



STP Risk-Informed Technical Specifications Application

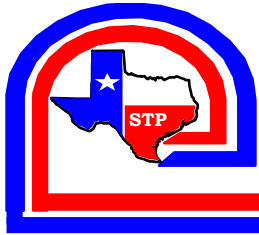
Use of PSA in Operation of NPPs
& in Regulatory Decision Making

May 17, 2004

Kyiv, Ukraine

Introduction

- In this presentation we will discuss the application of PRA to plant Technical Specifications
- Builds off of STP's previous risk informed Technical Specification submittals
- STP is piloting this effort with the NRC
 - Configuration Risk Management pilot,
 - PRA Quality (RG 1.200 Pilot)
- Implementation process



SOUTH TEXAS PROBABILISTIC SAFETY ASSESSMENT

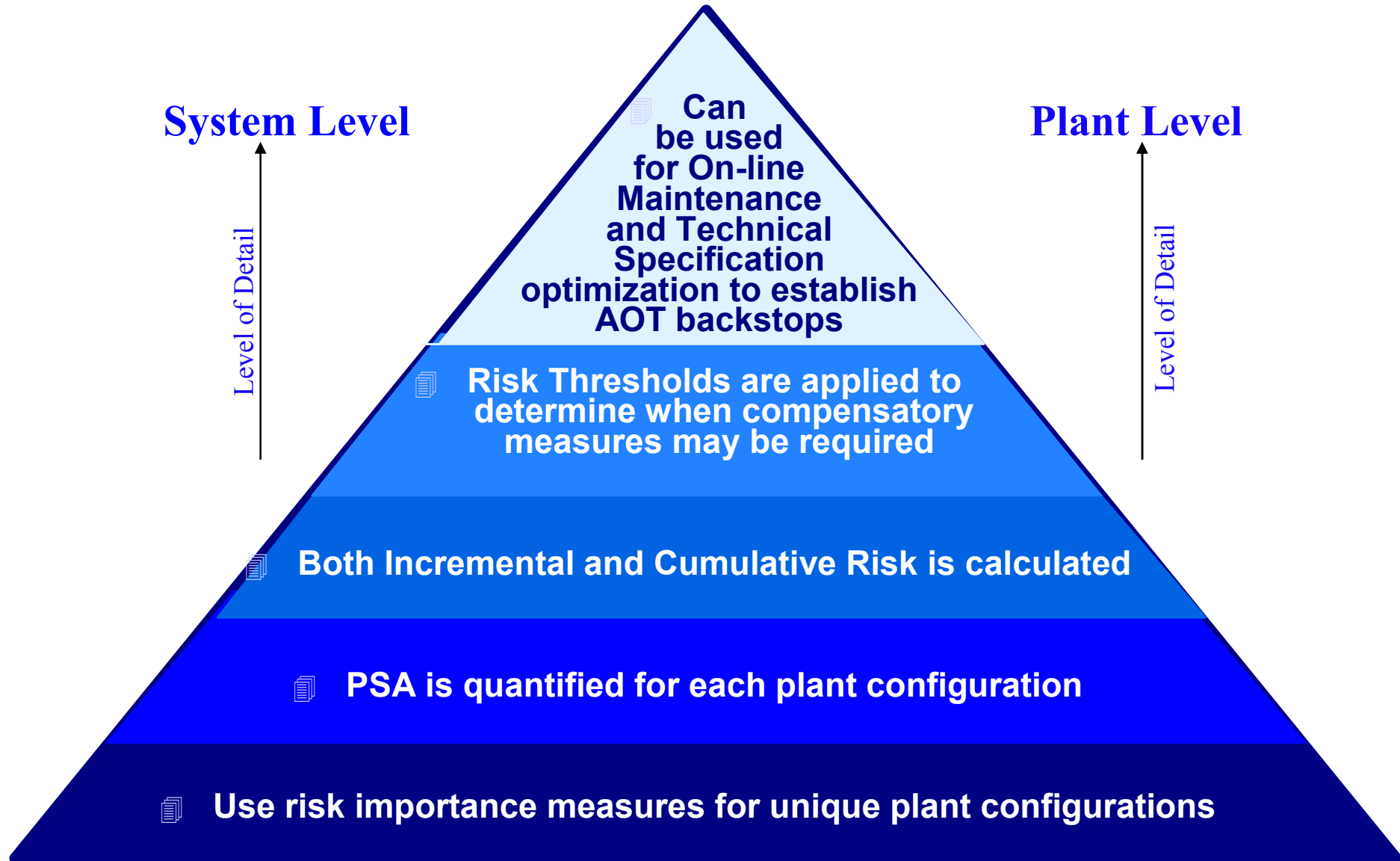
- **1982** - Initiated Work on PSA Model
- **1989** - Full scope Level 1 PSA including External Events
- **1990** - **Risk-based evaluation of Technical Specifications**
- **1992** - NRC staff issues SER on the STP Level 1 PSA
- **1992** - STP IPE per Generic Letter 88-20
- **1992** - Level 2 PSA
- **1993** - **NRC staff approves revised Tech Spec AOTs and Surveillance Intervals based on PSA**
- **1994** - PSA input to satisfy Maintenance Rule requirements
- **1994** - On-line maintenance evaluations
- **1995** - NRC staff approves STP Level 2 PSA / IPE for internal events.
- **1995** - **21 day diesel generator special test exception technical specification submitted to NRC**
- **1995** - Shutdown PSA (ORAM and RISKMAN models)
- **1996** - **14 Day DG/7 Day DG/EW AOT Tech Spec Change Approval by NRC**
- **1997** - Graded Quality Assurance Safety Evaluation Report Approval by NRC
- **2001** – Exemption from Special Treatment Requirement for Low Safety Significant Components (prototype pilot for 10CFR50.69)

