Progress on Industry Guidance for Phase 2
NEI 13-02 Rev 1 Draft

NRC Public Meeting

November 20, 2014

BWR OWNERS' GROUP

NEI
NUCLEAR ENERGY INSTITUTE

Meeting Agenda

- NEI 13-02 Draft 0D4 – Substantial Changes Submitted to NRC on November 7
- Review of Phase 2 Guidance Timeline
  - Phase 2 OIP Strategy
- Review HNP Main Stack Vent Use
- Discuss Phase 1 Topics
  - WP-03 Comments and WP-02
  - ISE Review Plans
  - Generic Response to Spreadsheet Audit Questions
- Next Steps/review Actions

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- The development and implementation of the severe accident capable HCVS consists of two phases. The first phase consists of providing a venting system from the containment wetwell that meets the functional, quality, and programmatic requirements listed in subsequent sections of this guide. The second phase involves either installing a containment drywell venting system or developing a reliable strategy to limit the possible need to vent from the containment drywell during severe accident conditions. ***Use of a drywell vent path that is not EA-13-109 severe accident capable is acceptable provided combustible gases have been mitigated (e.g. purged or diluted) such that a combustible gas mixture no longer exists in the Drywell.*** Thus the second phase will not be required to be installed concurrently with the first phase.

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Severe Accident Water Addition (SAWA)

- **Water addition path – RPV or Drywell**
- **Utilization (Motive force, Instrumentation)**
- **Severe accident deployment considerations (Temperature, Radiation)**

Severe Accident Water Management (SAWM)

- Sustained operational strategy using SAWA/WW vent **(~~48~~72 hrs.)**
- Preserve wetwell vent path until personnel and equipment resources are available to establish alternate decay heat removal and pressure control

Severe Accident Drywell Vent (SADV)

- Design Temperature 545°F after 2nd Containment Isolation Valve
- Utilization (Motive force, Instrumentation)
- Severe accident deployment considerations (Temperature, Radiation)

5.1.2

- Operation of components in locations subject to severe accident conditions is acceptable provided these actions are evaluated and determined reasonable to accomplish without heroic action (HCVS-WP02, Appendix F and Appendix G). **Examples of actions that may be determined acceptable include:**
  - **Connection of hoses with quick disconnect fittings**
  - **Positioning electrical disconnect switches**
  - **Positioning quick acting manual valves (e.g., quarter turn ball valves)**
- **The acceptability of operator actions in areas subject to severe accident conditions will be determined by the expected dose rates, temperatures and length of time needed to perform the action.**

5.2.4.5 and 5.4.6

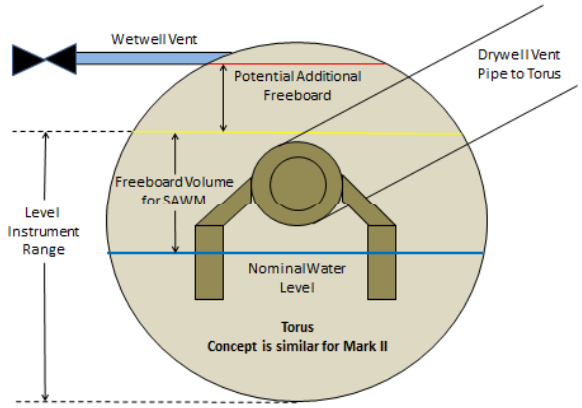
- 5.2.4.5 **Permanent SAWA components, including instrumentation external to a seismic category 1 (or equivalent building or enclosure), should be designed to meet the external hazards that screen in for the plant as defined in guidance NEI 12-06**
- 5.4.6 **HCVS and SAWA non-installed equipment should be stored in a manner consistent with the requirements imposed by EA-12-049/NEI-12-06. If the storage location is located within 100 feet of the HCVS vent pipe, the storage location should be evaluated for accessibility under severe accident conditions. (HCVS-WP-02, HCVS-FAQ-04 and HCVS-FAQ-09)**

6.1

- **SAWA will require operator actions. Connection of SAWA portable equipment will be subject to the requirements applicable to NEI 12-06 equipment with the additional requirement that it may be connected under severe accident conditions. The time frame for connection of SAWA equipment is based on loss of permanent plant injection systems. SAWA is not subject to the 24 hour limitations on use of portable equipment supporting HCVS (Order Element 1.2.6). SAWA system connections and operator actions should be achievable without heroic action (HCVS-FAQ-09) when performed under the severe accident conditions defined by Order EA-13-109 (both for deployment and continuing operations).**

