Savannah River Remediation
Human Performance Challenges & Initiatives

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A Complex Integrated High Hazard Scope

Legend:
ARP – Actinide Removal Process
DWPF – Defense Waste Processing Facility
MCU – Modular Caustic Side Solvent Extraction Unit
SWPF – Salt Waste Processing Facility

- Radionuclides to glass
- Chemicals to Saltstone
- Tanks empty and closed

Legacy Liquid Waste
49 tanks, 37M gal

Tanks Empty and Closed

Interim Salt Processing

Salt waste

Glass Waste Storage

>99% radionuclides to glass

Saltstone Disposal Facility

<1% radionuclides to saltstone

Nuclear Materials Disposition

Legends:
- ARP
- DWPF
- MCU
- SWPF

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Tank Closure Acceleration

- Safe Storage & Surveillance
- Bulk Waste Removal
- Mechanical Heel Removal
- Chemical Cleaning
- Cooling Coil Flushing
- Annulus Cleaning
- Final Sampling and Isolation
- Grout Tank

Human Performance Challenges
- New Technology
- Variable Tank Content & Chemistry
- Workforce Deployment
- Accelerated Schedule

From 12 in 8 to 22 in 8
A Time of Rapid Change

- Aggressive Contract Commitments
- New Technologies
- Modified Work Practices
- New Policies
- Multiple Site-Level Interfaces
- ARRA Scope
- Changing Requirements

New Business Systems
New Contract
New Organizational Structures

800 New Employees Permanent & Subcontractors

22 Waste Tank Closures in 8 Years!

HLW Tank Closure
HLW Tank Cleaning
HLW Sludge Bulk Waste Removal
HLW Sludge Batch Feed Prep
HLW Sludge Feed
DWPF Canisters
400 Canisters Per Year

3x Bulk Waste Removal
2x Sludge Prep
2x Sludge Feed
2x Salt Prep and Salt processing

Modified Work Practices

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# An Error Friendly Environment

**Error Precursors - How many were present for SRR?**

<table>
<thead>
<tr>
<th>Task Demands</th>
<th>Individual Capabilities</th>
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<tbody>
<tr>
<td>• Time pressure (in a hurry)</td>
<td>• Unfamiliarity w/ task / First time</td>
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<tr>
<td>• High Workload (memory requirements)</td>
<td>• Lack of knowledge (mental model)</td>
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<tr>
<td>• Simultaneous, multiple tasks</td>
<td>• New technique not used before</td>
</tr>
<tr>
<td>• Repetitive actions, monotonous</td>
<td>• Imprecise communication habits</td>
</tr>
<tr>
<td>• Irrecoverable acts</td>
<td>• Lack of proficiency / Inexperience</td>
</tr>
<tr>
<td>• Interpretation requirements</td>
<td>• Indistinct problem-solving skills</td>
</tr>
<tr>
<td>• Unclear goals, roles, &amp; responsibilities</td>
<td>• “Hazardous” attitude for critical task</td>
</tr>
<tr>
<td>• Lack of or unclear standards</td>
<td>• Illness / Fatigue</td>
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</table>

<table>
<thead>
<tr>
<th>Work Environment</th>
<th>Human Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Distractions / Interruptions</td>
<td>• Stress (limits attention)</td>
</tr>
<tr>
<td>• Changes / Departures from routine</td>
<td>• Habit patterns</td>
</tr>
<tr>
<td>• Confusing displays or controls</td>
<td>• Assumptions (inaccurate mental picture)</td>
</tr>
<tr>
<td>• Workarounds / OOS instruments</td>
<td>• Complacency / Overconfidence</td>
</tr>
<tr>
<td>• Hidden system response</td>
<td>• Mindset (“tuned” to see)</td>
</tr>
<tr>
<td>• Unexpected equipment conditions</td>
<td>• Inaccurate risk perception (Pollyanna)</td>
</tr>
<tr>
<td>• Lack of alternative indication</td>
<td>• Mental shortcuts (biases)</td>
</tr>
<tr>
<td>• Personality conflicts</td>
<td>• Limited short-term memory</td>
</tr>
</tbody>
</table>
• Implement Improved Defenses

• Focus on Error Reductions Tools

• Identify and Overcome Organizational Weakness
Improved Defenses

- Automatic Value Position Controls
- Electronic Waste Characterization System
- Management Control Plan
- Leading Indicators
- Management Field Observation (MFO)
- Bench-marking
Error Reduction Tools

- Electronic Material Balance
- Verifying and checking engineering documents (checklists)
- Checklist for Fire Hazard Analyses
- Environmental Review Checklist
Organizational Enhancements

• Control Room Consolidation
  – Consolidates 9 control rooms using state of the art distributed control systems (DCS)

• Executive Safety and Quality Board (ESQB)

• Corrective Action Review Boards (CARB’s)

• Edventures Training

• Earned Valued Management System (EVMS)

• Compass
The Results

9th VPP Star of Excellence Award
3rd VPP Legacy of Stars Award

Lowest ConOps ORPS rate in 10 years

Only one ORPS reportable radiological events

Construction workers without an injury requiring a day away from work - 23.2 million hours

More than Two Million Hours without a lost day of work due to injury

Lowest TRC rate in over 25 years

No Adverse Trends or Programmatic Issues

No Watch list Items or recurring issues

0 Reportable Spills
0 Notice of Violations
0 Notice of Violations

DOE-HQ Team validated SRR’s ISMS in July 2010

* = Actual as of 1/1/11
** = Expected by end of contract