Tabletop Exercises: Risk Managed Technical Specifications (RMTS)

Public Workshop to Perform
Tabletop Exercises Regarding Existing Guidance on
Risk Managed Technical Specification for
New Reactors

8:00 a.m. to 5:00 p.m.
Thursday, May 26, 2011
NRC, Twinbrook Office, Rockville, MD

Presented by
C. R. (Rick) Grantom P.E.
South Texas Project

OUTLINE

- Introduction & Background *(10 Minutes)*
- Operation's Risk Monitoring Tool *(5 Minutes)*
- RMTS Use at STP – Case Studies *(10 Minutes)*
  - Case Study 1 (Class 1E Inverters)
  - Case Study 2 (Class 1E 125V. Batteries)
  - Case Study 3 (Turbine Driven AFW Pump)
- Cumulative Effects Evaluation *(5 minutes)*
- RMTS Lessons Learned at STP *(15 minutes)*
  - Operational Impact
  - Software Platform
  - Software User Interface
  - Points of Confusion
- Summary *(5 Minutes)*

Introduction & Background

Introduction & Background

- Tech Spec AOTs have been based on heuristics or deterministic criteria
- The overall objective of the RMTS initiative is to provide a risk-informed approach to determine AOTs
- NRC approved STP's RITS 4B LAR on July 13, 2007
- STP implemented & deployed RMTS on July 13, 2007!
- STP now has nearly 4 years of experience using RMTS.
- RMTS has provided unprecedented operational flexibility, improved equipment reliability, and has reduced burden on STP and NRC staff
- There have been some lessons learned about the implementation of this program at STP via RICTCal

RMTS at STP

- STP does not have Improved Tech Specs
- Added RMTS Tech Spec 6.8.3.k:

k. Configuration Risk Management Program (CRMP)

A program to calculate risk-informed completion time in accordance with NEI 06-09, "Risk-Managed Technical Specifications (RMTS) Guidelines, Rev. 0". The CRMP may be used for calculating a risk-informed completion time only in Mode 1 and Mode 2. In accordance with NEI 06-09, the completion time determined using the CRMP shall not be more than 30 days.

Example RMTS LCO Action

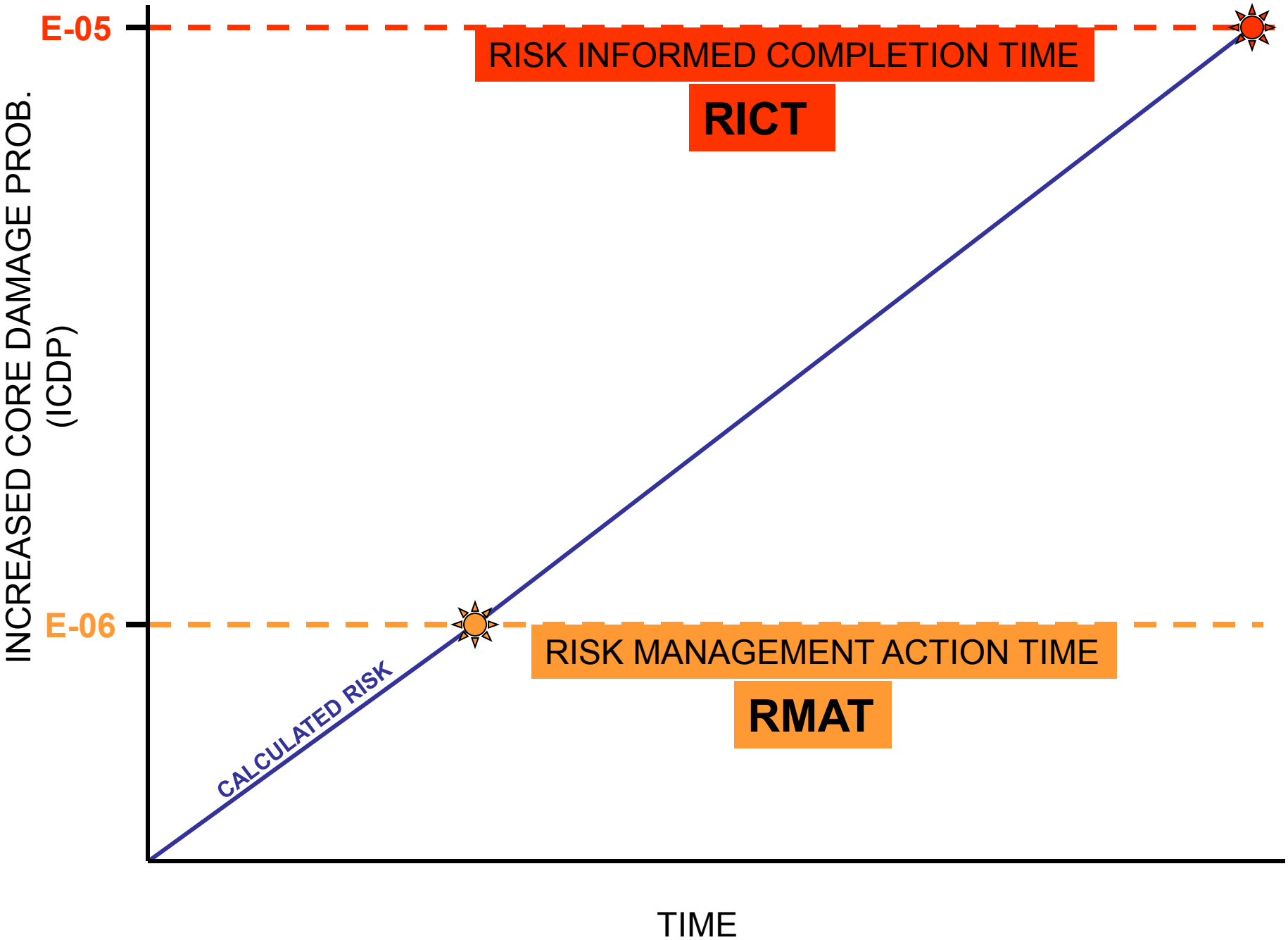
3.7.14 At least three independent Essential Chilled Water System loops shall be OPERABLE.