Approach

- STP has agreed to further improve Technical Specifications by implementing a configuration risk management approach to limiting conditions of operation or allowed outage times
- Concept extends STP's current approach for assessing the integrated effects of equipment out of service, 10CFR50.65(a)(4) Maintenance Rule requirement
- Thus, a "similar" approach to that used for Maintenance Rule will be now applied to Technical Specifications



CONFIGURATION RISK MANAGEMENT PROGRAMS



Configuration Risk Management

Tomorrow's Tech Specs

Scope and Content

- Selected instrumentation of TS 3.3
- Code safety valves
- Pressurizer PORVs
- Accumulators
- ECCS
- RHR
- RWST
- RCB Purge
- Containment Isolation Valves
- Containment Spray
- Containment Fan Coolers
- AFW
- MSIVs
- MFIVs
- Atmospheric Steam Relief
- Component Cooling Water
- Essential Cooling Water
- CRE HVAC
- FHB HVAC
- Essential Chilled Water
- SDGs and Off-site circuits
- Batteries
- ESF Buses

Application of Risk Management Guidelines

- References the industry (EPRI) Implementation Guidelines
- Would apply to conditions where TS 3.0.3 currently applies (more than one safety division/train out of service at the same time).
- TS 3.13 format is different, but the application is the same
- Incorporates the concept of Risk Thresholds

Risk Thresholds

- **Non Risk-Significant Threshold:** a *unit-less* weekly threshold below which cumulative risk levels are considered to be non risk-significant (1.00E-06)
- **Potentially Risk-Significant Threshold** - a *unit-less** weekly threshold, which if exceeded, creates the potential for a significant reduction in the ability of risk related functions to prevent or mitigate a core damaging event (1.00E-05)

Draft TS 3.13

RISK MANAGEMENT

ALLOWED OUTAGE TIME DETERMINATIONS

LIMITING CONDITION FOR OPERATION

3.13.1 When referred to this specification, equipment that has been removed from service or declared inoperable shall be evaluated for its impact on plant risk and allowed outage times determined accordingly.

APPLICABILITY: As required by the referencing specification

ACTION:

Determine that the configuration is acceptable for Completion Time extension beyond the [Front Stop AOT],

AND

Determine that the configuration is acceptable for continued operation beyond the [Front Stop AOT] whenever configuration changes occur that may affect plant risk,

AND

Restore required inoperable [subsystem, component] to OPERABLE status within the Acceptable Allowed Outage Time Extension or 30 days, whichever is shorter.

OR

Take the ACTION required in the referencing specification for required action or completion time not met

SURVEILLANCE REQUIREMENTS

4.13.1: As required by the referencing specification

Sample Specification

PLANT SYSTEMS

3/4.7.4 ESSENTIAL COOLING WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.4 At least three independent essential cooling water loops shall be OPERABLE.

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

ACTION:

- a. With only two essential cooling water loops OPERABLE, **within 7 days** restore at least three loops to OPERABLE status **or apply the requirements of Specification 3.13, OR** be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.
- b. **With two or more essential cooling water loops inoperable, within 12 hours restore at least two loops to OPERABLE status or apply the requirements of Specification 3.13, OR be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.**

