

**ACRS MEETING WITH  
THE U.S. NUCLEAR  
REGULATORY  
COMMISSION**

**October 20, 2006**

# **OVERVIEW**

**GRAHAM B. WALLIS**

## **Accomplishments**

- **Since our last meeting with the Commission on December 8, 2005, we issued 37 Reports:**
- **Topics included:**
  - **Early site permit applications for the Grand Gulf and Clinton sites**

- Generic Safety Issue-191,  
“Assessment of Debris  
Accumulation on PWR Sump  
Performance”**
- Regulatory Guide 1.97, Rev. 4,  
“Criteria for Accident  
Monitoring Instrumentation for  
Nuclear Power Plants”**

- Regulatory Guide 1.205, “Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants”**
- Proposed approach to enhance the Reactor Oversight Process to address safety culture issues**

- Report on the NRC Safety Research Program (NUREG-1635, Vol. 7)**
- Application of the TRACG computer code to evaluate the stability of the ESBWR**

- SRP Section 14.2.1, “Generic Guidelines for Extended Power Uprate Testing Programs”**
- Ongoing security-related activities**
- Digital instrumentation and control system research**

## **License Renewal**

### **Since December 2005:**

- **Completed timely review of four applications (Browns Ferry, Brunswick, Nine Mile Point, and Monticello)**
- **Reviewed Generic Letter 2006-xx, “Inaccessible or Underground Cable Failures That Disable Accident Mitigation Systems”**



- **Reviewed interim results of the study to determine the need for establishing limits for phosphate ion concentration in groundwater to protect concrete structures of plants**
- **Will perform final review of Palisades application on an expedited schedule**
- **Performing interim review of Oyster Creek application**

## **Power Upgrades**

- **Reviewed three extended power upgrade applications (Vermont Yankee, R.E. Ginna, and Beaver Valley)**
- **Will review the extended power upgrade application for Browns Ferry Units 1, 2, and 3 after receiving complete safety evaluation report**

## **Risk-Informing 10 CFR 50.46**

- **Will review draft final rule to risk inform 10 CFR 50.46 at the November meeting**
- **At the request of the staff, deferred review of Regulatory Guide and draft final NUREG on 10 CFR 50.46 LOCA Break Frequency Evaluations**

## **Ongoing/Future Activities**

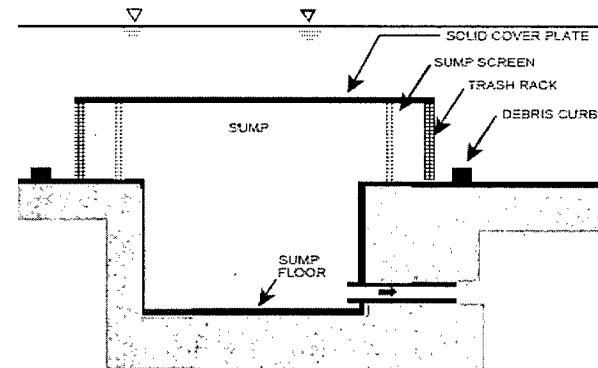
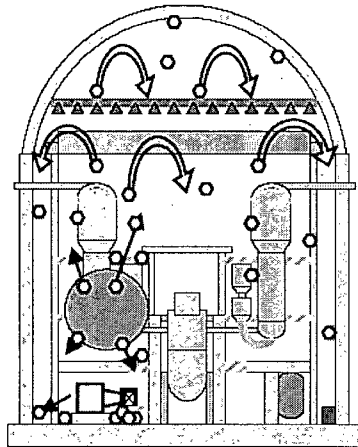
- **Advanced reactor design certifications**
- **Assessment of research quality**
- **Combined license applications**
- **Digital instrumentation and control system matters**
- **Early site permit applications**
- **Extended core power uprates**
- **Fire protection**

- **High-burnup fuel and cladding issues**
- **Human reliability analysis**
- **License renewal applications**
- **Operating plant issues**
- **Report on the NRC Safety Research Program**
- **Resolution of GSI-191, “Assessment of Debris Accumulation on PWR Sump Performance”**

