

POLICY ISSUE INFORMATION

January 2, 2004

SECY-04-0001

FOR: The Commissioners

FROM: William D. Travers
Executive Director for Operations

SUBJECT: SEMIANNUAL UPDATE OF THE STATUS OF NEW REACTOR LICENSING
ACTIVITIES

PURPOSE:

This paper informs the Commission of the staff's new reactor licensing activities since the issuance of SECY-03-0113, "Semiannual Update of the Status of New Reactor Licensing Activities," dated July 7, 2003.

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 supporting new reactor licensing. The staff also committed to provide the Commission with semiannual updates of the status of new reactor licensing activities. Three updates have been provided so far: SECY-02-0076, dated May 8, 2002; SECY-03-0005, dated January 8, 2003; and SECY-03-0113, dated July 7, 2003.

The attachment to this paper describes recent design certification review activities, receipt of early site permit (ESP) applications, preapplication activities for new reactor designs, and supporting infrastructure development. Interactions with stakeholders, including international and intra governmental activities, are also discussed.

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DISCUSSION:

The staff is focusing its efforts on the completion of the AP1000 (Advanced Plant 1000) design certification review and the review of the three ESP applications. The preapplication reviews are a lower level of effort with the ESBWR (Economic and Simplified Boiling-Water Reactor) and ACR-700 (Advanced CANDU Reactor 700) reviews more active than the others. We are addressing regulatory infrastructure issues to support these reviews. As resources allow, the staff is also working on long lead time infrastructure issues that will make the review of non-light water reactors more efficient and effective. Brief summaries of key new reactor licensing activities since issuance of SECY-03-0113 are provided below.

AP1000 Design Certification

The draft safety evaluation report (DSER) was issued on June 16, 2003, with 174 open items. As of December 2, 2003, 136 of the 174 DSER open items were considered to be either resolved (no additional information needed by the Nuclear Regulatory Commission (NRC) staff to write the final safety evaluation report (FSER)) or confirmatory (Westinghouse has agreed to make a change to the AP1000 design control document and the change will be confirmed by the NRC staff prior to the issuance of the FSER). The staff continues to work with Westinghouse to resolve the open items in preparation for issuing the FSER. The staff remains on schedule to issue the FSER by September 13, 2004.

Early Site Permits

The staff received ESP applications from three applicants: Exelon Generation Company, LLC (Exelon) for the Clinton ESP site and Dominion Nuclear North Anna, LLC (Dominion) for the North Anna ESP site on September 25, 2003; and System Energy Resources, Inc. (SERI), a subsidiary of Entergy Corporation, for the Grand Gulf ESP site on October 21, 2003. The staff has completed the acceptance reviews of the North Anna, Clinton, and Grand Gulf ESP applications and the Secretary of the Commission has issued the notices of hearing for the North Anna and Clinton applications. The notice of hearing for the Grand Gulf application will be issued in the near term (i.e., no later than the first week of January 2004). The staff is staggering the completion dates of the review products for the ESP applications to integrate the review schedules for the ESP applications with the review schedules for license renewal applications.

Construction Inspection Program (CIP)

The CIP team has initiated several actions to ensure staff readiness for conducting inspections of new reactor construction. The team continues to gather information from our regulatory counterparts in other countries about the challenges associated with inspecting new construction processes, including those related to modular construction. If new plant construction becomes a reality, the NRC may need to expand its oversight of nuclear component suppliers in order to deal with suppliers that are new to the industry, including foreign-based suppliers.

Regulatory Infrastructure

In the near-term, the staff is addressing comments from the notice of proposed rulemaking on Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52. The original due date for the final rulemaking has been revised to allow the staff to clearly identify the 10 CFR Part 50 provisions that apply to Part 52. Since the last status report, the staff has published the denials of the two petitions for rulemaking regarding Part 52 submitted by the Nuclear Energy Institute (NEI). The staff has also responded to external stakeholder comments on the Early Site Permit Review Standard (RS-002). To prepare for potential combined license applications in the 2007 time frame, the staff has engaged external stakeholders on the CIP and other issues related to combined licenses.

The staff is also preparing to review non-light-water reactor designs by addressing long lead time policy and technical issues. The staff is interacting with external stakeholders to implement or revise the issues in SECY-03-0047, "Policy Issues Related to Licensing Non-Light-Water Reactor Designs," as directed by the Commission. In October, the staff used the Phenomena Identification and Ranking Table technique to identify phenomena important to the failure and fission product transport for the fuel that will be used in high temperature gas reactors. Additional work is being conducted in the areas of high temperature materials and the structural and seismic issues related to deeply-embedded or buried structures. With respect to preapplication review, however, continued delay in General Atomic's response to requested information on the Gas Turbine Modular Helium Reactor design may result in premature termination of the review process.

CONCLUSIONS:

New reactor licensing activities are focusing on the review of applications for design certification and ESPs, and preparation for a combined license 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 build public confidence in these activities.

RESOURCES:

New reactor licensing resource expenditures in fiscal year 2004 are being maintained within levels established by the Commission. Within those levels, the staff will adjust resources as needed to meet critical ESP and AP1000 milestones, and to reflect changing industry plans and schedules. Industry stakeholders have been asked to communicate their plans and decisions to the staff as early as possible. This information will aid the staff in acquiring and budgeting its resources. The staff will use the planning, budgeting, and performance management (PBPM) process to prioritize work, integrating new reactor licensing activities in the overall NRC budget.