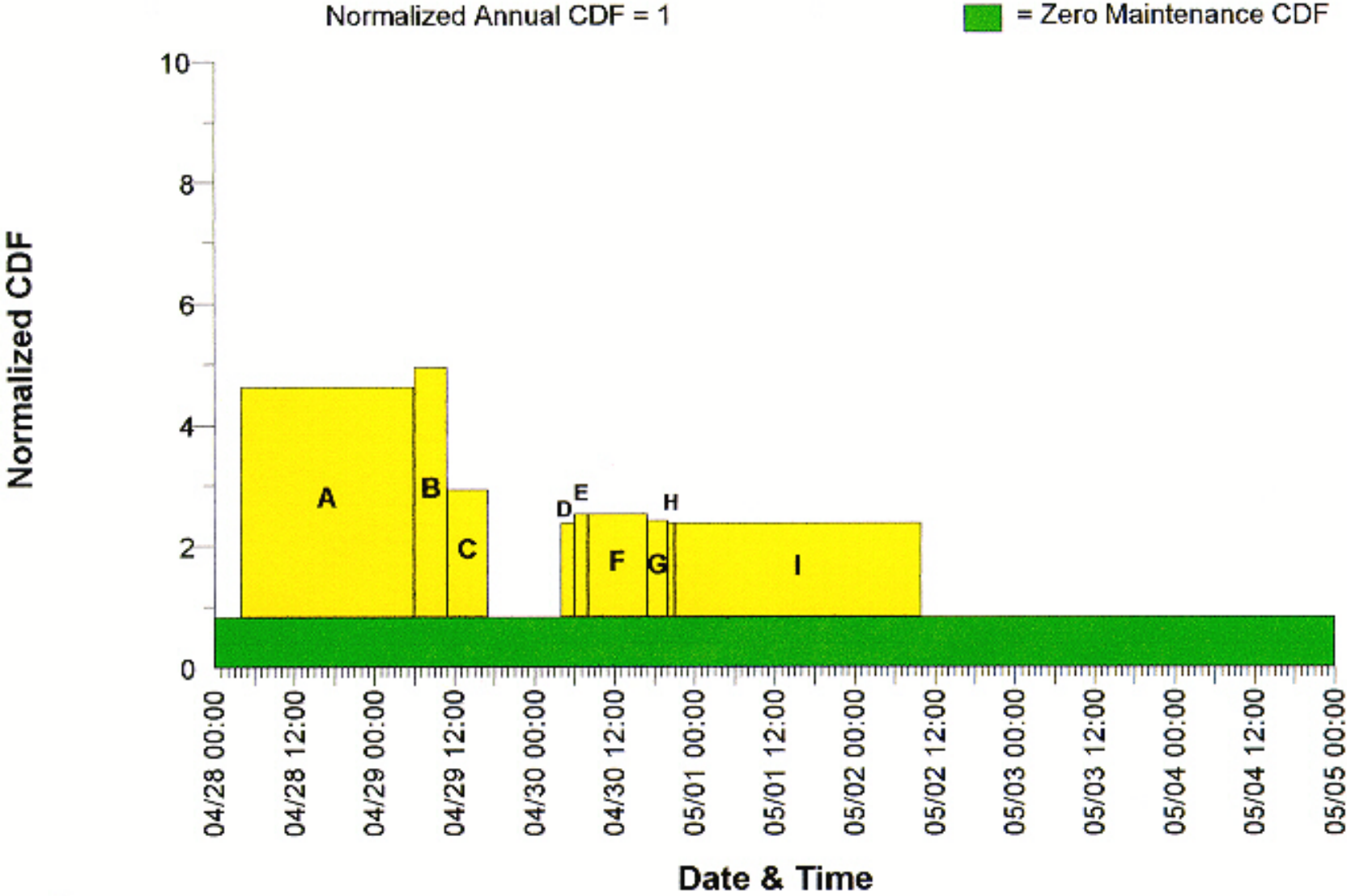
STP PRA Quality

- PRA quality issues to be addressed as part of the RG 1.200 pilot
- PRA quality scope to include industry peer review, ASME Stnd (ASME RA-S-2002), and RG 1.200
- PRA quality needed for 4B application will also be evaluated