Definitions

- **Freeboard: Freeboard volume is defined as volume available for water addition that will not result in the loss of the wetwell vent path. This volume may be limited by the wetwell level instrument range or the elevation of the wetwell vent line.**



Definitions

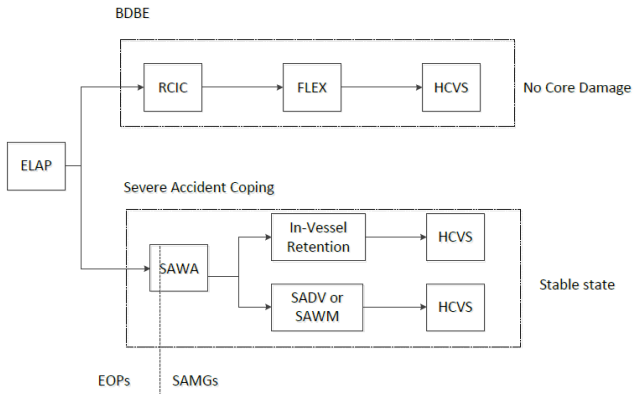
- Stable State: A plant condition, following an EA-13-109 initiating event, in which containment conditions are controllable at or near desired values. For the purposes of this Order, the applicable containment conditions that need to be controlled to achieve a Stable State are defined by the applicable Severe Accident Coping phase. This definition is based on the definition of safe stable state defined in NUREG-2122, Glossary of Risk-Related Terms in Support of Risk-Informed Decision making (Reference 28)

Definitions

- Severe Accident Coping: Actions that place containment in a Stable State. Following a Severe Accident, there may be multiple phases of Severe Accident Coping as it relates to Order EA-13-109 including:
  - Phase i: Containment pressure control using the HCVS vent. This phase of Severe Accident Coping is limited to controlling containment pressure such that containment function is maintained.
  - Phase ii: Containment pressure control using the HCVS vent and SAWA. This phase of Severe Accident Coping establishes containment protection by maintaining containment pressure and containment temperature such that containment failure modes due to the effect of molten core debris ex-vessel are minimized (e.g., gross drywell head seal leakage).
  - Phase iii: Containment pressure control using the wetwell HCVS, SAWA and SAWM. This phase of Severe Accident Coping preserves the wetwell vent path by balancing the water addition flow rate (SAWA) with the mass loss rate vented from the wetwell This method of Severe Accident Coping is appropriate until a means of reliable Alternate Decay Heat Removal and pressure control is established.

Definitions

- **Severe Accident Coping**
  - **Note: Severe Accident Coping ends when containment pressure control using alternate containment heat removal is established. The transition from Severe Accident Coping means that containment pressure control from the containment vent path is no longer required as a means to prevent containment overpressure. To achieve this objective, the alternate containment heat removal method must have sufficient capacity to remove all of the heat input to the containment so that containment pressure can be managed below PCPL without the use of the containment vent. The transition from Severe Accident Coping is appropriate when on site resources are available to place equipment in service to perform the alternate containment heat removal function.**



C.2.2.2

- Length of time that the wetwell vent path is to be preserved (e.g., ~~48~~**72** hours).
  - To transition to the alternate reliable containment heat removal and pressure control conditions sites may utilize a combination of installed and portable equipment.
  - This section provides the rationale for establishing ~~48~~**72** hours as a reasonable length of time for **preserving the wetwell vent path for Severe Accident Coping. Licensees that can demonstrate transition from Severe Accident Coping to alternate containment heat removal that does not require the use of a drywell vent may propose a shorter wetwell preservation time with supporting documentation in the Phase 2 OIP**. Decay heat is significantly reduced within the first hours of the event (SOARCA),
  - Significant heat is transferred to the Suppression Pool within the first hours of the event. The suppression pool will absorb some energy, but the majority of the heat will be removed through the WW vent within the first 24 hours. (EA-13-109 Phase 1 compliance)

