

# **On-Line Risk Monitor (OLRM) Turkey Point NPP**

International Workshop  
on  
**Use of PSA in Operation of NPPs and in  
Regulatory Decision-Making**

May 17 - 21, 2004  
Kyiv, Ukraine

# On-Line Risk Monitor (OLRM)

- is a PSA risk quantification tool (EPRI's EOOS software).
- is used primarily by the operators and work week managers to estimate the risk associated with proposed or actual plant configurations.
- is also used to provide operators with notes/precautions for particular configurations.

# OLRM Use at Turkey Point

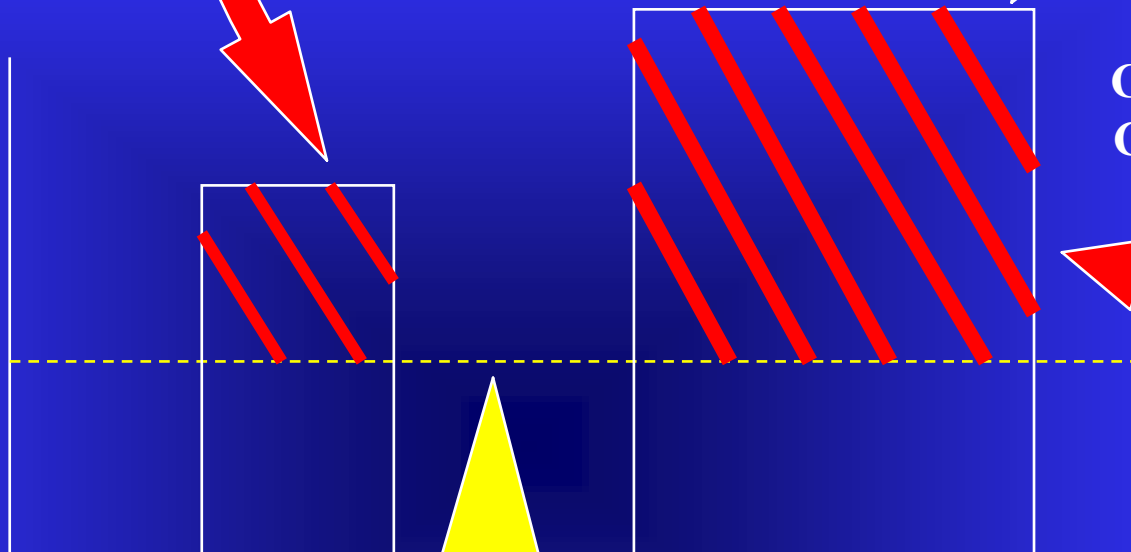
- The on-line maintenance schedule for a particular work week is analyzed for its impact on risk several weeks before it is implemented. The Work Week Managers use the OLRM to input the schedule and analyze it.
- The operators monitor the real-time risk level of the plant using the OLRM. Before a component is taken out of service, its impact on risk is calculated.

# OLRM Risk Measures

- Core Damage Frequency (CDF)
- Large Early Release Frequency (LERF)
- Change in Core Damage Probability (CDP)
- Change in Large Early Release Probability (LERP)

# NEW CDF W/ COMPONENTS OOS

CDF  
(LERP) ↑



CHANGE IN  
CDP (LERP)

