UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 20, 1997

MEMORANDUM TO: Gary M. Holahan, Director
Division of Systems Safety and Analysis

THRU: Carl H. Berlinger, Chief *RLP for CHB*
Containment Systems and Severe Accident Branch
Division of Systems Safety and Analysis

FROM: Robert L. Palla, Sr. Reactor Engineer *Robert L Palla*
Containment Systems and Severe Accident Branch
Division of Systems Safety and Analysis

SUBJECT: SEVERE ACCIDENT MANAGEMENT DEMONSTRATION VISIT AT NORTH ANNA, JULY 24-25, 1997

On July 24 and 25, 1997, NRC staff attended a severe accident management implementation "demonstration" at the North Anna Power Station (NAPS) in Mineral, Virginia. NRC attendees included Robert Palla, Containment Systems and Severe Accident Branch; Lawrence Cohen, Emergency Preparedness and Radiation Protection Branch; David Desaulniers and Mary Ann Blamonte, Human Factors Assessment Branch; Kenneth Barr, Region II; and Nageswaran Kalyanam, Reactor Projects. David Desaulniers was also on site on July 23 to observe a severe accident management training session provided to Emergency Response Organization (ERO) personnel. A list of attendees is provided as Attachment 1. An agenda is included as Attachment 2.

The purpose of the demonstration was to provide the NRC and visiting utility representatives information on North Anna's implementation of severe accident management pursuant to the formal industry position contained in NEI 91-04, Revision 1. The staff's objectives for the visit were to gain insights into: (1) the licensee's implementation/evaluation process, including development and implementation of plant-specific severe accident management guidelines (SAMG), training of personnel, real-time use of SAMG during drills, and licensee self-assessment of training effectiveness and drill performance, (2) how well the draft Temporary Instruction (TI) on accident management (A/M) implementation would guide the inspector activities, and where changes to the guidance may be needed, and (3) whether the industry-sponsored demonstrations may justify modification of the planned inspection process. This was the second industry-hosted demonstration organized by the Nuclear Energy Institute (NEI) for this purpose. The first demonstration visit was at Comanche Peak on May 29-30, 1997, and is documented in a trip report dated July 3, 1997.

Following a tour of the Technical Support Center (TSC), licensee staff provided a series of presentations overviewing the A/M implementation effort at NAPS. Topics discussed included: overall implementation strategy and the licensee's associated Administrative Program (i.e., VPAP-2604), plant-specific SAMG development and review/validation process, related changes to the Emergency Plan Implementing Procedures (EPIPs), applicability of 10 CFR 50.59

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and 10 CFR 50.54 (x) & (y), IPE considerations, and setpoint and computational aid development. SAMG training was discussed in detail, including: ERO positions identified for decision-maker, evaluator, and implementor level training; content basis and development process for training materials; training methods used for initial training and planned for refresher and new assignee training; training topics for each category of personnel; table-top drill process and logistics; and training feedback process. Presentation materials are provided as Attachment 3. The administrative program is described in Attachment 4.

An A/M table-top drill, involving use of the SAMG by control room operators and TSC staff, was observed on the morning of the second day. The table-top drill was performed as the last part of a 4 day SAMG training course for ERO personnel held July 22 through 25. The course consisted of one day of overview training on SAMG and severe accident phenomena for all three categories of personnel (implementors, decision-makers, and evaluators), additional training on the TSC Diagnostic Flow Chart, TSC Severe Challenge Status Tree, and Severe Accident Exit Guidelines for decision-makers and evaluators on the morning of the second day, and further training on the individual Severe Accident Guidelines, Severe Challenge Guidelines, and Computational Aids for evaluators on the afternoon of the second day and or the third day. The table-top drill was performed on the last day and involved participation of all three categories of personnel. The A/M demonstration visit was arranged to coincide with and not impact the drill.

The drill scenario was initiated by a loss of all transmission lines due to a tornado strike in the switchyard, and subsequent failures to start the Unit 1 diesel generators and one Unit 2 diesel generator. The SBO diesel was also unavailable as a result of a control panel fire. The Unit 1 turbine-driven AFW pump was out of service for pump rotating element replacement, and the charging cross-tie with Unit 2 was unavailable due to header vent valve replacement. Leakage from RCP seals occurred 45 minutes into the event, and increased later. Actions to recover diesel generators were initiated, but involved substantial delays. With feedwater and RCS makeup unavailable, core uncovery and heatup occurred, resulting in entry into the SAMG. Core damage continued and fission products and hydrogen were released into containment via the RCS breach and pressurizer PORV. The containment pressurized due to the release of steam and hydrogen from the RCS, but containment integrity was maintained. Several A/M strategies were implemented, including: depressurization of the RCS using a pressurizer PORV, depressurization of the steam generators to permit feeding with low pressure sources, gravity draining of the Casing Cooling Tank to flood the reactor cavity, and initiation of a hydrogen burn using a high voltage device (megger) outside containment to create a spark at the end of a coaxial cable that terminated in the incore instrument room inside containment. Eventually, a diesel generator was recovered and power to ECCS and containment spray was subsequently restored. The drill was terminated at that time. Additional information regarding the scenario is provided as Attachment 5.

