technical services group

U. S. Department of Energy Environmental Restoration Lessons Learned

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US-Japan Fukushima Forum

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Why DOE Lessons? Experience from the World's Largest Nuclear Clean-Up Aligns with Fukushima Challenges

EM Experience	Fukushima Challenges
Tank Waste	Millions of Gallons Water
Nuclear Material	Fuel & Debris
Dispose Waste	Liquid, Debris, Fuel
D&D	Remove Reactor & Fuel
Remediate Soil Groundwater	Soils, Water, 4 Reactor Bldgs.
Restore or Recover for Use	Recover Area – Return People

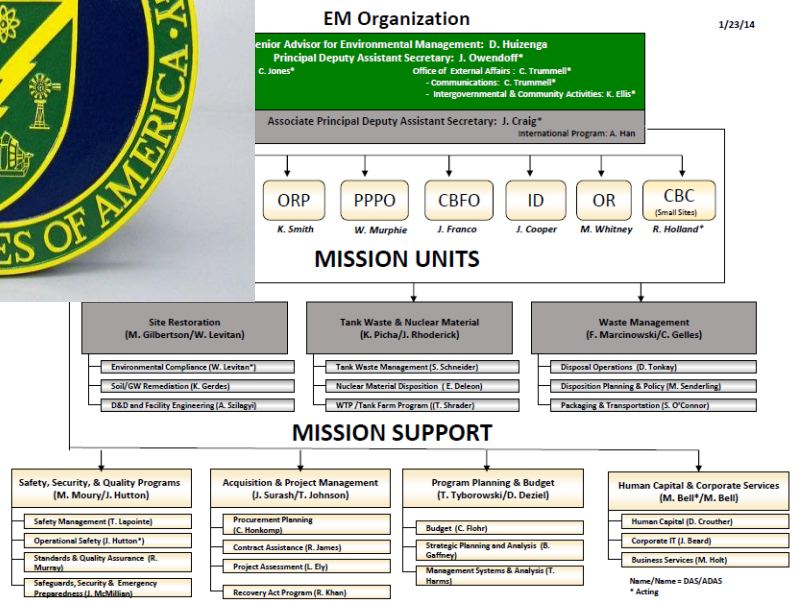
Lessons Learned Include Successes and Failures

My Observations on Lessons Learned from the DOE Clean Up

1. **Formed Office of Environmental Management**
2. **Adopted Accelerated Clean-up Culture**
3. **Established Incentivized Contracts with Clear Requirements**
4. **Established Safety & Compliance Performance Expectations**
5. **Applied Project Management Practices**
6. **Applied Proven Technologies**
7. **Aligned with Regulators**
8. **Built Stakeholder Relationships**
9. **Risk-Based Execution Strategy**
10. **Developed Integrated Waste Disposition Plans**
    1. Characterization
    2. Generator Services Introduction
    3. On-Site Disposal Cell Deployment

Best Lessons Learned Are from "Boots on the Ground"

1) Formed Office of Environmental Management



Benefits

- Focused on the closure objectives
- Managed closure risk
- Optimized life-cycle planning
- Shared complex-wide Lessons Learned
- Established complex-wide priorities
- Allowed inter-site cooperation and waste transfers

Environmental Management Office Formation Transitioned Performance Paradigm from Operating to Clean Up Priorities

2) Adopted Accelerated Clean-up Culture

FEED MATERIALS PRODUCTION CENTER
FMPC

Benefits

- Aligned work force with contract objectives
- Improved work force morale as they work toward new careers

Fernald
Closure Project

Environmental Management Office Formation Transitioned Focus from Operations to Clean Up