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 objections.

/RA/

William D. Travers
Executive Director
for Operations

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

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

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ADAMS ACCESSION NUMBER: ML033380831

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Semiannual Update of the Status of New Reactor Licensing Activities

December 2003

INTRODUCTION

This attachment to the December 2003 update of the status of new reactor licensing activities summarizes the status of the AP1000 (Advanced Plant 1000) design certification review, early site permit (ESP) reviews, preapplication activities for other reactor plant designs, regulatory infrastructure development, and stakeholder interactions.

DESIGN CERTIFICATION

AP1000 (Advanced Plant 1000)

On March 28, 2002, Westinghouse Electric Company (Westinghouse) submitted its application for final design approval 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. As of December 2, 2003, 136 of the 174 DSER open items were considered to be either resolved (no additional information needed by the NRC staff to write the final safety evaluation report (FSER)) or confirmatory (Westinghouse has agreed to make a change to the AP1000 design control document and the change will be confirmed by the NRC staff prior to the issuance of the FSER). The staff continues to work with Westinghouse to resolve the open items in preparation for issuing the FSER. The staff remains on schedule to issue the FSER by September 13, 2004. A letter to Westinghouse dated December 2, 2003, reaffirmed that the FSER would be issued by September 13, 2004. Two milestones were established that must be met in order to ensure the FSER will be issued by September 13, 2004: (1) all open items must be resolved by March 31, 2004, and (2) Westinghouse must issue the final AP1000 design control document by May 31, 2004. The issuance date of the final design approval (FDA) was moved up by 6 weeks to September 13, 2004, to reflect issuing the FDA concurrent with the FSER. In addition, it may be possible to complete the final design certification rule up to 5 months earlier than the scheduled date of December 2005. The NRC staff committed to provide the final schedule for the remainder of the design certification process when the FSER is issued. Both of these schedule improvements are contingent on Westinghouse meeting the May 31, 2004, milestone.

ATTACHMENT

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
Westinghouse submits the final AP1000 design control document	May 31, 2004
Issue final safety evaluation report	September 13, 2004
Issue final design approval	September 13, 2004
Complete design certification rulemaking	December 2005

The staff is continuing its activities to resolve open items related to AP1000 thermal-hydraulics during small break loss-of-coolant-accidents (LOCAs). Pertinent to AP1000 performance is the amount of liquid entrainment that occurs while the AP1000 is transitioning from automatic depressurization system Phase 4 (ADS-4) blowdown to in-containment refueling water storage tank (IRWST) injection. During this period entrainment may be large, and methods to predict the entrainment rates have high uncertainty. To investigate entrainment processes and performance of the ADS-4 system in the AP1000, a series of integral experiments have been conducted in the APEX facility at Oregon State University. Experimental data from testing performed at the APEX facility has been submitted by Westinghouse for AP1000 design certification consideration. Evaluation of the APEX test data is continuing, as is an independent scaling assessment of the APEX facility.

In addition, the NRC has sponsored further confirmatory experiments at the APEX facility. Five tests have been completed since June 2003, with plans to conduct six additional tests before mid-2004. The U.S. Department of Energy (DOE) has also conducted tests using the APEX facility, and these data have been provided to the NRC for evaluation and review. These tests have provided data that can be used to characterize the entrainment during various periods of an AP1000 small break LOCA, including the ADS-4 to IRWST transition period. Evaluation of the NRC tests shows that in general, the entrainment and net carryover from the primary system is high, as evidenced by measurements in the APEX facility. Review of DOE-sponsored tests showed that for design basis conditions, the AP1000 is expected to retain sufficient water in the vessel in spite of high entrainment. No core uncover is expected for failure of one of the four ADS-4 valves. The NRC tests are designed to assess the margin available simulating beyond-design-basis conditions, i.e., more than one ADS-4 valve failure. The NRC tests showed that failure of two of the four ADS-4 valves will lead to significant core uncover. This approach is helpful in the assessment of the safety margin available in the AP1000 small break LOCA.

The staff is continually assessing resources needed to support the design certification. Thus far, the resource estimates have been consistent with the estimates given in SECY-01-0188, "Future Licensing and Inspection Readiness Assessment," dated October 12, 2001. 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.

EARLY SITE PERMITS

In SECY-02-0076, the staff informed the Commission that there were three potential applicants for an ESP. Two of the potential applicants had originally planned to submit their ESP applications in June 2003, and the staff had planned to allocate its resources based on this schedule. The staff has now received ESP applications from all three applicants. On September 25, 2003, Exelon Generation Company, LLC (Exelon), submitted an ESP application for the Clinton ESP site. The same day, Dominion Nuclear North Anna, LLC (Dominion), submitted an ESP application for the North Anna ESP site. On October 21, 2003, System Energy Resources, Inc. (SERI), a subsidiary of Entergy Corporation, submitted an ESP application for the Grand Gulf ESP site.