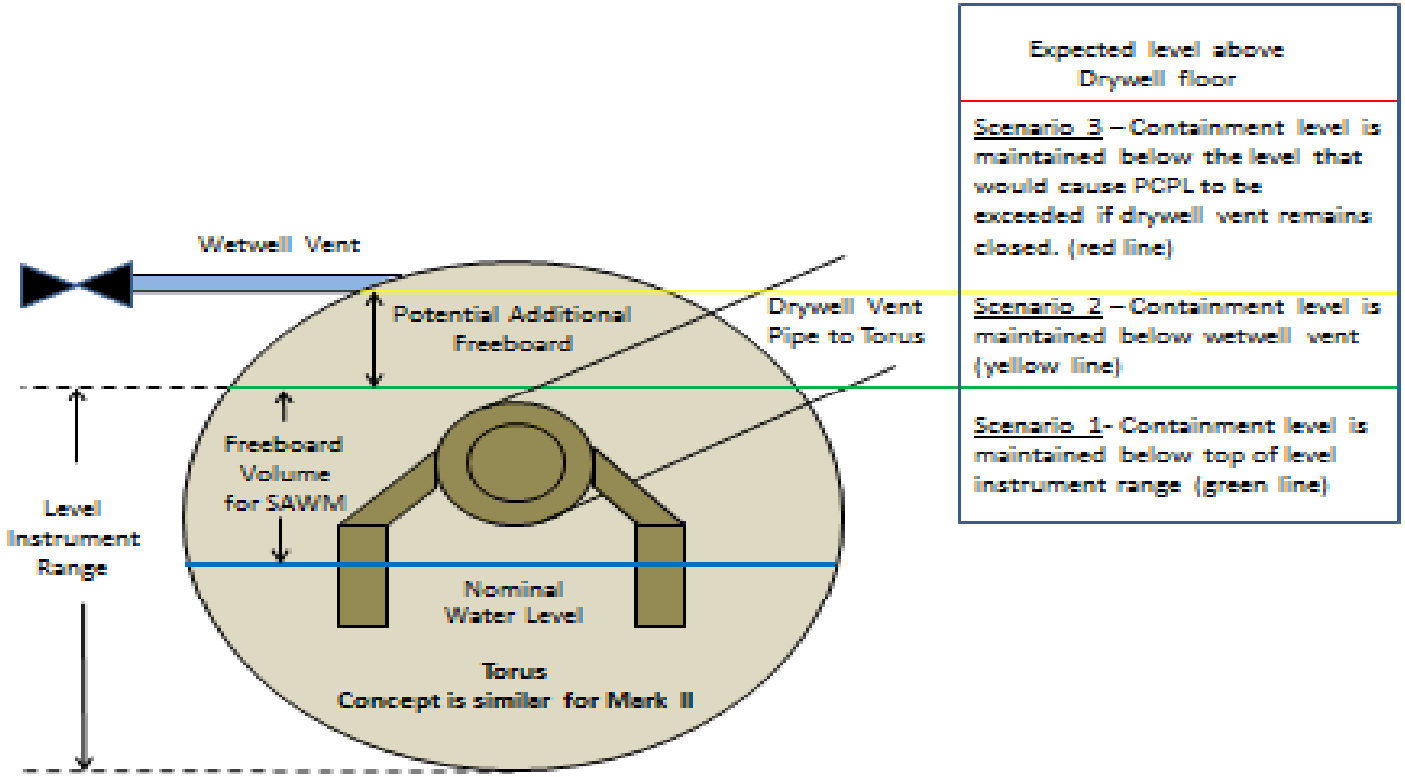
C.2.2.2

- The Emergency Response Organization (ERO) will be at full staff at 24 hours (EA-12-049 compliance, HCVS-FAQ-06) so that Command and Control is established to enable deployment of resources stored locally and arriving from the national response centers. This will enable effective SAWA/SAWM **Severe Accident Coping** until the transition to "alternate reliable containment heat removal and pressure control"
  - Due to the variability of the progression of a severe accident, it is not possible to identify specific actions for the transition from Severe Accident Coping to alternate reliable containment heat removal and pressure control. The ERO will determine the actions based on the status of the plant and the equipment available at the time.
- HCVS support equipment will be in-service and available (EA-13-109 Phase 1 compliance).
- National response center initial equipment delivery begins within 24 hours after notification (EA-12-049 compliance).
  - **All plant national response center equipment should be available for on-site use within 72 hours after notification.**
- **Expected containment heat input from zirconium water reactions and MCCI are significantly reduced shortly after water addition from SAWA begins (Ref. 27).**

