Remediated Nitrate Salts (RNS) Safing and Treatment

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Outline

- **Safety of the Situation**
  - Technical Studies
  - Storage: Temperature Control and Pressure Relief
  - Wildfire: Mitigation, Modeling and Simulation, Defense in Depth Actions

- **Hazard Elimination: RNS Treatment**
  - Stabilization Through Addition of Zeolite
  - Engineered Implementation
  - Regulatory Permit Requirements

- **Corrective Actions**
  - Types of Actions
  - Example, Process Engineering

- **Project Management**
  - Senior Integrated Project Team (Senior IPT)
  - Project Execution Plan and Resource Loaded Schedule
Nitrate Salt Waste: Robust technical basis established to ensure safety in storage, handling, and treatment.

- **Small-scale testing for thermal sensitivity**
- **Modeling and analysis**
  - Potential mixtures of nitrate salts
  - Thermo-chemical behavior at drum scale
- **Head space gas monitoring**
  - Temperature effects on reaction rate
  - Declining reactions over time (due to depletion)
- **Full-scale drum tests**
  - Early-warning signatures of thermal runaway
  - Importance of gas phase chemistry and pressure

**Key Conclusions**
- Addition of pressure relief, eliminates the possibility of thermal runaway.
- Reducing temperature prevents thermal runaway.
- Risk of thermal runaway decreases with time.

**Implications**
- After 20+ months of storage, thermal runaway is extremely unlikely under ambient conditions.
- Concerns remain about accident scenarios that could significantly increase the waste temperature by external heating.
- Providing enhanced pressure relief adds an additional margin of safety.

60 Drums in Los Alamos
LANS is implementing a two-pronged strategy to mitigate the remediated nitrate salt (RNS) risk.

A Senior Integrated Project Team (DOE/LANS) is responsible for developing and enabling implementation of mitigation strategies

- **Strategy 1:** Safely control the RNS environment (temperature and pressure) through engineered controls including wildland fire risk mitigation

- **Strategy 2:** Treat the waste in the RNS drums to eliminate risk of thermal chemical reactions as soon as we can do so safely.
Engineered-controls are being implemented to reduce the RNS storage risk.

- From extensive lab-scale/full-scale testing and modeling, we know lowering the ambient temperature and eliminating the possibility of significant pressurization of a drum reduces the risk of a thermal runaway
  - RNS drums currently stored in standard waste boxes in a Permacon® with automatic sprinkler system within Dome 375
  - Continuous temperature monitoring of the standard waste box
  - Supplemental cooling of the Permacon®
  - Pressure relief options are currently being finalized and will be implemented once safety basis analyses, procedure validation, and readiness demonstration are completed

- Improving conduct of engineering and maintenance of vital systems.
Full-Scale Drum Tests Showed the Importance of Pressure Relief.
We Have Established Mitigation Measures to Reduce the Threat of a Wildland Fire to the RNS Wastes in TA-54 Area G.

- Fuel mitigation (shrub and tree thinning) is performed in the canyons adjacent to Area G to minimize the amount of vegetation available for burning in a wildland fire.

- Area G Facility Emergency Response Actions are being upgraded to include actions to protect RNS-bearing containers in the PermaCon® in the event of an imminent fire hazard.
  - The Los Alamos Fire Department Pre-Incident Plan for Area G gives priority consideration to Dome 375/ PermaCon® for exposure protection in advance of an approaching fire, e.g., foaming the dome
  - Other controls include securing ventilation system, adding reflective blankets to the SWBs

- Preliminary results of the modeling of wildland fire behavior in the canyons surrounding TA-54 and the thermal response of the RNS-bearing containers indicates that wildland fire scenarios do not challenge the waste.
Wildland Fire Modeling of Bounding Scenario

1. Pinon-Juniper
2. No burn
3. Grassland
4. Shrubland or tall grasses
5. Wetland/Riparian
6. PIPO forest
7. PIPO woodland

Real topo Area G, updated veg/bld data, 3-line ign, 2m/s wind (Ongoing)
An RNS treatment approach has been preliminarily selected – approach undergoing broader review before finalization.