By letters dated October 23, October 24, and November 24, 2003, respectively, the staff informed the applicants of the staff's acceptance of the North Anna, Clinton, and Grand Gulf ESP applications for docketing. The staff will stagger the review of the ESP applications. Staggering the completion dates of the staff's review products for the ESP applications is necessary because of the need to integrate the review schedule for the ESP applications with the review schedule for license renewal applications, the need to reallocate staff resources because of delays in the submittal dates of two of the three applications, and resource constraints resulting from revisions to the fiscal year 2004 budget. In fiscal year 2005, some resources budgeted for design certification reviews will be redirected to fully fund the ESP reviews.

The staff's review of the Dominion application will be completed on the originally planned 21-month schedule. The reviews of the Exelon and SERI applications will be completed 2 and 4 months, respectively, after the Dominion review is complete. The Dominion review is being performed first largely because the planned environmental review team resources for that application were available. This was the case because Dominion's application was submitted on the original schedule announced by the applicant.

Highlights of the review schedules for the three applications are shown in the table below. 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 reviews.

ESP Milestone	Dominion North Anna	Exelon Clinton	SERI Grand Gulf
Application submitted	9/25/03	9/25/03	10/21/03
Environmental scoping meeting	12/8/03	12/18/03	1/21/04
Deadline for filing petitions to intervene	1/2/04	1/12/04	TBD
Environmental requests for additional information (RAIs) sent to applicant	2/26/04	5/7/04	7/2/04
Safety/emergency planning RAIs sent to applicant	6/3/04	7/27/04	9/21/04
Draft environmental impact statement (EIS) issued to EPA	10/14/04	12/27/04	2/25/05
Draft safety evaluation report (SER) issued	12/20/04	2/10/05	4/7/04
Final SER and EIS issued	6/16/05	8/25/05	10/21/05
Atomic Safety and Licensing Board initial decision	2/06	4/06	6/06

PREAPPLICATION ACTIVITIES

ESBWR (Economic and Simplified Boiling-Water Reactor)

The General Electric (GE) ESBWR is a 1390 MWe reactor using natural circulation for normal operation with passive safety features. This design is based on the certified advanced boiling-water reactor (ABWR) design and the simplified boiling-water reactor (SBWR) design which the staff started to review in the early 1990s. On April 18, 2002, GE requested a preapplication review of the ESBWR and proposed that the preapplication review be conducted in two phases. During Phase 1, GE and the staff discussed the scope, schedule, and resource estimate for the preapplication review. Phase 2 of the preapplication review is currently underway and includes assessment of the technology basis for passive safety systems and the analysis methodology for transients and accidents.

In support of the preapplication review, GE submitted eight topical reports. These documents discuss 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 TRACG application to ESBWR, ESBWR scaling, and the ESBWR design description. The staff plans to complete the review of these submittals in early calendar year 2004. GE has proposed additional preapplication review topics, including ESBWR anticipated transients without scram

(ATWS), stability, probabilistic risk assessment (PRA), and severe accidents. The schedule for these activities will be determined after GE informs the staff of the target date for submitting the associated topical reports for review. The preapplication review will also include discussions of the format and content of a design certification application, and the schedule and resource estimate for the design certification review. Resources budgeted to begin the ESBWR design certification review in fiscal year 2004 will be used to perform these additional reviews. It is anticipated that GE will submit a design certification application for the ESBWR design midway in calendar year 2005.

The staff is developing infrastructure to support a future design certification application. These activities include the development of methods, tools, and data to be used for independent safety assessments or confirmatory calculations. The staff has initiated programs to add modeling capabilities to NRC's thermal-hydraulic system analysis code TRACE, which are important to assess the safety features of the ESBWR design, including the tight coupling between the reactor vessel and the containment under certain accident scenarios. The coupled TRACE and CONTAIN codes will be the primary analytic tools used to perform confirmatory analyses of the ESBWR response to off-normal conditions. The staff is using the coupled TRACE/CONTAIN code system for independent calculations in its TRACG code review.

ACR-700 (Advanced CANDU Reactor 700)

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

The ACR-700 will have features that make it significantly different from operating CANDU reactors. The ACR-700 utilizes light water as coolant within the fuel channels, whereas operating CANDU reactors utilize heavy water. The ACR-700 will be designed to have a negative void reactivity coefficient so that if boiling occurs within the fuel channels, the reactor power will decrease. The negative void coefficient for ACR-700 will be achieved by using slightly enriched uranium fuel elements rather than the natural uranium fuel used in operating CANDU reactors. The reactor core will be smaller than operating CANDU reactors with fewer fuel channels.

Atomic Energy of Canada, Limited (AECL), provided its suggested plan for NRC's preapplication review of the ACR-700 in a letter dated September 26, 2002, and an amended plan on December 18, 2002. The December 18, 2002, letter expanded the scope of the preapplication review as originally identified in the September 26, 2002, preapplication review plan.

It is expected that the ACR-700 preapplication review will be accomplished in two phases. Phase 1 is a series of familiarization meetings designed to provide the staff with a general overview of the advanced CANDU reactor (ACR) design. Phase 1 of the ACR preapplication review has been completed and the ACR preapplication review is currently in Phase 2. The objective of Phase 2 is to provide more specific and detailed information about the ACR design

and to facilitate the staff's review of the focus topics identified in order to provide feedback to AECL Technologies in time to support their application for standard design certification.

