAAC SECY paper, on the resolution of EP ITAAC rather than submitting a separate paper.

### COL Application Guidance

In SECY-04-0117, the staff informed the Commission that NEI had begun developing guidance for preparing COL applications. NEI submitted Revision 4 of NEI 04-01, "COL Application Guidance," in December 2004. The staff expects to meet with NEI to discuss NEI 04-01. In 2005, NEI expects to address NRC comments, incorporate additional COL application and process guidance, and seek NRC endorsement of NEI 04-01, Revision 1. 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 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 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 staff's efforts to develop a technology-neutral licensing framework, resolution of non-light-water reactor (non-LWR) policy issues, including integrated risk and containment performance requirements and criteria, issues identified during the ACR-700 pre-application review.

### **Non-LWR Policy Issues**

In SECY-03-0047, "Policy Issues Related to Licensing Non-Light-Water Reactor Designs," dated March 28, 2003 (ML030160002), the staff discussed options and provided recommendations for Commission consideration on seven fundamental policy issues with respect to licensing non-light-water reactor designs. The staff stated in the SECY paper that four of the issues would be included in the development of the framework for future plant licensing. The four issues are the definition of defense-in-depth, the use of a probabilistic approach to establish the licensing basis, the use of scenario-specific source terms for licensing decisions, and whether to revise the emergency planning zone. The other three issues are how requirements for non-LWRs relate to international codes and standards, the implementation of the Commission's expectations for enhanced safety in future non-LWRs, and the possibility of licensing plants that do not have a pressure-retaining containment building.

The June 26, 2003, SRM in response to SECY-03-0047, provided direction on recommendations on the seven policy issues. The Commission approved the staff's recommendations on the four issues addressed in the framework, but rejected the staff's recommendation on international codes and standards. On the remaining two issues, the Commission asked the staff to: (1) provide further details on the options for, and associated impacts of, requiring that modular reactor designs account for the integrated risk posed by multiple reactors, and (2) develop functional containment performance requirements and criteria, and submit options and recommendations to the Commission.

In SECY-04-0103, "Status of Response to the June 26, 2003, Staff Requirements Memorandum on Policy Issues Related to Licensing Non-Light-Water Reactor Designs," dated June 23, 2004 (ML041140521), the staff provided a status report on the integrated risk of multiple reactors and containment performance requirements and criteria. The staff also held discussions with the ACRS on these issues and solicited stakeholder input via public meetings and workshops. The discussions have elicited additional views. The staff intends to consider the ACRS' and other stakeholder's feedback in further assessing these issues. Options and a recommendation on these two issues will be included in the paper planned for December 2004, on the technology-neutral framework for new plant licensing (discussed below).

### **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 (beyond the advanced designs currently in the pre-application stage). The staff is developing a regulatory structure with four major parts:

- (1) a technology-neutral risk-informed and performance-based framework that will give the staff guidance and criteria for developing technology-neutral requirements,

- (2) the content of a set of technology-neutral risk-informed and performance-based requirements based on the guidance and criteria established in the technology-neutral framework,
- (3) a technology-specific framework that will provide guidance and criteria for the staff on applying the technology-neutral framework on a technology-specific basis, and
- (4) technology-specific regulatory guides to show licensees how to meet the technology-neutral regulations on a technology-specific basis.

To date, the staff has made substantial progress in developing the framework. The staff is developing the framework in a hierarchical fashion, using guidance in the Commission's policy statements (i.e., Commission's Policy Statement on Severe Accidents, 50 FR 32138, August 8, 1985; Commission's Policy Statement on the Regulation of Advanced Nuclear Power Plants, 51 FR 24643, July 8, 1986; and Commission's 1986 Reactor Safety Goal Policy, 51 FR 28044). Supporting criteria and guidance are being developed to help achieve the top-level objectives in a risk-informed and performance-based manner and to provide the technical basis for developing a set of technology-neutral requirements for new plant licensing. In this regard, the framework will be used to implement the Commission's direction in the SRM of June 26, 2003, on the four approved non-LWR policy issues discussed in SECY-03-0047.

The staff conducted several public meetings in the May 2003—July 2004 period. The most recent public meeting, held on July 27 and 28, 2004, was attended by approximately 50 people, including representatives from the nuclear industry, public interest organizations, vendors, academia, DOE, national laboratories, consultants, and the NRC staff. The feedback on the framework was positive and indicated general agreement with the need for a framework and the conceptual bases for the framework. The attendees expressed a desire to comment on the draft framework when it is issued for public comment. In addition, the staff has had several discussions with the ACRS (both the full committee and the subcommittee on Future Plant Designs). The verbal feedback from the committee has been positive, indicating that the staff has made significant progress and is asking the right questions. The committee stated its interest in future staff briefings and its desire to support the staff. The staff plans to interact with both ACRS and external stakeholders on a regular basis.