- The selected treatment involves addition of water as a processing aid (and dissolution of the salt) followed by sorption with zeolite
  - Decreases energy content and can separate the fuel from the oxidizer (retained in the zeolite pores)
- The baseline engineering implementation will utilize two batch mixers within the Waste Characterization, Reduction, and Repackaging Facility (WCRRF) glovebox at LANL
  - A mock WCRRF glovebox has been procured and delivered to support development and readiness
- The approach has been peer reviewed by a broad team of experts to evaluate the use of WCRRF. Recommendations are due in April.
- Testing to demonstrate the effectiveness of the treatment is ongoing and is expected to be completed this month.
  - An EPA certified Laboratory, Southwest Research Institute, is conducting tests to demonstrate that the treated materials do not carry the RCRA hazardous characteristics
- A Hazardous Waste Permit modification is required to process the salts
  - Discussions with the New Mexico Environment Department expected the permit mod to be classified as a 1*
The Blending Process is Relatively Straightforward
We have developed corrective actions to eliminate the potential for a reoccurrence.

Addressing Systemic Issues
- JON 14: Process Engineering / Change Control
- JON 32: Procedure Development
- JON 39: Safety Culture

Improving Requirements Definition
- JON 9,10: RCRA Requirements
- JON 13,18: RNS Tech Basis
- JON 19, 20, 21: Safety Basis

Implementing Improvements
- JON 15,16,17: WCRRF GB Procedure
- JON 38: Training and Qualification

Ensuring Compliance
- JON 22, 23: Unresolved Safety Question
- JON 25: Contractor Assurance System/Quality Assurance

17 of the 40 “Justification of Need” or JONs, were directed to Los Alamos
Example is JON 14: Engineering Change Control Process

- **Conclusion**: LANS did not utilize a formal engineering change control process to develop modifications to repackaging activities in the WCRR Facility

- **JON 14**: LANS needs to implement an effective engineering change control process that includes defensible technical bases to justify process modifications

- **Approach**: Establish integrated process engineering function in ADEP TRU Waste Operations to assure adequate technical baselines, formal change control and configuration management
### JON 14 Corrective Actions

<table>
<thead>
<tr>
<th></th>
<th>Action Description</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-1</td>
<td>Develop documented new activity and change control process within ADEP</td>
<td>10/02/15</td>
</tr>
<tr>
<td>14-2</td>
<td>Define membership and charter a TRU Waste Change Control Board</td>
<td>10/02/15</td>
</tr>
<tr>
<td>14-3</td>
<td>Establish organization structure for “TRU Process Engineering” in ADEP, responsible for establishing process baselines and configuration control</td>
<td>8/06/15</td>
</tr>
<tr>
<td>14-4</td>
<td>Develop a TRU Waste Process Engineer description, and on-board (hire and qualify) MIN02 Process Engineer</td>
<td>11/06/15</td>
</tr>
<tr>
<td>14-5</td>
<td>Establish TRU waste process engineering requirements for specific waste streams</td>
<td>9/04/15</td>
</tr>
<tr>
<td>14-6</td>
<td>Develop and implement process flow sheet development procedure that identifies critical steps, specifications and controls, and operational records requirements</td>
<td>9/04/15</td>
</tr>
<tr>
<td>14-7</td>
<td>Define the requirements and charter for Integrated Process Control Teams (IPCT) for specific waste streams, with a lead engineer and full set of SMEs</td>
<td>9/04/15</td>
</tr>
</tbody>
</table>

**All JON 14 Actions are Complete**
After CAP is Implemented

- Systemic issues in TRU Waste Operations corrected
  - Process change control and sound technical basis
  - Configuration management of processes and materials
  - Procedure development incorporates all requirements (SMEs)
  - Training/qualification in place for all positions
  - Safety culture fully embraced by managers and employees

- Compliant nuclear safety and RCRA programs

- Strong and continuous oversight by managers, Facility Operations Division and LANL institution
A Senior Integrated Project Team has been established, with support in the key functional areas, to manage the project.

