A Tool To Support Improved Outage Risk Management

LWRS

Light Water Reactor Sustainability

PSAM 14

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Light Water Reactor Sustainability R&D Program

Outage Risk Management Improvement (ORMI) Project Scope

- Improve real-time plant risk management and configuration control during outages.

- Develop a means for combining actual plant status information with intended component manipulations embedded in procedures

- Monitor technical specifications, probabilistic risk assessment information, and ongoing risk mitigation plans to identify possible interactions of concern
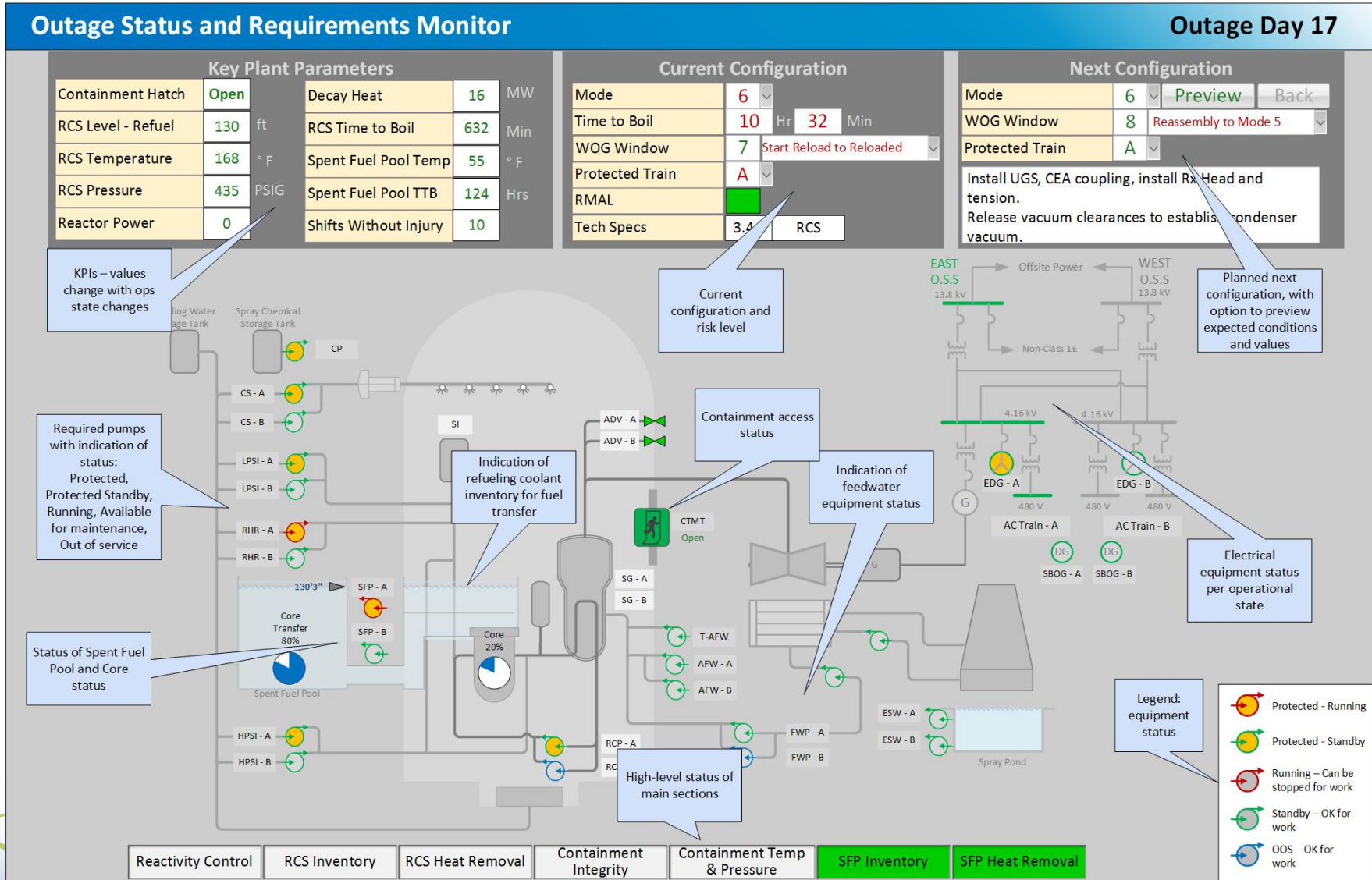
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Licensee Event Report Review

- Reviewed LERs during shutdown between 2010 and 2015 (421 LERs)
- Of these, 248 outage execution related, of those 113 identified as preventable

High Level Cause	Number of LERs noted
Configuration Control	26
Inadequate Procedures/ Procedure Use	66
Mode Change Issues	13
Poor Work Practices	11
Component Verification or Manipulation	6
Clearance Order Issues	5

