

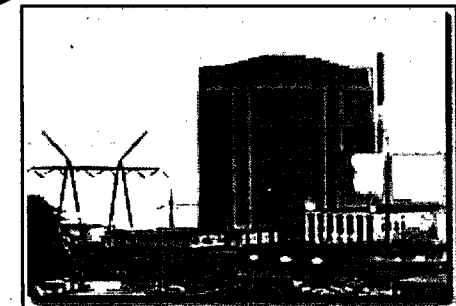
SM

NMHC

Committed to Nuclear Excellence

**Emergency Diesel Generator
Completion Time Extension License
Amendment Request**

February 1, 2006



NRC/NMC meeting

Agenda

Opening Remarks – Gabe Salamon

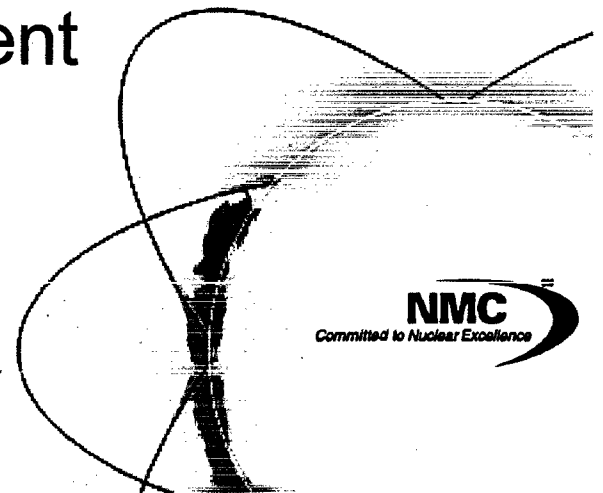
Amendment Purpose – Dale Vincent

Electrical Design – Mike Johnson

Risk Assessment – Tom Asmus

Amendment Overview – Dale Vincent

Action Item Review – Dale Vincent



Opening Remarks

Gabe Salamon – NMC Manager of Licensing

Chris Mundt – Engineering Design Manager

Dale Vincent – Licensing Engineer

Mike Johnson – Electrical Engineer

Tom Asmus – PRA Engineer

Amendment Purpose

- Current TS 3.8.1 EDG Completion Time 7 days
- This LAR proposes to increase Completion Time to 14 days

Allows EDG preventive maintenance activities on-line

- Some PMs require more than 7 days
- Improve quality of PM

Current TS

AC Sources-Operating 3.8.1

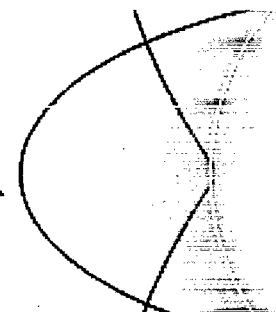
3.8 ELECTRICAL POWER SYSTEMS

3.8.1 AC Sources-Operating

LCO 3.8.1 The following AC electrical sources shall be OPERABLE:

- a. Two paths between the offsite transmission grid and the onsite 4 kV Safeguards Distribution System; and
- b. Two diesel generators (DGs) capable of supplying the onsite 4 kV Safeguards Distribution System.

APPLICABILITY: MODES 1, 2, 3, and 4.



TS Changes

AC Sources-Operating
3.8.1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.3.1 Determine OPERABLE DG is not inoperable due to common cause failure.	24 hours
	<u>OR</u>	
	B.3.2 Perform SR 3.8.1.2 for OPERABLE DG.	24 hours
	<u>AND</u>	
	B.4 Restore DG to OPERABLE status.	147 days
		<u>AND</u>
		214 days from discovery of failure to meet LCO

TS Changes

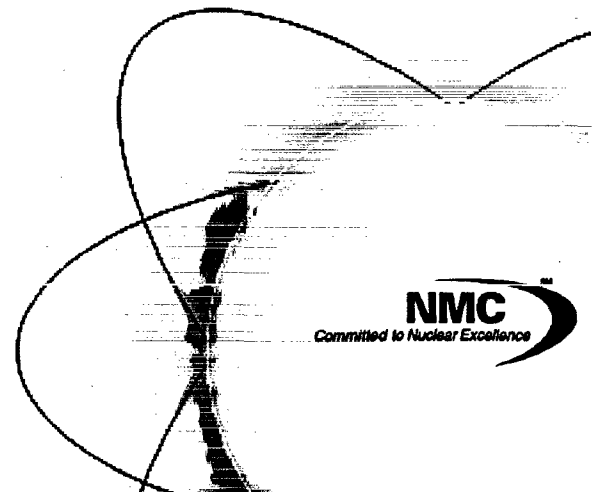
AC Sources-Operating
3.8.1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.2 Restore path to OPERABLE status.	7 days
		<u>AND</u>
		<u>214</u> days from discovery of failure to meet LCO