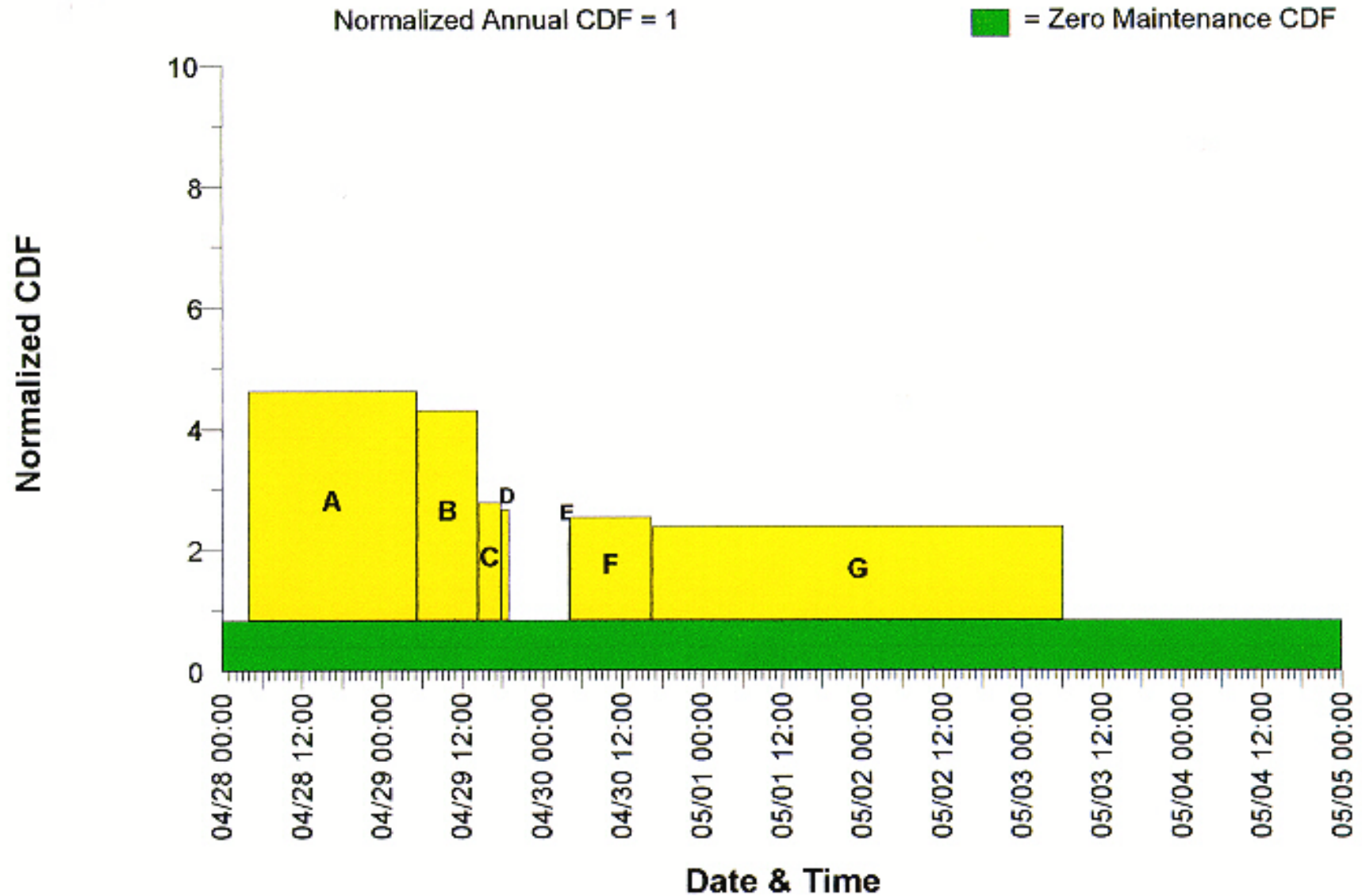
Implementation

- Applies the STPNOC Configuration Risk Management Program (CRMP)
 - Same program used for 10CFR50.65(a)(4)
- STP has extensive experience in applying the CRMP
 - Routinely used to manage weekly work
 - Effectively applied to manage the recent extended diesel generator outage