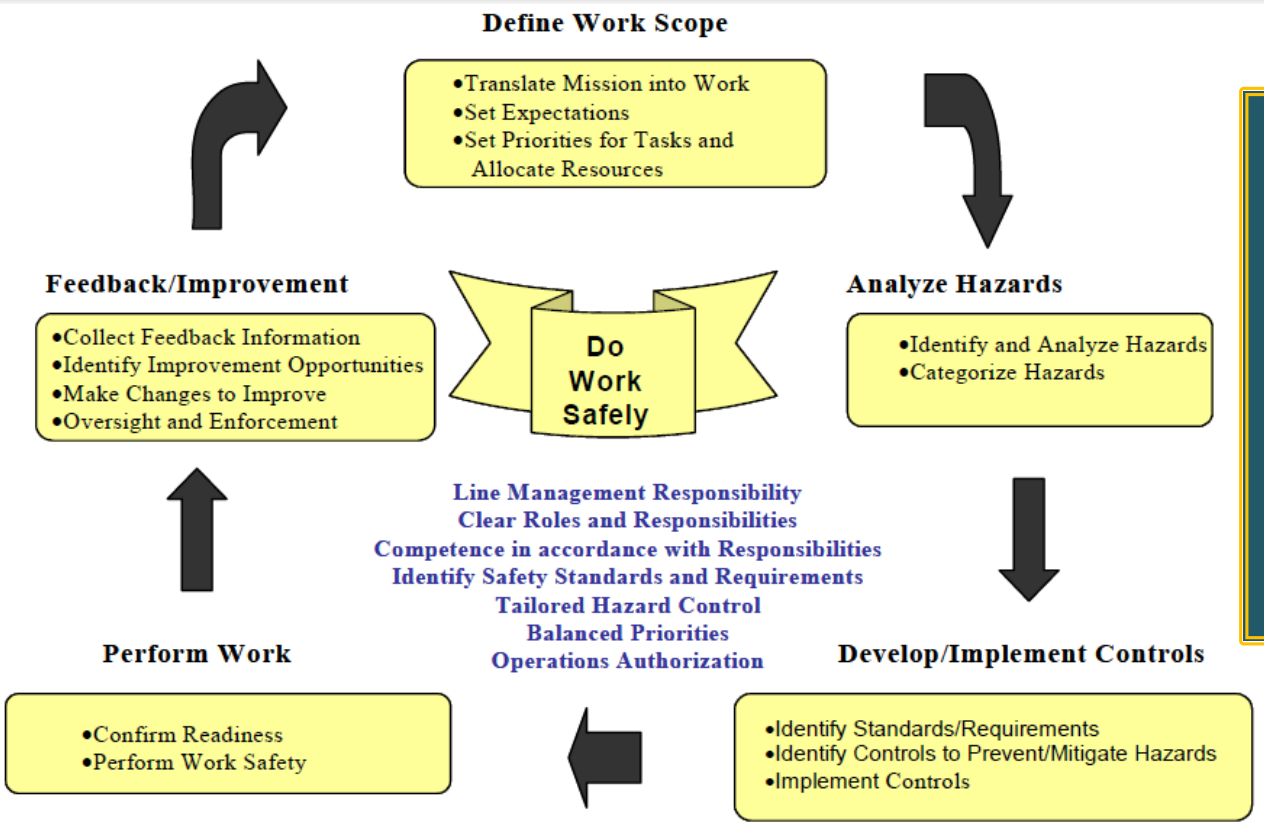
3) Established Incentivized Contracts with Clear Requirements

Benefits

- Common goals
- Pay for performance
- Celebrate achievement
- Minimize contract changes