C.2.2.3

- 4. This will provide for the initial removal of heat **from the core materials via steam production and transfer to the wetwell vent. In addition, this steaming will mix and equalize drywell temperatures cooling local hot spots as well as lowering overall containment temperature.**
- **5. Due to the relative size of the SP and SAWA flow rates, the change in SP level will be slow moving such that rapid, fine control of SAWA flow rate will not be required.**

SAWM Diagram



C.2.3

- **Plant–specific overall integrated plans submitted in response to Phase 2 of Order EA-13-109 will include information regarding freeboard, torus volume versus level, and an estimate of the rate level change in the suppression pool for various SAWA flow rates.**

Appendix H

- **The following sections of this appendix refer to the use of Argon as a purge gas for use in inerting the vent pipe. Argon is not the only acceptable purge gas so that the information regarding Argon can equally be applied to other purge gases such as Nitrogen or Carbon Dioxide.**
- **Added Consideration of the Open and Leave Open Strategy:**
  - **Although not considered as a 'formal option,' another possible approach to prevent detonation is to size the vent such that continuous venting occurs, once the vent is opened. This can also be accomplished through use of a flow-control valve restricting vent flow. This approach would be used if the containment would be expected to remain pressurized for an extended period (e.g., sustained operation) given a severe accident has occurred and no containment cooling is provided.**
- **Generic change throughout document of "Nitrogen" gas to "inerted/purging" gas**

I.1.4.1

- The water addition source, whether to RPV or drywell, should be capable of the flow rate and pressures **needed for water addition. The EPRI report of Reference 27 validated that the reference plant FLEX flow rate was sufficient for SAWA, therefore no additional plant-specific analysis is required.**

Key Dates for NEI 13-02 Revision 1

- ~~Complete initial draft of Section 1, 2 and 3; and, provide for staff review one week from 09/11/14 meeting, with NRC feedback by 9/23/14~~
- ~~Complete initial draft of Appendix C and I; and, provide for staff review one week from 09/25/14 meeting, with NRC feedback by 10/10/14~~
- ~~Complete draft of NEI 13-02 Revision 1 for staff review by one week from 10/30/14 meeting, with NRC feedback by 11/10/14~~
- 98% complete following 11/20/14 public meeting, with NRC feedback by 12/04/14, for submittal to NRC staff for endorsement as Revision 1 by 12/10/14 – **On Track**

Phase 2 Guidance Schedule

Date	Action
~~Jun – Jul 2014~~	~~NEI working group develop draft 13-02 Phase 2 scope~~
~~Jul – Nov 2014~~	~~NRC/NEI review draft 13-02 Phase 2 scope – public meetings~~ (Sep. 11, Sep. 25, Oct. 30, Nov. 20)
~~Nov 2014~~	~~NEI/BWROG industry comment and feedback (Nov. 4)~~
Dec 2014	NEI Phase 2 draft provided to NRC for reference in ISG (Dec. 10)
Jan 2015	NRC publish draft ISG for public comment
Apr 2015	NRC public comment period closed
Apr 2015	NEI issues NEI 13-02 Revision 1 for ISG endorsement
Apr 2015	**NRC issues approved ISG**
Apr – May 2015	NRC/NEI OIP template structure and content without pilots
May – Jul 2015	NRC/NEI OIP template pilots
Aug 2015	NEI/BWROG draft OIP to industry for comment for workshop
Sep 2015	NEI/NRC OIP workshop on pilots and template use
Oct 2015	NEI OIP finalized and included in a revision to NEI 13-02
Dec 2015	**Station OIPs submitted to NRC**

Phase 2 OIP Strategy

- Any Unit using a hardware DW vent for compliance with EA-13-109 Option B1 (Section 3 of NEI 13-02) will submit a separate OIP with specific details.
- Units using a strategy compliance with EA-13-109 Option B2 using SAWA will utilize a combined OIP for phase 1 and 2 compliance.
  - Annotate phase 1 OIP similar to the changes in section 2, 5 and 6 in NEI 13-02 Rev 1
  - The criteria for most of the hardware is the same for both phases
  - The criteria for the program and quality elements will be the same for both phases
  - The use of SAWA will be a separate section of the OIP
  - The use of SAWM or 545 SADV will be discussed in a separate section of the OIP
  - The milestone schedule will be appended to add the SAWA and SAWM/SADV for phase 2 compliance dates
- Simplifies work load for both NRC and Industry

