



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

January 6, 2014

NOTE TO: FILE

FROM: Sherry Meador, Technical Secretary */RA/*  
Advisory Committee on Reactor Safeguards

The minutes of the subject meeting were certified on May 24, 2013 as the official record of the proceedings of that meeting.



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

May 27, 2012

MEMORANDUM TO: ACRS Members

FROM: Sherry Meador **/RA/**  
Technical Secretary, ACRS

SUBJECT: CERTIFICATION OF THE MEETING MINUTES FROM  
THE ADVISORY COMMITTEE ON REACTOR  
SAFEGUARDS 604<sup>th</sup> FULL COMMITTEE MEETING  
HELD ON MAY 9-10, 2013, IN ROCKVILLE, MARYLAND

The minutes of the subject meeting were certified on May 24, 2013 as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment:  
As stated



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

May 24, 2013

MEMORANDUM TO: Sherry Meador, Technical Secretary  
Advisory Committee on Reactor Safeguards

FROM: J. Sam Armijo */RA/*  
ACRS Chairman

SUBJECT: MINUTES OF THE 604<sup>th</sup> MEETING OF THE ADVISORY  
COMMITTEE ON REACTOR SAFEGUARDS (ACRS),  
May 9-10, 2013

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting are an accurate record of the proceedings for that meeting.

OFFICE	ACRS	ACRS:RSB/Sunsi
NAME	SMeador	CSantos/sam
DATE	05/24/13	05/24/13

**OFFICIAL RECORD COPY**

# MINUTES OF THE 604<sup>TH</sup> MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

## ROCKVILLE, MARYLAND

The 604<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards (ACRS) was held in Conference Room T2B1, Two White Flint North Building, 11545 Rockville Pike, Rockville, Maryland, on May 9-10, 2013. A copy of the meeting agenda is attached.

The summary report ML13141A631 from the ACRS Chairman to the NRC Chairman contains the following information for this meeting: (1) an accurate description of each matter discussed and (2) a list of all the documents issued or approved by the Committee. A copy of the summary report is attached. The documents received by the Committee are listed in the references of each committee letter associated with this meeting.

A transcript of selected portions of the meeting is available in the NRC's public document room ([pdr.resource@nrc.gov](mailto:pdr.resource@nrc.gov) or 1-800-397-4209), or from the Publicly Available Records System (PARS) component of NRC's document system (ADAMS), or at <http://www.nrc.gov/reading-rm/doc-collections/acrs/agenda/>. The presentation slides and handouts used during the meeting are attached to these transcripts.

### ATTENDEES

#### ACRS Members

Dr. J. Sam Armijo (Chairman), Mr. John Stetkar (Vice-Chairman), Mr. Harold Ray (Member-at-Large), Dr. Sanjoy Banerjee, Dr. Dennis Bley, Mr. Charles Brown, Dr. Michael Corradini, Dr. Dana A. Powers, Dr. Joy Rempe, Dr. Michael Ryan, Dr. Stephen Schultz, Mr. Gordon Skillman, and Dr. William Shack.

#### ACRS Staff

E. Hackett  
C. Santos  
M. Banks  
C. Brown

A list of other attendees is attached.



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 – 0001**

**AGENDA  
604<sup>th</sup> ACRS MEETING  
May 9-10, 2013**

**THURSDAY, MAY 9, 2013, CONFERENCE ROOM T-2B1, 11545 ROCKVILLE PIKE,  
ROCKVILLE, MD**

- |                          |  |
|--------------------------|--|
| 1) 1:00 PM - 1:05 PM     | <u>Opening Remarks by the ACRS Chairman</u> (Open) (JSA/EMH)<br>1.1) Opening Statement<br>1.2) Items of Current Interest   |
| 2) 1:05 PM - 3:00 PM     | <u>Next Generation Nuclear Plant (NGNP) Key Licensing Issues</u><br>(Open) (DCB/MLB)<br>2.1) Remarks by the Subcommittee Chairman<br>2.2) Briefing by and discussions with representatives of the<br>NRC staff regarding key licensing issues pertaining to the<br>NGNP project.   |
| <b>3:00 PM - 3:15 PM</b> | <b>*** BREAK ***</b>   |
| 3) 3:15 PM - 4:45 PM     | <u>Generic Issue (GI)-189, "Susceptibility of Ice Condenser and Mark<br/>III Containments to Early Failure from Hydrogen Combustion<br/>during a Severe Accident"</u> (Open) (GRS/MLB)<br>3.1) Remarks by the Subcommittee Chairman<br>3.2) Briefing by and discussions with representatives of the<br>NRC staff regarding the closure of GI-189, "Susceptibility<br>of Ice Condenser and Mark III Containments to Early<br>Failure from Hydrogen Combustion during a Severe<br>Accident." |
| 4) 4:45 PM - 7:00 PM     | <u>Preparation of ACRS Reports</u> (Open)<br>4.1) Next Generation Nuclear Plant (NGNP) Key Licensing<br>Issues (DCB/MLB)   |