- **Leads:** Dave Funk (LANL) and Dave Nickless (EM-LA)
- **Contracting:** Chris Lockhart (EM-LA) and Jerry Ethridge (LANL)
- **Communications:** Peter Hyde (LANL) and Steven Horak (EM-LA)
  - Toni Chiri (NA-LA)
- **Safety Basis:** Jim O’Neil (NA-LA) and Derek Gordon (LANL)
  - Al Baione, Bob Nelson, Amanda Anderson (EM), Dave Kupferer (NA), Mark Kobi, Sharon Walker (LANL)
- **Regulatory:** Brian Hennessey (EM-LA) and John McCann (LANL)
  - Mark Haagenstad, Luciana Vigil-Holtermann, Susan McMichael (LANL)
- **Operational Readiness:** Greg Jones (NA-LA) and Mandy Krenek (LANL)
  - Chris Jones (LANL), Ed Westbrook (EM), Jeff Roberson (NA)
- **Engineering:** Lee Bishop (EM-LA) and Larry Goen (LANL)
  - Julie Minton-Hughes and Kurt Anast (LANL)
- **Maintenance/Construction:** Ed Keith and Jim Jones (LANL)
  - Barry Walker (LANL)
- **Operations:** Bill Mairson (LANL)
  - Chuck Conway, David Solms and David Frederici (LANL)
  - Emergency Preparedness: Bill Gentile (NA-LA) and Marla Brooks (LANL)
The LANS-EM bridge contract proposal contained the resource loaded baseline schedule.

- Submitted on June 30, 2015
- Updates are being developed to reflect the safing and treatment strategy
- The Project Execution Plan (PEP) and updated resource loaded schedule is in development
  - Pressure relief device addition schedule is complete; shows completion by mid-May
    o Highest MAR drums would be tended to first
- PEP and Schedule will be used by the IPT to keep the project on track
Our path forward accommodates the need for safety, urgency, thoroughness, and alignment among key stakeholders.

- Focus on expeditious risk mitigation strategies that are technically sound while maintaining safety during all evolutions.
- Leverage DOE/LANS Integrated Project Team to coordinate progress.
- Emphasize timely and meaningful communications to accommodate the number and diversity of stakeholders.
Backup Slides
JON 32: Procedure Development (ADEP)

- **Conclusion**: LANS existing processes governing preparation, review, and approval of ADEP procedures did not contain sufficient guidance related to hazard analysis and subject matter expert review necessary to ensure safe, consistent, and compliant execution of waste processing.

- **JON 32**: LANS needs to ensure that all procedures and procedure revisions contain:
  - The necessary level of detail to ensure the safe, consistent, and compliant performance of work, including process steps, materials, and material substitutions.
  - Explicit requirements and criteria regarding inclusion of appropriate subject matter experts and their review and concurrence with new and revised procedures.
  - Requirements that a Job Hazard Analysis (JHA) is appropriately amended when new activities such as nitrate salt remediation that could introduce new hazards are incorporated into existing processes.

- **Approach**: Issue new procedure EP-AP-10007 “ADEP Technical Procedure Development” that addresses all elements of JON 32 and DOE/IG recommendations on ADEP procedure development.
JON 32 Corrective Actions

| 32-1 | Issue new procedure to replace EP-DIR- AP-10007, "The Preparation, Review and Approval of ADEP Documents" to ensure that all ADEP technical procedures include:

- Necessary level of detail to ensure safe, consistent, and compliant performance of work, including process steps, materials, and material substitutions;
- Explicit requirements and criteria regarding inclusion of appropriate SMEs and their review and concurrence with new and revised procedures; and
- Requirements that a Hazard Analysis is appropriately amended when new activities such as nitrate salt remediation that could introduce new hazards are incorporated into existing processes. |
Conclusions: LANS allowed the safety culture at LANL to deteriorate within pockets of the organization

- Management failed to effectively respond to workers’ issues regarding unexpected conditions.
  
  Questioning attitudes were not welcomed by management and many issues and hazards did not appear to be readily recognized by site personnel.

