

Use of Digital Tools in Decommissioning

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Overview

- Areas where digital tools may be used
- Lessons learned
- Relevant EPRI projects

Areas for Application of Digital Tools

- Cost estimation
- Schedule development
- Resource planning
- Decommissioning scenario evaluation
- Waste estimation, tracking and logistics
- Dose estimation, tracking and ALARA planning
- Planning and execution of major component dismantlement
- Material movement logistics
- Radiological data management
- Worker training

Digital tools are already being used to some degree in all of these areas

Example Lessons Learned

Project Management

Lessons Learned:

- A comprehensive and fully integrated decommissioning schedule is critical to successful execution of the decommissioning plan
- Use of standard project management tools used in the construction industry is effective for decommissioning projects: decommissioning is very different from operations and must be managed accordingly
- Project management must be experienced in decommissioning or similar projects

Project Controls System Integration

HD Estimate

Basis of Estimate

Cost and Schedule Integration

 **PRIMAVERA**
Master Integrated Schedule



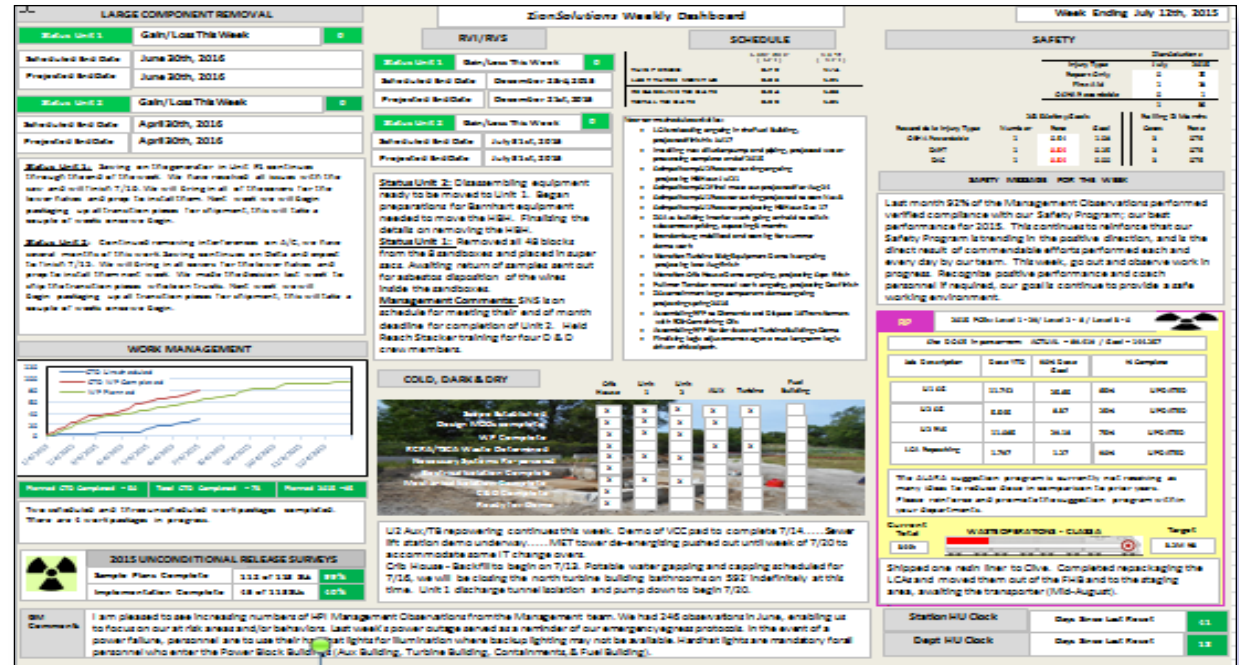
 **ORACLE**
Financial Accounting

Control Account and Description	BUDGET			COMMITMENTS			ACTUAL	PERCENT	Variance	Status
	Original Budget	Approved Budget	Current Budget	Original Commit	Approved Commit	Current Commit	Period To Date	EAC		
800100000101000101 ProjectDefinitionControl	17,500	0	17,500	0	0	0	17,500	17,500	0	100
800100000101000102 ProjectDefinitionAdministrative Assistance	41,250	0	41,250	0	0	0	41,250	41,250	0	100
800100000101000103 ProjectDefinitionCADD Support	150,000	0	150,000	0	0	0	150,000	150,000	0	100
800100000101000104 ProjectDefinitionMechanical/Engineering Support	207,100	0	207,100	0	0	0	207,100	207,100	0	100
800100000101000105 ProjectDefinitionEstimating	113,988	0	113,988	0	0	0	113,988	113,988	0	100
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Dashboard reporting

Categories

- Safety Message
- Safety Statistics
- Rad Pro
- Schedule (SPI)
- Cost (CPI)
- Earned Value
- Other KPIs
- Waste Generation Status



The Project Controls Dashboard contains real time status

Missed Opportunity Planned Salvage of Turbine



Plan to salvage components for sale to other utility.