Plant Hatch EA-13-109 Compliance Vent Pathway to Meteorological Stack (Chimney)

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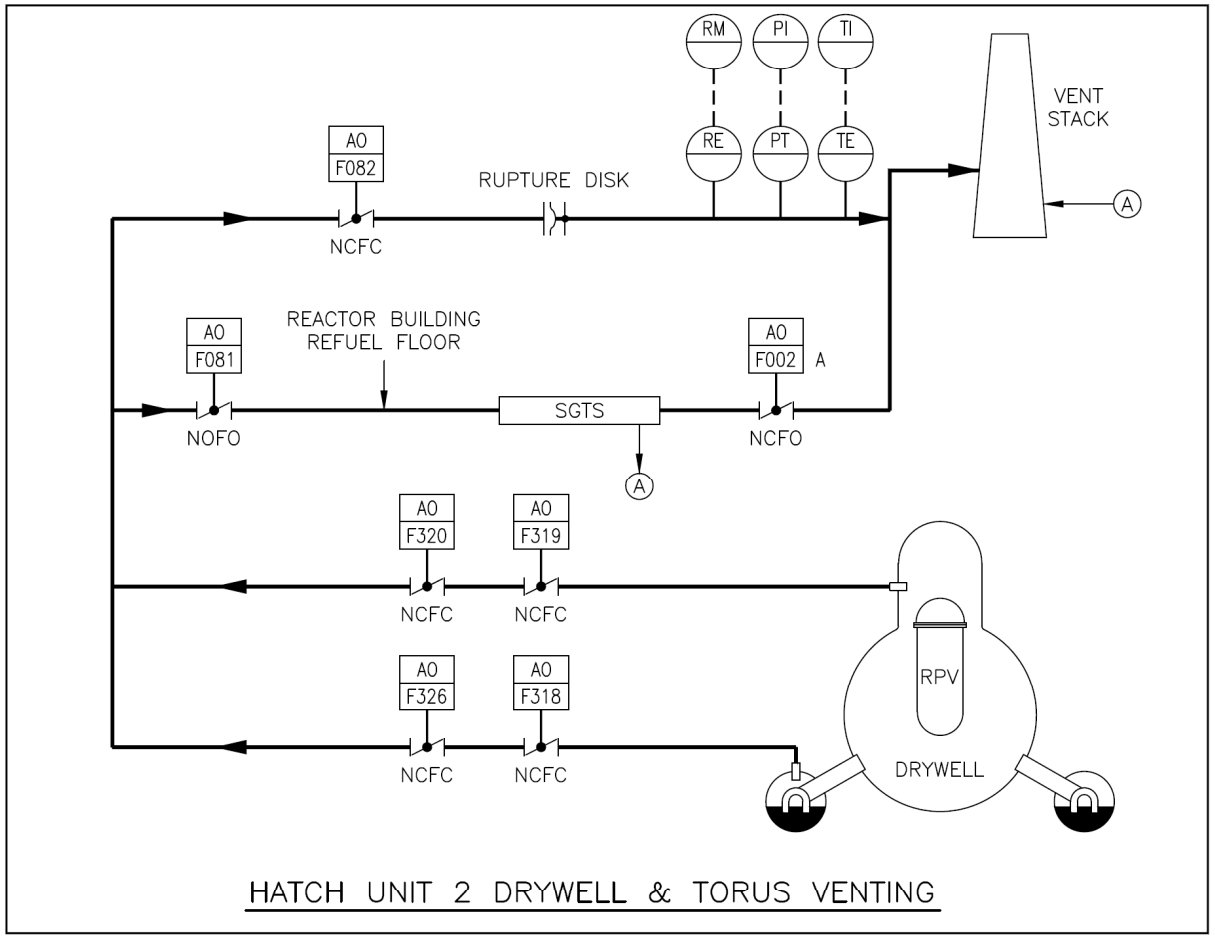
Plant Hatch – Venting Strategy P&ID



