



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

February 6, 2013

MEMORANDUM TO: William Shack, Chairman
Advisory Committee on Reactor Safeguards
Regulatory Policies and Practices Subcommittee

FROM: John H. Flack, Consultant /RA/
Office of the Advisory Committee on Reactor Safeguards

SUBJECT: MINUTES OF THE ADVISORY COMMITTEE ON REACTOR
SAFEGUARDS REGULATORY POLICIES AND PRACTICES
SUBCOMMITTEE MEETING ON STATION BLACKOUT, DECEMBER 5,
2012, IN ROCKVILLE, MARYLAND

A working copy of the minutes of the subject meeting is attached for your review. Please send me any comments and changes for incorporation. If you are satisfied with the minutes, please sign, date, and return the attached certification letter.

Attachments:

1. Certification Letter
2. Minutes

cc: C. Antonescu
E. Hackett



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

February 6, 2013

MEMORANDUM TO: John Flack, Consultant,
Office of the Advisory Committee on Reactor Safeguards

FROM: William Shack, Chairman
Advisory Committee on Reactor Safeguards
Regulatory Policies and Practices Subcommittee

SUBJECT: MINUTES OF THE ADVISORY COMMITTEE ON REACTOR
SAFEGUARDS REGULATORY POLICIES AND PRACTICES
SUBCOMMITTEE MEETING ON STATION BLACKOUT,
DECEMBER 5, 2012, IN ROCKVILLE, MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting held on December 5, 2012, are an accurate record of the proceedings for that meeting.

/RA/ 2/5/2013

William Shack, Chairman Date
Advisory Committee on Reactor Safeguards
Thermal Hydraulics Phenomena Subcommittee

CERTIFIED ON: FEBRUARY 5, 2013 **ISSUED ON: FEBRUARY 6, 2013**
CERTIFIED ON: Dr. William Shack

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
REGULATORY POLICIES AND PRACTICES SUBCOMMITTEE MEETING MINUTES
DECEMBER 5, 2012
ROCKVILLE, MARYLAND**

INTRODUCTION

The ACRS Subcommittee on Regulatory Policies and Practices met on December 5, 2012 to review and discuss the NRC's initiative to strengthen the station blackout rule. The meeting was held at 11545 Rockville Pike, Rockville, Maryland, in room T-2B3. Briefings were provided by NRC staff. Presentations were for information only; no formal documents had been submitted to the ACRS for review.

The objective of the ACRS subcommittee is to gather information, analyze relevant issues and facts, and formulate proposed positions as appropriate for deliberation by the ACRS Full Committee. Christina Antonescu acted as the cognizant staff engineer and the Designated Federal Official throughout the meeting. The Subcommittee did not receive any written comments or requests for time to make oral statements by members of the public. The meeting convened at 8:30 am on December 5, and adjourned at 12 noon the same day.

ATTENDEES

ACRS (1st day)

William Shack, Chairman
J. Sam Armijo, Member
Dennis Bley, Member*
Charles Brown, Member
Michael Corradini, Member
Dana Powers, Member
Harold Ray, Member
Joy Rempe, Member
Michael T. Ryan, Member
Stephen Schultz, Member
John Sieber, Member
Gordon Skillman, Member
John Stetkar, Member
Edwin M. Hackett, Executive Director

Christina Antonescu, Designated Federal Official
John H. Flack, Consultant

NRC

Tim Reed, NRR/DPR/PRB
Mike Cheok, NRR/DE
Jim Andersen, NRR/DE/EEEB
Eric Bowman, NRR/DPR/PGCB
Matt McConnell, NRR/DE/EEEB
Robert Weisman, OGC

A complete list of attendees is in the ACRS Office file and will be made available upon request. The presentation slides and handouts used during the meeting are attached to the Office Copy of these minutes.