JON 39: LANS and NA-LA need to develop and implement more rigorous, effective integrated safety management system that embraces and implements the attributes of DOE G 450.4-1C, Integrated Safety Management Guide

Approach: Assess and improve implementation of the Laboratory’s ISM program within TRU waste operations
## JON 39 Corrective Actions

<table>
<thead>
<tr>
<th>39-1</th>
<th>Reorganize ADEP and EWMO to separate program, line, &amp; FOD; clarify R2A2; and assign managers who embrace safety culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>39-3</td>
<td>Develop project plan to address identified gaps in ADEP/EWMO safety culture</td>
</tr>
<tr>
<td>39-4</td>
<td>Execute approved project plan</td>
</tr>
</tbody>
</table>
**JONs 9 & 10: Secondary Waste, Requirements Flow-down (ADESH)**

- **Conclusion**: LANS did not adequately evaluate the impact on the WIPP Waste Acceptance Criteria or effectively control the addition of secondary job waste into TRU waste containers.

- **JON 9**: LANS needs to improve the level of rigor in evaluating and controlling addition of secondary waste into TRU waste.

- **Conclusion**: LANS did not adequately incorporate upper tier requirements into development of repackaging at WCRRF (specifics focus on CBFO requirements and LANL RCRA permit requirements).

- **JON 10**: LANS needs to strengthen flow down of upper tier requirements into implementing procedures so that work is compliant.

- **Approach**: Address gap in institutional waste management policy for specific guidance on secondary waste, neutralization, absorption, and incompatible materials.
## JONs 9/10 Corrective Actions

| 9/10-1 | Improve the LANL waste management and environmental protection program to strengthen and verify requirements flow down through active line management and SME involvement for a) secondary waste requirements criteria and when SME reviews are required; b) criteria for when waste characterization, compatibility and processing reviews are required; c) definition of neutralization and absorption; d) HWFP modification process; e) changes in waste processing; and f) RCRA, WAC and HWFP requirements. |
| 9/10-2 | Validate the implementation of P409 in the ADEP engineering change control process to include management of technical baseline documentation (i.e., CBFO controls and EMRTC Report 10-13). |
| 9/10-3 | Evaluate and modify qualification standards, as appropriate, for Waste Management Coordinators (WMCs) and Deployed Environmental Professionals (DEPs) |
| 9/10-4 | Revise training for WMC, DEPs, and Waste Generators on RCRA requirements to include a) secondary waste segregation requirements or the need to conduct compatibility evaluations; b) understanding of what constitutes waste processing and treatment; and c) what steps are required to ensure compliance with the HWFP. |
| 9/10-5 | Develop Treatment, Storage, and Disposal Facility (TSDF) inspector qualifications for RCRA TSDF inspections to include field application of inspection criteria. |
| 9/10-6 | Develop ENV-CP-AP-200, Regulatory Review of Waste Management Procedures, that defines ENV-CP procedure review requirements to include a) RCRA secondary waste requirements; b) evaluation of waste management procedure compliance with RCRA and HWFP requirements; and c) signature line for SMEs. |
JON 13: Nitrate Salt Technical Basis (ADEP)

- **Conclusion:** LANS failed to provide sound technical basis for decisions regarding repackaging procedures and processes for the LA-MIN-02-V.001 waste stream.

- **JON 13:** LANS needs to strengthen documentation to include a detailed technical basis to justify decisions made regarding change control for procedures and processes for the LA-MIN-02-V.001 waste stream.

- **Approach:** Complete the technical basis actions for the LA-MIN02-V.001 waste stream. Implementation will follow the process established for JON 14.
<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>13-1</td>
<td>Using LANL and TAT technical studies and analysis, develop a summary document that describes our understanding of the RNS waste stream</td>
</tr>
<tr>
<td>13-2</td>
<td>Based on 13-1, develop a set of treatment options and evaluate their applicability to RNS and UNS waste streams</td>
</tr>
<tr>
<td>13-3</td>
<td>External peer review of the 13-2 report</td>
</tr>
<tr>
<td>13-4</td>
<td>Develop technical basis for storage and monitoring for early warning of thermal runaway, and update the Dome 375 Abnormal Operating Procedure</td>
</tr>
<tr>
<td>13-5</td>
<td>Develop and execute the experimental test plan to establish the technical basis for RCRA treatment of RNS and UNS waste streams</td>
</tr>
</tbody>
</table>
Conclusion: Available data indicated that oxidation was occurring in the Standard Waste Box where sibling drum 68685 was stored, along with other similarly remediated waste drums.