PLANNED RISK PROFILE FOR UNIT 1 WEEK OF 4/27/01



ACTUAL RISK PROFILE FOR UNIT 1 WEEK OF 4/27/01





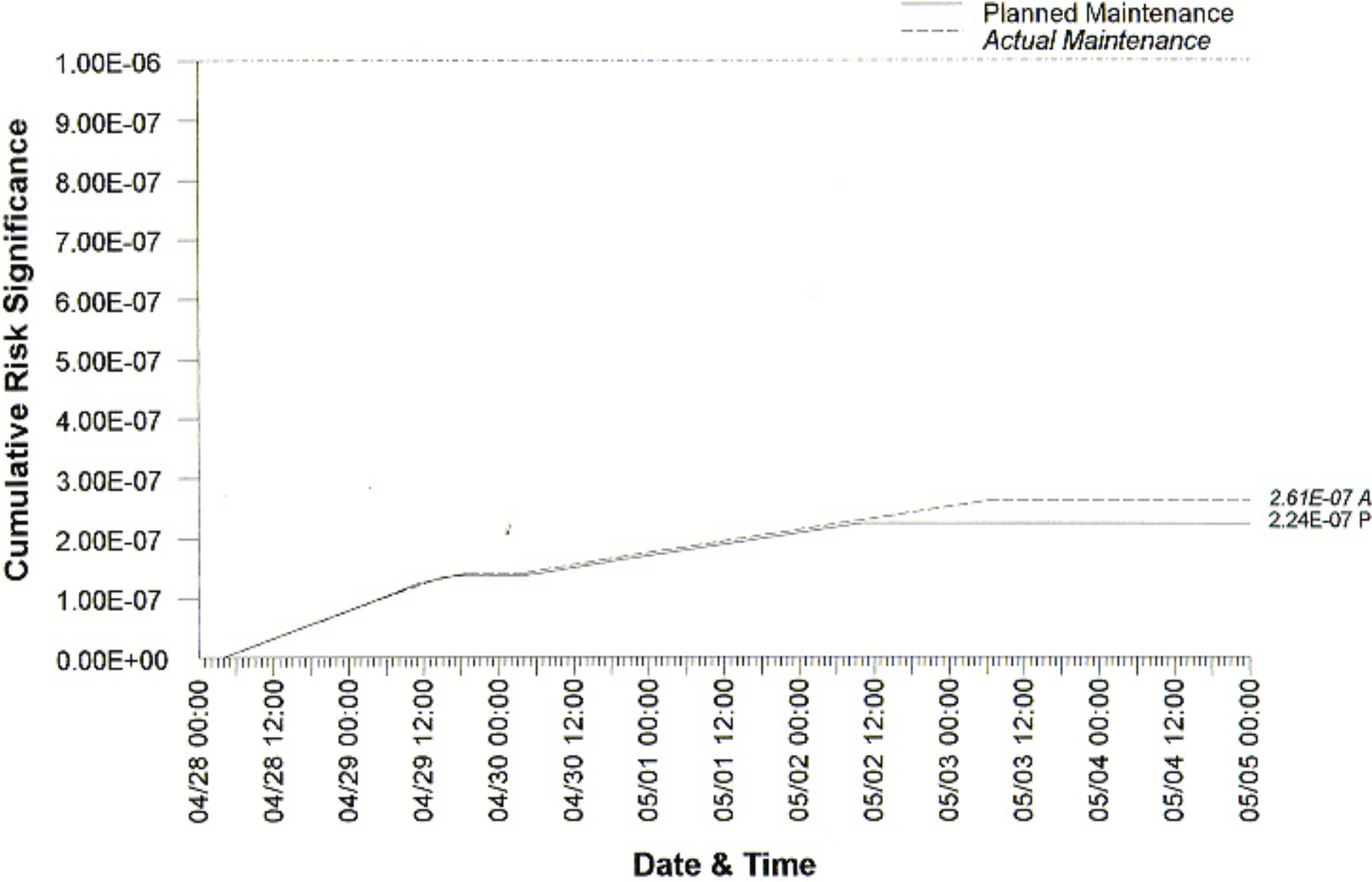
SCHEDULE FOR UNIT 1 WEEK OF 04/28/97

SCHEDULE						
System	Planned Time Out of Service	Planned Time Back in Service	Duration (hhh:mm)	Actual Time Out of Service	Actual Time Back in Service	Duration (hhh:mm)
AFC	04/28/97 06:00	04/28/97 19:00	013:00	04/28/97 06:15	04/28/97 20:37	014:22
AFC	04/28/97 07:00	04/28/97 10:00	003:00	***	***	
AFC	04/28/97 12:00	04/29/97 15:00	003:00	***	***	
CVA	04/28/97 04:00	04/28/97 20:00	016:00	04/28/97 05:15	04/28/97 21:07	015:52
PORVC	04/28/97 04:00	04/28/97 14:00	010:00	04/28/97 05:15	04/28/97 23:42	018:27