OPENING REMARKS BY THE SUBCOMMITTEE CHAIRMAN

The purpose of the ACRS subcommittee meeting was to hold briefings and discussions on NRC's effort to strengthen the station blackout rule following issuance of Order EA-12-049. William Shack, Chairman of the Regulatory Policies and Practices Subcommittee opened the meeting and introduced the ACRS Members. His opening remarks noted that the Near Term Task Force (NTTF) recommended strengthening the station blackout rule for both design and beyond design basis external events. This would include using a combination of installed equipment and offsite resources during extended loss of AC power, to provide core and spent fuel cooling, and for maintaining both reactor coolant system and containment integrity indefinitely. NEI 12-06 and FLEX strategy has been found acceptable by the staff for developing the strategy required by the Order EA-12-049.

SIGNIFICANT ISSUES AND OBSERVATIONS	
December 5, 2012	Reference Pages in Transcript
Staff introductions: Mike Cheok, NRR Deputy Director for Division of Engineering; Tim Reed lead project manager (PM) for station blackout (SBO) rulemaking; Eric Bowman lead project manager for mitigating strategies; Matt McConnell lead for the electrical engineering branch. Mr. Cheok noted that SBO rulemaking is to be completed within 24 to 30 months from date of SRM-SECY-11-0124 (October 18, 2011).	6-8
Mr. Reed noted that the SRM directed the staff to follow a performance based approach similar to what had been done for B.5.b, which became CFR 50.54(hh)(2). Staff initiated an Advance Notice of Proposed Rulemaking (ANPR) to begin the rulemaking process on March 20, 2012.	9-11
Mr. Reed discussed parallel activities associated with Near Term Task Force (NTTF) Report recommendations, specifically 4.1, 4.2, 8, 9.3, 7.1, and 5.1	11-16
Member Armijo asked about the deficiencies with the current rule SBO rule noting that NUREG-1776 concluded the SBO rule was effective. Mr. Cheok indicated that the focus was primarily on the "coping time."	16-18
Mr. Reed discussed the staff's response to ACRS 10/13/2011 letter, and how the staff added the comments to the ANPR for external stakeholder feedback.	18-20
Member Ray asked whether EOPs and SAMGs are considered differently in response to SBO, given SAMGs are voluntary. Mr. Reed responded that although they are treated differently, they should come together with the same regulatory pedigree following Recommendation 8 rulemaking.	20-22
Member Corradini asked whether FLEX is primarily for accident prevention or mitigation. Mr. Bowman responded that it is for prevention of core damage, although the equipment could be included in the SAMGs at some point.	22-27
Mr. Reed briefly discussed licensee's response to SBO and integration of FLEX into the EOPs in response to Member Skillman's questions.	27-33

Mr. Reed compared B.5.b to implementation of the Order, EA-12-049, and their approach to rulemaking. Lessons learned from implementation of Order EA-12-049 will be key to the rulemaking.	33-36
Mr. Reed discussed the regulatory approach to rulemaking based on stakeholder comments and meetings. Process has moved to a more high-level, performance-based, and flexible approach.	37-38
Difficulties noted with implementation of an “unbounded” Order, analogous to 50.54(hh)2. Implementation guidance will be needed for the development of procedures, guidance, and equipment to be used for mitigation of beyond design basis events, rather than systems, structures and components that address postulated events with assumed conditions.	39-42
Chairman Shack asked about what consideration had been given to building on the installed capability rather than relying on FLEX. Member Ray indicated that the mitigation strategies might mask the need to change the design basis.	42-45
Member Corradini questioned whether a Level 1 or Level 2 PRA can be used to evaluate mitigation strategies. Mr. Bowman indicated that the Order is unbounded so the staff would not be able to do a good assessment of the effectiveness of the FLEX strategy.	45-46
Member Stetkar cautioned the staff to be careful when using the term “bounding” because of its inherent limitations, i.e., that it may not solve all problems under all possible circumstances that could ever be envisioned. Member Schultz agreed that the staff has to be very careful on how they describe what has actually plan to achieved.	47-51
Member discussion on the use of PRA to evaluate the benefit of mitigation strategies and credit for FLEX. Mr. Reed responded that the Order focused on addressing uncertainties, some associated with the unknown unknowns, but didn’t know whether a PRA could measure it.	51-56
Member Stetkar asked about the FLEX capability. Mr. Bowman indicated that the plan is to be able to repower a train at the 4160V level, presuming the bus is available.	56
Mr. Cheok noted that 50.63 is effective but does not address significant external events that can affect large areas of the plant or multiple units at the site. To address this issue, the staff is trying to increase the coping capacity of the plants, and also have alternate AC that is independent of location, and can deal with multiple units at a site.	57-58
Member Shack questioned how much defense-in-depth is necessary. Members Shultz and Corradini caution the staff about what the public may accept but could be beyond what is intended by the staff.	58-61
Member Armijo asked whether an upgraded station blackout rule would be able to address events at least as severe as what happened at Fukushima. Staff responded that the flooding issue would be addressed by NTTF recommendation 2.1.	61-64
Member Armijo commented that we should know the point of protection, a limit which could be an extremely low frequency. Mr. Reed noted that facilities may have more margin than we realize.	64-67
Discussion of the seismic contribution and range and the “cliff edge,” which may be well beyond the design basis	67-69