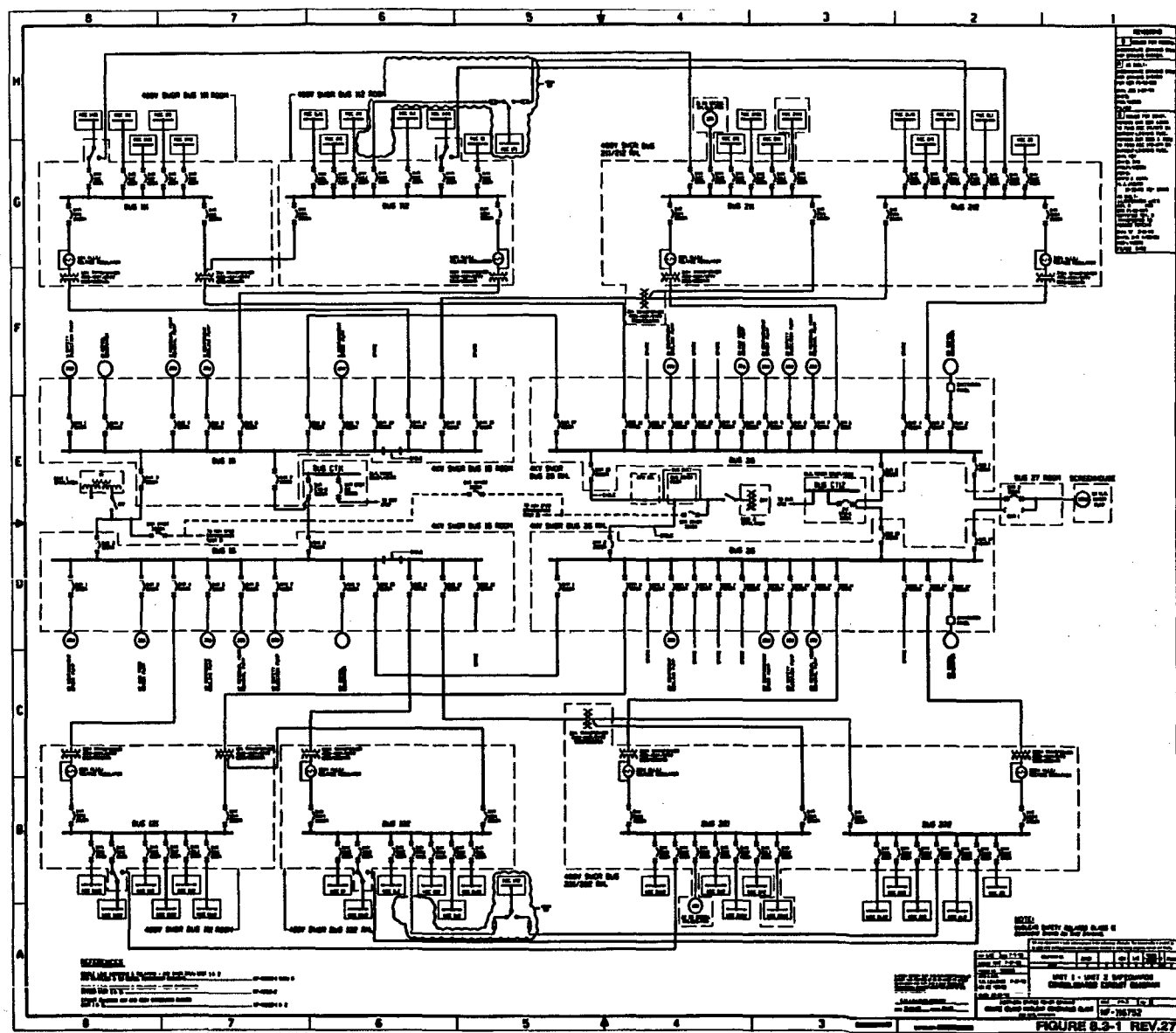
Make single line

Prairie Island Electrical Distribution System



Safeguards AC Distribution System

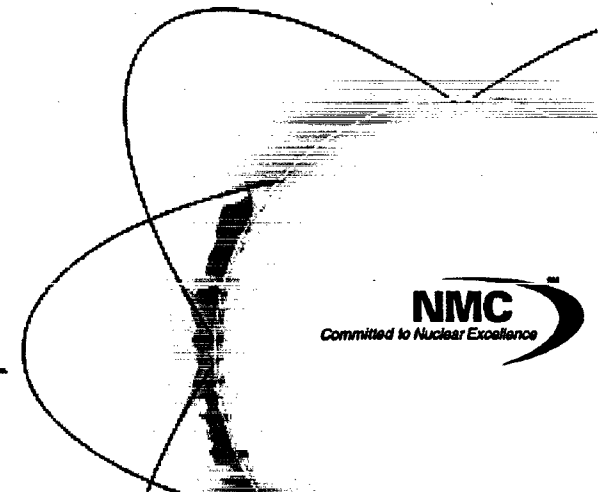
- Two independent 4KV buses per Unit
- Each Safeguards 4KV Bus has two paths from the offsite transmission system
- Each Safeguards Bus has one Emergency Diesel Generator
- Each Safeguards Bus has a dedicated Sequencer which senses UV/DV and transfers the bus to the alternate source or to the EDG



...lvmxknew_usarsu08301.dgn 04/28/2005 12:20:38 PM

Prairie Island Substation

- Two 345 KV buses
- Four 345 KV transmission lines
- One 161 KV transmission line
- Breaker and a half scheme