T1

T2



TIME

**BASELINE CDF W/NO  
COMPONENTS OOS**

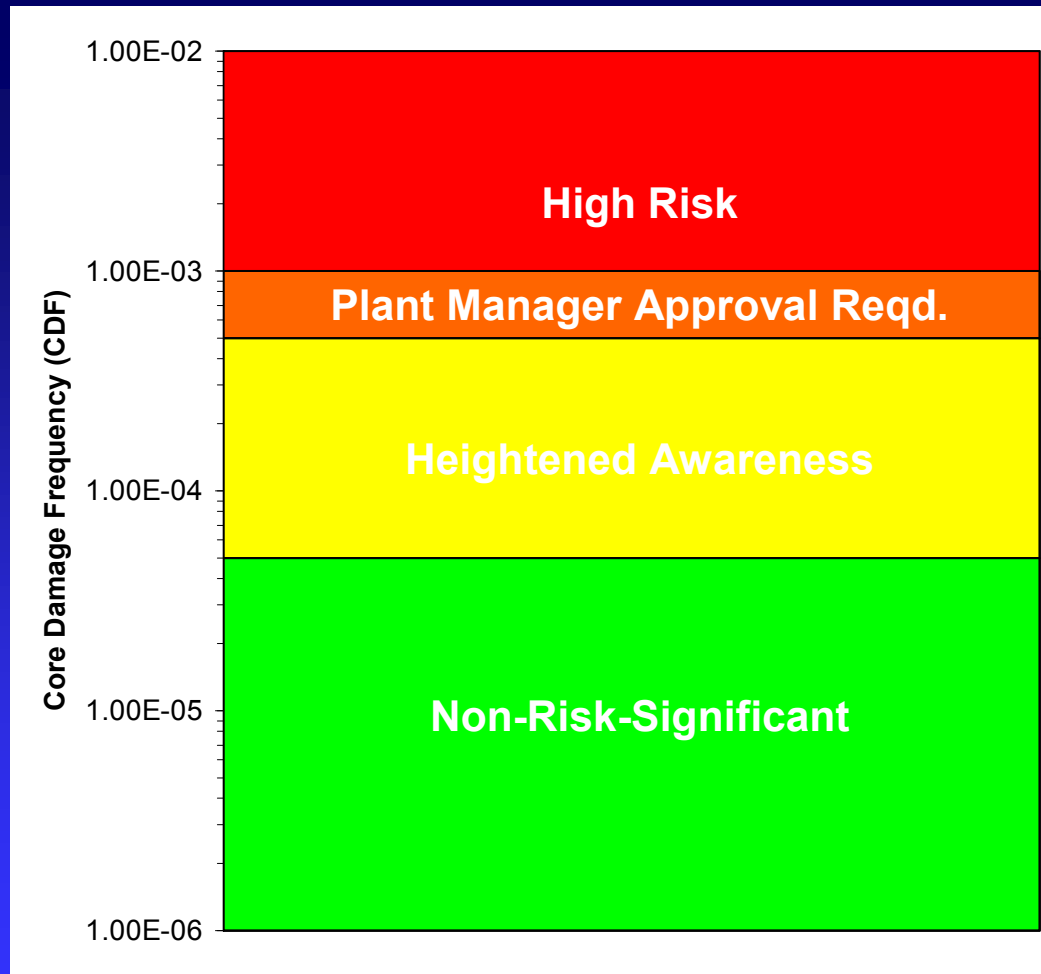
CDP = Core Damage Probability

LERP = Large Early Release Probability

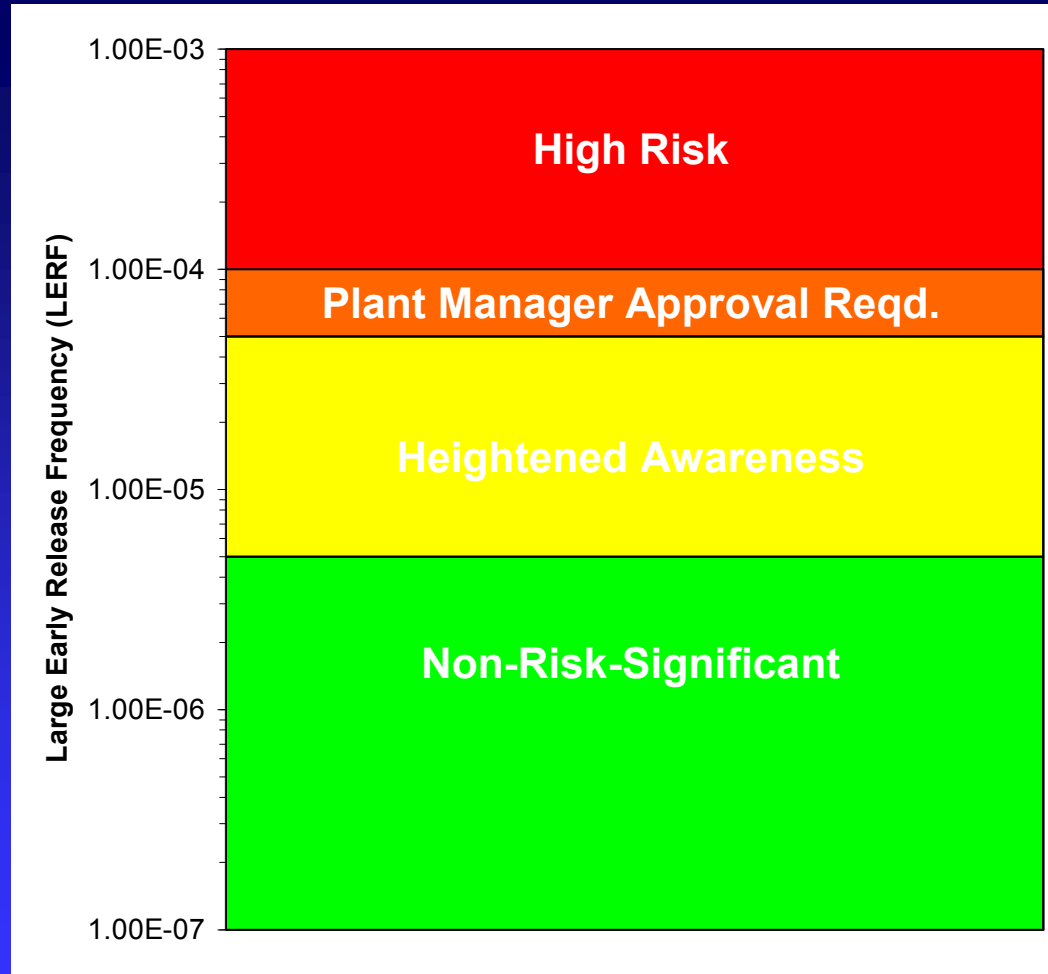
# Four-Color Risk Category Scheme

- Four colors: Green, Yellow, Orange, Red
- Based on the OLRM calculation of CDF, change in CDP, LERF, and change in LERP and comparison of these values to pre-defined thresholds for the four colors.
- The most conservative color will be chosen as representative of the configuration risk.