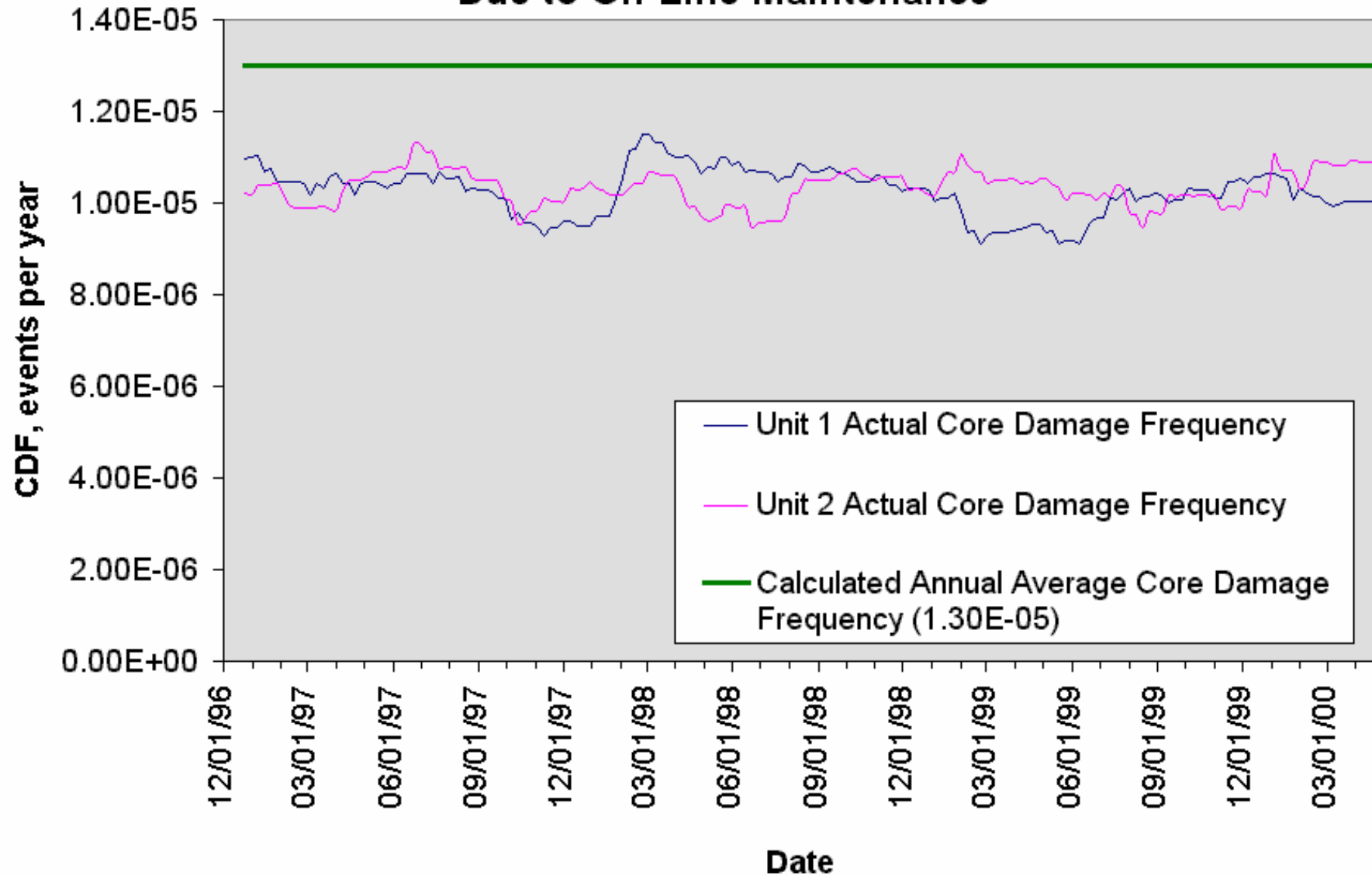
ACTUAL MAINTENANCE STATES:			
Maintenance State Label	PRA System Affected	Maintenance State Start	Maintenance State
No Risk-Significant Maint.	No Risk Significant Maintenance	04/28/97 00:00	04/28/97 05:15
Maintenance State A	CVA PORVC	04/28/97 05:15	04/28/97 06:15
Maintenance State B	AFC CVA PORVC	04/28/97 06:15	04/28/97 20:37
Maintenance State C	CVA PORVC	04/28/97 20:37	04/28/97 21:07
Maintenance State D	PORVC	04/28/97 21:07	04/28/97 23:42
No Risk-Significant Maint.	No Risk Significant Maintenance	04/28/97 23:42	04/28/97 00:00

PLANNED MAINTENANCE STATES:			
Maintenance State Label	Maintenance PRA System Affected	Maintenance State Start	Maintenance State
No Risk-Significant Maint.	No Risk Significant Maintenance	04/28/97 00:00	04/28/97 04:00
Maintenance State A	CVA PORVC	04/28/97 04:00	04/28/97 06:00
Maintenance State B	AFC CVA PORVC	04/28/97 06:00	04/28/97 14:00
Maintenance State C	AFC CVA	04/28/97 14:00	04/28/97 19:00
Maintenance State D	CVA	04/28/97 19:00	04/28/97 20:00
No Risk-Significant Maint.	No Risk Significant Maintenance	04/28/97 20:00	04/28/97 07:00
Maintenance State E	AFC	04/28/97 07:00	04/28/97 10:00
No Risk-Significant Maint.	No Risk Significant Maintenance	04/29/97 10:00	04/29/97 12:00
Maintenance State F	AFC	04/29/97 12:00	04/29/97 15:00
No Risk-Significant Maint.	No Risk Significant Maintenance	04/29/97 15:00	04/28/97 00:00