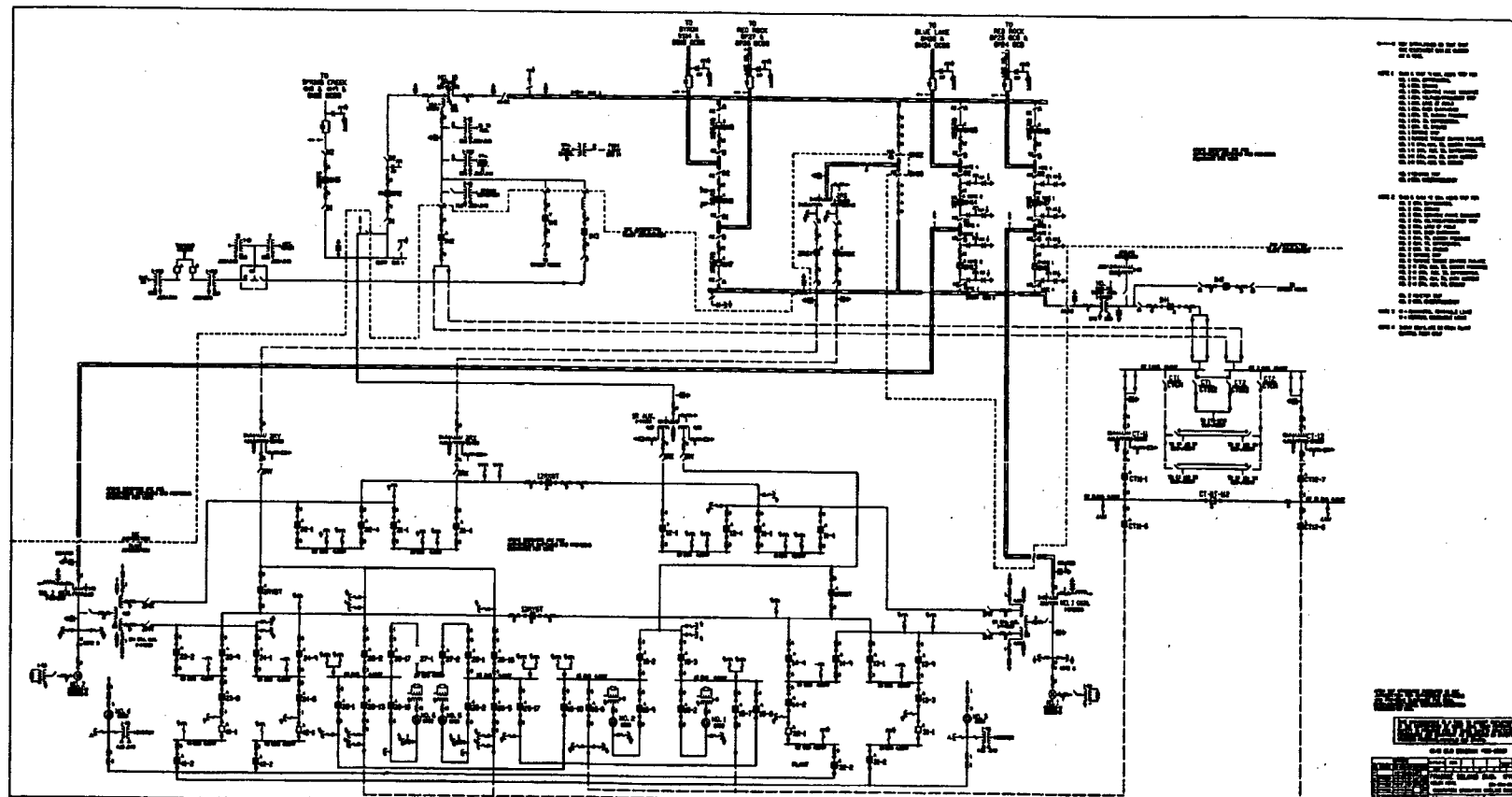
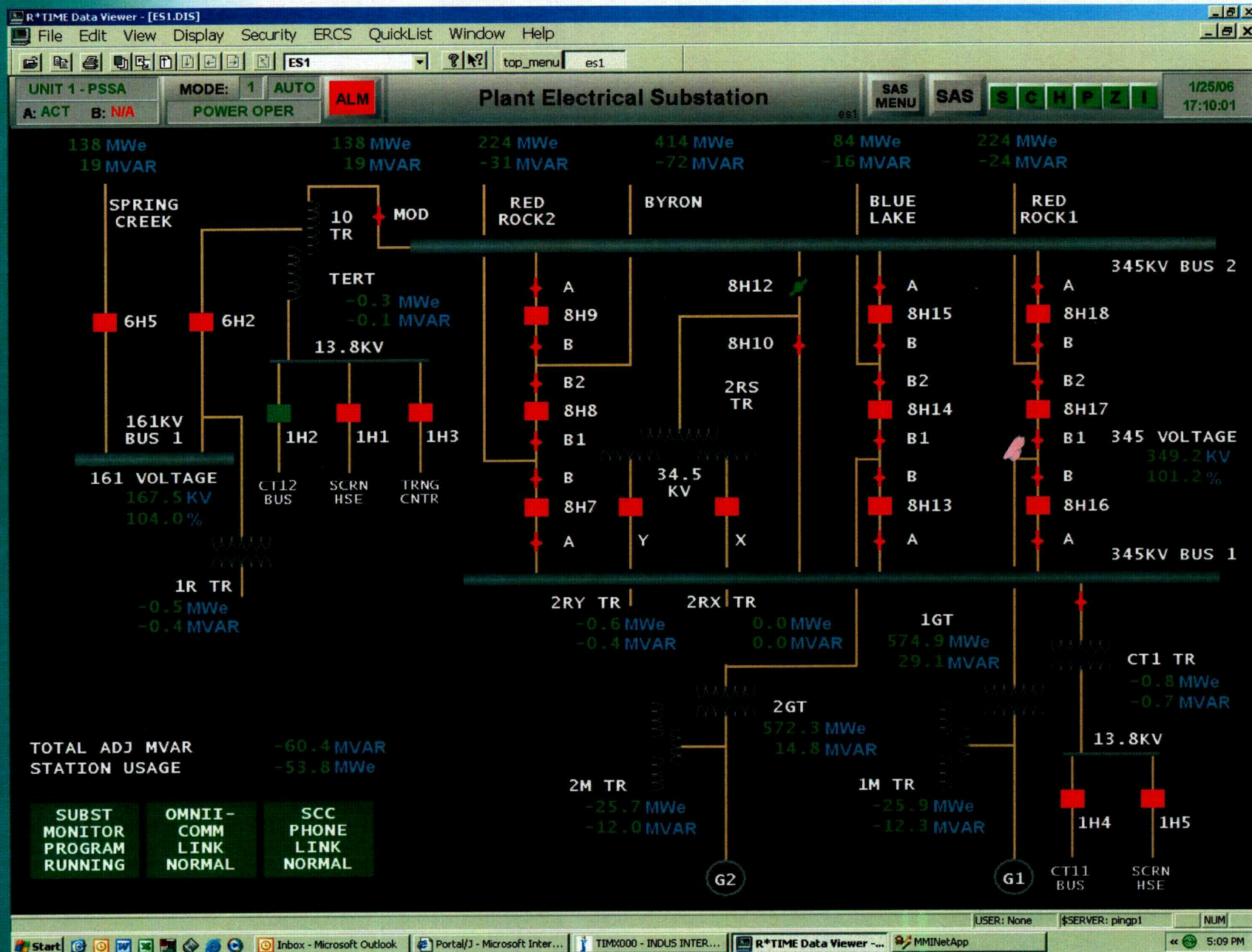