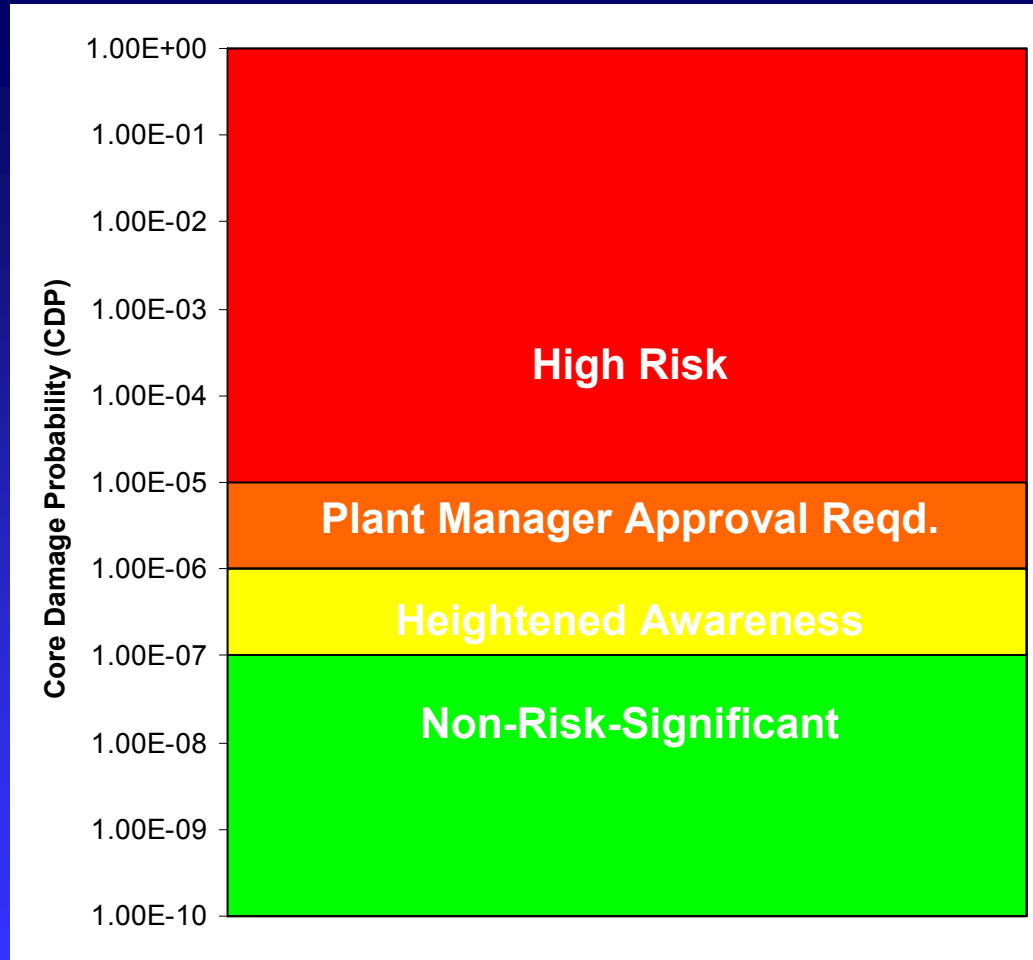
# CDF Thresholds



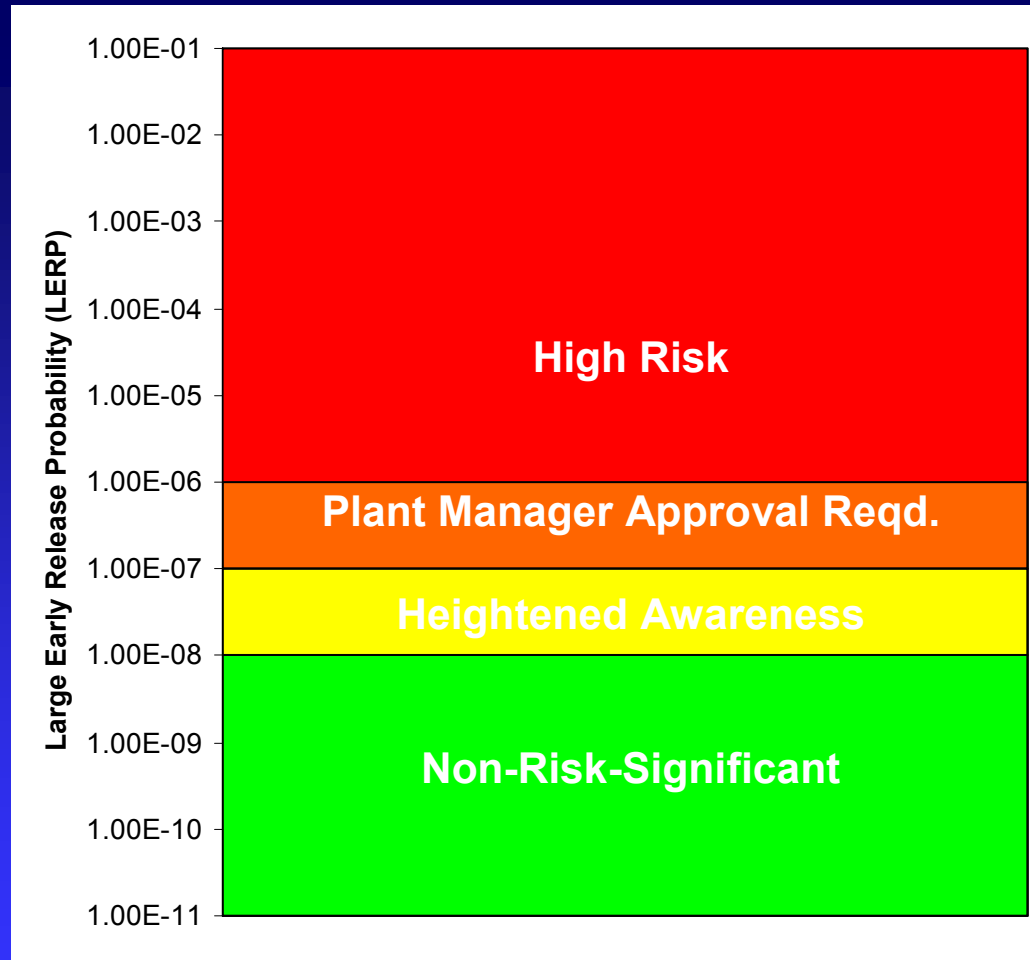
# LERF Thresholds



# CDP Thresholds



# LERP Thresholds



# Green

- Configuration has minimal impact on risk
- Normal work controls are applied.

# Yellow

- Yellow Risk activities should be avoided if possible. Although these activities carry a higher risk, they are NOT consider Potentially Risk Significant. Yellow status may be voluntarily entered provided:
  - Prior authorization is obtained from the Work Controls Manager AND the Operations Manager,
  - Appropriate limits are place on activity duration,
  - Compensatory actions are considered AND imposed IF deemed appropriate, and
  - Heightened risk awareness is communicated to the plant staff.

# Orange

- Proposed maintenance activities that are Potentially Risk Significant (Orange Risk Status) require a risk assessment by the PSA Group AND approval by the Plant General Manager prior to entering the potentially risk significant configuration.
- Proposed maintenance activities that are Potentially Risk Significant (Orange Risk Status) require that appropriate risk management strategies be applied.

# Orange (cont.)

The following risk management actions are intended to increase risk awareness and control.

1. Discuss planned maintenance activities with the operating shift to ensure shift awareness of planned evolution.
2. Conduct pre-job briefing with maintenance personnel, emphasizing risk aspects of planned maintenance.
3. Request system engineer to be present for the maintenance activity, or for applicable portions of the activity.

# Orange (cont.)

The following risk management actions are intended to reduce the duration of potentially risk significant configurations.

1. Pre-stage parts and materials.
2. Walk down clearance and maintenance activities with involved personnel prior to the maintenance activity.
3. Conduct mock-up training.
4. Perform maintenance activity around the clock.
5. Establish contingency plans to restore out-of-service equipment rapidly if needed.