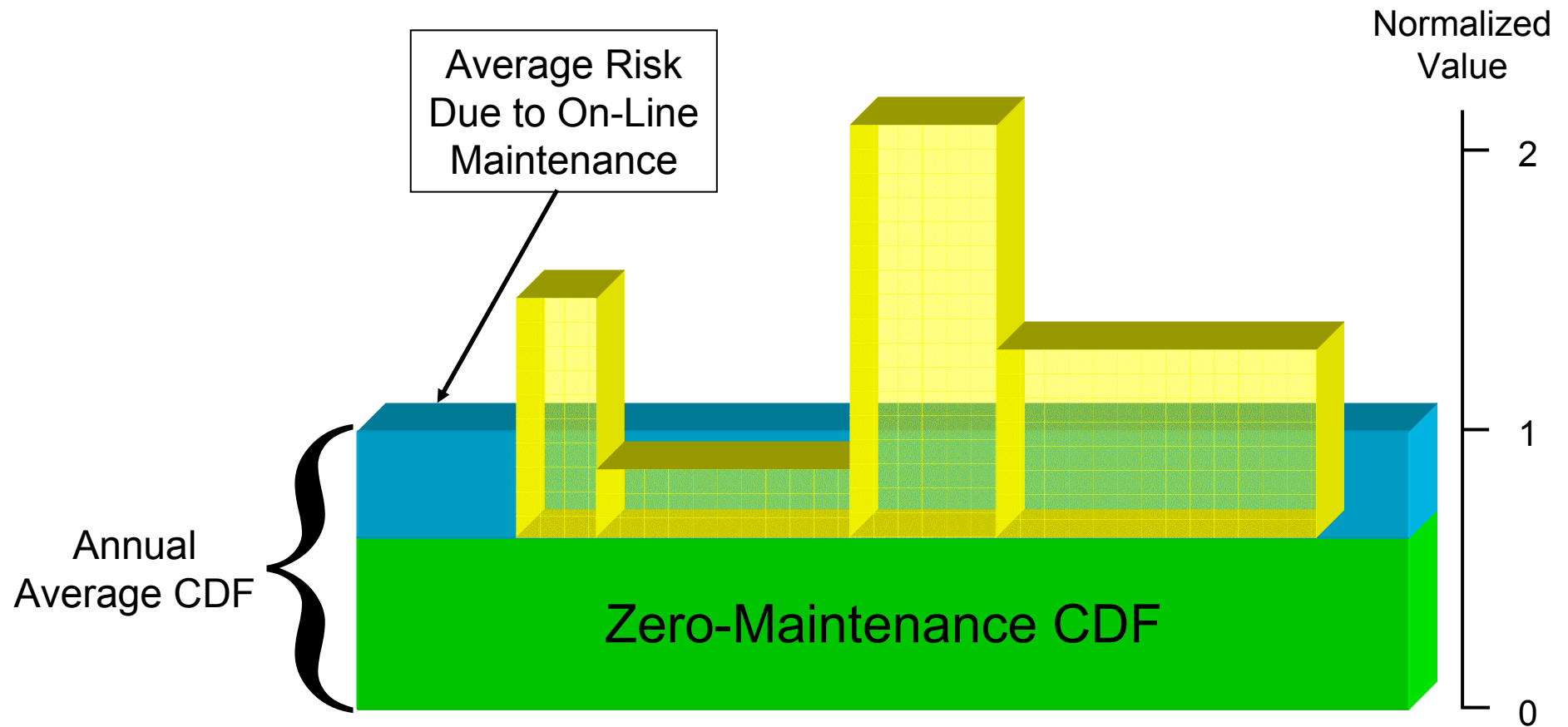
ACTUAL RISK PROFILES FOR UNIT 1 WEEK OF 4/27/01



South Texas Project Actual Core Damage Frequency Due to On-Line Maintenance

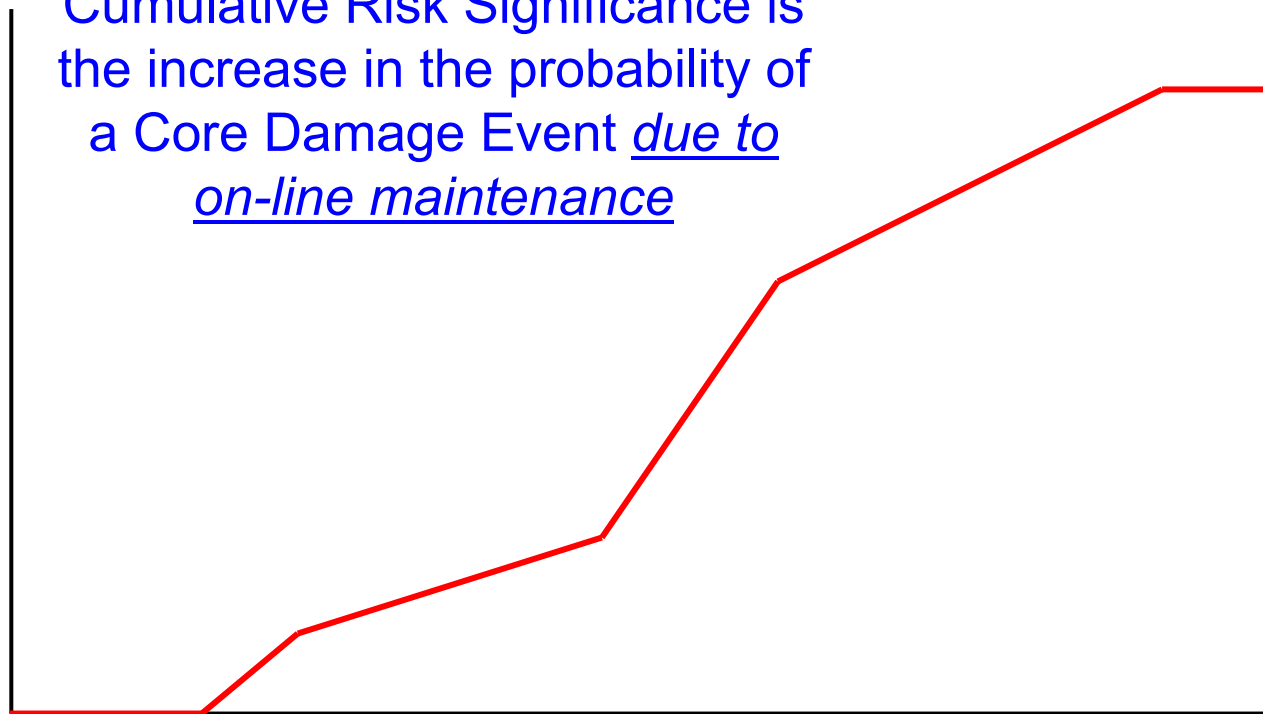


How Risk Values Stack Up



How Risk Values Add Up

Cumulative Risk Significance is the increase in the probability of a Core Damage Event due to on-line maintenance