What gets measured, gets performed

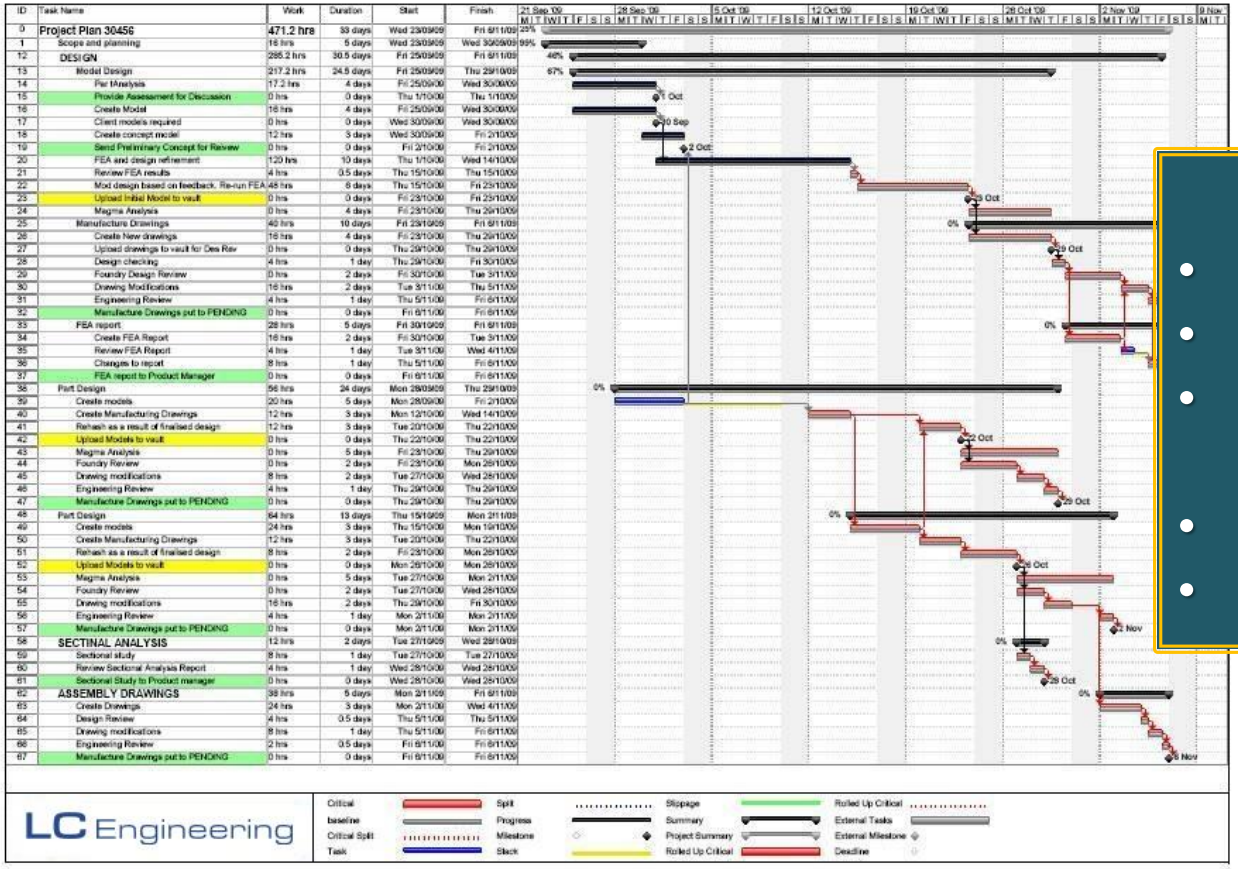
4) Established Safety & Compliance Performance Expectations



Benefits

- Safety as Priority One commits work force
- Reduced delays/downtime
- Hazard planning controls risk
- Reduced cost

Planning Safety into Project Execution Increases Worker Commitment and Reduces Clean-up Delays



Benefits

- Resource optimization
- Clear interfaces
- Schedule flexibility (float quantified)
- Progress measurement
- True cost tracking

Disciplined Approach to Meet Project Schedule Cost & Quality Expectations

Project Management Features

- Mission Need & Acquisition
- Critical Decision Process
- Project Charter
- Integrated Project Teams
- Project Execution Plan
- Project Management Plan
- Budget/Schedule Development
- Earned Value Management
- ISMS
- Quality Management Plan
- Risk Assessments
- Hazard Analysis – Job Planning
- Risk Management Plan
- Project Reviews
- Design & Readiness Reviews
- Communication Plan

Program management delivers projects within performance baseline and meets mission requirements.

