



FNP NFPA 805 LAR Submittal

Overview

March 19-21, 2013

Circuit Analysis

Summary

- Circuit Analysis Process and Controls
- Analyst Qualifications
- Governing Analysis Criteria
- NSCA vs. PRA
- Analysis Methodology
- Circuit Analysis Database
- Associated Circuits

Process and Controls

- Circuit Analysis Process
 - Performed IAW approved procedure
 - Strict and formal analysis conventions
 - Emphasis on consistency and standardization
 - Integrated PRA and NSCA requirements
- Controls
 - Rigidly defined Function States
 - Independent verification for each analysis
 - Detailed documentation in database (FDM/ARCPPlus)

Analyst Qualifications

- All analysts formally qualified to SNC & Contractor QUAL CARD for independent work
- Internalized industry lessons learned on training, qualifications, and oversight
- Procedure and database established to force consistency
- Maintained awareness of dual use – PRA and NSCA

Governing Criteria

- NEI 00-01, Rev.1
 - Initial Work to Rev.1
 - Gap analysis performed to Rev. 2 (per Generic RAI 10 and RG 1.205)
- NEI 00-01, Rev. 2
 - Later work
 - Integrated emerging PIRT issues
 - No credit taken for off-scheme exclusions
- NUREG/CR-6850
 - Included Open circuits

Note: Integrated requirements for conservative, but universal criteria between PRA and NSCA

NSCA vs. PRA

- Implementing Concepts
 - 95% of circuit analysis criteria for PRA and NSCA are the same
 - Establish single dataset for criteria to assure dual use and better interface between NSCA and PRA
 - Provide procedure and database flexibility to accommodate the 5% difference
 - Long-term configuration control extremely difficult if redundant data sets are maintained
 - Differences primarily handled through:
 - Use of Function States
 - Interlock identification and documentation

Analysis Methodology

- All circuit analysis drive by FUNCTION STATES
- Function States
 - Component + Initial State + Desired State
 - Permits maximum flexibility to accommodate PRA and NSCA differences (primarily auto signals)
 - Minimize false failures up front
 - Efficient and less error prone
 - Consistent with NUREG/CR-6850 methods for Tasks 3 & 9

Analysis Methodology, cont...

- Work package development to facilitate process
- Single, controlled database (FDM)
- Process and techniques based on NRC/EPRI training modules
- Major Steps

Prerequisites satisfied

- Function state established
- Plant specific rules and conventions
- General classification
- Resolve questions

Analysis Methodology, cont...

- Major Steps

Work Package Development

- Drawings
- Supplemental information

Cable Selection

- All scheme cables dispositioned
- Fault codes applied to all cables
- Basis documented for excluded cables
- Selection of required cables with “hot probe” method
- Cables generally excluded based only on design features at this stage (NUREG/CR-6850 concept)

Analysis Methodology, cont...

- Major Steps

- Power Supply Identification

- All Power Supplies identified
 - Required and not-required determined based on Function State requirements
 - Sensitive to alternate PS lineups and how they are credited

- Dependencies & Interlocks

- All circuit interlocks formally dispositioned
 - Equipment dependencies established or off-scheme cables directly incorporated
 - Differentiate auto functions so NSCA and PRA can apply as credited by Basic Event

Analysis Methodology, cont...

- Major Steps
 - Documentation
 - Controlled database, with individual analysis originate and check sign-offs
 - Reference drawing
 - Final calculation for circuit analysis and PRA Notebook

Circuit Analysis Database

Select System: Select Function Code:

Equipment Detail:

Function Code	N2C23SY0020ET-CLOSED:OPEN	Analyzed By	ZOHAB SAJJAD																				
Equipment ID	N2C23SY0020ET	Reviewed By	ALLEN G THOMAS																				
Primary Component	MAIN TURBINE EMERGENCY TRIP SOLENOID VALVE 20ET	Revision	7/20/2010																				
System	C23		7/26/2010																				
Component Type	SV	References:																					
Normal Position	CLOSED	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Drawings</th> <th>Description</th> <th>R</th> <th>Doc Type</th> </tr> </thead> <tbody> <tr> <td>D200217</td> <td>MAIN TURBINE EH FLUID SYSTEM</td> <td>20</td> <td>P & ID</td> </tr> <tr> <td>D202722</td> <td>TURB. AUX. AUTO STOP TRIPS & EMERG TRIP</td> <td>17</td> <td>Elementary Diag</td> </tr> <tr> <td>D202722</td> <td>TURB. AUX. AUTO STOP TRIPS & EMERG TRIP</td> <td>1</td> <td>Elementary Dia</td> </tr> <tr> <td>D204742</td> <td>125V DC DIST. PNLS</td> <td>18</td> <td>Wiring Diagram</td> </tr> </tbody> </table>		Drawings	Description	R	Doc Type	D200217	MAIN TURBINE EH FLUID SYSTEM	20	P & ID	D202722	TURB. AUX. AUTO STOP TRIPS & EMERG TRIP	17	Elementary Diag	D202722	TURB. AUX. AUTO STOP TRIPS & EMERG TRIP	1	Elementary Dia	D204742	125V DC DIST. PNLS	18	Wiring Diagram
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Comments:

- CIRCUIT ANALYZED FOR LOC-FTO.
- This is an active function
- Associated Cables have been analyzed in this package for Steam Generators 1A, 1B, AND 1C Level Transmitters-LTO474, LTO475, LTO476, LTO484, LTO485, LTO486, LTO494, LTO495, LTO496 for the functional state AVAILABLE-AVAILABLE.
- Power supply added to support interlock k621.
- Process protection cabinet 1 powers LTO474, LTO484, and LTO494. Cabinet 2 powers LTO475, LTO485, and LTO495. Cabinet three powers the remaining three elements. Power supplies added to support k621.

Power Supplies:

Power Supply ID	Description	Ckt Bkr #	Required
Q1R21L0001A	120V VITAL AC INSTRUMENTATION PANEL 1A	Q1R21L0001ABK	<input checked="" type="checkbox"/>
Q1R21L0001B	120V VITAL AC INSTRUMENTATION PANEL 1B	Q1R21L0001BBK	<input checked="" type="checkbox"/>
Q1R21L0001C	120V VITAL AC INSTRUMENTATION PANEL 1C	Q1R21L0001CBK	<input checked="" type="checkbox"/>
Q2R41L0001D	125V DC DISTRIBUTION PANEL 2D	Q1R41L0001DBK	<input checked="" type="checkbox"/>

Cables:

Cable ID	Function	Comments	Fault Consequence	Required
2UYT0001E	C		LOC-FTO	<input checked="" type="checkbox"/>
2UYTBA02E	C		LOC-FTO	<input checked="" type="checkbox"/>
2UYTBB01B	C		NR-FAULT CAN NOT CAUSE VALVE TO FAIL TO OPEN	<input checked="" type="checkbox"/>
2UYTBB02B	C		NR-FAULT CAN NOT CAUSE VALVE TO FAIL TO OPEN	<input checked="" type="checkbox"/>
2VBL1D19A	P		NR-FAULT CAN NOT CAUSE VALVE TO FAIL TO OPEN	<input checked="" type="checkbox"/>

MS Access Ver. 3.2

Circuit Analysis
Slide 12 of 14

Associated Circuits

- Electrical Coordination
 - Consolidated calculation
 - Addresses NSCA & PRA
- Common Enclosure
 - Addresses secondary fire concerns
 - Addresses loss of DC control power to Switchgear
- CPT Open Circuits
 - Followed PIRT recommendations
- MHIF Analysis
 - Followed NEI 00-01, Appendix B method

Questions ?

Circuit Analysis
Slide 14 of 14