The drill involved simulation of activities in the control room and TSC. The Operations Support Center (OSC) was represented through the use of a control cell (drill facilitator), but activities within the OSC and the plant were not

simulated. The Emergency Offsite Facility (EOF) was also not simulated. The control room portion of the drill was conducted in the plant's simulator facility, however, relevant plant information was provided to the control room staff using a status board (manually updated by a drill coordinator) rather than using the simulator or panel displays. The TSC portion of the drill was conducted in a classroom adjacent to the simulator. Players were pre-staged in both facilities, and manning and activation of the ERO were not simulated. Communications between the control room and TSC was via phone links. Communications between the TSC and the OSC were through the facilitator.

Upon drill initiation, control room use of SACRG-1 (which addresses control room actions prior to activation of the TSC) was simulated. (EOP-directed actions, event classification, and transition from EOPs to the SACRG-1 portion of the SAMG were not simulated). In practice, the control room operators would branch from SACRG-1 to SACRG-2 (which addresses control room actions following activation of the TSC) after the TSC has assumed control and is in a position to recommend implementation of severe accident management strategies. During the drill this transfer would have occurred prior to the control room operators having completed the first pass through SACRG-1. However, for training purposes, the drill controller artificially delayed the transfer of decisionmaking responsibilities from the control room to the TSC until the control room staff had completed the first pass through the SACRG-1.

TSC use of SAMG was simulated in parallel with the control room's use of SACRG-1 and SACRG-2. The emphasis of the drill was on use of the SAMG by TSC engineers to evaluate potential strategies contained within the SAMG and develop recommendations on response actions and priorities. Inter-facility coordination and communication were also simulated, but to a much lesser degree due to the limited number of ERO facilities involved in the table-top, and the use of atypical communications between the two facilities. A debrief, led by the instructor/lead controller, was held at the conclusion of the table-top drill as part of the training activity. An exit meeting was then held during which the licensee, NRC, NEI, and other participants provided their respective observations.

In closing comments, Fred Emerson, NEI, reminded participants of the importance of keeping the priority of SAM implementation in line with the priorities of more important plant activities. He indicated that in keeping with a performance viewpoint of the demonstration, the answer to the following questions would be yes:

- Has the ability to manage a severe accident been enhanced?
- Has the value of the demonstration process been demonstrated to the industry (and hopefully, the NRC)?
- Should there be more demonstrations?
- Did this demonstrate that a variety of approaches to SAM implementation can work?

He stressed that comparisons of the NAPS and Comanche Peak approaches are useful only to the extent that we can extract useful information for improving other implementation plans (rather than for judging one plant to be "better" than another), and that since industry committed to do this they need to do it well.

Major staff observations were discussed at the exit meeting and are provided below. The observations are based largely on information presented during the presentations, without the opportunity for staff follow-up, and should not be construed as conclusions:

Overall

- Information provided during the presentations was useful, and generally indicative that each of the major elements of the formal industry position on severe accident management (Chapter 5 of NEI 91-04, Revision 1) have been addressed by the licensee. Based on information provided it appears that: (1) plant-specific SAMG has been developed from the generic SAMG, deviations are minimal and documented, (2) severe accident management training materials have been developed based on the training guidance and materials generated by the Westinghouse Owners Group, (3) initial training has been administered to a broad population of ERO personnel commensurate with their positions and responsibilities in the ERO, using a combination of classroom training and table-top drills, (4) feedback from internal SAMG review, external A/M program peer reviewers, trainee comments, and table-top drill debriefs has been obtained and will be considered by the licensee in subsequent program/guidance revisions, and (5) an administrative program is in place to maintain and update accident management capabilities. Additional discussion and review of severe accident materials and records in each of these areas would be needed to confirm these observations.

- The licensee did not discuss or indicate plans for conducting broader-based, EP-type drills for the purpose of evaluating A/M capabilities. Such drills, staged in the actual TSC and involving participation of additional ERO facilities, would provide a more realistic context for exercising SAMG and an increased opportunity to more fully simulate (e.g., walk through) A/M strategy implementation relative to the table-top drills. The use of such drills as an adjunct to table-top drills is recommended as part of an integral approach for maintaining A/M capabilities.

Development and Implementation of Plant-Specific SAMG

- The SAMG review and validation process involved a combination of: (1) internal review by operations, training, engineering, emergency procedures and several other departments (per VPAP-2604), (2) detailed review of the guidelines by the NAPS training department in parallel with their development of plant-specific training materials, (3) coordination with the parallel training development effort at Surry on areas of concern, and (4) resolution of comments generated from classroom training, table-top drills, external peer review, and

experience and feedback from Surry implementation. Remaining actions include revising the SAMG to reflect comments, and review and approval by appropriate management.

- Similar to the implementation at Comanche Peak, the licensee did not incorporate additional IPE insights (e.g., unique system alignments or success paths) into the plant-specific SAMG, and did not develop additional strategy implementing procedures or pre-stage equipment as part of A/M implementation. Licensee staff indicated that: (1) insights regarding core damage prevention have already been incorporated into the plant EOPs, (2) insights regarding core damage mitigation are adequately reflected in the SAMG, and (3) existing plant procedures are sufficient to guide implementation of the A/M strategies, without relying on developing implementing procedures on-the-fly. However, a systematic process for evaluating the capability to respond to important IPE sequences, such as provided in NUMARC 92-01, was not applied to reach these judgements. The manner in which plant-specific IPE insights were incorporated into the licensee's emergency response capabilities, the availability of plant procedures and pre-staged equipment for implementing accident management strategies, and the process used to assure that instrumentation relied upon in the plant-specific SAMG would be available during severe accidents were not discussed in detail given the time constraints of the demonstration. These are possible areas for staff follow-up.