FIGURE 8.2-2 REV.23

Offsite Source Voltage

- Each of the two paths are designed to provide required voltage to the safeguards loads following a trip of both Units
- Continuous monitoring is provided by real-time analysis software utilized by the Transmission System Operator (TSO)
- TSO procedural guidance directs notification of the plant Control Room Supervisor on a real-time analysis alarm

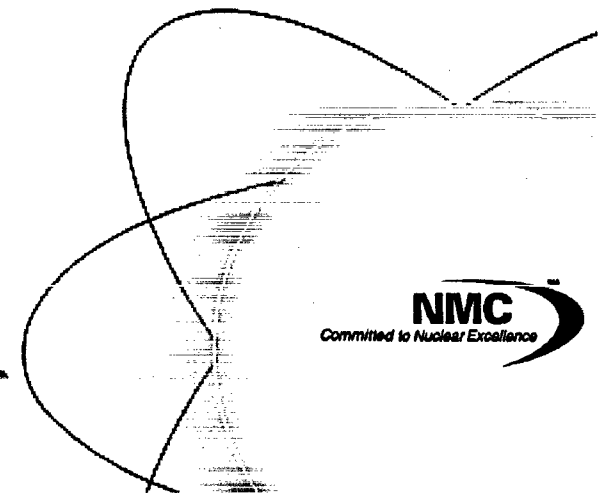


Emergency Diesel Generators

- Each Safeguards Bus is connected to an Emergency Diesel Generator dedicated to that bus
- Each EDG is capable of sequentially starting and supplying one set of redundant engineered safety features
- Each EDG is started by its respective Safeguards Bus sequencer on a UV/DV signal or on an SI signal

