

Computer-Based Procedures for Workers in the Field



Light Water Reactor Sustainability R&D Program

Johanna Oxstrand

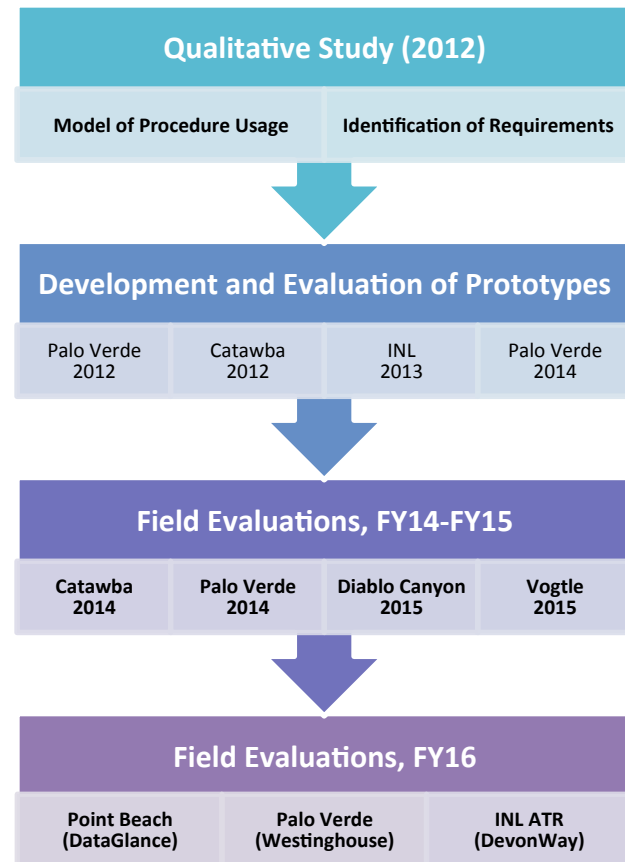
Advanced Sensors and Instrumentation
2015 NE I&C Review
October 29th, 2015



Computer-Based Procedures (CBPs)

Research Objectives

- Define design requirements
- Streamline and distill information
- Use dynamic presentation to:
 - Increase efficiency
 - Improve the ease of use
 - Reduce opportunities for errors
 - Incorporate human performance tools
- We do **NOT** demonstrate how to convert a procedure to a PDF and display it digitally.



CBP – FY15 Activities

- Field Tests
 - Diablo Canyon
 - Vogtle 1 and 2
- Evaluation of Layout
- Human Factors
Evaluation of Graphical
User Interface



CBP - FY15 Results

Appreciated Functionality

- Automatic placekeeping
- Digital Correct Component Verification
- Photos and drawings
- Notifications
- Timers

6. INSTRUCTIONS

6.1 Swapping an ASW Pump and CCW Heat Exchanger Train

NOTE In steps with two columns, only one column is performed. Use the same column throughout the section. Use the left-hand column to swap from Train A to Train B, OR the right-hand column to swap from Train B to Train A.

6.1.1 Before continuing, ensure that the system is in one of the following configurations:

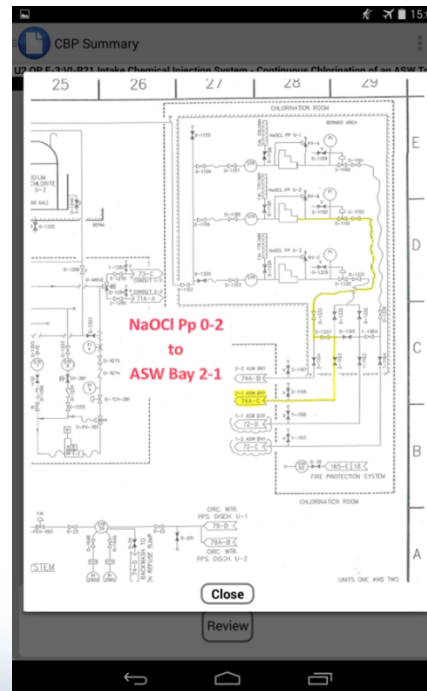
ASW Pump 2-1 running and CCW HX 2-1 in service	ASW Pump 2-2 running and CCW HX 2-2 in service
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6.1.2 IF in service, THEN secure continuous chlorination to the in-service ASW suction bay PER OP E-3-VI, "Intake Chemical Injection System - Continuous Chlorination of an ASW Train":

ASW Bay 2-1	ASW Bay 2-2
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6.1.3 Prior to continuing, direct the Aux Building Watch to ensure the following:

- Ensure that no liquid radwaste discharge is in progress.
- IF a liquid radwaste discharge permit was authorized during the shift, THEN ensure that the discharge has been completed.



CBP Procedure

U2 OP E-3-VI-R12 Auxiliary Saltwater System - Swapping Pumps or HXs During Single CCW HX Operation

Swapping an ASW Pump and CCW Heat Exchanger Train

6.1.1 In what configuration is the system currently in?

- ASW2-1 CCWHX2-1: ASW Pump 2-1 Running and CCW HX 2-1 in service.
- ASW2-2 CCWHX2-2: ASW Pump 2-2 Running and CCW HX 2-2 in service.