- The licensee modified their emergency plan implementing procedures (EPIPs) to address changes in the assignment of emergency organization responsibilities associated with the SAMG, but did not modify its emergency plan (E-Plan) to recognize SAMG. The licensee's rationale was that SAMG does not address onsite or offsite response to emergencies, and that the responsibilities of the station emergency manager and technical support team called out in the E-Plan have not changed. Based on questions raised by staff concerning the transfer of responsibilities for technical decisionmaking from the control room operators to the emergency manager, the licensee indicated that they would reconsider whether E-Plan changes are needed.

- The licensee did not consider it necessary to add an additional position to the TSC engineering team to support use of the SAMG. Existing minimum staffing includes an operational advisor, a reactor engineer, an electrical engineer and a mechanical engineer. The licensee intends for a minimum of three of the four staff members that fill these positions to be SAMG qualified. (Based on the table-top drill observations, no problems with workload were noted, however, all duties and emergency response activities were not simulated in the table-top drill.)

- The licensee indicated that changes to the EOPs (related to the transition to SAMG) and the EPIPs will be evaluated in accordance with plant practice concerning 10 CFR 50.59 and 50.54(q), respectively. According to VPAP-2604, the SAMGs will receive an Activity Screening for their impacts on the non-affected unit as part of the 50.59 process. The licensee anticipates that for certain strategies, a safety

evaluation of the impact on the non-affected unit will need to be performed on-the-fly prior to strategy implementation. If this approach is taken, the ability to perform the necessary evaluations in a timely manner should be demonstrated, e.g., in a drill.

- The licensee has adopted a philosophy that a single 10 CFR 50.54(x) and (y) determination will be made upon entry into SAMG, rather than considering each action taken under SAMG individually with respect to 50.54(x) and (y). Based on drill feedback, the first step of (draft) SACRG-1 has been modified to include explicit direction to inform NRC that SAMG has been entered and the basis for entering the SAMG, and that a departure from license conditions per 50.54(x) and (y) will be necessary. Part of the rationale for making the declaration at the transition is that certain non-operating systems, including containment spray pumps, are put in pull-to-lock position upon entry into SAMG, which is a deviation from the licensing basis. The licensee's approach is consistent with views expressed in a July 22, 1997, NEI letter on implementation of severe accident management. An NRC staff position on the acceptability of this approach will be included in the staff response to the NEI letter.

Severe Accident Training

- The plant-specific training materials were briefly examined, and portions of the ERO training course were observed during the visit. Based on this limited observation, no significant weaknesses in content or implementation were identified. Training concerning the reasons why certain mitigation actions (e.g., RCS injection, containment depressurization) that might be taken for design basis events but may not be appropriate for severe accident conditions was considered a strength. The breadth of personnel provided overview training, in addition to ERO personnel, appeared appropriate for facilitating onsite and offsite communications during a severe accident.

- The licensee did not appear to be fully implementing a systematic approach to training. For example, no basis was provided for the training methods selected (i.e., classroom and table-top drills). Consequently, it was unclear how the licensee might evaluate any proposed changes to the training methods or frequency of refresher training. The training process also appeared to lack an appropriate activity for evaluating individual proficiency in performing SAM related activities. Although table-top drills are a key part of the licensee's initial and planned refresher training for SAMG, the staff notes that the table-top drills are performed as a training rather than evaluation activity. Evaluation of individual performance to ensure proficiency is an essential element of a systematic approach to training. Remediation of performance deficiencies was also not mentioned, and since no performance standards were in place for the table-top drill, the criteria for determining if remediation would be appropriate was undefined.

- The licensee indicated that they planned to use performance information from initial training to guide selection of topics for refresher training. However, the lack of a formal SAMG training process to evaluate, document, and track individual performance deficiencies identified during the training does not assure that an individual's weaknesses are corrected in the subsequent training cycle. The licensee's program also does not include a mechanism for comparing performance between different crews to identify generic weaknesses in the training program.

- Some aspects of the licensee's refresher training program remain undefined and therefore the staff is unable to ensure that the training will support maintenance of proficiency in SAM related activities. The licensee plans to provide refresher training to approximately one-third of the ERO staff each year, such that each ERO member will receive refresher training once every three calendar years. However, this approach does not consider the possibility that more frequent refresher training may be needed to maintain proficiency. Additionally, a decision regarding which training methods will be used for refresher training -- computer based, classroom, and/or self-study -- has not yet been made. Refresher training will include participation in a table-top drill for all positions in which participation in a table-top drill is required as part of initial training. Thus, TSC and control room staff would participate in a SAMG table-top drill and experience the "training" benefit of this activity once every three years. This will result in one or two table-top drills every year, however, it is unclear if this will provide a sufficient level of feedback regarding training effectiveness.

A/M Drill Performance and Self-Assessment Process

- In general, the SAMG appeared beneficial in increasing the TSC's awareness of the potential negative impacts of certain actions and in assisting in the prioritization of activities. Use of the SAMG resulted in deliberate consideration of potential impacts of strategy implementation that might not have been considered otherwise (such as the threat to steam generator tubes by reflooding the reactor pressure vessel), and identification of response strategies beyond those which might normally be identified by the TSC staff (such as use of a megger to create a spark inside containment and initiate a hydrogen burn). The execution of the SAGs and the development of recommendations regarding strategy implementation appeared timely, and did not result in undue delays in accident response. Computational aides to provide information on the capability of injection sources and combustion limits also appeared useful. The licensee indicated that several additional means of accomplishing A/M strategies identified through the table-top drills will be further evaluated for inclusion in the SAGs.