Station Blackout Design

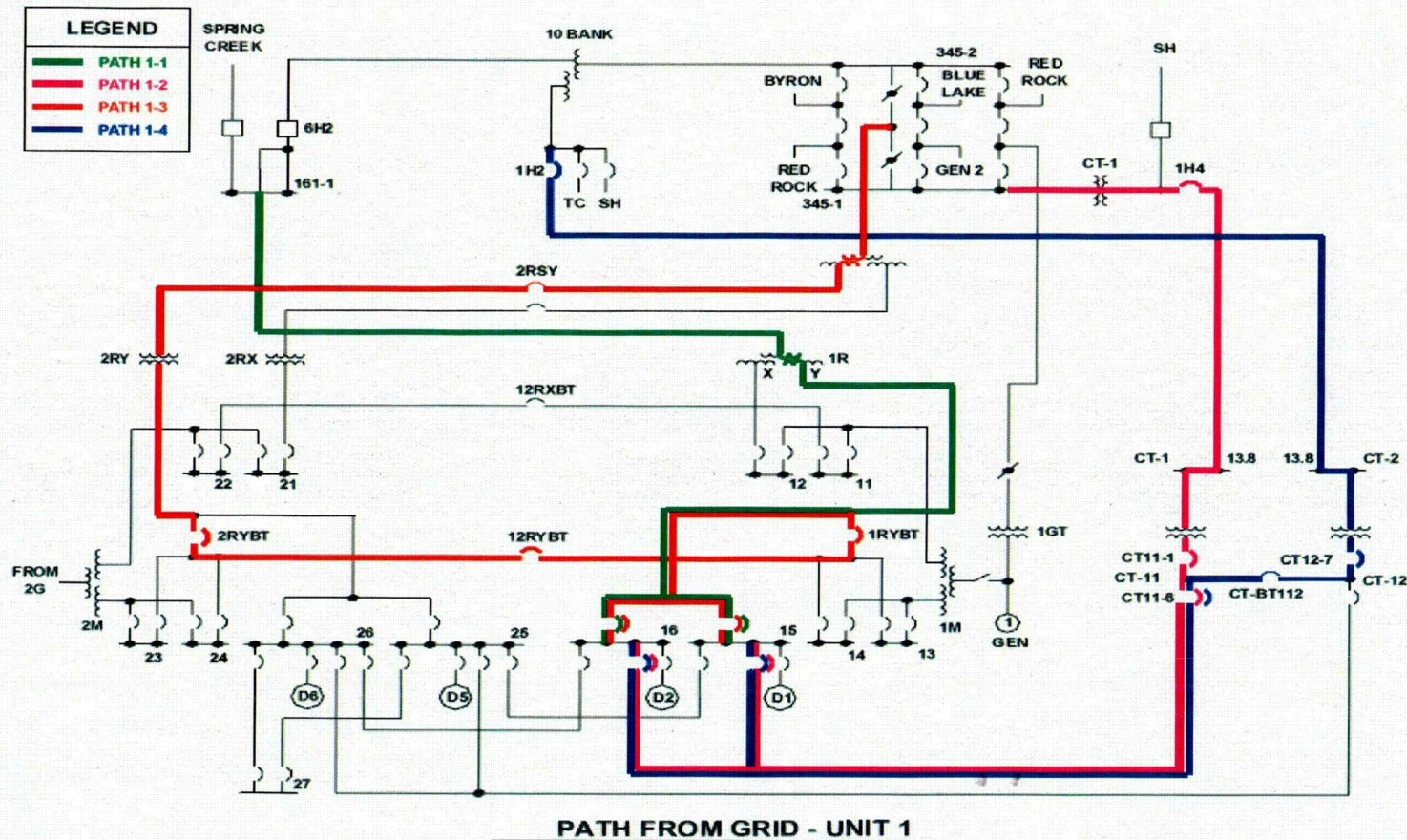
- Each Safeguards Bus has a bustie available to the same Train bus on the opposite Unit
- Each EDG is capable of sequentially starting and supplying the hot shutdown loads for its Unit along with the essential loads of the opposite Unit in the event of a SBO



Design Strengths

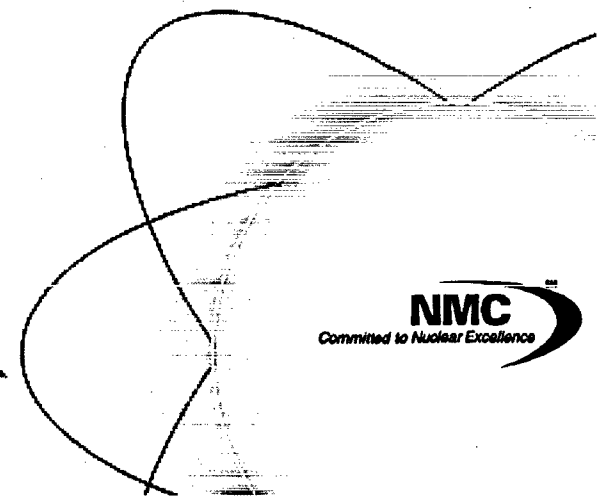
- Multiple transmission lines each capable of supplying full power requirements
- Two 345 KV buses with breaker and a half scheme
- Bustie to the same Train bus on the opposite Unit for SBO conditions
- Multiple possible electrical system alignments to provide two paths to each safeguards bus