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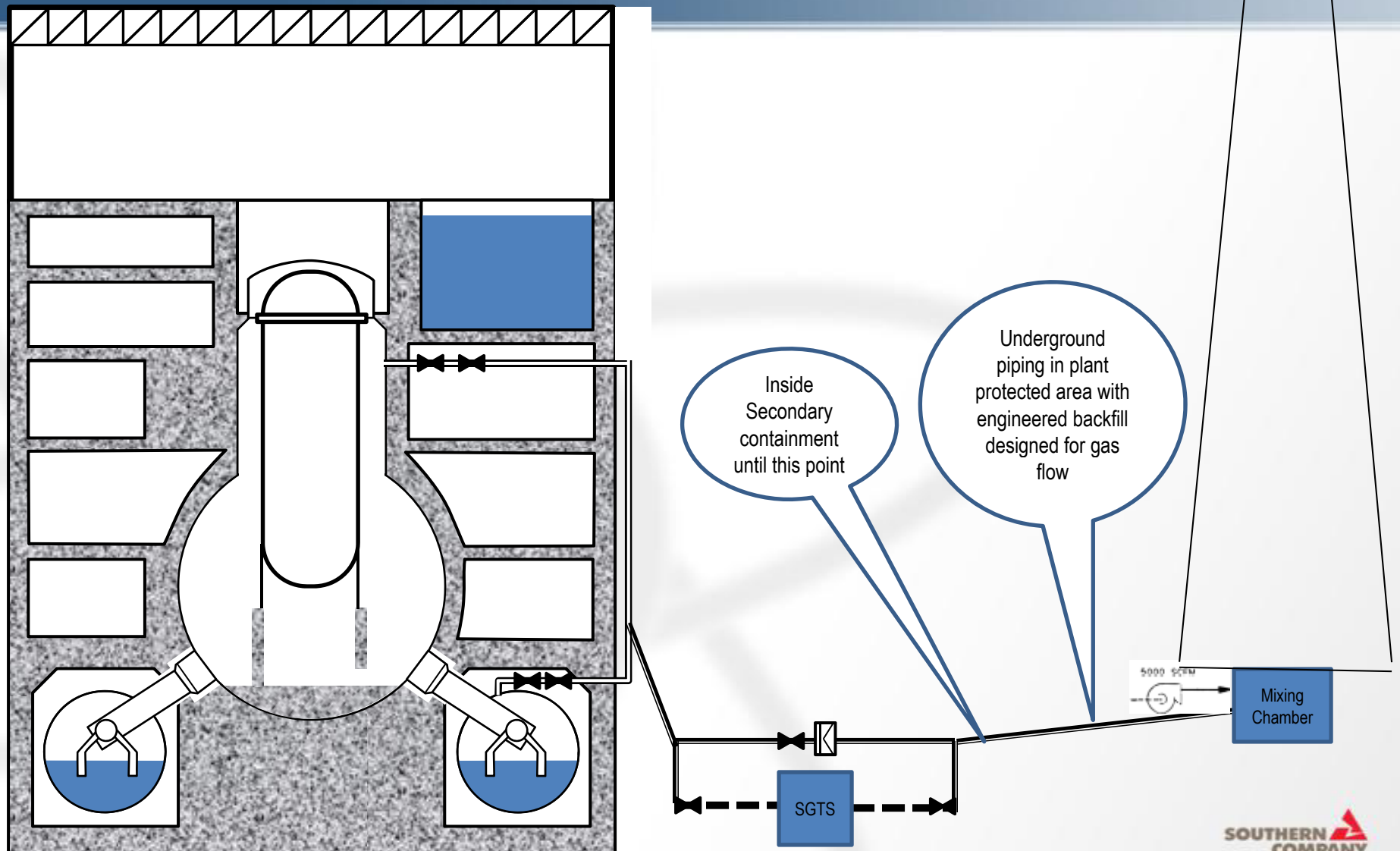
Existing Plant Hatch Design