- In accordance with NAPS training on transfer of responsibility, the control room operators did not transition from SACRG-1 to SACRG-2 until the TSC was manned and operational, and had been through the SAMG and had a recommendation for strategy implementation. At that time, the

operators branched to SACRG-2 and began taking direction from the TSC. This transition criteria is different than the description provided in the WOG SAMG Users Guide, which indicates that the control room will transition to SACRG-2 when the TSC is ready to use the TSC SAMG. The decision to delay the transition until the TSC has offered a recommendation appears preferable to automatically transitioning upon the TSC starting to use the SAMG, since a significant amount of time can elapse before the TSC is prepared to offer recommendations. However, the licensee should confirm that extended use of SACRG-1 during sequences other than large LOCA and ATWS is appropriate, since the actions in SACRG-1 are predicated on a large LOCA or ATWS sequence. Additional guidance from the Westinghouse Owners Group would be helpful in this regard.

- The degree of participation and staffing of the various emergency response facilities in the A/M drill appeared appropriate for training on SAMG and command and control issues, but insufficient for purposes of fully demonstrating: (1) the transition from EOPs to SAMG, (2) the ability of TSC engineers to implement SAMG and other EP responsibilities concurrently, and (3) communications between ERO facilities, since these aspects of response were not fully represented in the table-top drill. Strategy implementation by recovery teams was also not simulated in the table-top and could be useful for confirming the feasibility of implementing certain strategies in future drills.

- The drill debrief was thorough and resulted in identification of a number of areas for improvement, including drill control, transfer/communication/display of data between and within facilities, and minor modifications to the SAMG documents. The debrief was attended by all drill participants/trainees, thereby providing an opportunity for control room and TSC staff to share their perspectives. This appeared helpful in addressing command and control issues, such as the transition from SACRG-1 to SACRG-2. In response to a staff comment regarding potential benefits of increasing trainee participation in the debrief, the licensee indicated that trainee-led debriefs were considered and judged to be inappropriate due to the trainees' lack of experience with the material. The licensee expects to move toward trainee-led debriefs as trainees become more experienced with SAMG.

- The drill package included a drill scenario timeline and description of expected actions at various times. This information was useful to observers in tracking the progress/performance of the TSC during the drill. However, the degree to which TSC performance met the outlined expectations was not discussed during the debrief. Assessment of team performance against these expectations or some other performance-based criteria is recommended as a goal for future drills.

Viability of the Demonstration Process

- The demonstration provided a good overview of actions taken by the licensee to implement A/M. As in the Comanche Peak demonstration, the length of the visit and the level of information provided was not

sufficient to permit the staff to determine whether the licensee had met the commitment for implementing severe accident management guidelines.

- The A/M demonstration visit met the established objectives of providing insights into the licensee's implementation/evaluation process, and areas where changes to the draft TI may be needed. Although some differences in SAM implementation and evaluation details are apparent, the insights from the NAPS demonstration together with those from the Comanche Peak demonstration provide a reasonably complete and consistent picture of how SAMG is being implemented at Westinghouse plants. Additional demonstrations will be needed in order to form a consolidated view on the industry implementation process, necessary changes to the TI, and the need for any adjustments to the planned inspection process. Such demonstrations would preferably involve CE, B&W, or GE plants since implementation approaches for these NSSS designs may differ considerably due to the differences in implementation guidance and materials provided by each owners group.

Attachments: As stated

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Attachments: As stated

VIRGINIA POWER
NORTH ANNA POWER STATION
SEVERE ACCIDENT MANAGEMENT GUIDELINE DEMONSTRATION PROGRAM
JULY 24 - 25, 1997

(1.)

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Attachment 1

VIRGINIA POWER
NORTH ANNA POWER STATION
SEVERE ACCIDENT MANAGEMENT GUIDELINE DEMONSTRATION PROGRAM
JULY 24 - 25, 1997

2.

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BRIAN McEFFEE	VA. POWER	

Attachment 2

VIRGINIA POWER
NORTH ANNA POWER STATION
SEVERE ACCIDENT MANAGEMENT GUIDELINE
DEMONSTRATION PROGRAM

Thursday, July 24, 1997

- 10:30 a.m. Assemble at North Anna Nuclear Information Center (NANIC)
- 11:00 a.m. Tour: Technical Support Center (TSC)
- Noon Lunch: NANIC
- 1:00 p.m. Virginia Power Presentation: NANIC
- 4:00 p.m. Open Discussion: NANIC

Friday, July 25, 1997

- 7:00 a.m. Pre-Drill Briefing: Classroom 11, North Anna Training Center
- 7:30 a.m. Table-Top Drill: Classroom 11, Simulator and TSC
- 11:00 a.m. Debriefing: Classroom 11, North Anna Training Center
- Noon Lunch: NANIC
- 1:00 p.m. Presentation Continues: NANIC
- 1:30 p.m. Question and Answer, Open Discussion Session: NANIC