**FRIDAY, MAY 10, 2013, CONFERENCE ROOM T-2B1, 11545 ROCKVILLE PIKE,  
ROCKVILLE, MD**

- 5) 8:30 AM - 8:35 AM      Opening Remarks by the ACRS Chairman (Open) (JSA/EMH)  
5.1)    Opening Statement  
5.2)    Items of Current Interest
- 6) 8:35 AM - 10:00 AM      Consequential Steam Generator Tube Rupture (C-SGTR) (Open)  
(JLR/CLB)  
6.1)    Remarks by the Subcommittee Chairman  
6.2)    Briefing by and discussions with representatives of the  
          NRC staff regarding the development of an enhanced risk-  
          assessment procedure for C-SGTR.
- 10:00 AM - 10:15 AM      \*\*\* BREAK \*\*\***
- 7) 10:15 AM - 11:45 AM      Future ACRS Activities/Report of the Planning and Procedures  
Subcommittee (Open/Closed) (JSA/EMH)  
7.1)    Discussion of the recommendations of the Planning and  
          Procedures Subcommittee regarding items proposed for  
          consideration by the Full Committee during future ACRS  
          meetings.  
7.2)    Report of the Planning and Procedures Subcommittee on  
          matters related to the conduct of ACRS business, including  
          anticipated workload and member assignments.
- [NOTE: A portion of this meeting may be closed pursuant to  
5 U.S.C. 552b (c) (2) and (6) to discuss organizational and  
personnel matters that relate solely to internal personnel  
rules and practices of the ACRS, and information the release  
of which would constitute a clearly unwarranted invasion of  
personal privacy.]**
- 8) 11:45 AM - 12:00 PM      Reconciliation of ACRS Comments and Recommendations  
(Open) (JSA/EMH/CS)  
Discussion of the responses from the NRC Executive Director for  
Operations to comments and recommendations included in recent  
ACRS reports and letters.

**12:00 PM - 1:00 PM**

**\*\*\* LUNCH \*\*\***

9) 1:00 PM - 6:30 PM

Preparation of ACRS Reports (Open)

Continue discussion of the proposed ACRS reports listed under Item 4. There may be 15-minute breaks at some points during this activity.

10) 6:30 PM - 7:00 PM

Miscellaneous (Open) (JSA/EMH)

Discussion of matters related to the conduct of Committee activities and specific issues that were not completed during previous meetings, as time and availability of information permit.

**NOTES:**

- When appropriate, members of the public and representatives of the nuclear industry may provide their views during the briefings.
- During the meeting, phone number 301-415-7360 should be used in order to contact anyone in the ACRS Office.
- Presentation time should not exceed 50 percent of the total time allocated for a given item. The remaining 50 percent of the time is reserved for discussion.
- Thirty five (35) hard copies and one (1) electronic copy of the presentation materials should be provided to the ACRS in advance of the briefing.
- One (1) electronic copy of each presentation should be emailed to the Designated Federal Official 1 day before the meeting. If an electronic copy cannot be provided within this timeframe, presenters should provide the Designated Federal Official with a CD containing each presentation at least 30 minutes before the meeting.



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

May 22, 2013

The Honorable Allison M. Macfarlane  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

SUBJECT: SUMMARY REPORT – 604<sup>th</sup> MEETING OF THE ADVISORY COMMITTEE ON  
REACTOR SAFEGUARDS, MAY 9-10, 2013

Dear Chairman Macfarlane:

During its 604<sup>th</sup> meeting, May 9-10, 2013, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters and completed the following letter and memoranda:

**LETTER**

Letter to R. W. Borchardt, Executive Director for Operations, NRC, from J. Sam Armijo, Chairman, ACRS:

- Next Generation Nuclear Plant (NGNP) Key Licensing Issues, dated May 15, 2013

**MEMORANDA**

Memoranda to R. W. Borchardt, Executive Director for Operations, NRC, from Edwin M. Hackett, Executive Director, ACRS:

- Draft Revisions to Standard Review Plan Sections, dated May 15, 2013
- Final Revision 2 of Regulatory Guide 1.137, dated May 15, 2013

**HIGHLIGHTS OF KEY ISSUES**

1. **Next Generation Nuclear Plant (NGNP) Key Licensing Issues**

The Committee met with representatives of the U.S. Department of Energy (DOE), Idaho National Laboratory (INL), and the NRC staff to review the staff's assessment of DOE/INL NGNP key licensing issues. The Energy Policy Act of 2005 directed DOE to establish and manage the NGNP project with INL as the lead laboratory and stipulated that the NRC has



licensing and regulatory authority for any reactor developed by the project. DOE selected a high-temperature gas-cooled reactor for the NGNP project. As required by the Act, DOE and the NRC have been engaged in interactions on technical, licensing, and policy issues that could affect the design and licensing of a NGNP facility. DOE and INL provided an overview of the NGNP safety and design basis approach. The overview included a summary of licensing issues (licensing basis event selection, source terms, functional containment performance, and fuel qualification and radionuclide retention) that have been the subject of interactions between DOE/INL and the NRC staff. The staff presented a summary of its assessment of licensing issue white papers submitted by INL regarding fuel qualification; mechanistic source terms; safety classification of structures, systems, and components; defense-in-depth; and licensing basis event selection. The staff indicated that the DOE/INL proposed approaches to NGNP licensing issues were generally reasonable, with caveats: deterministic elements should be strengthened and technical issues should be resolved through prototype testing in accordance with 10 CFR 50.43(e)(2). The staff emphasized that its assessment feedback is advisory; regulatory decisions would need to be based on actual design detail contained in a NGNP license application.

#### Committee Action

The Committee issued a letter to the Executive Director for Operations on this matter, dated May 15, 2013, concluding that the staff assessment of the INL white papers on key issues is appropriate given the unavailability of many plant-specific design details. In addition, the Committee recommended that 1) the staff assessment documents be revised to provide clear links to the numerous requests for additional information and responses, 2) the licensing basis event selection assessment should point out the need to clarify the definition of event sequences and event sequence families to ensure consistency in developing licensing basis events and design basis accidents, and 3) the staff's suggestion that the final selection of design basis accidents include postulated deterministic event sequences is inconsistent with the risk-informed framework proposed by the NGNP project and other ongoing NRC activities, so if such sequences are not in the probabilistic risk assessment, they should be revised to include them.

#### 2. Generic Issue (GI)-189, "Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion during a Severe Accident"

The Committee met with representatives of the NRC staff regarding the staff's completion of GI-189, "Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion during a Severe Accident." GI-189 was opened due to concern that hydrogen could accumulate in ice condenser and Mark III containments (14 reactors) following a severe

accident if the installed hydrogen igniter system was without power (e.g., station blackout) – the conditional containment failure probability exceeded the regulatory guideline. 10 CFR 50.44 required ice condenser and Mark III containment to have the capability to control combustible gas; however, there was no requirement to provide backup power to the chosen combustible gas control, AC-powered igniters. The staff presentation described the process used to investigate and successfully resolve the GI-189 issue. The staff's initial evaluation indicated that the most suitable solution to GI-189 was to provide backup power to the hydrogen igniters. Subsequently, the staff interfaced with stakeholders through several public meetings, developed a regulatory analysis regarding the need for rulemaking, obtained licensee commitments to install backup power to the igniters, and verified the installation of backup power using inspection procedure TI 2515/174, "Hydrogen Igniter Backup Power Verification." All licensee modifications were completed and inspected by the end of 2010. GI-189 was also reviewed for impacts following the Fukushima accident. The staff concluded that the agency's mitigating strategies order will enhance containment combustible gas control.

#### Committee Action

This was an information briefing. No Committee action was necessary.

### 3. Consequential Steam Generator Tube Rupture (C-SGTR)

The Committee met with representatives of the NRC staff to discuss ongoing efforts on the C-SGTR study. The staff is developing a methodology for a quantitative risk assessment of consequential steam generator tube rupture during (1) a severe accident after the onset of core damage and (2) a Design Basis Accident (DBA) event before the onset of core damage. The focus of the study is on estimating the probability of large early release from steam generator tube rupture and containment bypass. Simplified large early release frequency calculation methods have been developed for two representative PWR plants: a Westinghouse and a Combustion Engineering design. The staff indicated that the study utilized the latest available thermal-hydraulic models, updated steam generator tube flaw distributions, and new models and software for estimating the failure probability/timings of steam generator tubes and reactor coolant system components (i.e. hot leg and surge line). Although the staff has additional work to complete, they are currently reviewing and evaluating preliminary results.