JON 18: LANS needs to investigate and determine the cause for oxidation in sibling drum 68685 and take action to mitigate the condition as well as prevent future nitrate salt bearing waste drums (remediated and unremediated) from oxidizing.

Approach: Utilize best technical information available to develop an approach to safe storage, implement, and develop early warning protocol and response.
## JON 18 Corrective Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
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<tbody>
<tr>
<td>18-1</td>
<td>Sample headspace gas from 68685 and other RNS containers and trend data</td>
</tr>
<tr>
<td>18-2</td>
<td>Analyze data, develop models, and interpret results</td>
</tr>
<tr>
<td>18-3</td>
<td>Establish control methods for mitigating and inhibiting oxidation</td>
</tr>
<tr>
<td>18-4</td>
<td>Implement supplemental cooling to mitigate and inhibit oxidation in RNS containers</td>
</tr>
<tr>
<td>18-5</td>
<td>Develop methods for temperature and headspace gas monitoring that will provide early warning</td>
</tr>
</tbody>
</table>
JONs 19, 20, 21: Safety Basis (ADNHHO)

- **Conclusion**: The WCRRF Basis for Interim Operation (BIO) did not thoroughly describe or evaluate nitrate salt processing or waste storage activities.

- **JON 19**: The WCRRF BIO needs to be revised to include more specificity in description of nitrate salt waste processing activities and then update the hazard analysis to include identification of all hazards and their evaluations.

- **JON 20**: LANS needs to review the Area G BIO in light of changes made to the WCRRF BIO and update accordingly.

- **JON 21**: LANS needs to conduct an extent of condition review for issues that are similar to nitrate salt bearing waste processing in WCRRF and Area G.

- **Approach**: Develop and submit a Page Change to WCRRF BIO to correct statements regarding nitrate salts. After technical basis is developed for treatment of RNS and UNS nitrate salts, submit Page Change to WCRRF BIO that addresses treatment. Evaluate Area G BIO based on changes to WCRRF BIO and develop/submit Page Change if appropriate. Conduct independent safety basis review to provide assurance that operations/activities described in WCRRF, Area G, and RANT BIO/TSRs are safe and compliant with current facility basis. Upon completion of review, submit applicable page changes as required.
### JONs 19, 20, 21 Corrective Actions

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>19-1</strong></td>
<td>Submit WCRRF BIO Rev 3.1 Page Change to NNSA revising Ch. 2 and 3 to correct statements regarding nitrate salts and other oxidizers and include a statement in Ch. 3 regarding the potential presence of liquids in TRU waste streams.</td>
</tr>
<tr>
<td><strong>19-2</strong></td>
<td>Submit WCRRF BIO/TSR Page Change to NNSA addressing treatment of remediated and un-remediated nitrate salt drums.</td>
</tr>
<tr>
<td><strong>20-1</strong></td>
<td>Upon submittal of WCRRF BIO/TSR, Rev. 3.1 evaluate Area G BIO/TSR for applicable Page Changes.</td>
</tr>
<tr>
<td><strong>20-2</strong></td>
<td>Contingent on results of CA 20-1, develop Page Changes to Area G BIO/TSR.</td>
</tr>
<tr>
<td><strong>20-3</strong></td>
<td>Submit Area G BIO/TSR Page Change to NNSA addressing cold safing and de-nesting of remediated nitrate salt containers.</td>
</tr>
<tr>
<td><strong>21-1</strong></td>
<td>Conduct backward looking Safety and Compliance Review per SBP-351 on WCRRF, Area G, and RANT processes described in Chapter 2 of BIOs.</td>
</tr>
</tbody>
</table>
Conclusion: LANS failed to ensure that there was sufficient detail provided in the WCRRF glovebox procedure to ensure safe, consistent, and compliant repackaging of waste and accurate documentation of the contents of the waste drums in the records.

JON 15: LANS needs to revise the WCRRF glovebox operations procedure to contain the necessary level of detail to ensure safe, consistent, and compliant remediation of nitrate salt bearing waste.

