



**U.S.NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

# **AP1000 Initial Test Program**

## **Digital I&C Testing and Related Inspection Activities**

**Thomas R Fredette, PE**

**NRO/DCIP/CIPB**

**[thomas.fredette@nrc.gov](mailto:thomas.fredette@nrc.gov)**

# Discussion Topics

- **AP1000 I&C Test Strategy**
- **Staff – Licensee Interactions**
- **Staff Internal Activities**
- **IP 70702 Revision**
- **IP 70702 Tabletop**
- **Inspection Path Forward**

# Test Strategy Overview

- **Rigorous, overlapping testing scheme to maintain integrity between I&C system design to factory validation/testing and on-site (preoperational) testing**
- **UFSAR Chapter 14 preoperational test commitments satisfied by combination of factory testing, component testing and preoperational testing (with overlap between each)**
- **Strategy dependent on configuration control of system hardware/software**
- **Key feature- using factory testing to satisfy later preoperational testing requirements (e.g. prerequisites and acceptance criteria)**

# Interactions

- **Since early 2014, various public meetings, inspection planning meetings, etc. to discuss the test strategy (among staff, licensee(s) and WEC)**
- **Licensee(s) wanted assurance of staff understanding of the test strategy in recent public meetings (August and October 2016) and stressed that the strategy still complied with the licensing basis**
- **Discussions in the public meetings centered on the concept without much detail**

# Staff Activities

- **Internally, Staff reached a “general” consensus that the test strategy was “acceptable”**
- **Staff recognized that enhanced inspection guidance was needed to address preoperational testing of systems controlled by digital platforms (testing that would implement elements of I&C test strategy)**
- **Inspection guidance promulgated as new “Appendix A” to IP 70702 “Inspection of Preoperational Test Performance”**

# **New Inspection Guidance**

- **IP 70702 (Appendix A)**
- **Procedure, Test and Test Results attributes**
- **Addresses “sufficient” vice exhaustive testing in an integrated operational environment**
- **Adequate testing of inputs/outputs from digital platform (e.g. Protection & Safety Monitoring or Plant Control System (PMS or PLS))**
- **Verification of overlap (FAT to as-built configuration)**
- **Functional testing of priority logic, trips, alarms, permissives, interlocks, bypasses, etc.**

# IP 70702 Tabletop

- **Information sharing meeting at VEGP (August 2017), including walk-through of the revised IP 70702 with proposed feedwater system preoperational test procedure**
- **Staff gained insights into details of factory software testing and component testing as elements of the test strategy**
- **Licensee (SNC) gained insights into typical inspection focused on preoperational testing attributes**
- ***Open collaborative activity***

# **Inspection Activities**

- **Inspect PMS and PLS factory testing where results will be used to satisfy preoperational test requirements (PLS inspection ~Fall 2017)**
- **Plan for inspection of selected systems preoperational testing**
- **Inspection of selected component tests will be accomplished in conjunction with associated preoperational testing**
- **Coordination and information/documentation protocols between Staff and licensee (on-going)**



# Discussion / Questions?