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## Palisades Regulatory Conference November 25, 2003



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# Agenda

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Introduction	Douglas Cooper
Objectives	Daniel J. Malone
Background	Michael Carlson
Risk Discussion	Jeb Kingseed
Corrective Actions	Michael Carlson
Conclusion	Daniel J. Malone

# Objectives

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- NMC will present
  - Agreement with finding
  - Facts and assumptions used to determine safety significance
  - Corrective actions
  - Conclusion of Green safety significance



# Background

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- March 25, 2003, with plant in Mode 6
- Signpost driven into buried conduit in parking lot
- Conductors within conduit damaged, affecting breaker protective relaying
- Protective relaying tripped breakers open, disconnecting offsite power circuits

## Background (cont)

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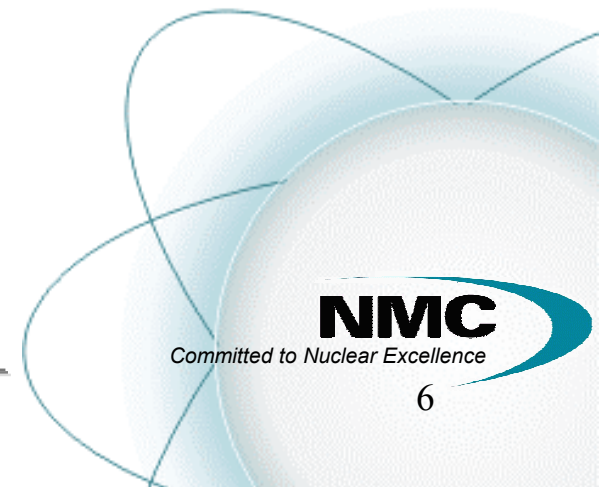
- Systems responded as expected
- NRC finding identified
  - Failure to have administrative controls in place for digging or excavating
- NMC agrees with the finding
- NMC has determined the finding significance to be Green



# Risk Discussion

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- Background
  - Completed qualitative assessment of 3/25/03 loss of offsite power (LOOP) for the shutdown condition
  - Completed quantitative analysis of the LOOP for the at-power condition
  - Used Phase III probabilistic safety assessment (PSA) model



# Risk Discussion (cont)

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- Methodology
  - Identified dominant PSA sequences
  - Re-examined basis for recovery actions
  - Re-assessed the time available for recovery actions using modular accident analysis program (MAAP)
  - Determined the time for operators to complete recovery actions
  - Calculated new human error probabilities (HEPs)

# Risk Discussion (cont)

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- Dominant PSA sequences
  - LOOP, failure of both diesel generators (DGs), successful auxiliary feedwater (AFW) injection, failure to restore safety related bus within 4 hours
  - LOOP, failure of both DGs, failure of AFW, failure to restore safety related bus within 2 hours





# Risk Discussion (cont)

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## Time Available For Recovery Actions

Sequence	Baseline PSA Time to Core Damage (hrs)	MAAP Analysis Time to Core Damage (hrs)
LOOP, Loss of DGs, AFW available	4	8.5
LOOP, Loss of DGs, Loss of AFW	2	2.5

# Risk Discussion (cont)

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## Time for Operators to Complete Recovery Actions

Time to Recover Offsite Power and Open the First PORV (includes both diagnosis and manual actions)		
	Crew 1	Crew 2
Diagnosis and manual actions	114 min	91 min
Manual actions	54 min	57 min

*Time used in the analysis 115 min and 57 min*

# Risk Discussion (cont)

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## Diagnosis Time Used in Analysis

LOOP (both circuits) and Loss of DGs	MAAP Calculated Available Time	Available Time for Diagnosis	Diagnosis Time used in the HEP Analysis
With AFW	~8.5 hrs (~510 min)	453 min (510 min - 57 min)	183 min (240 min - 57 min)
Without AFW	~2.5 hrs (~150 min)	93 min (150 min - 57 min)	90 min



# Risk Discussion (cont)

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## New Human Error Probabilities

Sequence	Baseline Recovery Factor	Updated Recovery Factor
LOOP, Loss of DGs, AFW available	6.0E-01	5.6E-03
LOOP, Loss of DGs, Loss of AFW	7.4E-01	2.3E-02

*The change is the result of credit for recovery actions specific to the LOOP scenario of 3/25/03*

## Risk Discussion (cont)

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- Model and analyses conservatisms
  - Assumed no AFW flow after 4 hours
  - DG recovery not credited
  - Used 1 in 32 years as initiating event likelihood (IEL)
  - Used degraded high pressure safety injection pump curve
  - Assumed core damage at 1600 degrees F

## Risk Discussion (cont)

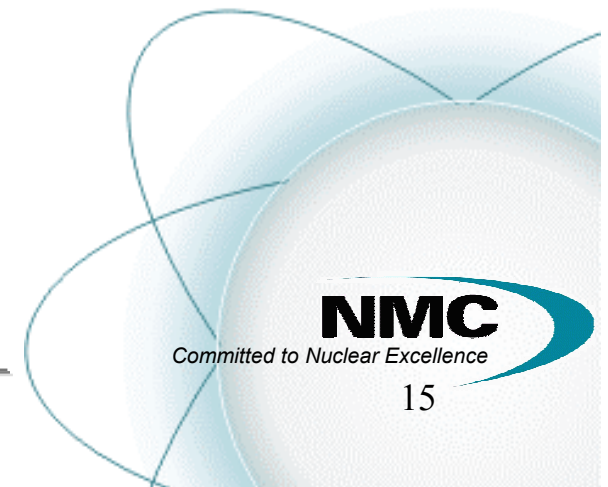
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- NMC calculated IEL as  $2.26\text{E-}02/\text{year}$  using industry standard Bayesian methods
- NRC's IEL is 1 in 32 years ( $3.11\text{E-}02/\text{year}$ )
- Regardless of which IEL is used in the Palisades PSA model, the change in risk is  $<1\text{E-}06/\text{year}$  : Green

# Risk Discussion (cont)

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- Palisades analyses validated by industry experts
  - Initiating Event Likelihood
  - Modular Accident Analysis Program
  - Probabilistic Safety Assessment



# Risk Discussion (cont)

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- Summary
  - Identified dominant PSA sequences
  - Re-examined basis for recovery actions
  - Re-assessed the time available for recovery actions using MAAP
  - Determined the time for operators to complete recovery actions
  - Calculated new HEPs
  - Calculated risk using revised HEPs



# Corrective Actions

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- Issued stop work order
- Repaired damaged conductors
- Rerouted protective relaying
- Protected conduit
- Created new controls



# Conclusion

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- Evaluated the performance deficiency
- Implemented corrective actions
- Determined safety significance to be Green