JON 16: The glovebox operations procedure needs to be revised to require operators to document critical process steps in a quality record, e.g., initial pH, absorbent added, neutralizer used, adjusted pH.

JON 17: Operators need to be adequately trained on the revised glovebox operations procedure.

Approach: Revise glovebox procedures for nitrate salt waste to include necessary level of detail and document key process steps in quality record. Corrective actions for JONs 9, 10, 13, 14, 19, 22, 23, & 32 are predecessor actions. (There are likely precursors from other CAPs as well.)
### JONs 15, 16 & 17 Corrective Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>15/16-1</strong></td>
<td>Revise glovebox (GB) procedure for nitrate salt waste (separate procedure for each waste stream) to include necessary level of detail to ensure safe, consistent, and compliant remediation of nitrate salt waste, and document key process steps in a quality record</td>
</tr>
<tr>
<td><strong>17-1</strong></td>
<td>Develop training content in accordance with P781-1, <em>Conduct of Training</em></td>
</tr>
<tr>
<td><strong>17-2</strong></td>
<td>Train operators and supervisors</td>
</tr>
</tbody>
</table>
Conclusion: EnergySolutions, LLC (ES) operators and supervisors were not adequately trained and qualified to process waste with regard to identification and control of incompatible materials.

JON 38: LANS needs to evaluate and strengthen the operator and supervisor training programs of LANS and their subcontractors to ensure adequate understanding of basic chemistry interactions and associated controls.

Approach: Conduct organizational profile for Waste Disposition Division (WDD) and establish appropriate positions; through analysis, develop training plans for positions and update Training Implementation Matrix (TIM).
<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
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<tbody>
<tr>
<td>38-1</td>
<td>Review, modify and update WDD position descriptions within ADEP to include position description summary, job knowledge, education, and work direction components of the position.</td>
</tr>
<tr>
<td>38-2</td>
<td>Develop, based on analysis, training and qualification programs for WDD positions within ADEP that address specific training and qualification requirements of each position, including positions that require training and qualification related to chemistry.</td>
</tr>
<tr>
<td>38-3</td>
<td>Revise TIM for WDD positions based on analysis from actions 38-1 and 38-2.</td>
</tr>
<tr>
<td>38-4</td>
<td>Clarify the oversight role of LANS with regard to Subcontractor training and qualification for TRU Waste Operations (JON 25 Actions 25-4, 25-5, 25-6, and 25-7).</td>
</tr>
</tbody>
</table>
JONs 22 and 23: USQ (ADNHHO)

- **Conclusion:** The LANS Unreviewed Safety Question (USQ) process was ineffective in ensuring that important procedure changes related to processing of nitrate salts were adequately evaluated for impacts to the safety basis.

- **JON 22:** LANS needs to ensure that USQ evaluators are organizationally independent of line management.

- **JON 23:** LANS needs to conduct retraining of USQ process evaluators/approvers focused on implementation of the USQD process consistent with DOE Guide 424.1-1B, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*.

- **Approach:** Locate USQ evaluators in Safety Basis and Engineering Services organizations that are independent of ADEP line management. Utilize independent Senior Analyst Review Panel for review of all USQ documents. Develop and deliver facility specific training on Hazards and Accident Analysis and Technical Safety Requirements (TSRs) to USQ Qualified Evaluators.
### JONs 22 and 23 Corrective Actions

<table>
<thead>
<tr>
<th></th>
<th>Corrective Action</th>
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</thead>
<tbody>
<tr>
<td>22-1</td>
<td>Continue Senior Analyst Review Panel for all USQ documents and develop a procedure to replace the existing Standing Order</td>
</tr>
<tr>
<td>23-1</td>
<td>Revise USQ initial and refresher/continuing training.</td>
</tr>
<tr>
<td>23-2</td>
<td>Provide revised USQ initial and refresher/continuing training.</td>
</tr>
<tr>
<td>23-3</td>
<td>Develop facility-specific training on Hazards and Accident Analysis and TSRs.</td>
</tr>
<tr>
<td>23-4</td>
<td>Provide facility-specific training on Hazards and Accident Analysis and TSRs.</td>
</tr>
</tbody>
</table>
JON 25: Contractor Assurance / QA (ADBI)

- **Conclusion:** The Los Alamos National Security, LLC (LANS) contractor assurance system was not effective in identifying weaknesses in the process for developing/changing procedures, analyzing and controlling hazards, performing work to repackage nitrate salt bearing wastes, and feedback mechanisms which resulted in the production and shipping of noncompliant waste drums to WIPP and Waste Control Specialists, LLC.