Design Strengths

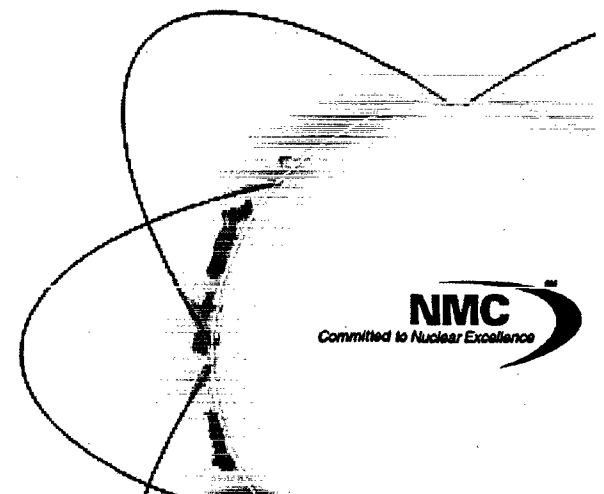


Design Strengths

- Diverse EDG manufacturers and cooling system design
- Real-time analysis and monitoring of predicted substation bus voltage following trip of both Units

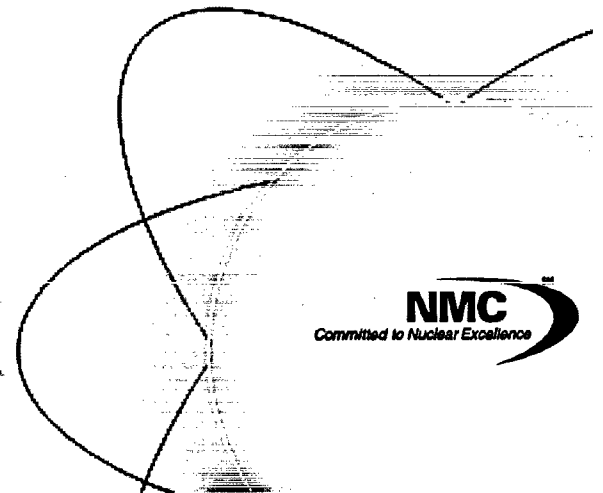


PRA Risk Assessment



PRA Risk Assessment

- PRA Model updates
- PRA Model Description
- Completion Time Extension Analysis
- Risk Significant Configuration Avoidance
- Configuration Risk Management Program (CRMP)



PRA Model Description

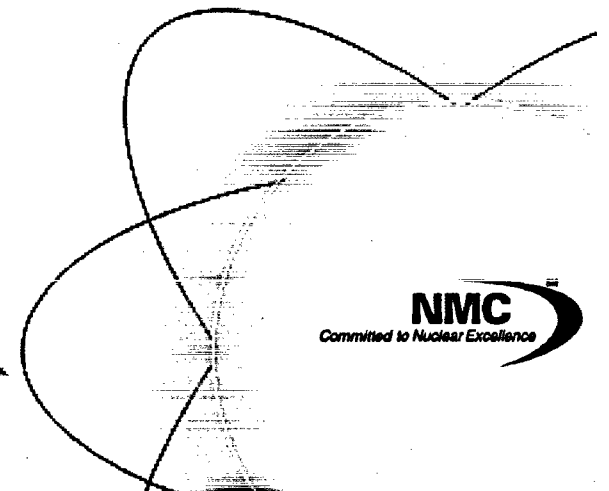
- IPE submitted to NRC on March 1, 1994 and accepted on May 16, 1997
- IPE has been substantially updated since 1997
- Exhibit E of submittal provides summary of all revisions
- The rev 2.1 model was used for EDG analysis

PRA Model Description

- WOG peer review performed in September 2000
- 37 Findings and Observations (F&O) resulted
 - 5 significance level A
 - 32 significance level B
- 33 of 37 F&Os were dispositioned before LAR submitted
- Exhibit F of submittal details the F&O

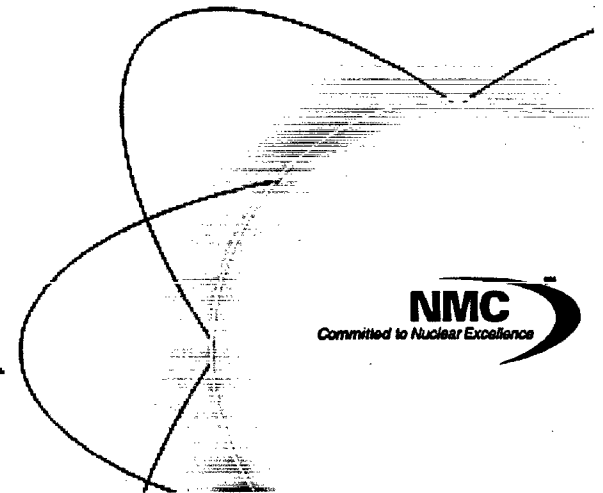
PRA Model Description

- Internal events model includes internal flooding
- Model includes support system initiating event fault trees (i.e. Loss of Cooling Water)
- Model is large fault tree small event tree style



PRA Model Description

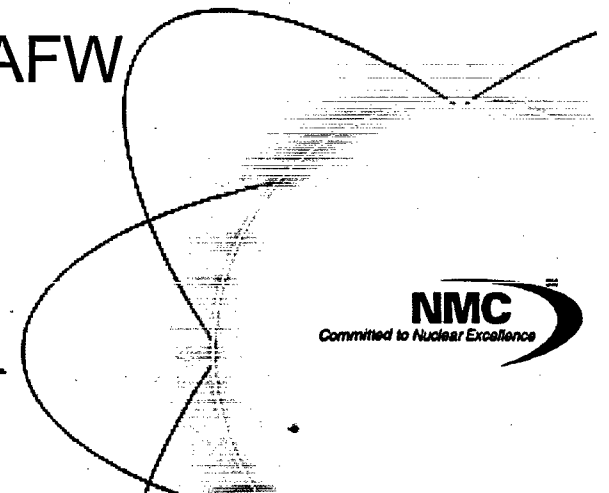
- LERF model includes individual containment penetration modeling
- The equipment hatch, the fuel transfer tube and the containment airlocks are also modeled