VIRGINIA POWER
NORTH ANNA POWER STATION
SEVERE ACCIDENT MANAGEMENT GUIDELINE
DEMONSTRATION PROGRAM

Thursday, July 24, 1997

1.	WELCOME & INTRODUCTIONS		Station Management
2.	NRC OPENING COMMENTS		
3.	NEI OPENING COMMENTS		
4.	SAMG DEVELOPMENT PROCESS		
	a.	Implementation Strategy	NEP
	b.	Administrative Program (VPAP-2604)	NEP
	c.	Guideline Development and Review	Procedures
		1. Introduction and Overview	
		2. SAMG Development	
		3. ERG Transition	
		4. Review and Validation	
		5. Deviations from WOG SAMG	
	d.	Emergency Plan and EPIP Changes	NEP
	e.	10CFR50.54(x) and (y)	NEP
	f.	10CFR50.59 Reviews	NEP

5.	EQUIPMENT, INSTRUMENT AVAILABILITY	NEP
6.	SAMG STAFFING POPULATION	NEP
	a. Decision Maker, Evaluator, Implementor	
7.	TRAINING OVERVIEW	Nuclear Training
	a. Description	
	b. Materials	
	c. Initial Training	
	d. Refresher Training	
	e. New Assignees	
	f. Example Schedule and Training Modules	
	g. Lesson Plan Content	
	h. Table-Top Drill Process and Overview	
8.	SELF-ASSESSMENT	
	a. SAMG Feedback Process	Nuclear Training
	b. Training Feedback	Nuclear Training
	c. Peer Review	NEP
	d. Benchmarking Results	NEP
	e. Table-Top Drills	NEP

9. DAY 2 OVERVIEW — NEP
   a. Demonstration Table-Top Scenario
   b. Agenda

10. OPEN DISCUSSION

Friday, July 25, 1997

1. DEMONSTRATION TABLE-TOP DRILL
   a. Briefing, Table-top and Debrief

2. PRESENTATIONS (continued from Day 1) — Nuclear Analysis & Fuels
   a. IPE Considerations
   b. Setpoint and Computational Aid Development

3. VIRGINIA POWER, NEI AND NRC CLOSE-OUT
   a. Question and Answer Period
   b. Virginia Power Close-Out
   c. Industry Insight
      - NEI
   d. Open Discussion

VIRGINIA POWER
NORTH ANNA POWER STATION
SEVERE ACCIDENT MANAGEMENT GUIDELINE DEMONSTRATION PROGRAM

- WELCOME & INTRODUCTIONS
  - Gene Grecheck

    Assistant Station Manager,

    Operations and Maintenance

    North Anna Power Station

  - Bill Renz

    Director, Nuclear Emergency Preparedness

- NRC OPENING COMMENTS

- NEI OPENING COMMENTS

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SAMG DEVELOPMENT PROCESS

Steve Harrison

Nuclear Emergency Preparedness

Implementation Strategy

- Initiated effort following 1994 NEI Workshop and letter establishing formal industry position.
- Designated core task team:
  - NEP, NAF, Training, Procedures, and Licensing
- Initial target established per SN 95-130
  - Revised commitment to 1/30/98 following completion of WOG template material
- Phased schedule to address NEI 91-04 Sections 5.2, Closure Process, and Section 5.3, Implementing Elements:
  - Administrative Control
  - Convert WOG material
  - ERG - SAMG interface
  - Emergency Plan, EPIP considerations
  - Setpoints, Computational Aids
  - Develop training material, train ERO, conduct drills
  - Validate scenario templates
  - Future incorporation of severe accident information
  - Self-assessment

Administrative Program (VPAP-2604)

- Provides stand-alone document for the development, maintenance, training and use of SAMGs.
- Addresses:
  - Responsibilities
  - SAMG Development
  - Review
  - Validation
  - Approvals
  - Training (Initial, Refresher, New Assignees)
  - Drills
  - Self-Assessment
  - Distribution
  - User's Guide
  - Lesson Plan Outline
- Implemented June 10, 1997

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SAMG DEVELOPMENT PROCESS (CONTINUED)

GUIDELINE DEVELOPMENT AND REVIEW

Ben Spencer

Station Procedures

Introduction and Overview

- Basic assumption - plant conditions have degraded such that:
  - Preventing core damage by recovering core cooling, depressurizing RCS, and establishing heat sink have been attempted using EOPs
  - EOPs have failed to protect the core
  - Plant conditions are beyond the design basis
- A variety of degraded plant conditions requiring the use of severe accident management strategies may exist.
- Detailed, step-by-step instructions are not possible or practical.
- SAMGs were developed to provide the Control Room personnel, plant managers, and technical staff with guidance for:
  - Diagnosing the progress of severe accidents
  - Planning an appropriate response to severe accident conditions

SAMG Development

- WOG generic SAMGs used as template to prepare plant specific guidelines.
- Variation from the WOG generic SAMG avoided unless necessary due to plant design.
- Commonality between North Anna and Surry was stressed.
- Training, Procedures, Engineering and Nuclear Emergency Preparedness departments met to resolve comments and differences between Surry, NAPS and WOG generic versions.
- Format
  - SACRGs, DFC: Two-column
  - SCST, SCGs, SAGs, SAEGs, CAs: Procedure format
  - CAs: Also written as a calculation

ERG Transition

- WOG provided detailed instruction for transition from EOP to SAMG. There are six EOPs that have transitions:
  - 1/2-ECA-0.0, Loss of All AC Power
  - 1/2-FR-S.1, Response to Nuclear Power Generation/ATWS
  - 1/2-FR-C.1, Response to Inadequate Core Cooling
- No other changes to Operations procedures as they are directed to SAMGs from the ERGs.
- Transition made when core exit T/Cs are greater than 1200 F and actions to cool the core are not successful.
- ERG Feedback Direct Work Request Form was provided from the WOG for each of the EOPs to identify the interface between the EOP and SAMGs, and provide the exact transition point, step and RNO wording.