The staff will complete the draft framework and provide it concurrently to the Commission and to the public for review and comment by the end of December 2004. The staff will also provide preliminary recommendations on new policy issues for Commission consideration and will provide final recommendations after the public review and comment period.

### **High-Temperature Gas-Cooled Reactor (HTGR)**

In August 2004, RES published NUREG/CR-6844, Volumes, 1, 2, and 3, "TRISO-Coated Particle Fuel Phenomenon Identification and Ranking Tables for Fission Product Transport Due to Manufacturing, Operations and Accidents." The PIRTs identify and rank the significant factors, characteristics, and phenomena associated with the integrity and fission product release of HTGR fuels. This NUREG documents the results of work that was initiated in FY 2002 in anticipation of a potential HTGR COL or design certification application. If the NRC receives an application to license or certify an HTGR, the TRISO fuels PIRTs report will provide significant input to the NRC in its effort to develop an infrastructure of data, analytical codes,

methods, and expertise to effectively review HTGR fuel safety performance. The staff obtained comments on the PIRT's report from international experts in TRISO fuel technology.

In FY 2005, RES will continue activities related to "HTGR Knowledge Management." This will include: (a) maintaining and updating the staff's cognizance of domestic and international developments in safety-related aspects of HTGR technology, (b) ensuring that the HTGR analysis tools developed are documented and retrievable for future use by the staff, and (c) preserving and transferring the knowledge gained from the staff's earlier efforts on HTGR technology. For these HTGR knowledge management activities, the staff is allocating 0.5 staff FTE and \$100K of contract funding. This is consistent with Chairman Diaz's FY 2005 budget guidance in his memorandum to the Commissioners dated June 20, 2003. Further, within this revised level of funding, resources should be targeted to monitor international activities related to gas-cooled reactor technology. The staff believes that this approach recognizes the high uncertainty of the nature of future designs and the timing of applications for new reactor construction.

### **Instrumentation and Control (I&C)**

In March 2004, RES and NRR staff members participated as observers in a workshop held by the Electric Power Research Institute (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 I&C system upgrades for present nuclear power plants (NPPs) and future advanced reactors. As a result of input from this group, EPRI recently published "Interim Human Factors Guidance for Hybrid Control Rooms and Digital I&C Systems" as a draft document. During the workshop, these draft guidelines and their current status were discussed, along with future efforts. The development of the guidelines is funded in part through the DOE Nuclear Energy Plant Optimization (NEPO) project. Representatives of various NPPs, utility organizations, and industry consultants and vendor organizations presented current and planned digital I&C system upgrades. While the pace of digital I&C safety system modernization has been slow, applications have been increasing in the last 2 to 3 years.

### **Human Factors**

The RES and NRR staffs participated in a workshop 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, the "Development of Insights Report on the Role of Human Performance in Advanced Reactors," which was sponsored by the NRC and performed by Brookhaven National Laboratory. Five external subject matter experts (three with U.S. industry experience and two from other countries) participated in the workshop. The attendees concluded: (1) the research was comprehensive and identified most of the major issues, (2) the human performance issues should be reorganized to better reflect their importance and to make them more meaningful, and (3) while the preliminary prioritization was appropriate, there was a consensus that developing methods, models, and tools for human performance evaluation is crucial to the success of NRC review of advanced reactor design processes. The participants also recommended that NRC hold a formal prioritization workshop with a larger group of subject matter experts. A workshop is being planned for FY 2005.



## **Structural and Seismic Accomplishments**

In February 2004, RES staff traveled to Japan (Tokyo and Tadotsu) to exchange information and gather Japanese data on the seismic performance of deeply embedded or buried structures and to develop the technical basis for the safety evaluation of the deeply embedded or buried structures that have been proposed for some advanced reactor designs. The RES staff also visited the Tadotsu Laboratory, which contains the world's largest "shake table" for testing structural models against simulated earthquakes to determine their seismic resistance.