Discussion of “special treatment” assurance requirements based on required performance and need to protect equipment from external events.	69-73
Member Powers asked how airlifting equipment can be assured following a major earthquake due to competition with civil authorities. Mr. Bowman indicated that there were discussions taking place between the licensees and their civil authorities.	74-77
Mr. Reed notes that licensees will have to deploy and service FLEX support guidelines, and have longer coping capabilities all within the context of adequate protection consistent with the Order.	78-80
Mr. Reed response to Member Stetkar’s question about how the coping time is determined, and notes that the Order will now determine the coping duration, not the durations predetermined by the plant and site conditions as prescribed in R.G. 1.155.	81-86
Chairman Shack call for a Break	86
Chairman Shack comments about changing the current regulation to match up with the needed capability, for example adding a robust alternate AC source instead of stripping the buses down to the last volt to accommodate an extended coping time. Discussion followed on what industry might do and flexibility gained by adding an alternate AC source.	87-92
Discussion of mitigating strategies building on RG 1.155 and NUMARC 8700, noting that for plants having to go beyond 4 hour coping, an AAC source is the likely choice.	92-94
Member Sieber asked about RCP seal cooling for PWRs, and need for high head injection. Mr. Reed commented that the RCP leakage is still uncertain and is a concern. An offsite pump to provide makeup is not a practical solution. One alternative may be to power up a motor control center to power a charging pump.	94-97
Member Ray commented that there will be a number of issues with maintaining natural circulation with no level control. Also a concern regarding depressurization, and the potential for forming a bubble in the reactor head. Mr. Reed also noted issues with nitrogen injection, safety valves, and loss of natural circulation.	97-98
Discussion focused on Order EA-12-049 and its relationship to the proposed rule with associated details in the guidance document. Chairman Shack commented that an adequate protection rule for mitigation strategies would need to have something enforceable. Mr. Reed responded that the Order has set the expectations, OGC council Mr. Weisman indicated that they were trying resolve enforceability issues.	99-102
Mr. Weisman discussed issues associated with enforceability of the new rule, including independence, separation, redundancy, and procedures.	102-105
Mr. Reed noted that Industry would like to keep 50.63 unchanged. Nevertheless, the rule would have to change to at least clarify the role of FLEX.	106
Member Skillman asked what the new coping times would be, e.g., 72 hrs, 240 hrs, ten days? Discussion of battery lifetimes followed including research on extending battery lifetime by stripping loads, extending times out to possibly 72 hours.	107-110