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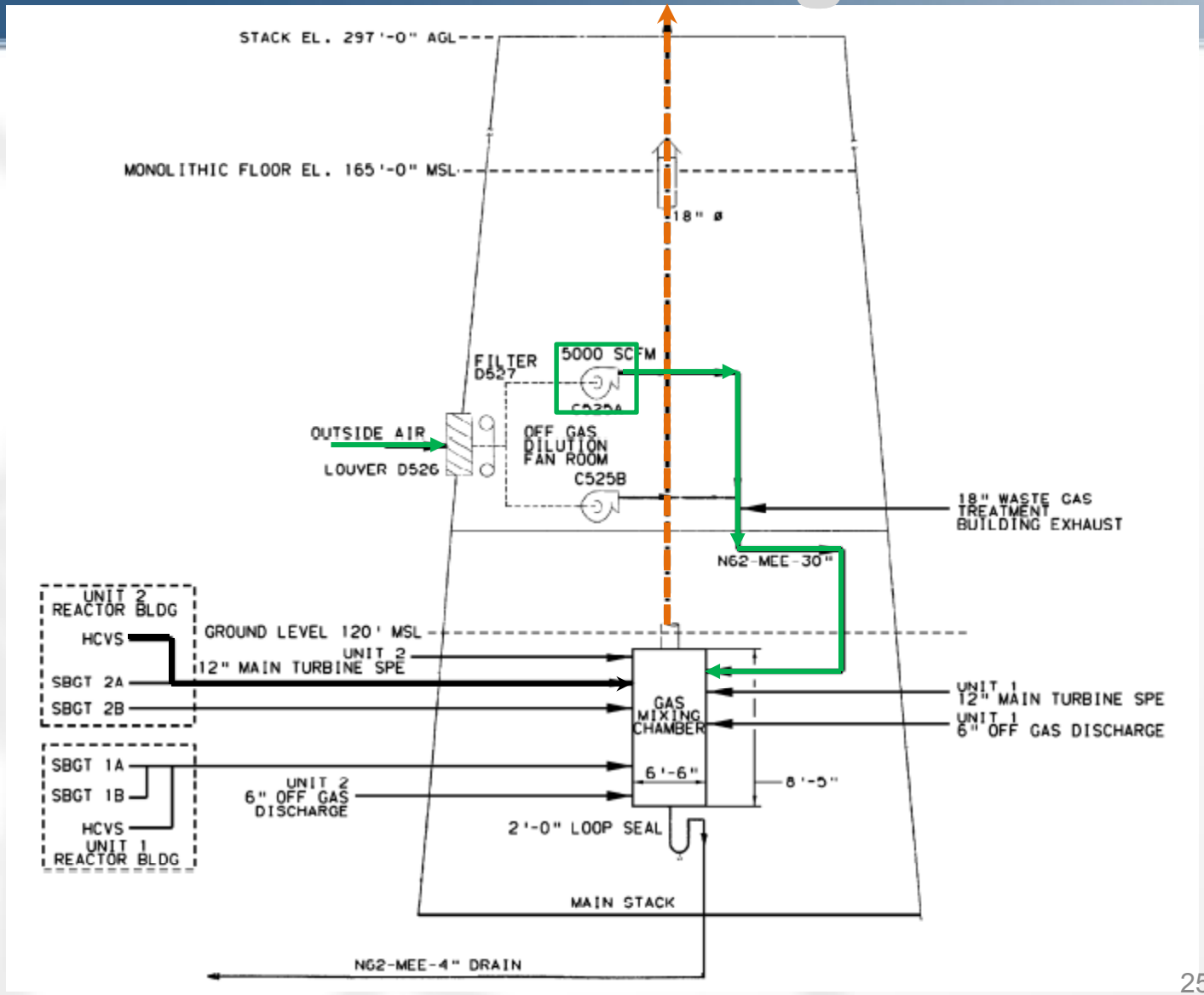
Main Stack Mixing Chamber