In addition, given limited NRC resources, AECL Technologies has requested that priority be given to the following focus topics during Phase 2 of the preapplication review:

- Focus Topic #1 - Class 1 pressure boundary design
- Focus Topic #3 - Computer codes and validation adequacy
- Focus Topic #8 - On-power fueling
- Focus Topic #9 - Confirmation of negative void reactivity

Results of the preapplication review will be documented in a report to AECL providing staff comments on the material that has been submitted for review, and identification of additional information needed for the design certification review. The report will highlight any significant issues or safety problems which would affect the ultimate ability of the ACR-700 to receive design certification. Completion of the ACR-700 preapplication review is expected by September 30, 2004, in anticipation of AECL's plan to submit a design certification application in fall of 2004. The staff is currently refining the estimated resources required for the agency's preapplication review. Estimated resources to perform a design certification review will be developed based on experience gained from the preapplication effort. The staff is currently developing essential infrastructure in support of a future design certification application.

AECL modified the ACR-700 fuel design in July 2003 to provide increased confidence that the coolant void coefficient of reactivity is negative. On September 4, 2003, the staff sent Atomic Energy of Canada, Ltd. (AECL), a status report on our independent analysis of the ACR-700 coolant void coefficient.

On October 30 and 31, 2003, the staff conducted Phenomena Identification and Ranking Table (PIRT) meetings on the ACR-700 design. The PIRT process is used to identify key phenomena and processes that are important to understanding plant behavior under normal and accident conditions. The strengths of the PIRT process are in the importance ranking of these phenomena and the identification of data and models to support its predictions. The staff will use PIRT information to identify gaps in tools and data and help prioritize activities to address the gaps. The PIRT meetings were the first in a series of expert panel working meetings for applying the process to support the ACR-700 review. This initial meeting included introductory technical presentations by AECL and employed technical experts from the NRC, national laboratories, contractors, consultants, and universities. The second PIRT meeting was held on December 11-12, 2003.

NRC managers visited the AECL research and test facilities at White Shell and Chalk River on October 27 and 28, 2003, to explore possibilities for further cooperative versus independent research.

The international cooperation efforts with the Canadian Nuclear Safety Commission (CNSC) on the review of the ACR-700 design established a venue for the staff to gain access to Canadian safety information on CANDU reactors. On November 20, 2003, the CNSC provided the staff with a copy of the Generic Action Items Position Statements for Canadian Power Reactors including the unresolved action items. These Generic Action Items Position Statements are similar to NRC generic safety issues. Communication with CNSC staff CANDU experts on

various technical areas under review continues on a regular basis including monthly project meetings to discuss emergent technical issues identified by reviewers.

The CNSC staff was invited to participate on PIRT panels for the ACR-700 thermalhydraulics, severe accidents and reactor physics. During October 2003, the staff participated in CNSC sponsored training on ACR-700 thermalhydraulic computer codes. Additional physics codes training is currently planned for February 2004. The CNSC will be an invaluable asset as the NRC prepares to develop the criteria to be applied to the CANDU unique aspects of the ACR design not currently addressed by existing NRC criteria, such as the use of pressure tubes versus a pressure vessel. The staff is currently exploring the on-power fueling capability of the ACR design, including fuel design issues, as another major area of collaboration with CNSC. Interactions at the staff level with CNSC have been integrated in the preapplication review of the ACR-700 Quality Assurance (QA) process. The NRC and CNSC staffs plan to perform parallel reviews of AECL's QA programs. The two regulatory bodies will conduct their audits simultaneously at AECL's facilities beginning in March 2004.

SWR-1000 (boiling-water reactor with passive safety features)

In SECY-03-0113, the staff informed the Commission that Framatome Advanced Nuclear Power (Framatome ANP) intended to pursue a design certification for the SWR-1000, which is a 1253 MWe boiling-water reactor incorporating passive safety features. Framatome ANP had informed the staff that it planned to submit a design certification application sometime after 2005. Although Framatome ANP has previously stated that it expects to submit selected documentation for NRC review in calendar year 2004, the staff has not yet had any indication of what the material will involve or if it will be submitted.

The SWR-1000 was bid for the fifth reactor in Finland and Framatome ANP is currently assessing the results of the bidding process to determine what impact, if any, it will have on its plans to pursue design certification in the U.S. In October 2003, the Finnish utility Teollisuuden Voima Oy (TVO) informed the companies participating in the bidding competition for the new nuclear power plant unit that it will continue the negotiations with the preferred bidder, the consortium Framatome ANP - Siemens AG, based on their offer on a pressurized-water reactor plant with electric output of about 1600 MWe. TVO stated, however, that it has not yet excluded the other alternatives.

As stated in SECY-03-0113, in June 2003, the staff conducted a visit to examine test facilities in Germany used to conduct testing to support the SWR-1000 design certification application. Framatome ANP has indicated that further trips may be beneficial, but has not presented the staff with a schedule. The staff currently does not expect any significant activity in fiscal year 2004 on the SWR-1000. If Framatome ANP does decide to pursue design certification, the staff hopes to use, to the extent possible, the same review team for the SWR-1000 review and the ESBWR design review. Since the issues associated with the reviews are similar, the staff believes this approach will be more efficient than forming two independent teams.

GT-MHR (Gas Turbine Modular Helium Reactor)

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 the ceramic-coated fuel particles contained in fuel compacts inserted in graphite fuel elements.