#### Committee Action

This was an information briefing. No Committee action was necessary.

#### 4. Final Revision 2 to Regulatory Guide 1.137

The Committee considered the draft final revision to Regulatory Guide 1.137, "Fuel Oil Systems for Emergency Power Supplies," and decided not to review it. The Committee has no objection to the staff's proposal to issue this Regulatory Guide as final.

#### 5. Draft Revisions to Standard Review Plan Sections

The Committee considered the draft revisions to the following Standard Review Plan (SRP) Sections and decided not to review them. The Committee would like an opportunity to review the draft final versions of those SRP Sections.

- Section 3.8.1 - Concrete Containmentment
- Section 3.8.3 - Concrete and Steel Internal Structures of Steel or Concrete Containments
- Section 3.8.4 - Other Seismic Category I Structures
- Section 3.8.5 – Foundations

#### RECONCILIATION OF ACRS COMMENTS AND RECOMMENDATIONS

- The Committee considered the EDO's response of April 9, 2013, to comments and recommendations included in the March 20, 2013, ACRS letter on Draft Revision 1 of Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program." The Committee decided that it was satisfied with the EDO's response.
- The Committee considered the EDO's response of March 25, 2013, to comments and recommendations included in the February 14, 2013, ACRS letter on the safety aspects of the license renewal application for the Limerick Generating Station. The Committee decided that it was satisfied with the EDO's response.
- The Committee considered the EDO's response of March 25, 2013, to comments and recommendations included in the February 26, 2013, ACRS letter on the Construction Reactor Oversight Process (cROP) Program and the cROP Pilot Program Results. The Committee decided that it was satisfied with the EDO's response.

SCHEDULED TOPICS FOR THE 605<sup>th</sup> ACRS MEETING

The following topics are scheduled for the 605<sup>th</sup> ACRS meeting, to be held on June 5-7, 2013:

- Station Blackout Mitigating Strategies Rulemaking
- Revisions to Six Regulatory Guides on the Use of Digital Computer Software in the Safety Systems of Nuclear Power Plants
- Assessment of the Quality of Selected NRC Research Programs - FY 2013
- Preparation for Meeting with the Commission

Sincerely,

*/RA/*

J. Sam Armijo  
ACRS Chairman

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
604<sup>th</sup> FULL COMMITTEE MEETING  
May 9-10, 2013

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TODAY'S DATE: May 9, 2013

	<u>NAME</u>	<u>NRC ORGANIZATION</u>
1	Elijah Dickson	NRO
2	Russell Chazell	NRO
3	James Shep	NRO
4	Don Carlson	NRO
5	Michelle Hart	NRO
6	GEORGE THOMAS	NRO
7	Jonathan Decharge	NRO
8	VANICE PERIN	NRO
9	Shie-Jong Peng	NRO
10	SARDAR LUTHEE	NRO
11	KIMBERLY GAMBONE	NSR
12	Sud Basu	RES
13	JOHN TILLOCH	OCM
14	Bruce Musico	NSIR
15	Steven Jones	NRR/DSS
16	Thomas Boyle	NRO / DARK
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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
604<sup>th</sup> FULL COMMITTEE MEETING

May 9-10, 2013

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TODAY'S DATE: May 9, 2013

NAME

AFFILIATION

Thomas J O'Connell  
DAVID ALBERSTEIN  
JIM KINSEY  
Finis Southworth  
FRED SILADY  
MARK HOLBROOK  
Thomas Hicks

US DOE  
INL  
INL-DOE  
AREVA + NGNP Industry Alliance  
INL - TECHNOLOGY INSIGHTS  
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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
604<sup>th</sup> FULL COMMITTEE MEETING  
May 9-10, 2013

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TODAY'S DATE: May 10, 2013

	<u>NAME</u>	<u>NRC ORGANIZATION</u>
1	Karl Coyne	RES/DRA
2	Robert Beaton	RES/DSA
3	Selim Sanculutar	RES/DRA
4	Mila Case	RES/DE
5	M. GAVRIAS	RES/DE/OMB
6	Emmett Murphy	NRR
7	Ken Karwowski	NRR
8	Rob Triggamy	RES/DE
9	SHAH MALIK	RES/DE
10	STUART RICHARDS	RES/DBA
11	Doug Cole	RES/DRA
12	Antonijs M. Zolir	NRR/DRA
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