# Orange (cont.)

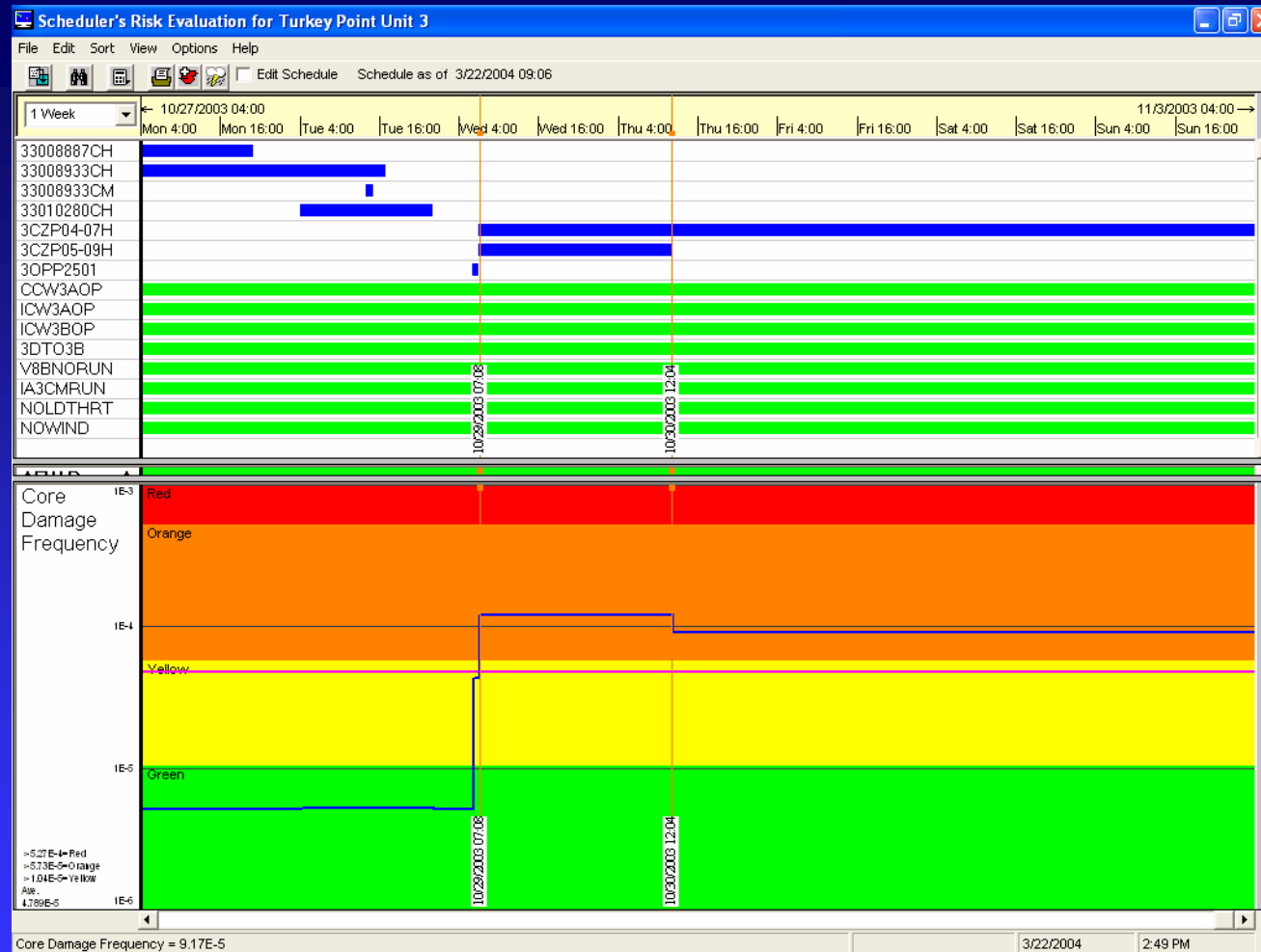
The following risk management actions are intended to minimize the magnitude of risk increase.

- Minimize other work in areas that could affect initiators such as reactor trip or loss of offsite power (e.g. RPS equipment areas, switchyard, switchgear rooms). This action will reduce the likelihood of an initiating event that is mitigated by the out-of-service equipment.
- Minimize other work in areas that could affect redundant or diverse equipment that performs the same safety function as the equipment that is out-of-service.
- Establish compensatory measures that will accomplish the safety function of the equipment that is out-of service.

# Red

- **Ni! Nyet!**
- Proposed maintenance activities shall not be planned or scheduled if they result in a Red condition.
- If already in a Red condition, restore components to service as soon as possible to exit the condition.

# Schedulers Screen



# OLRM Operator's Screen

Operator's Risk Evaluation for Turkey Point Unit 3

File Options Add Ins Help

Core Damage Frequency: **4.55E-5**

Active Items as of 9/11/2002 11:02

3K4B since 9/11/2002 11:01:53 Component 3K4B 3B DIESEL GENERATOR  
 P2A since 9/11/2002 11:01:39 Component P2A AUXILIARY FEEDWATER PUMP A

Note: Use "Add Ins" on Menu bar or number icons to view OLRM notes

### Unit 3 System Alignment / Threat Display

CAUTION: Change using System Alignment Button (red and green valves) only  
 (Red = True, Green = False)

Component Cooling Water Pump Alignment	D-Bus Alignment	Aux. Bldg. Exhaust Fan
3A Operating 3B Operating 3C Operating	Aligned to 3A Aligned to 3B	V8A NOT Running V8B NOT Running
Intake Cooling Water Pump Alignment		
3A Operating 3B Operating 3C Operating		