On May 30, 2003, the NRC staff transmitted requests for additional information in connection with the staff's review of documents submitted by GA on the derivation of GT-MHR fuel quality specifications, fuel and source term technology data needs, and plans for fuel manufacturing quality controls. GA is following the development of the U.S. program for demonstration of nuclear-based hydrogen production, which could impact GA's GT-MHR preapplication activities with the NRC. Continued delay in the applicant's response to the staff's request for information may result in premature termination of NRC effort in fiscal year 2004.

IRIS (International Reactor Innovative and Secure)

On August 12, 2003, Westinghouse requested staff comments on portions of WCAP-16062-P, "IRIS Plant Description Document," and WCAP-16103-P, "IRIS Scaling Analysis, Part I." Westinghouse is seeking these comments to assist in its preparation of reports describing the IRIS test program with the goal of obtaining agreement on the adequacy of the testing to be performed. The staff plans to meet with Westinghouse in the near future to discuss the initial review scope.

Westinghouse also stated that it plans to submit a report in 2005 describing application of risk-informed regulations to IRIS, including justification for reduction of the plant emergency planning zone.

Westinghouse's goal is to have the first IRIS module deployed in the 2012-2015 time frame. To support this schedule, testing will need to start by the end of 2004, followed by a design certification application in 2006.

PBMR (Pebble Bed Modular Reactor)

The staff continues to monitor the status of the PBMR project in the Republic of South Africa. PBMR Pty. has informed the staff that PBMR design and development activities for the PBMR, a modular HTGR are continuing in South Africa. Current PBMR Pty. efforts are focused on detailed plant design and confirmatory research programs to support a demonstration plant in South Africa and the preparation of the safety analysis report for the South African National Nuclear Regulator (NNR). PBMR Pty. representatives continue to interact with the professional societies in the U.S. regarding development of codes and standards that would be important to licensing the PBMR in this country. The staff has been informed that PBMR Pty. intends to begin preapplication discussions with the U.S. NRC by mid-2004 and formal preapplication work in FY 2005/6. PBMR Pty. is also following the development of the U.S. program for demonstration of nuclear-based hydrogen production, which could influence PBMR's planning assumptions regarding engagement with the NRC.

On August 7, 2003, the staff attended a workshop, sponsored by DOE and presented by PBMR design and project management personnel, on the design and demonstration plant plans for the PBMR, including its potential use as a very high temperature reactor for hydrogen generation.

REGULATORY INFRASTRUCTURE

Title 10 of the *Code of Federal Regulations* (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 nuclear industry representatives about the ESP and combined license (COL) review processes. The proposed rule was published for comment in the *Federal Register* on July 3, 2003 (68 FR 40025). The comment period closed on September 16, 2003. The staff received eight comment letters on the proposed rule and is in the process of analyzing the comments.

The staff expects to forward a final rule to the Commission in August 2004, instead of February 2004, as originally planned. This extension was necessary to provide adequate time to revise the proposed rule in response to the public comments. One of the most prevalent and complex issues commented on relates to Part 52 requirements that broadly invoke requirements in various Part 50 provisions by reference. Based on the comments, the staff has determined that it is necessary to make changes to both Part 52 and Part 50 to make clear which Part 50 provisions apply to each of the seven Part 52 licensing processes. This is a large undertaking that will require close inter-office coordination.

Petitions For Rulemaking

The Nuclear Energy Institute (NEI) submitted two petitions for rulemaking regarding 10 CFR Part 52 in July 2001. In the first petition, PRM 52-1, NEI proposed adding two new sections to 10 CFR Part 52 to allow siting and programmatic information that was previously reviewed and approved by the NRC to be incorporated by reference and treated as resolved. NEI's second petition, PRM 52-2, proposed to eliminate requirements that applicants and licensees analyze and the NRC evaluate alternative energy sources and the need for power with respect to the siting, construction, and operation of nuclear power plants. Staff recommendations on the two petitions were provided to the Commission in September and November 2002. Staff requirements memoranda on both petitions were issued in May 2003 approving the staff's recommendations for denial, with comments. Notices of denial were published in the *Federal Register* on September 29, 2003, for PRM 52-2 (68 FR 55905) and on October 3, 2003, for PRM 52-1 (68 FR 57383).

Other Rulemakings

As stated in SECY-03-0113, the staff has deferred the rulemaking activities associated with Tables S-3 and S-4 of 10 CFR Part 51, alternative sites review of Part 51, and Appendix I to Part 50 until FY 2006. These deferrals were due to budget constraints based on the prioritization of these activities against other reactor arena activities. As stated in the attachment to SECY-03-0113, the staff had planned to continue developing a technical bases document for alternative site reviews. However, the staff believes that further development of this document should reflect the insights gained during the review of the three ESP applications

that contain alternate site reviews. Therefore, the staff has deferred the development of the technical document until the rulemaking activities resume.

Construction Inspection Program (CIP) Development

As noted in SECY-03-0113, the Construction Inspection Program (CIP) team, composed of Office of Nuclear Reactor Regulation (NRR) and regional personnel, developed a framework document after reviewing existing inspection procedures and regulatory guidance. The CIP framework document provides an inspection program overview regarding early site permit applications, issuance of a COL, verification of inspections, tests, analyses, and acceptance criteria (ITAAC) during the new reactor construction period, and transition to the Reactor Oversight Process (ROP).