ASW2-1 CCWHX2-1

6.1.2 Contact Intake Watch to determine if continuous chlorination to ASW Bay 2-1 in service.

Is continuous chlorination to ASW Bay 2-1 in service?

Yes No

6.1.2* Direct Intake Watch to secure continuous chlorination to ASW Bay 2-1 PER OP E-3-VI, "Intake Chemical Injection System - Continuous Chlorination of an ASW Train".

6.1.3 Direct the Aux Building Watch to ensure the following:

- Ensure that no liquid radwaste is in progress.
- Was a liquid radwaste discharge permit authorized during the shift?

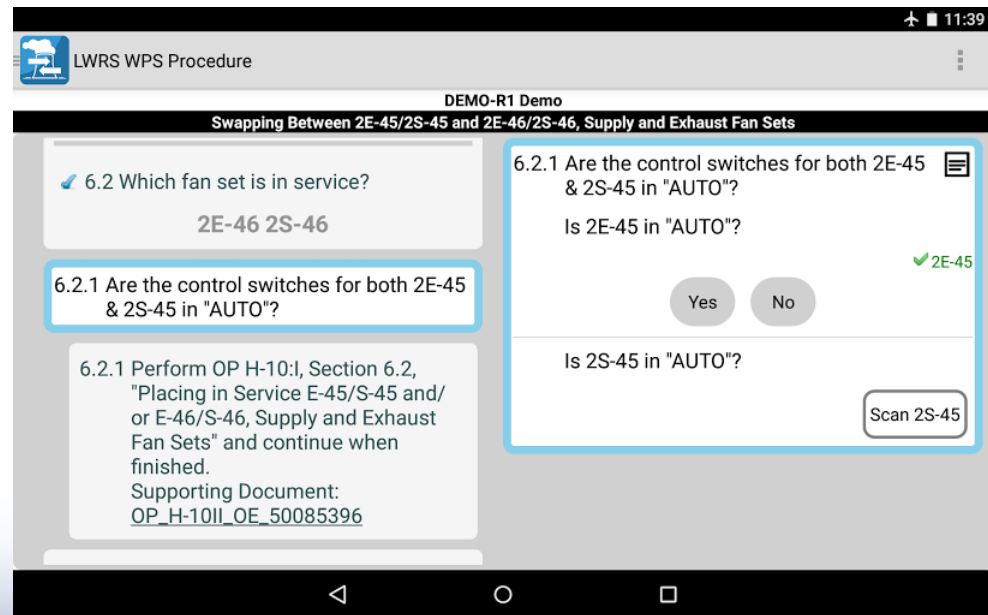
6.1.3 b.* Ensure that the discharge has been completed.

6.1.4 Advise U1 Control Room to place U1 standby ASW pump in "MANUAL", to prevent a possible auto-start.



CBP – FY15 Results

- Landscape mode
- Add a Help option to the navigation menu
- Improve revision of steps



CBP - Impacts

- Commercial nuclear power industry ready to adopt CBP concepts
- Industry asked INL to serve neutral stakeholder and organize an industry/vendor workshop to define requirements for commercial systems
- Demonstration and use of CBPs for operational evolutions
- Multi-stakeholder engagements: Standards organizations, vendors, and nuclear utilities



CBP – FY16 Activities

- Field tests
 - FPL Point Beach & DataGlance
 - APS Palo Verde & Westinghouse
 - INL ATR & DevonWay
- Requirements for Electronic Work Packages and Procedure Execution
 - Utility Workshop
 - December 7-9, 2015
 - Requirements document



CBP – FY15 Demos and Presentations

Demonstrations

- Rolls Royce (Executive Vice President and Vice President – Business Services), October 2014
- AREVA (Cyber Security Engineering Supervisor), October 2014
- **Chief Nuclear Operator at Diablo Canyon, April 2015**
- The Nuclear Information Technology Strategic Leadership, June 2015
- DevonWay, June 2015
- LWRS Utility Working Group Meeting, August 2015
- Diablo Canyon Power Plant (control room modernization reps), August 2015

Presentations

- ANS Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies, February 2015
- Procedure Professionals Association 27th Annual Symposium, June 2015
- Human Performance, Root Cause, and Trending, July 2015



CBP – FY15 Publications

- Milestone Reports
 - Computer-Based Procedures for Field Workers—Result and Insights from Three Usability and Interface Design Evaluations
 - INL/EXT-15-36658, Rev. 0
 - Light Water Reactor Sustainability Program Automated Work Package Prototype: Initial Design, Development, and Evaluation.
 - INL/EXT-15-35825, Rev. 0.
- Conference Papers
 - The Next Step in Deployment of Computer Based Procedures For Field Workers: Insights And Results From Field Evaluations at Nuclear Power Plants.
 - Computer-Based Procedures For Nuclear Power Plant Field Workers: Design Implications Based On Three Evaluation Studies.
 - Standardized Procedure Content And Data Structure Based on Human Factors Requirements For Computer-Based Procedures.