PRA Model Updates

Updates included in PRA rev 2.1 model for EDG analysis:

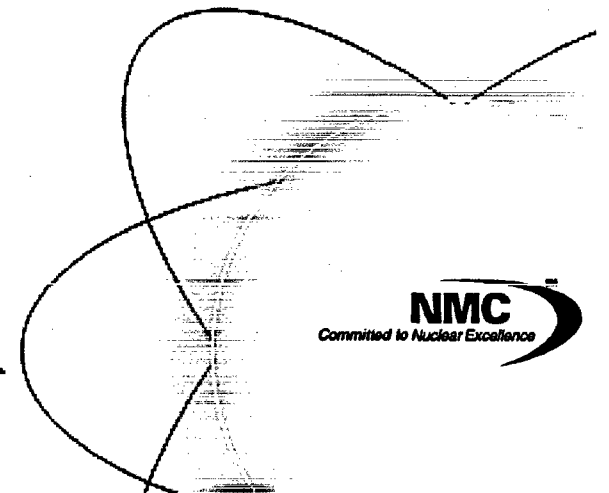
- Updated LOOP initiating event frequency
- Updated important system fault trees
- Upgraded HRA for key actions and added misalignment and miscalibration events
- Updated failure data for EDG and AFW systems
- Updated CCF values for EDG and AFW
- Updated internal flooding analysis



PRA Model Updates

Results of recent PRA update:

- CDF decreased
- LOCA and transient CDF contributions increased
- LOOP CDF contribution decreased
- Internal flooding CDF contribution decreased
- SGTR CDF contribution was unchanged



PRA Model Updates

CDF Comparison from Previous PRA Model

Initiating Event	Unit 1 CDF Results (per yr)		Unit 2 CDF Results (per year)	
	Rev 2.0	Rev 2.1	Rev 2.0	Rev 2.1
LOCAs	5.00E-06	7.88E-06	5.02E-06	7.88E-06
Transients	3.22E-06	3.07E-06	5.68E-06	4.44E-06
SGTR	2.92E-06	2.10E-06	3.00E-06	2.10E-06
LOOP	5.70E-06	1.45E-06	6.46E-06	1.66E-06
Internal Flood	5.09E-06	2.44E-07	5.09E-06	2.44E-07
Total	2.19E-05	1.47E-05	2.52E-05	1.63E-05

Completion Time Extension Analysis

Δ CDF and Δ LERF Assumptions:

- 14 day overhaul performed every 18 months for each EDG
- Corrective maintenance increases by ratio of proposed to current Completion Time (14/7)
- Only a single EDG is in CM or PM at any one time
- Turbine-driven AFW pump is assumed to not be in maintenance when an EDG on the same unit is

Δ CDF and Δ LERF Results

Results for Increased CM and PM

Risk Parameter	Unit 1	Unit 2	RG 1.174 criteria
Base Line CDF	1.47E-5	1.63E-5	NA
Base Line LERF	5.74E-7	5.74E-7	NA
Delta CDF	2.91E-7	3.68E-7	<1E-6
Delta LERF	<5.0E-10	<5.0E-10	<1E-7

Completion Time Extension Analysis

ICCDP and ICLERP Assumptions:

- CCF terms for EDG in the same CCF group are set to 0 when inoperable EDG is in PM
- Remaining EDG in CCF group has new CCF factors calculated using smaller group size

ICCDP and ICLERP Results

ICCDP and ICLERP for EDG
When EDG is Inoperable for Preventative Maintenance

Unit	DG Inoperable	Delta CDF	ICCDP	ICLERP
1	D1	3.69E-06	1.41E-07	< 5E-10
	D2	4.37E-06	1.67E-07	< 5E-10
	D5	4.95E-06	1.90E-07	< 5E-10
	D6	5.35E-06	2.05E-07	< 5E-10
2	D1	5.05E-06	1.94E-07	< 5E-10
	D2	3.16E-06	1.21E-07	< 5E-10
	D5	7.35E-06	2.82E-07	< 5E-10
	D6	6.28E-06	2.41E-07	< 5E-10

Discussion of Results

ICCDP and ICLERP results are less than RG 1.177 limits because:

- Each 4kV bus is supported by its own dedicated EDG
- Bustie capability between same train opposite unit 4kV buses is easily accomplished from the control room
- EDGs are diverse so CCF potential is insignificant

Fire and Other External Events

- The extended EDG Completion Time is an administrative change and does not have a significant impact on the likelihood of occurrence of fires or SBO
- The ability to bustie from the opposite unit same train 4 kv bus to a non-fire affected bus mitigates the risk from fires