The CIP team made the framework document public on May 30, 2003. On August 27, 2003, the staff conducted a Category 3 facilitated public meeting to solicit comments from stakeholders on the framework document. The staff also issued a *Federal Register* notice seeking written comments on the document. The CIP team is currently addressing the comments from the workshop and the written comments that were received in response to the *Federal Register* notice. The staff expects to issue the final framework document in early calendar year 2004.

The CIP team is also supporting the QA inspections associated with the ESPs. These inspections will be conducted in accordance with Inspection Manual Chapter 2501, "Early Site Permit." The first of these inspections was held for the Dominion North Anna ESP application during the week of November 17, 2003. The inspections for the Exelon Clinton and Entergy Grand Gulf ESP applications are scheduled for early calendar year 2004.

CIP-Staff Readiness to Conduct Inspections

The CIP team has initiated several actions to ensure staff readiness for conducting inspections of new reactor construction. These actions include familiarizing inspectors with construction-related activities at fuel cycle facilities such as the mixed oxide fuel fabrication facility. Other training actions will include observing some activities (e.g., cable pulling, welding) connected with the planned restart of Browns Ferry Unit 1. The team has also reviewed the inventory of skills and knowledge contained in the Strategic Workforce Planning (SWP) database to identify the current level of staff experience in the area of new construction. The CIP team is evaluating the need to incorporate a more defined list of skills related to construction inspection/oversight into SWP. This information would act as a means of capturing construction-related experience that may have been gained through work unrelated to the NRC's previous CIP. Steps are also being taken to ensure staff readiness to oversee licensee activities associated with nuclear component procurement for new plant construction.

The team continues to gather information from our regulatory counterparts in other countries about the challenges associated with inspecting new construction techniques, including those related to modular construction. As NRR staff members have had the opportunity to visit reactors under construction in other countries, they have taken the opportunity to learn more about current construction techniques. For example, during a trip to Japan, several staff members toured the Shika ABWR which is approximately 73 percent complete. During

discussions, the staff learned that both small and large modular construction techniques had been examined and piloted during construction of Japanese nuclear plants. It appears that the method that will be utilized for future plants is the large modular technique being implemented at the Shika facility. This construction technique will pose a number of challenges if utilized in the U.S. For example, detailed fabrication and construction schedules may be needed so that NRC inspectors will be able to identify and plan for vendor inspections that would need to be conducted. Such inspections may need to take place at the vendor's facility, or on site. Another aspect of planning and scheduling inspections is the speed of plant construction after a license is issued. The large modular technique could allow a plant to be constructed in approximately 3-5 years after a COL is issued. This will pose planning and inspection implementation challenges. During information exchange meetings in 2003, with the regulatory authorities of Korea and Taiwan, NRR staff members discussed the potential learning that visits to new reactor construction sites in these countries could yield.

The staff plans to examine construction techniques currently being used in the U.S. at non-nuclear facilities to gain additional insights and understanding of the challenges that are likely to be faced as we plan for and implement inspection programs during the construction phase.

CIP-Inspections of Component Suppliers

Currently, the NRC staff conducts inspections of nuclear component suppliers only under special circumstances and when needed to address specific safety allegations. A recent example of a special circumstance was the inspection conducted for the procurement of the North Anna Unit 2 reactor vessel head manufactured in France.

Most suppliers of replacement parts to operating U.S. nuclear plants are audited and approved by the Nuclear Procurement Issues Committee (NUPIC) under the NUPIC joint utility audit program. NUPIC has traditionally provided oversight of suppliers who supply the industry as a whole. The staff believes that the current approach of relying on the licensees' Appendix B programs and NUPIC audits is adequate to ensure the quality of safety-related components. To verify that the NUPIC audits are maintaining adequate oversight of suppliers of nuclear components, the NRC will observe NUPIC audit activities at least twice during the upcoming year.

The NRC may need to expand its oversight of nuclear component suppliers if new plant construction becomes a reality. The expanded oversight will be necessary to deal with the nuclear component suppliers that are new to the industry, some of whom will be foreign-based. It is also anticipated that new designs will use modular construction. The staff believes that these new suppliers engaged in modular construction activities will need to be inspected to ensure that the components are designed and fabricated to 10 CFR Part 50, Appendix B quality assurance requirements. The staff is considering the need for direct oversight of suppliers and plans to meet with NUPIC to discuss its possible role in the oversight of both foreign and domestic suppliers to new nuclear plant construction.

ESP Review Standard

As discussed in the previous update, the NRC staff is developing a review standard for ESP applications to provide guidance to the NRC staff on the process and criteria for reviewing an ESP application. The standard, designated Review Standard (RS) 002, "Processing Applications for Early Site Permits," consolidates existing guidance, updates the guidance to reflect the ESP licensing process, and identifies the scope of the ESP review. The standard also informs stakeholders regarding information the staff expects to be provided in an ESP application.

The draft review standard was released for interim use and public comment in December 2002. Two additional sections, addressing quality assurance and accident analysis, were released on April 11, 2003. The staff received comments on the document from NEI, Exelon Nuclear, Entergy Nuclear, Mr. Paul Gunter of the Nuclear Information and Resource Service, and Ms. Sandra Lindberg, a resident of the area near the Clinton site in Illinois, representing the organization No New Nukes. The staff has responded to all the comments by letter and has placed the comments and staff responses on the NRC's new reactor licensing Web page.