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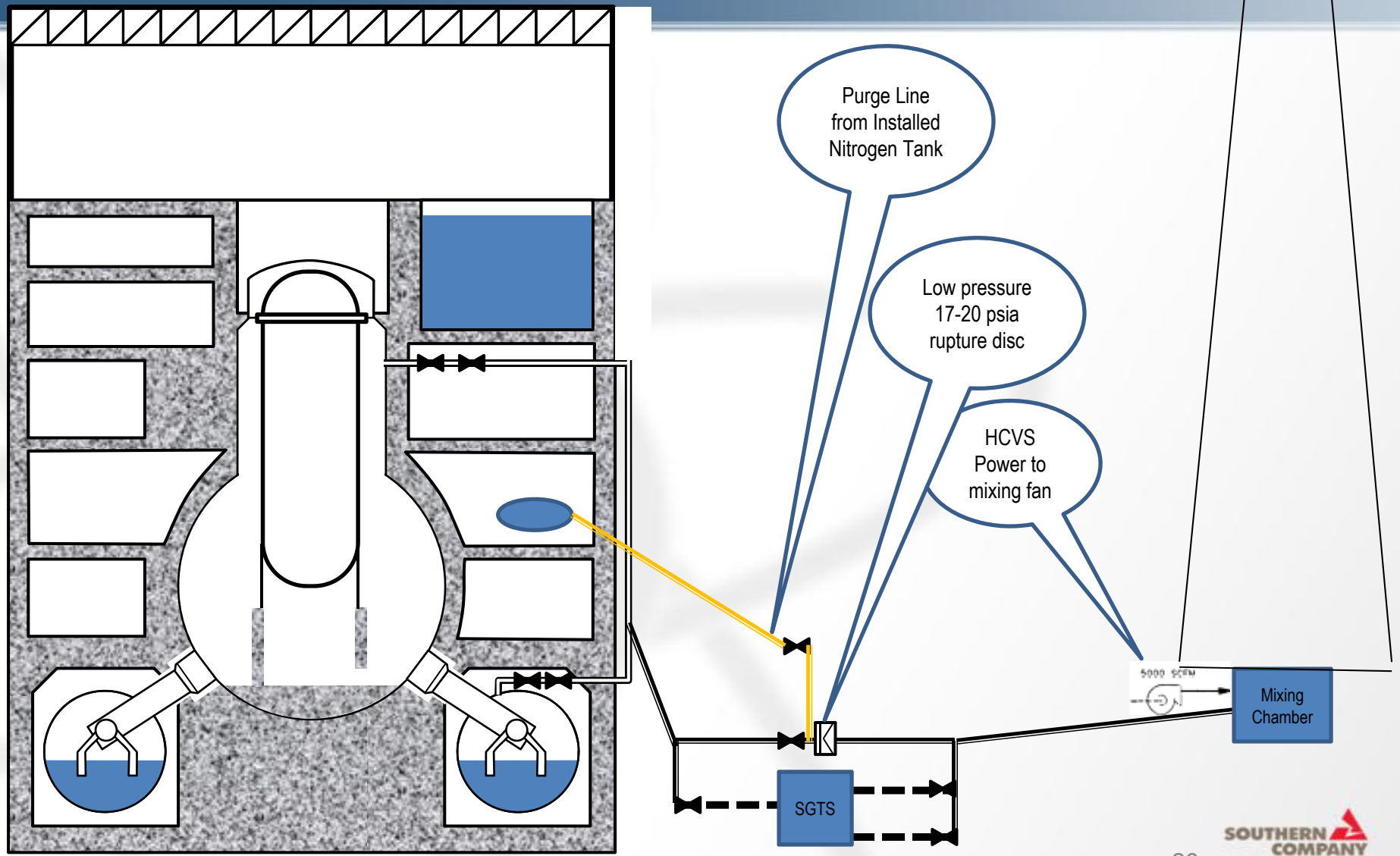
EA-13-109 Plant Hatch Design



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Low Pressure Rupture Disc

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Discussion of Phase 1 Topics

- NRC Staff WP-03 Comments and WP-02
- ISE Review Plans
  - Provide an overview presentation of the OIP, with figures and attachments to provide an illustration of the planned design
  - Use ePortal for documents
  - Use Generic Responses for audit questions
  - Instrument environmental condition information to be provided in a future 6-month update

Next Steps/Review Actions

- **Dec 4, 2014:** NRC Comments on NEI 13-02 Rev 0D4
- **Dec 10, 2014:** NEI Issue Final Draft NEI 13-02 Rev 0E1
- **Jan 15, 2015:** NRC Issue EA-13-109 Draft Phase 2 ISG for 90 day Public Comments
- **Mid Feb 2015:** Proposed NRC public meeting on Phase 2 OIP, Phase 1 ISE, Phase 2 White Paper discussion
- **Mid Apr 2015:** Proposed NRC public meeting on discussion of Public comments on ISG for inclusion in NEI 13-02 Rev 1
- **Apr 24-27, 2015:** NEI issue NEI 13-02 Rev 1 for Endorsement in ISG
- **Apr 30, 2015:** NRC Issue EA-13-109 Phase 2 ISG