Meetings to exchange information were held with the Japan Nuclear Energy Safety (JNES), Nuclear Power Engineering Corporation (NUPEC), Tokyo University, Tokyo Electric Power Corporation (TEPCO), Kajima Corporation, and Tokyo Gas. The focus of the meetings was experiments conducted, and actual earthquake data recorded, at a deeply embedded nuclear unit owned and operated by TEPCO. JNES is currently planning an international collaborative research program on deeply embedded structures and would like to have NRC join the effort. Representatives from Tokyo Gas summarized the design, construction, and analysis of the world's first and largest completely underground liquified natural gas tank, which was constructed in late 2003. During the site visit to Tadotsu Laboratory, the travelers observed the fragility capacity test of a full-scale horizontal-shaft pump. The horizontal-shaft pump was typical of pumps used in nuclear plants. The test setup contained a full piping loop. The plant was operating at normal conditions when it was subjected to an earthquake five times the recorded level of the 1995 Kobe earthquake, 0.8g. The initial test results indicated that the horizontal pump did not sustain any damage. RES staff plan to analyze information collected during the trip and follow up on the proposal to join the international collaborative test planned by JNES.

## **ADDITIONAL STAKEHOLDER INTERACTIONS**

### **International Cooperation**

The staff stated its intention to engage in international cooperation efforts for new reactor designs in a staff paper to the Commission, "International Cooperation on New Reactor Designs," (ML031740205). Consistent with the staff's intention, NRC and the Canadian Nuclear Safety Commission (CNSC) have conducted a series of meetings to discuss the feasibility of collaborating in the parallel CNSC/NRC design reviews of the ACR-700 design. The NRC and CNSC recently renewed their long-standing information exchange agreement and have used this agreement to sign a communication protocol on technical cooperation and on the exchange of technical information during the ACR-700 review.

The CNSC staff participated in the NRC PIRT meetings on the ACR-700 design to assist the PIRT panel. The staff participated in a series of meetings with CNSC to discuss the status of the ACR-700 preliminary design results on the coolant void reactivity analysis. The international collaboration with CNSC continues to make optimal use of regulatory resources and to accelerate the staff's acquisition of knowledge of CANDU safety technology. The staff requested background information from CNSC to understand the Canadian requirements for the safety analysis of CANDU nuclear power plants and the differences to the ACR-700 licensing basis document. The CNSC also provided, at the staff's request, copies of the report on the re-evaluation of measurements of the power coefficient of reactivity for the MAPLE-1 reactor and a copy of an annual fuel performance report. Information received from CNSC is

used as background material to accelerate the staff's knowledge of generic CANDU safety issues, and operating experience. Each agency will make its own independent assessment of the ACR-700 design based on information provided by the applicant and each agency will make its own final safety determination.

The staff also continues to seek opportunities to interact with and, where appropriate, initiate cooperative programs with other agencies and organizations. Such organizations include the Japan Atomic Energy Research Institute (JAERI), and National Nuclear Safety Administration (NNSA), the regulatory authority of the People's Republic of China (in the area of HTGR technology).

The NRC and NNSA are working to develop a joint research agreement on HTGR technology. In addition, a workshop with NNSA was held in July 2004, on the design certification process.

NRC is also supporting meetings sponsored by the International Atomic Energy Agency (IAEA), including various Coordinated Research Projects dealing with advances in fuel technology for HTGR and the effects of near-field earthquakes on nuclear facilities.

Looking ahead, the NRC will interact with various parties in France and South Africa if formal EPR and PBMR pre-application programs are approved.

### **Department of Energy**

RES senior management met with representatives of DOE's Office of Nuclear Energy in July 2004, to discuss issues related to nuclear reactor research. DOE discussed plans related to the new "Idaho National Laboratory," which will include the research and development (R&D) elements of INEEL plus ANL-West; DOE's objective is to make INL into a world-class nuclear R&D laboratory. DOE also provided updated information on plans for the so-called Next Generation Nuclear Plant (NGNP). DOE will, in the near future, be soliciting interest in participating in this program. DOE will then formally request NRC's involvement in reviewing aspects of the NGNP R&D effort. In this regard, DOE requested further discussion with NRC on the issue of appropriate quality assurance for NGNP activities. DOE also gave a brief update on the progress of the DOE-supported initiative to develop COL applications for near-term deployment. Finally, NRC and DOE discussed the renewal of the memorandum of understanding (MOU) on cooperative research between RES and DOE/NE. The MOU expired in August 2004. RES expressed interest in expanding the scope of the agreement to include access to data from DOE's international cooperative research programs. DOE stated that this will not in principle pose a problem and that the two parties will work together to develop a new MOU.

NRR and RES staff met with representatives of DOE's Office of Nuclear Energy in September 2004. DOE provided a status update on their Nuclear Power 2010 and generation IV initiatives, and discussed current activities related to the NGNP program. DOE proposed future interactions with the NRC to discuss regulatory issues associated with the proposed NGNP. DOE also discussed an ongoing activity to identify potential regulatory implications associated with the implementation of new construction techniques including modular construction.