Vitrification:
Complex, High Temperature, Narrow Process Window

Grout: Proven, Low Temperature, Robust Operation

Benefits

- Proven design & operation:
  - Not R&D
  - Few unknowns
- Streamlines implementation
- Simpler to operate
- Reduces cost
- Improves schedule
- Mitigates technical risk

Reducing Technical Uncertainty to Control Critical Path

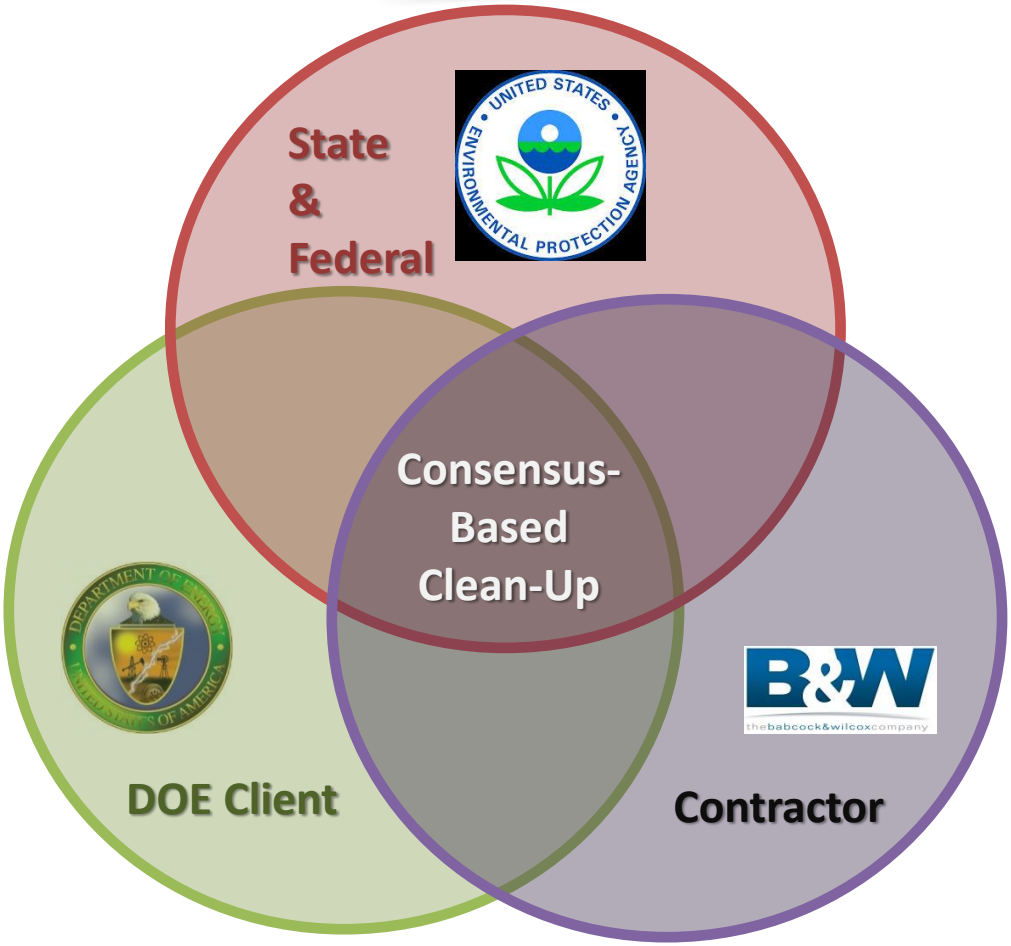
More Proven Technology Successes

- **Coatings: Reduce contamination**

Coating Approved as a Transportation Type A Package

- **Green-Is-Clean: Sort and Assay for free release to minimize waste**

7) Aligned with Regulators



Benefits

- Clear definition of goals
- Common understanding of requirements
- Accelerated schedule
- Defined reporting and documentation

Alignment with Regulators Provides Pathway for Clean-Up

Benefits

- Support with government
- Public acceptance
- Streamlined regulatory approvals
- Greater Confidence
- Accurate Goal Definition
- Mitigates Risks/Buy-In

Informed Stakeholders Enables Progress

9) Adopted Risk-Based Execution Strategy

High Risk	Self perform to manage and control risk
Medium Risk	Assess probability/ consequence to determine approach
Low Risk	Maximize fixed price subcontracting for cost savings

Benefits

- Contingency planning
- Cost savings
- Improved management and control

Manage Risk to Meet Performance Baseline

Tailor Contract Options to Risk Level

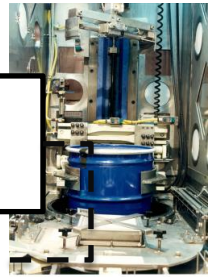
- Fixed Price – containers, equipment components
- Fixed Unit Price – analytical, transportation & disposal
- Cost Plus Fixed Fee – design, assignment of SME's
- Cost Plus Incentive Fee – self-perform high risk activity (start up and operations)
- Time & Materials – support services