Failure: Responsible Department not identified and rotor was not placed on rotation jacks following shutdown. Resulted in loss of component sale due to shaft flex.

Change Management Approach:

Assign Program Responsibility and key members tasked with coordination of Work Groups (Operations, Maintenance)

Missed Opportunity Sequencing of Major Activities

Trojan Decommissioning found it was critical to coordinate major activities. Initial planning and work was defined by individual groups without coordination with other projects.

Failure: Projects such as Removal of Major Components were allowed to proceed independently.

Example – Independent Removal of Insulation, Major Components and Ancillary Equipment all treated as stand alone projects.

Result: Radiation Protection Setup, Staging and Barriers were put up and removed THREE times. In some cases decontamination of rooms was performed following each of these activities.

Change Management Approach:

Assign Program responsibility and key members tasked with coordination of Work Groups (Engineering, RP, Maintenance and Operation)



Missed Opportunity

Discontinued Circulating Water Too Early

Termination of Circulation Water Pumps

Failure: Elimination of major circulation flow in the discharge channel was not fully evaluated. Radioactive liquid was continued to be directed to the channel resulted in contamination of surfaces and sediment.

Result: Major work was required in the characterization and remediation of channel. Major expenditure and schedule impact.

Change Management Approach:

Assign Program Responsibility and key members tasked with coordination of Work Groups (Engineering and Operations)



Missed Opportunity

Ventilation off-gas filtration and monitoring

Plant Systems Depressurized and Fuel placed in Fuel Pool.
Volatile Radionuclides no longer present fluids (I-131).
Building Ventilation Requirement limited.

Failure: Plant Groups not notified:

- Continued change out of ventilation
Carbon filters
- Ventilation monitoring continued
- Reports generated

Result: Continued for 2 years – unwarranted
labor and commodities expended



Change Management Approach:

Assign Program Responsibility and key members tasked
with coordination of Work Groups (Operation, Maintenance,
Chemistry and Environmental)

EPRI Projects

Completed Projects (1/2)

- Decommissioning HUB website
 - Provides overview of major decommissioning topics, with links to EPRI and non-EPRI reference material
 - 2019 update will provide experience summaries and capability for user input
 - EPRI product 3002010606, 2017
- Automatic Estimation of Radiological Inventory (AERI)
 - Originally developed by Ibedrola for use in Spain
 - EPRI project expanded for global applicability
 - Uses plant data to generate activity estimate, waste packaging requirements, etc.
 - May be used for scenario planning
 - EPRI product 3002005799, 2016
- Technical specification for waste tracking software
 - Tracking and management of waste from generation, treatment, conditioning and packaging for final disposition
 - EPRI report 3002008169, 2016

Completed Projects ^(1/2)

- Remedial Operations Assessment Model (ROAM)
 - Software for evaluation of environmental remediation options for radiological and non-radiological contamination
 - EPRI product 3002000242, 2013
- Waste Logic Solid and Decommissioning Multi-Site Manager (SDMSM)
 - Software for evaluation of waste management scenarios
 - EPRI product 1013337, 2006
- Decommissioning Economic Risk Advisor (DERAD)
 - Software for evaluation of cost benefit of decommissioning approaches
 - EPRI product TR-106788, 1996

Current Projects

- Automation of site characterization
 - Robot with autonomous controls to perform characterization of buildings and land areas
 - Target 2019-2020 completion
- Automation of reactor internals segmentation
 - Semi-autonomous, remotely operated equipment for segmentation, material manipulation, waste packaging, environmental controls
 - Target 2020-2021 completion
- Evaluation of the use of a Building Information Model approach to decommissioning planning
 - 2019 start/2020 completion
 - Collaborative with ENRESA and/or EC-funded effort
- Software for management of radiological characterization data
 - Will include the capability for data analysis using MARSSIM protocol
 - 2019 start/2020 completion



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