- **JON 25:** LANS needs to develop and implement a fully integrated contractor assurance system that provides DOE and LANS confidence that work is performed compliantly, risks are identified, and control systems are effective and efficient. *(Specific areas focus on TRU waste operations)*

- **Approach:**
  1. Assess and improve the Contractor Assurance System for ADEP TRU Waste Operations;
  2. Assess and improve the oversight roles of LANS with regard to subcontractors doing TRU Waste Operations work; and
  3. Assess and improve the Quality Assurance program for TRU Waste Operations work, including review of rigor in implementation of the change control process (JON 14), requirements flow down process (JON 10), and responding to operations feedback by LANS senior management (JON 39).
### JON 25 Corrective Actions

<table>
<thead>
<tr>
<th>Action</th>
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<tbody>
<tr>
<td>25-1</td>
<td>Assessment of the formal aspects of the Contractor Assurance System (CAS) as described in SD 320 (rev 3) within ADEP/EWMO and applicable organizations involved in processing and packaging of waste. CAS findings identified in the AIB report will be addressed.</td>
</tr>
<tr>
<td>25-2</td>
<td>Develop project plan to address identified gaps in CAS elements (per assessment above).</td>
</tr>
<tr>
<td>25-3</td>
<td>Execute approved project plan.</td>
</tr>
<tr>
<td>25-4</td>
<td>Assess ASM Contractor and Subcontractor requirements in regard to oversight role to include R2A2s for ADEP and EWMO.</td>
</tr>
<tr>
<td>25-5</td>
<td>Develop project plan to close gaps in detailing and improving contractor requirements identified in assessment.</td>
</tr>
<tr>
<td>25-6</td>
<td>Execute approved project plan.</td>
</tr>
<tr>
<td>25-7</td>
<td>Modify the existing STR refresher training to emphasize that technical changes to the subcontract and changes to the scope of work require a review and concurrence by applicable SMEs and other stakeholders and that such changes and reviews are documented and included in the STR subcontract administration file.</td>
</tr>
<tr>
<td>25-8</td>
<td>Assessment of the formal aspects of the Quality Assurance program to the scope of activities to which the ADEP QA program is applied to ensure that regulatory, statutory, and contractual QA requirements that are applicable to those activities are applied to those activities. This activity includes providing institutional QA personnel to ADEP.</td>
</tr>
<tr>
<td>25-9</td>
<td>Develop project plan to address identified gaps in Quality Assurance.</td>
</tr>
<tr>
<td>25-10</td>
<td>Execute approved project plan.</td>
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</table>
Temperature Control: Headspace Gas Analysis Indicates Decreasing Reactivity

- Robinson developed a model of headspace gas concentration that includes chemical reaction production, venting, and air exchange.
- The model yielded activation energies of ~15-20 kcal/mol and heat generation rates of less than one Watt (Summer of 2014).
- Qualitatively, thermal runaway requires increasing chemical reaction and heat production – decreasing concentrations would suggest that we are on the “back side” of the reactivity curve.
Temperatures and the correlated N\textsubscript{2}O and CO\textsubscript{2} concentrations are at their lowest points ever.
We are developing a communication plan in coordination with NNSA, EM and both field offices.

- Briefings to stakeholders, e.g. the New Mexico Environment Department, Northern NM Citizens Advisory Board, etc.
- Development of fact sheet(s) on and potential media interviews on:
  - Safe storage of RNS drums
  - Plans for venting drums to further improve safety
  - Wildfire risk mitigation activities
- Advance preparation for DNFSB hearing in March
- Key messages and talking points have been developed and include:
  - What We Have Done and What Is the Current Situation
  - What Have We Learned to Further Improve Safety
  - What Are We Doing Now