10) Developed Integrated Waste Disposition Plans

Plan Decommissioning

Generate Waste

Characterize for Process & WAC



Process

Package & Store

Manifest & Transport

Dispose

Benefits

- Pollution prevention
- Risk mitigation
- Cost and schedule savings
- No orphan waste
- Optimized logistics
- Streamline material handling

Waste Disposition Eliminates Orphan Waste

10) Developed Integrated Waste Disposition Plans
A) Characterization

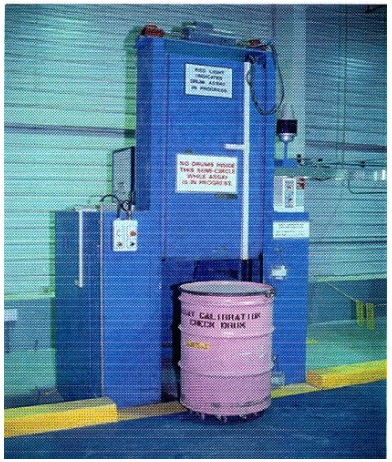
Characterize Samples Based on Data Quality Objectives

Quantity	RTRAK	RSS1	RSS2
		Uranium (ppm)	
4sec MDC	337	345	306
8sec MDC	234	239	207
3xFRL*	246		
4sec MDC	18.4		
8sec MDC	9.8		
3xFRL	5.1		
4sec MDC	1.6		
8sec MDC	1.1		
3xFRL	4.5		

*A 3xFRL activity is

Benefits

- Cost effective
- Accelerated remediation
- Effective tracking
- Fewer shipping delays



Data Quality Objectives Process Removes Characterization Bottle Neck

10) Developed Integrated Waste Disposition Plans
B) Generator Services

Generator Services

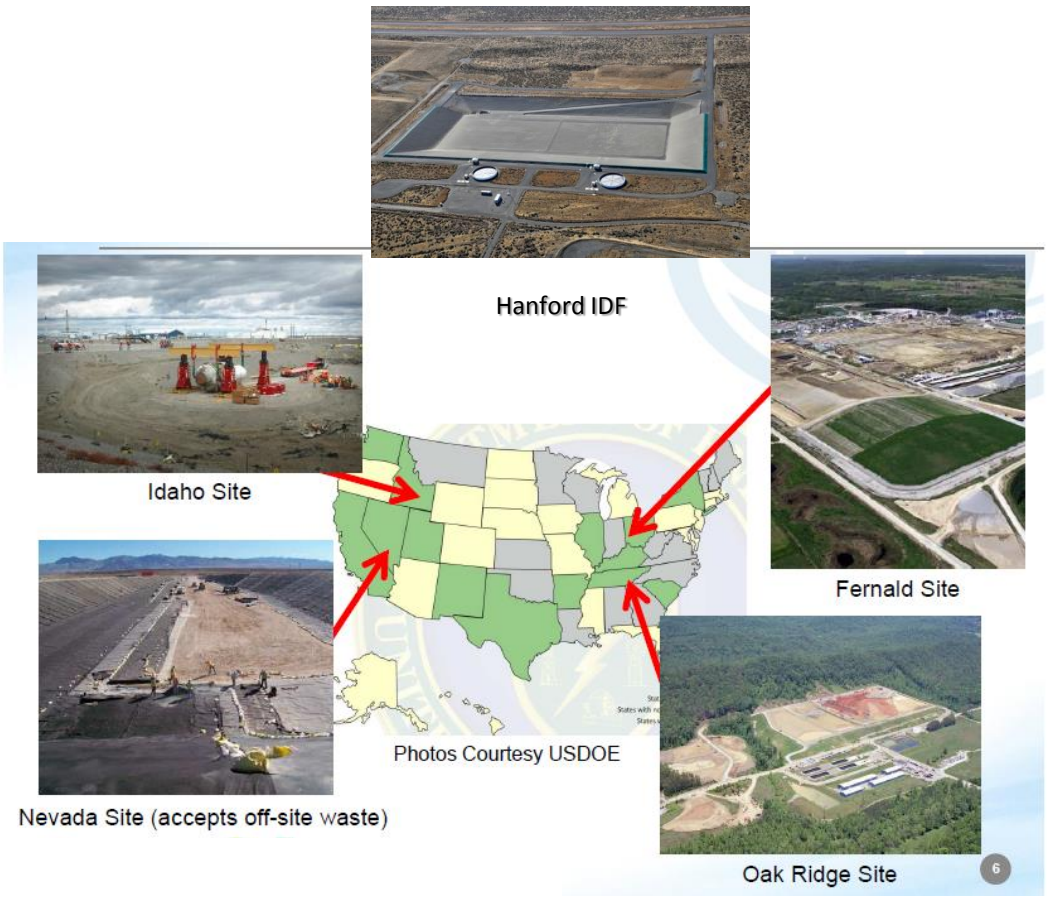
- Assignment of WM Expertise at Point of Generation
- Standardize WM Procedures
- Integrate WM across Multiple Projects
- Provide Independent Compliance Oversight