Chairman Shack requested a copy of RES battery report when available. Staff responded that it may not be available for another year, but if a plan may be available which the staff could forward to the ACRS if available.	110-111
Discussion on the relationship between 50.63 and mitigating strategies. Mr. Reed commented that they didn't want to lose the benefits that came along with 50.63 like the alternate AC source, and enhanced diesel reliability.	112-114
Mr. Reed noted that 50% of licensees have alternate AC sources and didn't want to give them up. Discussion on maintaining alternate AC as a viable source, and use of the Maintenance Rule to maintain diesel generator reliability.	115-117
Member Skillman question how the staff plans to credit EDG already in place, including the ability to cross-tie AC power sources between units.	117-120
Mr. Reed discussed how SBO rulemaking had evolved and is trying to retain credit for the AAC with the addition of new mitigating strategies rule. Staff is waiting to receive feedback from licensees implementing the Order, to give them some direction. If licensees can extend their coping time to 16 hours, that might be a number that we can put in the new rule.	120-126
Member Bley commented (via telecom) that for identifiable sequences FLEX may less reliable than other options, but for scenarios not identified by the PRA, FLEX could offer advantages.	126-128
Mr. Reed notes the staff would like to provide flexibility in the rule, for example, adding incentives for employing a robust alternate AC source as a preferred engineering approach. But FLEX would need to be added in at some point. Member Stetkar points out the importance of having multiple and separate power supply paths to all emergency AC buses.	129-135
Member Stetkar noted that Europeans installed bunkered single train systems with an injection pump, a cooling water pump, auxiliary feedwater pump, and diesel generator. Mr. Reed responded that given a large enough event, that would be gone too, so FLEX is still needed.	136-138
Mr. Reed discussed the schedule, and importance of getting feedback and lessons learned from the Order and associated implementation plans to be considered for rulemaking. Implementation plans are due to the staff 02/28/2013, and full implementation by 12/31/2016. The SRM directed that the staff provide a proposed rule by April 2013 and final rule by April 2014.	138-139
Mr. Reed commented that there is no need to rush SBO rulemaking because the March 12, 2012 Order basically implements the rule. Additionally, it would be beneficial to risk-inform the new rule which would also require more time to finalize. The only difference between the rule and the Order is the rule may offer more flexibility.	139-143
Member Skillman asked whether other plants in addition to Ginna and Oconee were proposing dedicated systems. Mr. Reed responded that they will be meeting with Prairie Island next. Additional discussion followed on the use of a dedicated AC system that would not be credited under mitigating strategies, for example, but a portable AC generator would be credited under FLEX.	143-145
Member Stetkar cautioned the staff about what a licensee can feasibly mitigate given the spectrum of conditions that can happen during beyond design basis scenarios. Chairman Shack noted the need to perform a full PRA to really know the situation.	145-147

Consultant Flack questioned the use of non-safety equipment to meet adequate protection and how it can become a slippery slope. Discussion followed on implementation and issues associated with configuration and change control, and working outside the 50.59 process. Mr. Weisman commented that the change control process is an issue that they are working on for the strategies themselves.	148-154
Member Bley commented (via telecom) that the battery testing to be performed at Brookhaven should consider the plant-specific loads that the batteries had experienced. The staff should also look at what protective measures have been done by the Dutch against flooding.	155-156
Mr. McConnell commented that battery testing will be performed on relatively new batteries; Member Bley recommended that they consider using in-plant testing of batteries as well.	157-158
Mr. McConnell noted one of the deficiencies with 50.63 is that it did not specify any testing guidance for the Class 1E batteries, and that only about half the industry actually tested their station blackout profiles.	159
Member Schultz commented that the staff appears to be looking for ways to accept incentives and work them into the process. Staff responded that they had endorsed NEI 12-06 and invited alternative approaches for consideration.	159-160
Mr. Bowman noted that the staff is looking for criteria similar to what is in place for crediting existing design features under 50.54 (hh) 2.	161
Member Schultz questioned the coordination and interface of the SBO initiative with other ongoing activities in response to NTTF recommendations, and how the interfaces and connections would be implemented. Staff discussed the timeline and connection to other NTTF recommendations, specifically 2.1 and 8.	162-168
Chairman Shack adjourned meeting.	169

Follow-up Actions

- Another ACRS subcommittee meeting to review the proposed station blackout rule and regulatory basis, April 2013
- Full Committee briefing on SBO rulemaking activities, June 2013