A major focus of industry and ESP applicant comments on the draft RS-002 was the need for the document to more clearly address the plant parameter envelope (PPE) approach. The staff has agreed to address this approach in RS-002. Other industry comments focused on the need to clearly differentiate between information needed at the ESP stage and information needed at the COL stage.

A number of the industry comments also addressed the various generic ESP issues that had been raised by NEI. As discussed in the previous update, the staff met with NEI and the prospective ESP applicants several times in 2002 and early 2003 to discuss and move toward resolution of these issues. NEI submitted industry positions on many of the issues, and the staff responded with letters stating the staff's positions. NEI disagreed with the staff's positions on some of these issues and reflected these disagreements in comments on RS-002.

Many of the comments submitted by Ms. Lindberg and Mr. Gunter did not directly address RS-002, though both expressed concern about the PPE approach. Other comments addressed fuel cycle concerns (e.g., storage and shipment of spent nuclear fuel, Yucca Mountain).

The staff has incorporated comment responses into the draft RS-002 as appropriate. In accordance with Commission direction in the staff requirements memorandum (SRM) for SECY-02-0199, "Denial of Petition for Rulemaking to Use Information from Prior Licensing Actions as Resolved Information for Early Site Permit and Combined License Applications," the staff plans to submit RS-002 to the Commission by the end of 2003, and will issue the final document after the Commission review. The current draft RS-002 and the staff's responses to public comments on the draft provide sufficient guidance for the staff's initial review of the ESP applications received in 2003.

Combined License (COL) Issues

The staff has begun interactions with stakeholders to resolve generic COL issues prior to the receipt of the first COL application. A public meeting was held on November 20, 2003, to discuss COL issues. A preliminary set of 22 generic issues has been identified and NEI indicated during this meeting that it is targeting a COL application for calendar year 2007.

In response to SECY-02-0067, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for Operational Programs," the Commission issued an SRM dated September 11, 2002. This SRM directed the staff to bring added predictability to the programmatic ITAAC process by developing appropriate guidelines to support the submission of necessary and sufficient information on programs in COL applications. Additionally, the SRM stated that the guidelines should clarify when programs beyond emergency planning require, or are likely to require ITAAC in the COL application. The Commission directed the staff to provide a report on the issue by March 1, 2004. The staff has developed a proposal using fire protection as an example program to discuss programmatic ITAAC. The staff issued a *Federal Register* notice and held a facilitated category 3 public meeting on August 25, 2003, to solicit comments on its proposal. The staff is currently addressing the comments it has received in response to the proposal and will provide a report to the Commission by March 1, 2004.

The staff has budgeted resources to support this COL generic review. The resources may need to be revised depending on the timing and the scope of the work involved with supporting this review.

Advanced Reactor Steering Committee

The Advanced Reactor Steering Committee, a joint Office of Nuclear Regulatory Research (RES) and NRR management team, continues to review activities associated with advanced reactor preapplication reviews, design certification reviews, and advanced reactor research infrastructure development. The steering committee identifies research activities necessary to support design certification reviews, including the agency's independent assessments of new reactor designs and the formulation of the technical bases for the regulatory requirements.

The Advanced Reactor Technical Advisory Group (TAG) continues to support and advise the Advanced Reactor Steering Committee by reviewing and assessing the agency's infrastructure needs that have been identified by the NRC technical staff in key areas. These areas include both advanced light-water reactor designs and non-light-water reactor (e.g., HTGR) designs. Current activities include research associated with the ESBWR, ACR-700, and GT-MHR preapplication reviews and policy issues related to non-light-water reactors.

Policy Issues

SECY-03-0047, "Policy Issues Related to Licensing Non-Light-Water Reactor Designs," dated March 28, 2003, identified seven policy issues for Commission consideration. In an SRM dated June 26, 2003, the Commission approved the staff's recommendations on four of the issues, requested additional information on two other issues, and did not approve the staff's recommendation on one issue. Currently, the staff plans to respond to the Commission's request for additional information on the two issues in April 2004.

Work to implement the four approved issues is proceeding as part of the effort to develop a framework for advanced reactor licensing described below. The status of the work on these four issues will also be summarized in the April 2004 response mentioned above. Currently, no additional resources for Fiscal Year 2004 and beyond are needed to support this work.

Advanced Reactor Framework Development

A preliminary Framework for a Risk-Informed Regulatory Structure for Advanced Reactors was developed in October 2003. This framework will help to ensure that a structured and systematic approach is used during the development of the regulations that will govern the design, construction, and operation of advanced reactors. The staff held an offsite meeting in August 2003 to discuss the preliminary results of the framework development and its schedule. The Advisory Committee on Reactor Safeguards (ACRS) and Advanced Reactors Steering committee were also briefed in November 2003 regarding the status, scope, technical approach, and safety guidance. In addition, the staff held a public workshop meeting in November 2003 to discuss the project plan, schedule, framework approach, and treatment of uncertainties.

HTGR (High Temperature Gas-cooled Reactor)

On October 30, 2003, a PIRT staff panel completed the identification of phenomena important to the failure and fission product transport for TRISO-coated fuel particles and fuel elements used in HTGRs. The panel identified and defined factors associated with design and manufacture, as well as phenomena associated with plant operations and postulated accidents, including heatup, reactivity insertion, and air and water ingress accidents. The final report is complete and will be sent in the near future to international HTGR fuel technology experts for comment.