Review and Validation

- Following development, routed per VPAP 2604 for review:
  - Operations
  - Nuclear Training
  - Station Engineering
  - Station Nuclear Safety
  - HPE Coordinator
  - Nuclear Emergency Preparedness
  - Nuclear Analysis and Fuels
  - Station Procedures
- Initial guidelines validated during classrocm training and drills.
- Comments generated from classroom training, drills, peer review and self-assessment evaluated for implementation by both stations, emphasizing commonality, and incorporated as appropriate.
- The guidelines will be reviewed by SNSOC for recommended approval.
- SAMGs will be approved at the Station Manager level.
- NA&F to maintain Setpoints and Calculational Aids
- SAMG maintenance and modification identified via periodic reviews, drill conduct and training.

Deviations from WOG SAMG

- Deviation from the WOG generic SAMG was avoided unless necessary due to plant design (e.g., SAG-4 Fire Water into Casing Cooling Tank).
- Documentation that described the deviations from the WOG version was prepared by Station Procedures Department at each station for each guideline.
- This documentation is described in VPAP-2604 and will be forwarded to Station Records as a permanent record included in the PAR package.

SAMG DEVELOPMENT PROCESS (CONTINUED)

Steve Harrison

Nuclear Emergency Preparedness

Emergency Plan & EPIP Changes

- No Emergency Plan revisions were deemed necessary to implement the SAMG program:
  - SAMG does not address onsite or offsite response to emergency.
  - Station Emergency Manager already responsible for activities to place plant in safe stable condition.
  - Technical Support Team already assesses plant status, severity of conditions, and develops corrective action strategies.

- EPIP-3.02, TSC Activation, will be revised to facilitate the transition into SAMG space:
  - Station Emergency Manager (SEM):
    - Designated as Decision Maker.
    - Assumes responsibility for authorizing the Severe Accident Management Guideline strategy to be implemented based on recommendations from the Emergency Technical Director (ETD) and Emergency Operations Director (EOD).

- Emergency Operations Director (EOD):
  - Keeps the SEM informed of strategies being implemented by the Control Room.
  - Remains cognizant of the responsibility for directing Operations personnel in the development of possible methods to implement the strategies recommended (or being considered) by the Technical Support Team.
  - Determines if equipment manipulations being requested by the Control Room should be evaluated by the Technical Support Team prior to the activity taking place.

- Emergency Technical Director (ETD):
  - Verifies minimum complement of 3 SAMG Evaluators available, specifying Evaluators as part of the Technical Support Team.
  - Has Technical Support Team review the Diagnostic Flow Chart and Severe Challenge Status Tree, and makes results available to the SEM and EOD.
  - Considers designating one Evaluator for the purpose of Team Leader and for tracking DFC and SCST status.
  - Advises SEM and EOD of the Severe Accident Management Guideline's suggested methods of implementation.
  - Directs Technical Support Team to use the Severe Accident Management Guideline indicated by the Diagnostic Flow Chart and Severe Challenge Status Tree, as appropriate.

10CFR50.54 (x) and (y)

- SAMG considered to be an exercise of provisions of 10CFR50.54(x)
- Notification in accordance with VPAP-2802, Notifications and Reports, upon SAMG entry.
- Each action to be documented
- Considering addition of note prior to Step 1 of SACRG-1:
  - Inform NRC that SAMGs have been entered, the basis for entering the SAMGs, and that a departure from license conditions per 10CFR50.54(x) and (y) will be necessary.
- Neither SAMGs nor CAs used while plant conditions within design basis, not allowed until explicit transition from EOPs occurs.

10CFR50.59 Review

- Not applicable to SAMGs...conditions beyond design basis.
- SAMGs receive Activity Screening via review process.

Equipment and Instrument Availability

a. Parameter Availability:
   - ERFCS
   - Plant Computer
   - Control Boards

b. Parameters include:
   - S/G Pressure, Level
   - RCS Pressure
   - Core Temperature
   - Reactor Water Level
   - Containment Pressure, Temperature, Water Level
   - RWST level
   - ECST Level
   - Casing Cooling Tank Level
   - Radiation Levels

c. Focus on consistency and trending versus actual snapshot value

d. 10CFR50.49 Post-LOCA Harsh Environment Qualifications

e. WOG Instrumentation to Support SAMG Diagnostics

SAMG Staffing Population

- Note: An asterisk (*) indicates classroom training only. Participation in a table-top drill is not required.
- Some positions overlap, where one individual may be qualified to fill multiple positions.