Fire and Other External Events

- Seismic events were evaluated in the IPEEE using the seismic margins assessment
- No significant seismic concerns were identified
- High winds, external floods and other external events were evaluated in the IPEEE
- The proposed changes to the EDG Completion Time have an insignificant effect on the risk profile from external events

Risk Significant Configuration Avoidance

Avoidance of risk significant plant configurations is assured by:

- Potential combinations of equipment out of service will be managed by the configuration risk management program
- The condition of the offsite power supply and switchyard will be evaluated prior to entering the extended EDG Completion Time for elective maintenance
- No elective maintenance will be scheduled in the switchyard that would challenge offsite power availability during the proposed extended EDG Completion Time

Risk Significant Configuration Avoidance

Avoidance of risk significant plant configurations is assured by:

- The system dispatcher will be contacted once per day and informed of the EDG status along with the power needs of the facility
- The turbine-driven AFW pump on the associated unit will not be removed from service for planned maintenance activities during the extended EDG Completion Time

Risk Significant Configuration Avoidance

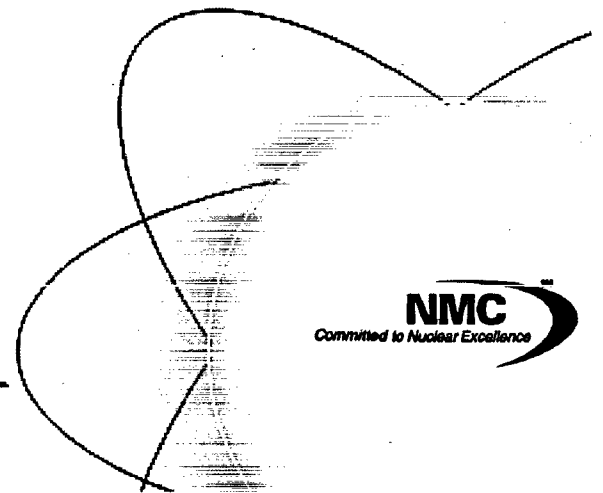
Avoidance of risk significant plant configurations is assured by:

- Assure operating crews are briefed on the EDG work plan and procedural actions regarding:
 - ✓ LOOP and SBO
 - ✓ 4 kV safeguards bus bustie
 - ✓ Reactor Coolant System bleed and feed

Risk Significant Configuration Avoidance

Avoidance of risk significant plant configurations is assured by:

- Weather conditions will be evaluated prior to entering the extended Completion Time for elective maintenance. An extended EDG Completion Time will not be entered for elective maintenance purposes if official weather forecasts are predicting severe conditions.



Configuration Risk Management Program

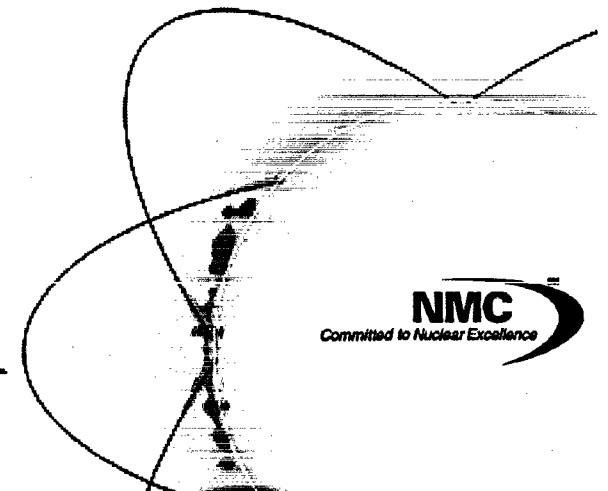
- Configuration dependent assessment of risk is performed prior to scheduled work
- Severe weather effect on offsite power can also be assessed
- A quantitative risk assessment is performed by utilizing the current level 1 PRA model
- Operations management is trained to perform risk assessments for emergent work

LAR Overview

- Cover letter
- Exhibit A – Licensee Evaluation
- Exhibits B and C – TS/Bases pages
- Exhibit D – Commitments
- Exhibits E – Summary of PRA Revisions
- Exhibit F – Peer Review Certification of
PINGP PRA

LAR Overview

- Submitted 11/21/05
- Request approval in 1 year
 - Need for Unit 1 diesel overhaul in 2007



Licensee Evaluation

- Offsite power and grid reliability – 3.1
- Diesel generator description – 3.2
- Station blackout capability 3.3
- RG 1.155 EDG reliability program – 3.4
- Benefits of the proposed TS changes – 4.2
- Deterministic basis for extension – 4.3

Licensee Evaluation

- Probabilistic risk assessment – 4.4
 - Tier 1 – capability and insights – 4.4.1
 - Delta CDF/LERF
 - Incremental Conditional CDP/LERP
 - Fire
 - External Events
 - Tier 2 – avoid risk-significant configurations – 4.4.2
 - Commitments
 - Tier 3 – Configuration risk management program – 4.4.3
- Industry Precedents – 4.5

Closing Comments

- Robust Electrical Design
- Risk Assessment Results
- Extend Completion Time from 7 days to 14 days
- Maximize reliability of Diesel Generators
- Action Item Review