Application of RITS

Example 1: Routine Train A work week with emergent Train B condition

Time (hh:mm)	Event	Frontstop	Calculated AOT (time to reach 1E-05)	Risk (/hr)	Comment
00:00	Begin Train A work week (SDG, ECW, CCW, HHSI)	HHSI (3.5.2.a): 7 days CCW (3.7.3.a): 7 days ECW (3.7.4.a): 7 days SDG (3.8.1.1.b): 14 days	NA, planned to remain within frontstop allowed outage time.	5.9E-09	Routine planned maintenance
24:00	Train B HHSI found to be inoperable	3.5.2.b: 6 hours to apply TS 3.13	24 days	1.7E-08	Emergent condition where CTS would require TS 3.0.3 entry. RITS permits the station to address the condition with normal work controls.
36:00	Train B HHSI restored	Exit TS 3.5.2.b and TS 3.13 applicability. Back on the work week clock with 36 hours elapsed.	NA	5.9E-09	

Application of RITS

Example 2: Emergent condition while in configuration where TS 3.13 is in use

Time (hh:mm)	Event	Frontstop	Calculated AOT (time to reach 1E-05)	Risk (/hr)	Comment
00:00	ECW pump replacement expected to last 10 days.	TS 3.7.4.a: 7 days (Also makes associated SDG inoperable)	1 train of ECW could be allowed OOS up to the 30-day backstop	4.5E-09	TS 3.13 requirements apply after 7 days. The risk is calculated from the time the ECW is taken out of service.
8 days	Turbine-driven AFW found to be inoperable	TS 3.7.1.2.b: 72 hours TS 3.8.1.1.d: 24 hours	27 days	1.5E-08	Regardless of the frontstop time for the TDAFW pump, TS 3.13 applies because the ECW has gone beyond its frontstop. TS 3.13 requires a determination of the acceptability of the configuration with the additional inoperable TDAFW. Application of the CRMP would determine the configuration is acceptable.
9 days	ECW pump is restored	TS 3.7.1.2.b: 72 hours less the 24 hours that have transpired.	> 30 days (backstop would apply)	1.5E-09	The condition that caused TS 3.13 to apply has been exited and there are no TS beyond their frontstop time. The frontstop AOT may be applied to the TDAFW.

Application of RITS

Example 3: Same as Example 2, except that the emergent condition is restored first

Time (hh:mm)	Event	Frontstop	Calculated AOT (time to reach 1E-05)	Risk (/hr)	Comment
00:00	ECW pump replacement expected to last 10 days.	TS 3.7.4.a: 7 days	1 train of ECW could be allowed OOS up to the 30-day backstop	4.5E-09	TS 3.13 requirements apply after 7 days. The risk is calculated from the time the ECW is taken out of service
8 days	Turbine-driven AFW found to be inoperable	TS 3.7.1.2.b: 72 hours TS 3.8.1.1.d: 24 hours	27 days	1.5E-08	Regardless of the frontstop time for the TDAFW pump, TS 3.13 applies because the ECW has gone beyond its frontstop. TS 3.13 requires a determination of the acceptability of the configuration with the additional inoperable TDAFW. Application of the CRMP would determine the configuration is acceptable.
9 days	TD AFW restored	NA	> 30 days	4.5E-09	TS 3.13 still applies. TDAFW no longer contributes to risk calculation. A new completion time may be calculated.

SDG 22 113 Day Extended AOT

- One-time emergency TS Change approved on December 30, 2003
- Configuration risk to be managed by application of the STP Configuration Risk Management Program (CRMP).
- Good example of how the CRMP works
 - Duration and risk bound any that would be encountered using proposed RITS

SDG 22 113 Day Extended AOT

- AOT extension met RG 1.174 and RG 1.182 acceptance criteria
- Installed non-safety DGs (NDG) as compensatory action
 - RG criteria met without credit for NDGs
- STPNOC is closely monitoring the risk profile

SDG 22 113 Day Extended AOT

Comparison of Planned and Actual Risk (ICCDP) for Unit 2 During SDG 22 Outage

Data source: NDG Planned - PRA Rev 4 Model including NDG effect on risk (NDG failure and associated operator data are assumed)
 Rev 4 Planned - PRA Rev 4 Model assuming no NDG effect on risk
 Actuals - RAsCAL data for previous work week and PRA Rev 4