- DECISION MAKER LEVEL TRAINING
  - TSC:
    - Station Emergency Manager (6)
    - Emergency Operations Director (4)
    - [illegible]gency Technical Director (4)
    - [illegible]ergency Procedures Coordinator (5)
    - Emergency Maintenance Director* (4)
    - Radiological Assessment Director* (4)
  - LEOF:
    - Recovery Manager* (7)
    - Radiological Assessment Coordinator* (8)
    - Emergency Plan Advisor* (4)
    - LEOF Operations Support Coordinator* (7)

- DECISION MAKERS
  - CERC:
    - Corporate Response Manager* (4)
    - Technical Support Manager* (3)
    - Plan/Design/Construction Manager* (4)
    - Chief Technical Spokesperson* (5)

- EVALUATOR LEVEL TRAINING
  - TSC (Technical Support Team):
    - Technical Support Team Leader (3)
    - Operational Advisor (4)
    - Reactor Engineer (4)
    - Electrical Engineer (4)
    - Mechanical Engineer (4)
  - CERC:
    - Reactor Engineer* (3)
    - Safety Analysis Engineer* (3)

- IMPLEMENTOR LEVEL TRAINING
  - Senior Reactor Operators, Reactor Operators (ALL)
  - Shift Technical Advisors (ALL)
  - State/Local Emergency Communicators*, Phonetalkers* (11)
  - NRC Communicators* (4)
  - OSC Director* (4)
  - Public Information Technical Advisor* (3)

SAMG TRAINING OVERVIEW

Bryan Thompson

Nuclear Training

- Description
  - Content basis established by NEI-91-04, Rev. 1, as implemented by WOG Program MUHP-2312.
  - Lesson plans and self-study guides are Virginia Power-specific adaptations of WOG materials.
  - WOG materials were analyzed, designed and developed using the Systematic Approach to Training.
  - Changes to WOG materials restricted to differences between WOG reference plant design and terminology.

- Materials
  - Lesson Plans
  - Learning Objectives
  - Self-study Modules
  - SAMGs proper

- Initial Training
  - Accomplished via classroom training and table-top drills.
  - Lecture and self-study may be interchanged depending on trainee needs and resource requirements.
  - All trainees participate in table-top drill except where noted for selected ERO.
  - Adequacy of training evaluated via drill debrief, quiz/exam, and trainee feedback.

- Refresher Training
  - Every 3 calendar years
  - Computer based, classroom and/or or self-study
  - Table-top drill participation and debrief

- New Assignees
  - SAMG training not a prerequisite to ERO position assignment
  - New assignees complete initial or self-study training within 6 months
  - Participation in next scheduled table-top

- Example Schedule and Training Topics

TIME	DAY 1	DAY 2	DAY 3	DAY 4
0800-0830	Overview	DFC/SCST	SAG-4, CA-6,	Table-Top
0830-0900	(I, DM, E)	(DM, E)	CA-7 (E)	Drill
0900-0930			SAG-5	(I, DM, E)
0930-1000		Instrumentation	(E)	
1000-1030	Executive	(DM, E)	SAG-6	
1030-1100	Volume		(E)	
1100-1130	(I, DM, E)	SAEG-1, -2	SAG-7	Debrief
1130-1200		(DM, E)	(E)	(I, DM, E)
1200-1230				
1230-1300	Severe	SAG-1, CA-2	SCG-1	Written
1330-1330	Accident Progression and	(E)	(E)	Exam
1330-1400	Phenomena	SAG-2, CA-3	SCG-2, CA-4	(I, DM, E)
1400-1430	(I, DM, E)	(E)	(E)	
1430-1500	SACRG-1	SAG-3	SCG-3	
1500-1530	(I, DM, E)	CA-1, CA-5	(E)	
1530-1600	SACRG-2	(E)	SCG-4	
	(I, DM, E)		(E)	

NOTES:

1. Abbreviations: I - Implementor, DM - Decision Maker, E - Evaluator
2. Implementors (Operating Team) attend Day 1 and Day 4 (12 hours).
3. Decision Makers attend Day 1, Day 2 morning, and Day 4 (16 hours).
4. Evaluators attend Day 1 through Day 4 (28 hours).
5. Decision Makers may attend entire session, if desired.
6. Training takes place five consecutive weeks.

- Lesson Plan Content
  - Decision Maker:
    - Severe Accident Progression and Phenomena
    - SAMG Overview
    - SAMG Executive Volume
    - SACRG-1
    - SACRG-2
    - DFC/SCST
    - Instrumentation
    - Severe Accident Exit Guidelines 1 - 2
  - Implementor:
    - Severe Accident Progression and Phenomena
    - SAMG Overview
    - SAMG Executive Volume
    - SACRG-1
    - SACRG-2

- Evaluator:
  - Severe Accident Progression and Phenomena
  - SAMG Overview
  - SAMG Executive Volume
  - SACRG-1
  - SACRG-2
  - DFC/SCST
  - Instrumentation
  - Severe Accident Exit Guidelines 1 - 2
  - Severe Accident Guidelines 1 - 7
  - Computational Aids 1 - 7
  - Severe Challenge Guidelines 1 - 4

- Table-top Drill Process and Overview
  - Training evolution, coaching expected and encouraged.
  - Provide for initial training of new and replacement Decision Makers, Evaluators and Implementors.
  - May be conducted in classroom environment or inter-facility approach.
  - Not associated with Emergency Plan drills/exercises.
  - Table-top drill scenarios focus on use of SAMGs:
    - Exit ERGs, Enter SACRGs
    - Monitor DFC/SCST
    - Implement strategies and evaluate results
    - Recognize exit criteria
  - Logistics:
    - 3 lines of communication between "TSC," Simulator
    - 3 overhead projectors (2 in "TSC," 1 in Simulator)
    - Projection screen in Simulator
    - 2 Operations Training instructors (booth, floor)
    - 2 EP facilitators
  - Debrief