IS A LOAD-THREATENING TEST/MAINTENANCE ACTIVITY PLANNED?  
 YES NO IF "YES" SEE NOTE 7

HIGH WINDS  
 HAS A HURRICANE OR TORNADO WARNING BEEN ISSUED OR IS ONE EXPECTED DURING THE MAINTENANCE WINDOW?  
 YES NO IF "YES" SEE NOTE 8

TIER 2 RESTRICTIONS FOR EDG AOT EXTENSION

UNIT 3 EDG/SU XFMR RESTRICTION - SEE NOTE 9	EDG/SBO CROSSTIE RESTRICTION - SEE NOTE 10
UNIT 4 EDG/SU XFMR RESTRICTION - SEE NOTE 9	UNIT 3 EDG / UNIT 4 EDG RESTRICTION - SEE NOTE 11
EDG (OOS > 72 HOURS) FIRE RESTRICTION - SEE NOTE 12	

### UNIT 3 Risk Assessment SSCs - OOS Display

Set status by clicking in panel box or by using "red pump" icon  
 (Red = Unavailable; Green = Available)

AFW			HHSI				RHR/LHSI	
P2A	P2B	P2C	3P215A	3P215B	4P215A	4P215B	3P210A	3P210B
AFW Steam Supply			MOV-3-843A	MOV-3-843B		MOV-3-744A	MOV-3-744B	
MOV-3-1405	MOV-3-1403	MOV-3-1404	MOV-3-866A	MOV-3-866B		MOV-3-750	MOV-3-751	
MOV-6459A	MOV-6459B	MOV-6459C	MOV-3-856A	MOV-3-856B		MOV-3-860A	MOV-3-860B	
AFW Flow Control Valves			MOV-3-864A	MOV-3-864B		MOV-3-861A	MOV-3-861B	
CV-3-2816	CV-3-2817	CV-3-2818	MOV-878A	MOV-878B		MOV-3-862A	MOV-3-862B	
CV-3-2831	CV-3-2832	CV-3-2833	MOV-3-869		MOV-3-863A	MOV-3-863B		
Condensate Storage Tanks					MOV-3-758			
3T8	4T8		RWSTs					
			3T1	4T1				

Mode 1 - At Power 9/11/2002 11:03 AM

# Risk Status Calculator

**Risk Status Calculator** [X]

File Edit

Anticipated Duration

1 day

Risk Measure	Core Damage	Large Early Release
Frequency (CDF/LERF)	1.99E-5	1.26E-6
Baseline Frequency	4.96E-6	3.66E-7
Yellow Frequency Threshold	5.E-5	5.E-6
Orange Frequency Threshold	5.E-4	5.E-5
Red Frequency Threshold	1.E-3	1.E-4
Probability Increase (CDP/LERP)	4.1E-8	2.44E-9
Yellow Probability Threshold	1.E-7	1.E-8
Orange Probability Threshold	1.E-6	1.E-7
Red Probability Threshold	1.E-5	1.E-6

**Non-Risk-Significant**

OK

# Risk Status Calculator (cont.)

Risk Status Calculator

File Edit

Anticipated Duration

3 week

Risk Measure	Core Damage	Large Early Release
Frequency (CDF/LERF)	3.38E-5	1.34E-6
Baseline Frequency	4.96E-6	3.66E-7
Yellow Frequency Threshold	5.E-5	5.E-6
Orange Frequency Threshold	5.E-4	5.E-5
Red Frequency Threshold	1.E-3	1.E-4
Probability Increase (CDP/LERP)	1.66E-6	5.6E-8
Yellow Probability Threshold	1.E-7	1.E-8
Orange Probability Threshold	1.E-6	1.E-7
Red Probability Threshold	1.E-5	1.E-6

**PGM Approval Required**

OK

# On-line Risk Monitor

OLRM RESULTS DO NOT JUSTIFY  
REMOVAL OF COMPONENTS  
FROM SERVICE FOR A TIME  
FRAME EXCEEDING THAT  
ALLOWED BY TECHNICAL  
SPECIFICATIONS

# OLRM Demonstration