In addition, two research contracts are in place to develop bases and improved methods for updating the American Society of Mechanical Engineers Code (ASME or Code) for high-temperature materials design procedures needed for components in HTGRs. International methodologies and data are being reviewed to develop these proposed improvements. A review and evaluation of the current ASME Code and Code cases for applicability to HTGR metallic components was completed and published in NUREG/CR-6816. A review of existing information on metal component behavior in HTGR environments was conducted and the results were published in NUREG/CR-6824. Creep testing of materials in simulated HTGR helium coolant, including impurities which may reduce creep life at HTGR temperatures, will be initiated in April 2004. Staff and contractor effort has developed a draft materials specification standard for nuclear grade graphite. Efforts are also underway with ASME to develop a code incorporating the best available methods and design criteria for graphite. The results of the materials testing program and improvements to the Code should assist the staff in evaluating the integrity and failure modes of components used in HTGR designs by licensees.

Instrumentation and Control

A review of lessons learned from the design, construction, and licensing of advanced digital instrumentation, control, and protections systems used in foreign evolutionary reactor designs is nearing completion and will be published in March 2004. This review will highlight areas where

revision to the current regulatory guidance may be needed. A research program for development of new risk models for advanced digital instrumentation and control, and reactor protection systems to support possible inclusion in risk-informed licensing, will begin in Fiscal Year 2004. This work will provide reliability and availability models for advanced digital safety systems expected to be used in new reactor designs.

Structural and Seismic Accomplishments

The staff is sponsoring a research program at Brookhaven National Laboratory (BNL) to develop a technical basis to support the safety evaluation of deeply embedded and/or buried (DEB) structures proposed for advanced reactor designs (e.g., PBMR, GT-MHR). 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 GT-MHR new reactor designs submitted to the NRC for preliminary review, the entire reactor building and a significant portion of the gas turbine 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.

On September 16, 2003, BNL published a technical letter report entitled "Current Practice for Deeply Embedded/Buried NPP Structures Subject to Seismic Loading." This report provides the results of BNL's review and evaluation of existing practices for SSI analyses that were performed under Task 1 of the Statement of Work (SOW) for this program.

Supporting Infrastructure Development

The staff has completed a draft NUREG on "Regulatory Guidance for Assessing Exemption Requests from Nuclear Power Plant Licensed Operator Staffing Requirements Specified In 10 CFR 50.54(m)," dated September 2003. The draft NUREG describes the process recommended for reviewing requests for exemption from the regulation. The guidance is based on function and task analyses and the anticipated role of the operator, given the concept of operations, rather than on a prescriptive rule that specifies a fixed number of licensed operators per site. This approach is consistent with Commission direction to use performance-based approaches when feasible. The staff plans to make the draft NUREG available for public comment in the spring of 2004.

Organizational Structure

A reorganization in NRR in June 2003 moved the New Reactor Licensing Program Office functions into the Division of Regulatory Improvement Programs. The New Reactors Program was combined with the Research and Test Reactors Program to provide administrative infrastructure to new reactor licensing activities. This improvement did not impact the strategy to manage new reactor licensing projects outlined in SECY-01-0188. An assigned project manager will coordinate the review of each specific licensing project with technical review staff

working in the current matrixed organization of the NRC in order to integrate the review of future licensing activities with other agency work.

ADDITIONAL STAKEHOLDER INTERACTIONS

International Cooperation

In addition to the international cooperation efforts with the CNSC as described in the ACR-700 section of this paper, the staff 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 the National Nuclear Safety Administration (the regulatory authority) of the People's Republic of China, in the area of HTGR technology. 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. The NRC staff has signed an agreement with JAERI to include HTGR technology research within the framework of the bilateral agreement related to reactor research. The NRC is also pursuing cooperative research with Tsinghua University's Institute of Nuclear Energy Technology in the People's Republic of China related to its HTR-10 reactor safety experiments.

Department of Energy

The staff held periodic meetings with representatives of DOE to discuss subjects related to new reactors. DOE representatives provided information related to DOE's perspective on energy legislation before Congress and the status of various DOE initiatives. NRC staff representatives discussed ESP activities, design certification activities, and research activities related to new reactors.

On November 19, 2003, DOE issued a solicitation for participation in new nuclear plant licensing demonstration projects. In this solicitation, DOE proposed to provide financial assistance for up to 50 percent of the cost of activities leading to issuance of a combined license for a new nuclear plant. In Fiscal Year 2004, DOE expects to make up to \$15 million available for this work. Applications are being sought from power companies, or teams led by power companies and plant owner/operators, with participation from reactor vendors, suppliers, architect-engineers, and constructors. DOE will accept applications until December 31, 2004, and will evaluate them as they are received. Additional information regarding this solicitation is available at <http://www.fedgrants.gov/Applicants/DOE/PAM/HQ/DE-PS07-04ID14435/listing.html>.

As discussed above, the staff is interacting with stakeholders on generic issues associated with COL applications. Resources are budgeted for these activities into Fiscal Year 2006. The impact of the DOE program will be evaluated as the staff develops the Fiscal Year 2006 budget.