- **Revisions to Regulatory Guides and SRP Sections to support new reactor licensing**
- **Risk-informing 10 CFR 50.46**
- **SPAR models**
- **Safeguards and security matters**
- **Technology-neutral regulatory framework**
- **Thermal-hydraulic codes**

# PWR SUMP PERFORMANCE

Graham B. Wallis



## **ACRS Interactions With The Staff And Industry**

- **February and June 2006 – NRC Staff and NEI**
- **August 2006 - Strainer Vendors and PWR Owners Group**
- **September 2006 – Observation of Vendor Tests**



## **Recent NRC Research**

- **Chemical effects**
- **Debris bed structure**
- **Coatings transport and head loss**
- **Head loss correlations**
- **Downstream effects**

## **Industry Activities**

- **Prototypical full-scale tests of strainer modules**
- **Chemical effects testing**
- **Head-loss correlations**
- **Coatings**
- **Debris transport**
- **Downstream effects**

## **The Path Forward**

- **ACRS letter April 10, 2006**
  - **PWR licensees are installing larger sump screens**
  - **Screen performance validated by “proof tests”**
  - **Debris formation and transport treated conservatively**
  - **Industry is performing additional needed research**

- ACRS is questioning how the NRC will determine the adequacy of plant-specific solutions**
- ACRS Letter August 1, 2006**
  - Research efforts and development of predictive models should continue**

**ACRS 2006 REPORT ON  
NRC SAFETY  
RESEARCH PROGRAM**

**Mario V. Bonaca**

## **Scope**

- **Research projects dealing with the safety of existing plants and advanced LWR designs submitted for certification**

## **Considerations**

- **Justification for the research**
- **Technical approach**
- **Progress of the work**

## **General Observation**

- **NRC Safety Research Program is focused on addressing near term regulatory needs of the agency with an appropriate concentration in three disciplines:**
  - **Materials and Metallurgy**
  - **Probabilistic Risk Assessment**
  - **Thermal Hydraulics**

## **Notable RES Accomplishments**

- **Multidisciplinary development of technical basis for revising the PTS screening criterion in the PTS Rule**
- **Performance of high-burnup fuel during reactivity transients**
- **Embrittlement of zirconium alloy cladding when taken to high burnup**



## **International Collaboration**

- **The NRC has developed effective collaborations with other countries on reactor safety research**
- **More collaboration with Asian countries having active nuclear power programs should be pursued**

## **Support For Future Licensing Activities**

- **NRC's resources for advanced reactor safety research are appropriately focused on addressing issues associated with ESBWR and EPR**
- **NRC needs to provide clear guidance on its expectations for the experimental validation of computer models to be used in the licensing of advanced reactors that do not use familiar technologies**

# **Opportunities For Independent Research**

- **Focusing NRC research entirely on the immediate needs of the line organizations reduces the opportunities for independent research by RES that could improve the regulatory process**

## **A Vision For Future**

- **A portion of research program needs to be devoted to the development of a regulatory infrastructure to deal with future regulatory demands**
- **The ACRS can foresee, for example, a time when regulatory staff has routine access to superior tools for system analysis, phenomenological analysis, and risk assessment**

**LESSONS LEARNED  
FROM THE REVIEW OF  
EARLY SITE PERMIT  
APPLICATIONS**

**William J. Shack**

## **Early Site Permit Applications**

- **North Anna**
- **Grand Gulf**
- **Clinton**

## **Generic Lessons**

- **Common understanding of expectations between staff and applicants**
- **Internet Data**
- **Electronic submissions**
- **Criteria for permit conditions and COL action items**
- **Performance-based seismic hazard analysis**

## **Other Lessons**

- **Definitions of pertinent site characteristics**
- **Guidance on plant parameter envelope**
- **Guidance on major features of emergency plans**
- **Calculation of probable maximum flood**



- **High frequency ground motion**
- **Weather cycles**
- **Lessons learned should aid considerably preparation and processing of COL applications**