Outage Status and System Requirements

OSSRM Software Application

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Example data structure

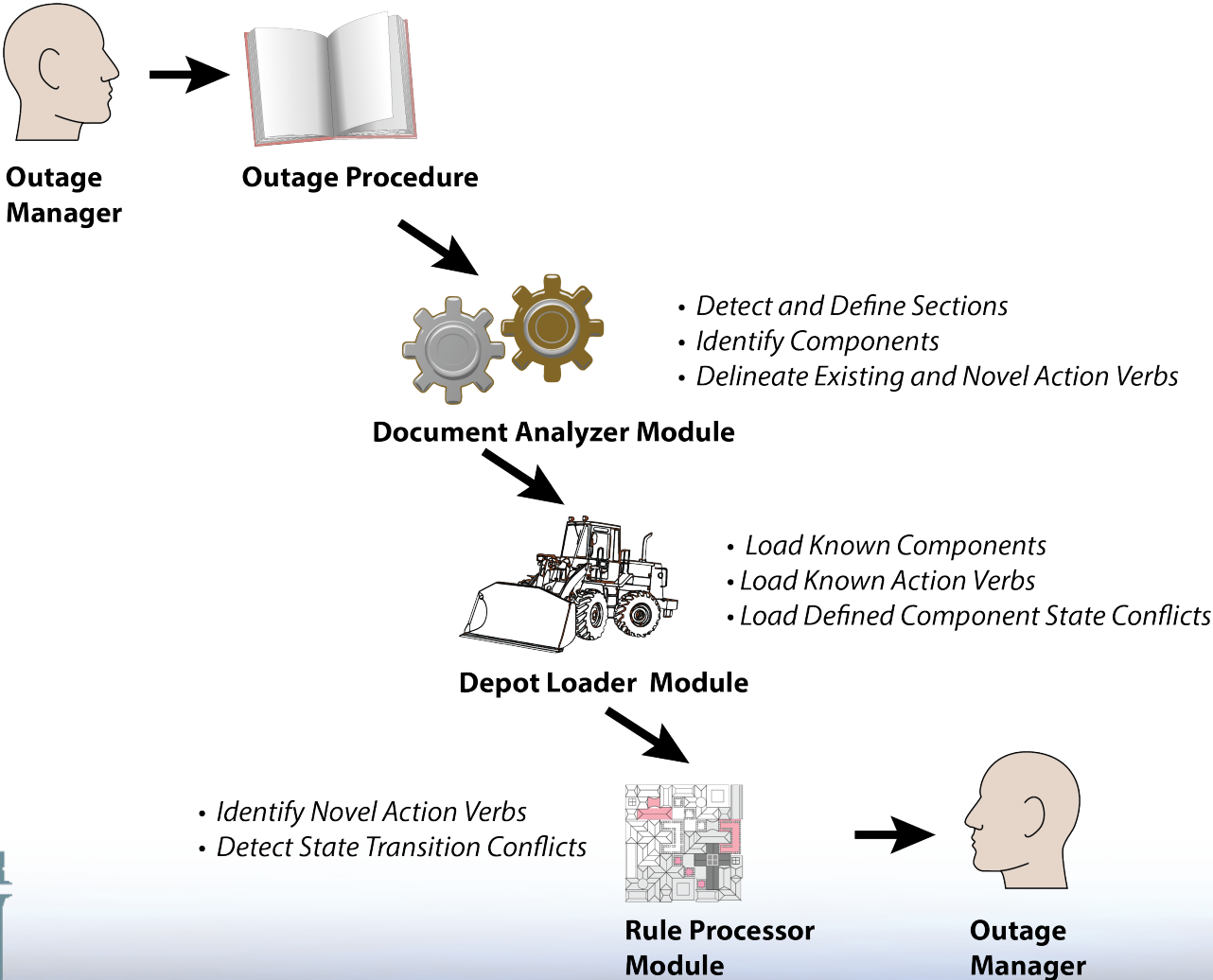| ID	EQID	Noun Name	System	Component Type	Current Actual Position	Current Required Position	Current Required Status	Current Position Requirement reference	Next Operating State Required Position	Next Operating State Required Status	Procedure Requested Position
AFA-P01	AFAP01	Essential Turbine Driven AFW Pump	AF A	Pump	Standby	Any	OK for Work	N/A	Any	Protected	Any
AFB-P01	AFBP01	Essential Motor Driven AFW Pump	AF B	Pump	Standby	Any	OK for Work	N/A	Any	Protected	Any
AFN-P01	AFNP01	Non-Essential Motor Driven AFW Pump	AF N	Pump	Standby	Any	OK for Work	N/A	Any	Protected	Any
CHA-P01	CHAP01	Charging Pump A	CH A	Pump	Running	Any	Protected	Shutdown Safety Plan	Running	OK for Work	Any
CHB-P01	CHBP01	Charging Pump B	CH B	Pump	Standby	Any	OK for Work	N/A	Any	Protected	Any

Natural Language Processing

- Natural Language Processing will be used to evaluate upcoming procedures and work orders for manipulations of monitored components.

- System will look for combinations of identified Equipment IDs and action verbs to create a new component position.

- For example: Procedure step to close SIA-HV683 will result in LPSI pump A being unavailable.

Extracting Component Information from Procedures

Outage Manager

Outage Procedure

Document Analyzer Module
- *Detect and Define Sections*
- *Identify Components*
- *Delineate Existing and Novel Action Verbs*

Depot Loader Module
- *Load Known Components*
- *Load Known Action Verbs*
- *Load Defined Component State Conflicts*

Rule Processor Module
- *Identify Novel Action Verbs*
- *Detect State Transition Conflicts*

Outage Manager

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Conclusions

- Working on a system to support the evaluation of work against various requirements.

- System will consolidate data from multiple sources related to important shutdown safety systems.

- System will evaluate upcoming plant operating states against current requirements and identify conflicts.