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**E. I. Hatch Nuclear Plant
Degraded Grid Voltage
License Amendment Request**

HNP Degraded Grid Voltage LAR Overview

Definitions

DVR - Degraded Voltage Relay – senses voltage on 4 kV Emergency Bus
– provides contacts for automatic action

LAR – License Amendment Request

LOCA – Loss of Coolant Accident – requires group starting of Class 1E equipment

MEV – Minimum Expected Voltage on 4 kV bus concurrent with
a) steady-state LOCA loading, and
b) offsite supply at minimum normal voltage, 101.3% of 230 kV

MRV – Minimum Required Voltage on 4 kV bus; is the greater of
a) Min voltage for non-accident operation of Class 1E loads,
b) Min pre-start voltage for LOCA group motor starting
c) Min start/run voltage for individual motors under max accident loading

SAT – Startup Auxiliary Transformer – supplies 4 kV buses from 230kV grid

HNP Degraded Grid Voltage LAR Overview

Purpose of LAR and Submittal Date

- Eliminate use of manual actions for degraded voltage protection
- LAR Submission: Targeting February 28, 2017
- The LAR will contain the following:
 - Detailed Description
 - 3.0 Technical Evaluation
 - 4.0 Regulatory Evaluation
 - 4.1 Significant Hazards Consideration
 - 4.2 Applicable Regulatory Requirements/Criteria
 - 4.3 Precedent
 - 4.4 Conclusion
 - 5.0 Environmental Consideration
 - 6.0 References

HNP Degraded Grid Voltage LAR Overview

Physical Change Highlights

- Replace existing SATs and add a 3rd SAT per unit
- Expand 4 kV cable bus system and realign loads among the 3 SATs
- Replace 4 kV breakers and upgrade bus bar supports
- Replace induction disc DVRs with new solid-state DVRs (3 per bus)

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Technical Specification Change Highlights

- TS 3.8.1 - Change required OPERABLE offsite circuits from 2 to 3
- TS 3.3.8.1 - Increase DVR actuation voltage, specified for each bus
- TS 3.3.8.1 - Decrease DVR actuation delay time
- TS 3.3.8.1 - Return alarm relay function to non-Tech Spec status

Methodology for Relay Setpoints (Voltage and Time Delay)

- Degraded Voltage Relays (DVRs) shall be set such that offsite power will be automatically disconnected and transferred to onsite power during an extended degraded grid condition (any voltage dip having a longer duration than expected for normal or accident operations).
- The DVRs on each Class 1E 4KV bus will be set so that, including tolerances, voltage dropout value will be above the MRV value.
- The DVR voltage reset value, including tolerances, will be set below the MEV.

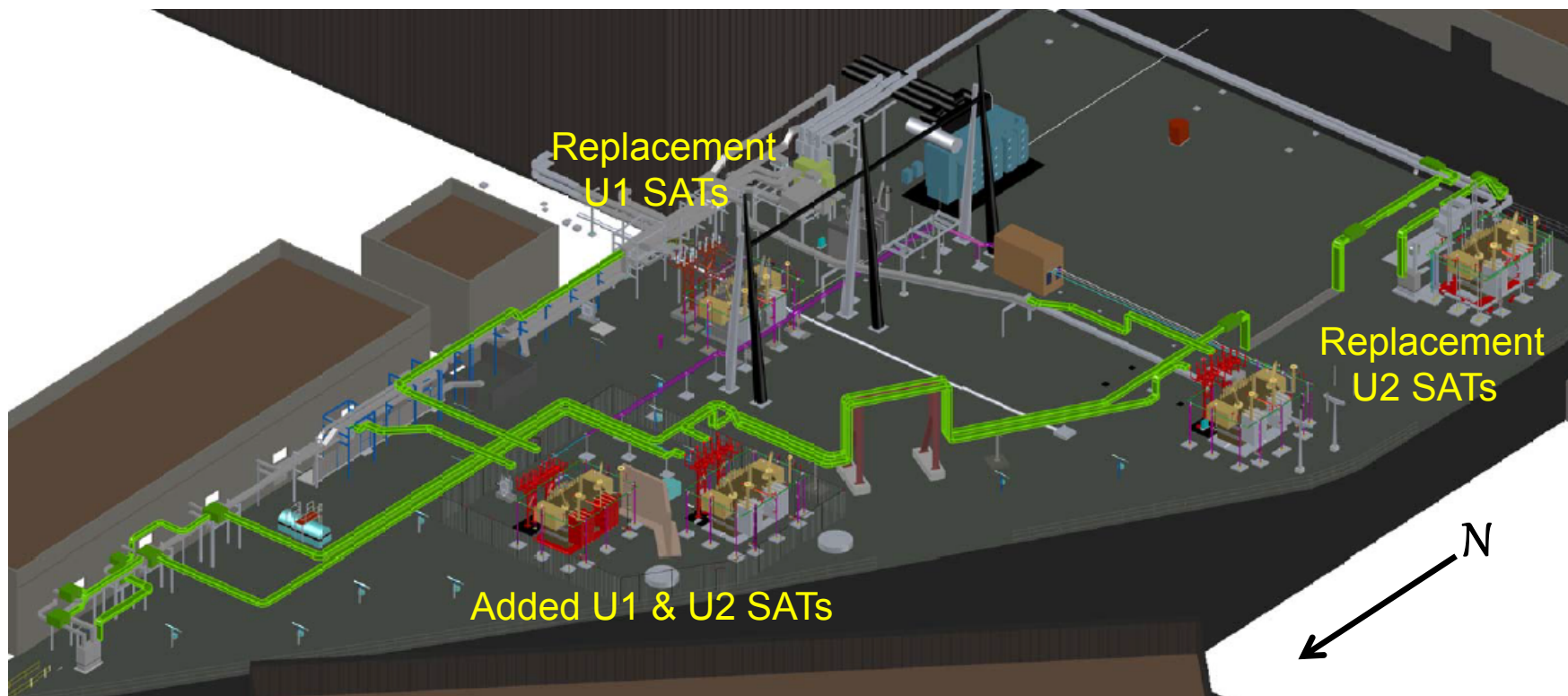
HNP Degraded Grid Voltage LAR

Electrical system lineup after mods are implemented

Bus	Existing Electrical Lineup		Revised Electrical Lineup	
	Normal Supply	Alternate Supply	Normal Supply	Alternate Supply
1E	SAT 1D	SAT 1C	SAT 1E	SAT 1D
1F	SAT 1D	SAT 1C	SAT 1C	SAT 1E
1G	SAT 1D	SAT 1C	SAT 1D	SAT 1C
2E	SAT 2D	SAT 2C	SAT 2E	SAT 2D
2F	SAT 2D	SAT 2C	SAT 2C	SAT 2E
2G	SAT 2D	SAT 2C	SAT 2D	SAT 2C

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**Low-Voltage Switchyard Layout Showing Unit 2 SATs,
Added SATs & Upgraded / Added 4 kV Cable Buses**



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Limiting Values Diagram

Bus 1E is shown; other buses are similar

	VAC at primary	(VAC at secondary)
Upper Operating Limit	3975.2 (95.56%)	(113.5)
Upper Allowable Value	3930.5	(112.3)
NTSP Pickup (Reset)	3923.5	(112.1)
NTSP Dropout (Trip)	3902.5	(111.5)
Technical Specification Allowable Value	3871.0	(110.6)
Lower AL	3821.0 (91.85%)	(109.2)

Future Submittal

- Increased RAS times for a single offsite power source out of service
- LAR Submission: Targeting June 9, 2017

Hatch Degraded Grid LAR

- Questions?