**FUTURE PLANT DESIGN  
ACTIVITIES AND  
COORDINATION WITH  
STAFF ON THE MASTER  
INTEGRATED SCHEDULE**

**Thomas S. Kress**

# **ACRS Activities on New Reactor Designs**

- **Early Site Permit Applications**
- **Design Certifications**
- **Coordination on the development of Master Integrated Schedule**
- **COL Applications**
- **Revisions to Reg. Guides and SRP Sections**
- **10 CFR Part 52**

## **Early Site Permit Applications**

- **Completed review of ESP applications for North Anna, Grand Gulf, and Clinton**
- **Issued a lessons learned report**
- **Will review Vogtle ESP application after receiving staff's SER**

## **ESBWR Design**

- **Reviewed application of TRACG Code to analyze ESBWR stability**
- **ACRS letter dated April 26, 2006:**
  - **Recommended that the staff approve the use of TRACG to analyze the stability of ESBWR during normal operation, anticipated operational occurrences, and the low-power phase of reactor startup**

- **Reviewed Draft SER related to ESBWR pre-application**
- **Agreed with the staff's decision to approve the TRACG code for use in analyzing ESBWR in response to LOCA scenarios**
- **Identified issues that should be considered when using TRACG for design certification purpose**
- **Reviewing ESBWR PRA**
- **Will review staff's SER for ESBWR design certification in 2007**

## **Master Integrated Schedule**

- **Memorandum from former Chairman Diaz recommending ACRS coordination in the development of Master Integrated Schedule**
- **Provided ACRS planning assumptions for reviewing ESP, Design Certification, and COL applications**

- **Discussed the staff's proposed Master Project Management Plan at the October ACRS meeting**
- **Will continue to coordinate with the staff in the development and refinement of the Master Integrated Schedule and the Master Project Management Plan**



## **COL Applications**

- **Established design-specific COL Subcommittees**
  - **R-COL**
  - **S-COL**
- **Review to focus on COL action items and on plant and site-specific features**
- **Review of topic-specific issues**

# **Guidance For New Reactor** **Licensing**

- **COL application guidance (DG-1145)**
- **RG revisions**
- **SRP revisions**

## **ACRS Recommendations Related To Proposed Revisions To Part 52**

- **Level-3 PRA at the ESP stage should not be required**
- **Support a requirement for COL holders to maintain an up-to-date PRA**
- **Major features of the site emergency plan**
- **Operation up to 5 percent power even with deficiencies in emergency preparedness**

# ABBREVIATIONS

<b>ACRS</b>	<b>Advisory Committee on Reactor Safeguards</b>
<b>CFR</b>	<b>Code of <i>Federal Regulations</i></b>
<b>COL</b>	<b>Combined license</b>
<b>CY</b>	<b>Calendar year</b>
<b>DG</b>	<b>Draft guide</b>
<b>EPR</b>	<b>Evolutionary Power Reactor</b>
<b>ESBWR</b>	<b>Economic Simplified Boiling Water Reactor</b>
<b>ESP</b>	<b>Early site permit</b>
<b>GSI</b>	<b>Generic Safety Issue</b>
<b>LWR</b>	<b>Light-water reactor</b>
<b>LOCA</b>	<b>Loss-of-coolant accident</b>
<b>NEI</b>	<b>Nuclear Energy Institute</b>
<b>NRC</b>	<b>Nuclear Regulatory Commission</b>
<b>PRA</b>	<b>Probabilistic risk assessment</b>
<b>PTS</b>	<b>Pressurized thermal shock</b>
<b>PWR</b>	<b>Pressurized water reactor</b>
<b>R-COL</b>	<b>Reference combined license</b>
<b>RES</b>	<b>Office of Nuclear Regulatory Research</b>
<b>RG</b>	<b>Regulatory guide</b>
<b>S-COL</b>	<b>Subsequent combined license</b>
<b>SER</b>	<b>Safety evaluation report</b>
<b>SPAR</b>	<b>Standardized Plant Analysis Risk Model</b>
<b>SRP</b>	<b>Standard Review Plan</b>
<b>U.S.</b>	<b>United States</b>