Documents Provided to the Subcommittee

1. Station Blackout (10 CFR 50.63) 53 FR 23203, June 21, 1988, 63 FR 50480 Sept. 22, 1998
2. SECY-11-0093, "The Near-Term Report and Recommendations for Agency Actions following the Events in Japan", July 12, 2011 (ML111861807)
3. SRM-SECY -11-0093, "The Near-Term Report and Recommendations for Agency Actions following the Events in Japan", August 19, 2011 (ML112310021)

4. SECY-11-0124, Recommended Actions to be Taken Without Delay from the Near Term Task Force Report, September 9, 2011 (ML11245A127)
5. SRM-SECY-11-0124, Recommended Actions to be Taken Without Delay from the Near Term Task Force Report, October 18, 2011, (ML112911571)
6. SECY-11-0137, Prioritization of Recommendations in Response to Fukushima Lessons Learned, October 3, 2011 (ML11269A204)
7. SRM-SECY-11-0137, Prioritization of Recommendations in Response to Fukushima Lessons Learned, December 15, 2011 (ML113490055)
8. WASH-1400 (NUREG-75/014), Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants, October 1975 (ML072350618)
9. Resolution of Generic Safety Issues: Item A-44: Station Blackout (Rev. 1) (NUREG-0933, Main Report with Supplements 1–34
10. Resolution of Generic Safety Issues: Item A-45: Shutdown Decay Heat Removal Requirements (Rev. 1) (NUREG-0933, Main Report with Supplements 1–34)
11. G. A. Reed and J. H. Flack, "Technical Note: Primary Blowdown for Enhanced Core Cooling of Pressurized-Water Reactors," NUCLEAR SAFETY, Vol. 30, No.2, April-June 1989.
12. NUREG-1032, "Evaluation of Station Blackout Accidents at Nuclear Power Plants, Technical Findings Related to Unresolved Safety Issue A-44". June 1988
13. NUREG/CR-3226, "Station Blackout Analysis Accident Analysis (Part of NRC Task Force Action Plan A-44)," May 1983
14. NUREG/CR- 6890, "Reevaluation of Station Blackout Risk at Nuclear Power Plants," December 2005
15. NUREG-1776, Regulatory Effectiveness of the Station Blackout Rule, August 2003
16. NRC Regulatory Guide 1.155, "Station Blackout". August 1988 (ML003740034)
17. NUMARC 8700, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors," (ML12074A007)
18. INPO-11-005, "Special Report on the Nuclear Accident at the Fukushima Dai-ichi Nuclear Power Station". November 2011 (ML11347A454)
19. General Design Criteria for Nuclear Power Plant Construction Permits, July 11, 1967 32 FR 10213.
20. NUMARC-8700, Guidelines and Bases for NUMARC Initiatives Addressing SBO, November 23, 1987 (ML12074A007)
21. Report from J. J. Ray, Chairman, ACRS, to William J. Dircks, Executive Director for Operations, NRC, Subject: ACRS Comments on the NRC Staff Proposal for Resolution of USI A-44 "Station Blackout,, dated July 13, 1983
22. Report from David A. Ward, Chairman, ACRS, to William J. Dircks, Executive Director for Operations, NRC, Subject: ACRS Comments on the NRC Staff Proposal for Resolution of USI A-44 "Station Blackout,, dated March 12, 1985
23. Report from William Kerr, Chairman, ACRS, to Lando W. Zech, Jr., Chairman, NRC Subject: ACRS Comments on the NRC Staff Proposal for Resolution of USI A-44 "Station Blackout,, dated June 09, 1987
24. Report from William Kerr, Chairman, ACRS, to Lando W. Zech, Jr., Chairman, NRC Subject: Proposed Resolution of Unresolved Safety Issue A-45, "Shutdown Decay Heat Removal Requirements,, dated September 14, 1988
25. NRC Draft Interim Staff Guidance Rev 0, JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," May 31, 2012
26. NEI 12-06 [Rev0], "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, August 2012.