Benefits

- Reduce cost
- Handle once
- Mitigate release risk
- Avoid orphan waste
- Minimize errors
- Centralize experience
- Cross-site help

Generator Services Minimize Cost, Handling, Exposure, Volume

10) Developed Integrated Waste Disposition Plans C) On-Site Disposal Cell Deployment



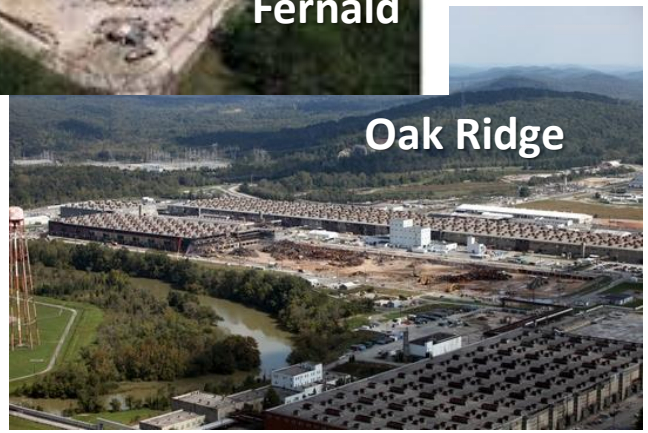
Benefits

- Simplifies transportation
- Minimizes over-the-road shipments
- Reduces cost
- Can simplify transport regulations for moving material
- May provide WAC relief

On-Site Disposal Accelerates Clean-Up for Large-Volume Projects

DOE Success Stories

- **Rocky Flats**
  - Saved 60 years Schedule
  - Saved $30 B
- **Fernald**
  - Saved 12 years Schedule
  - $7.8 B
- **Oak Ridge Reservation**
  - Projected 30% Cost Savings
  - Projected $1.3 B Savings over Contract



Case Study #1: Rocky Flats

- Shipped >21 metric tons SNM
- Shipped 550,000 m^3 LLW/MLLW
- Shipped 15,000 m^3 TRU
- 5,000 acre (2,025 hectare) site
- 385 acre (156 hectare) industrial area with 800 structures demolished

Case Study #2: Fernald

- Shipped 1.2 million tons (1.09 x 10^6 metric tons) of rad waste, including 979,000 tons (890,000 metric tons) to Energy Solutions in Utah in 9,100 railcars
- Shipped 6.6 million ft^3 (187,000 m^3) of LLW to Nevada National Security Site
- Shipped 234,059 gal (886,000 liters) liquid mixed waste for incineration or treatment
- 1,050 acre (425 hectare) site
- 323 structures demolished

Case Study #3: Oak Ridge

- 2,200 acre (890 hectare) site
- Part of 35,000 acre (14,000 hectare) Oak Ridge Reservation
- Remediated and demolished structures totaling 6.4 million ft^2 (600,000 m^2=6 hectare)
- Dedicated on-site landfill capacity 1.7 million yd^3 (1.3 million m^3)