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SELF - ASSESSMENT

Bryan Thompson

Nuclear Training

- SAMG Feedback Process
  - EOP Equivalent Using Feedback Forms
  - Submittal to Station Procedures
    - Surry SAMG training yielded 62 feedback recommendations
    - NAPS SAMG training still in progress
  - Common Resolution Between NAPS and SPS
  - Incorporation

- Trainee Feedback Survey Results
  - Student Evaluation and Exam Analysis:
    - Following training at Surry, an exam analysis was performed resulting in changes to the examination, instructional techniques and trainee handout material.
    - Similarly, an evaluation will be conducted at NAPS following completion of initial training. Training will be modified, as necessary, based on results.

SELF - ASSESSMENT
(continued)

Steve Harrison

Nuclear Emergency Preparedness

- Peer Review
  - Representative Attendance at Turkey Point SAMG Training
  - Representative Attendance at Commanche Peak Pilot Demonstration
  - Surry Initial Training Peer Review From Farley:
    - 20 Recommended Enhancements to SAMGs Proper
    - 18 Comments Related to Table-Top Drill Observation
    - Distributed per EP Letter 97-056 for Consideration

- Benchmarking Results
  - 14 Questions Related to Program Administration
  - 8 Utilities Responded
  - Shared with NEI, SUEPG, Industry Peers

- Table-top Drills
  - Mechanism to ensure ERO familiar with SAMGs
  - Debriefings:
    - Capture lessons learned
    - Identify areas for improvement
    - Discuss (positive and negative impacts of) strategies undertaken
    - Provide participants opportunity to receive direct feedback from facilitators and to provide input into self-assessment process.

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DAY 2 OVERVIEW

Wilson Madison

Nuclear Emergency Preparedness

- Demonstration Table-Top Scenario

- Agenda
  - Demonstration Table-top Drill
    - Briefing
    - Drill
    - Debriefing
  - Lunch
  - Presentations (continued from Day 1)
  - Virginia Power, NEI and NRC Close-out
    - Question and Qnswer
    - Open Discussion

IPE CONSIDERATIONS

SETPOINT & COMPUTATIONAL AID DEVELOPMENT

Mayo Oppenheimer

Nuclear Analysis & Fuels

IPE CONSIDERATIONS

- IPE Insights included in Severe Accident Management:
  - For the purposes of incorporating IPE insights into Severe Accident Management we have defined Severe Accident Management as two phased:
    - Prevention of Severe Accidents
    - Mitigation of Severe Accidents

- IPE insights incorporated two different ways:
  - Actions to prevent core damage
  - Actions to prevent or mitigate large early release given that core damage has occurred

- Actions to prevent core damage:
  - Included in VPAPs, OPs, PTs, ARs, APs, FCAs, and EOPs
  - Actions include:
    - Two Surry specific vulnerabilities addressed via new procedures devoted to the vulnerability:
      - FCA for Uncontrollable Turbine Building Flooding
      - AP for Loss of ESGR cooling
    - Other generic modifications include:
      - Risk factored into planning of component maintenance outages (MRule)
      - Independent verifications of AFW recirc valve closed after testing
      - Independent operations system walkdown of QS and RS systems following testing
      - Addition to Response Not Obtained for verification of SI in E-0 to align alternate SI header
      - Inspection of charging pump cubicle drain back flow prevention devices
      - Administrative control, inspection of flood control devices (dikes, barriers, alarms, indicators)

- Actions to prevent or mitigate large early release (LER) given that core damage has occurred:
  - These are the actions contained in the SAMGs
  - IPE provided two main LER pathways:
    - Containment bypass (SGTF, ISLOCA)
    - Containment Failure (Overpressure from steam or H2, Underpressure, Base melt, DCH, inside RV steam explosion, penetration failure)

- Containment bypass:
  - SGTF (SAG-1 and SAG-2)
  - ISLOCA (ECA-1.2, SACRG-1, SACRG-2, SAG-5, SCG-1)

- Containment Failure:
  - Steam Overpressure (SAG-6, SCG-2)
  - Underpressure (SCG-4)
  - H2 flammability/explosivity (SACRG-1, SAG-7, SCG-3)
  - Base melt (SAG-3, SAG-4)
  - DCH (SAG-2)
  - Steam Explosion (SAG-2)
  - Penetration Failure (SAG-6)

Setpoint and Computational Aid Development

- Prepared by Nuclear Analysis and Fuels Department
- Transmitted to the Procedures and Training Departments using Engineering Transmittal (ET), a permanent record, retained for future reference.
- Follow generic WOG framework
- Each has a one-to-one WOG counterpart
- Considers plant-specific characteristics
- Results and values formally documented in calculation packages
- Computational Aid Packages:
  - Follow WOG guidance
  - Purpose, Basis, Usage, Assumptions, Plant-specific Information, Definitions and Calculations, Figure, References
  - SAMG CAs include Purpose, Limitations, Figure Usage, Notes (if any) and Figure
- Setpoints:
  - Follow WOG Guidance
  - Include Parameter, Description, Usage, Basis, Value, References

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VIRGINIA POWER, NEI AND NRC CLOSE-OUT

- Question and Answer Period
- Virginia Power Close-Out
- Industry Insight
  - NEI
- Open Discussion