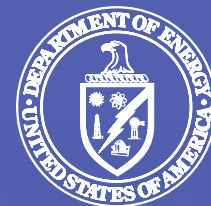




# Combined Tritium Facility (CTF) 233-H Inadvertent Stack Release and Impact on Safety Basis Hazard Analysis

DNFSB Brief – November 30, 2022



# Presenters

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- Kevin Cross: Savannah River Tritium Enterprise (SRTE) Area Operations Manager

# Background

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- January 30, 2022, SRTE experienced an inadvertent release of tritium from the 233-H stack, due to improper dispositioning of process tank contents.
- A rare meteorological condition (deep temperature inversion with high wind speeds) caused a portion of the inadvertent release (~1,000 curies of tritium) to be drawn down to the ground, of which approximately 1 curie of tritium re-entered the 233-H Facility via the building ventilation supply inlet.
- DNFSB issued a letter of concern on August 11, 2022, requesting a briefing to the Board regarding:
  - i. any plans to address this scenario in the hazards analysis, and
  - ii. any improvements to SRTE's operations, safety controls, and planned responses.

# Bottom Line Up Front

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- SRNS has evaluated the events of January 30<sup>th</sup> related to the inadvertent release of tritium from the 233-H stack and re-entry, against the forthcoming Combined Tritium Facility (CTF) Safety Basis and determined that no additional analysis is required.
- N&CSE Programs has developed a Site-Wide applicable Engineering Study Report (ESR) documenting the impact of deep inversions with high wind speeds to dose consequence accident analysis methodology.
- The CTF Consolidated Hazard Analysis (CHA) will acknowledge the event and reference the ESR in inadvertent stacking events 233H-3-016 and 264H-3-009, pending final CHA revision.
- SRTE has developed and implemented operational improvements to minimize and address the possibility of tritium re-entry.

# SRNS Atmospheric Dispersion Modeling

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## Updated Methodology

- The Atmospheric Dispersion Modeling methodology was updated in 2013.
- The updated methodology addressed DOE Safety Bulletin 2011-02, *Accident Analysis Parameter Update* and other factors.
- The updated methodology complies with Option 3 in DOE-STD-3009-2014.
- The updated methodology was approved by both NNSA and DOE.
- CTF uses this updated methodology.

## Methodology

- The public – Directionally independent 95th percentile site-specific meteorology from a 5-year dataset.
- A co-located worker (CW) - evaluated at a distance of 100 m from the release point
  - Unmitigated and mitigated ground-level releases use the default X/Q value specified by DOE-STD-3009-2014.
  - Mitigated analysis that credits an elevated release uses the default X/Q value specified by DOE-STD-3009-2014 reduced by an effective stack height factor.
- A facility worker - Qualitative judgement informed by the results of the CW dose consequence accident analysis calculations.

# Deep Inversion Impact Evaluation

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## Inversion Information

- An inversion is an increase in temperature with height
- A deep inversion condition at SRS is rare with a frequency of occurrence well below 2%.
- An inversion is not an accident initiator; it is a condition that affects atmospheric dispersion
  - DOE–STD–1020 defines Natural Phenomena Hazard (NPH) Events (e.g., Tornado, Straight Winds)

## Evaluation

- **Ground level and elevated release**
  - Consequences for ground level releases bound consequences involving inversion condition.
  - The SRS site-specific directionally independent 95% meteorology is Stability Class F and 1.3 m/s wind speed.
  - The default X/Q value from DOE-STD-3009-2014 is based on Stability Class F and 1.0 m/s wind speed. This value is beyond, but correlates closely to, the SRS 95% meteorology data point.
  - The deep inversion condition frequency of occurrence is well below 2% and is considered beyond the SRS 95% meteorology and the default X/Q values.

# Deep Inversion Impact Evaluation

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## Evaluation

- The public – The deep inversion meteorological condition represents a condition beyond the 95% meteorological data evaluation point. Therefore, there is no impact to the method for how these dose consequences are calculated.
- A co-located worker - Evaluated at a distance of 100 m from the release point
  - Unmitigated and mitigated ground-level release consequences calculated from the updated model bound inversion condition consequences. Therefore, there is no impact to the method for how these dose consequences are calculated.
  - Mitigated analysis that credits an elevated release uses the default X/Q value specified by DOE-STD-3009-2014 modified by an effective stack reduction factor. The deep inversion condition frequency of occurrence is well below 2% and is considered beyond this value. Therefore, there is no impact to the method for how these dose consequences are calculated.
- A facility worker - A facility worker dose consequence is qualitatively judged. The judgement is informed by the results of the collocated worker dose consequence accident analysis calculations. Therefore, there is no impact to the method for how these dose consequences are calculated.

# SRTE Operational Improvements and Response

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- Improvements to the SRTE Operations, Safety Controls, and Planned Responses to Abnormal Conditions (Protection of Workers)
- Review of Procedures Governing Gas Movements
- Improving the Safety of Planned Releases



# SRTE Operational Improvements and Response (cont.)

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- Improvements to the SRTE Operations, Safety Controls, and Planned Responses to Abnormal Conditions (Protection of Workers)
  - Response to Tritium Air Monitor (TAM) alarms
    - Personnel move away from alarms. Radiological Protection Department (RPD) provides escort / direction to lower areas of Tritium concentration.
  - New protocols
    - Thresholds for expected and unexpected releases established at >500 Ci/hr of tritium or > 2,000 Ci/day of tritium via a new Abnormal Operating Procedure (AOP).
    - Exceeding thresholds drives remain indoors, supervisory accountability, and follow-on discretionary bioassay.
    - Includes administrative buildings.
  - Drills and exercises
    - Accountability has been drilled frequently and exercised (2Q-3Q FY22) to familiarize personnel with new protocols.

# SRTE Operational Improvements and Response (cont.)

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- Review of Procedures Governing Gas Movements
  - Technical Rigor added to Flammable Mix Disposition and Internal Gas Transfers procedures.
  - Procedures modified to explicitly require use of tritium processing systems for potential flammable mix disposition.
- Improving the Safety of Planned Releases
  - Proceduralized involvement of Savannah River National Lab (SRNL) Meteorology
  - Proactive 'Remain Indoors' issuance

# Conclusion

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- The issue of Tritium re-entry into our facilities is being addressed rigorously. NNSA and SRTE have implemented measures to improve facility worker safety, based on application of DOE guidance and Conduct of Operations principles.
- Based on the review of the meteorological conditions and the impact of deep inversions with high wind speeds on dose consequence accident analysis methodology, no additional hazard analysis is required for the forthcoming CTF Safety Basis. The CHA will be updated to acknowledge the event and reference the Site ESR.
- SRTE has developed and implemented operational improvements to minimize the possibility of and address the response to potential Tritium re-entry. This includes a new AOP, proceduralized engagement with SRNL on planned releases, and improved technical rigor in gas movements.

# Questions

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