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

ACTION:

a. With only two Essential Chilled Water System loops OPERABLE, within 7 days restore at least three loops to OPERABLE status or apply the requirements of the CRMP, 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 Chilled Water System loops inoperable, within 1 hour restore at least two loops to OPERABLE status or apply the requirements of the CRMP, or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.


E-05
E-06
INCREASED CORE DAMAGE PROB.
(ICDP)
RISK INFORMED COMPLETION TIME
RICT
RISK MANAGEMENT ACTION TIME
RMAT
CALCULATED RISK
TIME

Operations’ Risk Monitoring Tools

Operations' Risk Monitoring Tool RAsCal/RICTCal

- **R**isk **As**sessment **Cal**culator
  - Used for 50.65(a)(4)
  - Based on "FUNCTIONAL"
- **R**isk **I**nformed **C**ompletion **T**ime **Cal**culator
  - Used for RMTS
  - Based on "OPERABLE"
- Operations & Work Control responsible for 'planned' and 'actual' risk profiles

On-Line Risk Monitoring Tools

- Features of Risk Monitoring tools:
  - **Extends/translates** the plant specific PRA to a configuration risk management software user tool for plant operators & work control
  - Used for **50.65 (a)(4)** which displays increases in ICDP and ILERP based on **Functional/Non-Functional** times
  - For **RMTS**, calculates allowed outage time (RMAT & RICT) to specified risk thresholds in accordance based on **OPERABLE/Non-OPERABLE** times
  - Facilitates required documentation for Maintenance Rule and RMTS regulatory requirements
  - Best if located on an enterprise database platform (ORACLE) but can be local to control room with LAN access
  - Incorporates User requirements
- Several exist (e.g., Safety Monitor, EOOS, Paragon, Risk Spectrum) but will need extensive programming to satisfy RMTS & User requirements

RICTCal/RAsCal Entry Screen

PRD2 Oracle Application Server Forms Services - WebUtil - Microsoft Internet Explorer provided by South Texas Project

RAFMAIN - RictCal and Rascal Main Form - T020258@PI0

Action Edit Query Block Record Field Favorites Help

Entry | RICTCal | RAsCal | CALC | RAsCal CALC

RictCal/Rascal Header: CURRENT

RA Seq No: 1546 Unit: 1 Used By: SRO - Actual

PRA Model: MAS_REV6 BOP Model: BOP_REV1 RAsCal Eval Start Date: 01/09/2011 20:00

Comments:

Curr Rict Start: Original Rict Start:

PRA Maintenance:

Seq No	Risk Function	RMTS	Train	Inoperable Date	Operable Date	Front Stop Exceeded Date	Non Functional Date	Functional Date	View CRMG
1	CCA	Y	A	01/09/2011 22:00			01/09/2011 22:00		
2	DGA	Y	A	01/09/2011 22:00			01/09/2011 22:00		
3	EWA	Y	A	01/09/2011 22:00			01/09/2011 22:00		
4	CHA	Y	A	01/09/2011 20:00			01/09/2011 20:00		
5	HHA	Y	A	01/09/2011 20:00			01/11/2011 03:00		
6	LHA	Y	A	01/09/2011 20:00			01/09/2011 20:00	01/10/2011 15:09	
7	SICA	Y	A	01/11/2011 14:00			01/11/2011 14:00		

ALL OPEN

BOP Maintenance:

Seq No	Risk Function	Non Functional Date	Functional Date	View CRMG

ALL OPEN

Clone WC - Planned to WC - Planned

Clone SRO - Actual to WC - Planned

Merge WC - Planned to SRO - Actual

RICTCal User Manual

PRA Generic Guidelines

BOP General Information

Record: 1/8 ... List of Valu... <OSC>

Example: Comparison of Two Equipment

PRD2 Oracle Application Server Forms Services - WebUtil - Microsoft Internet Explorer provided by South Texas Project

RAFMAIN - RictCal and Rascal Main Form - T020258@PI0

Action Edit Query Block Record Field Favorites Help

Entry | RICTCal | RAsCal | CALC | RAsCal CALC

RA Seq No: 1546 Unit: 1

SRO - MODE

Print RICTCal

Current Config: CCA CHA DGA EWA HHA LHA RHRA

Time Now: 01/11/2011 12:29 Current Rict Start: 01/09/2011 20:00 Duration: 40.48

CDF: 4.46E-05 ICDP (Year): 3.96E-05 ICDP (Hour): 4.52E-09

LERF: 1.85E-06 ILERP (Year): 1.38E-06 ILERP (Hour): 1.58E-10

ICDP (RICT): 1.79E-07

ILERP (RICT): 6.19E-09

RICT BSCT: 02/08/2011 20:00

For: CHA

Risk Informed: 04/12/2011 02:53

Bounded By: Backstop

CT: 02/08/2011 20:00

AT: 01/19/2011 02:15

	ICDP Threshold	CT	Completion Date	ILERP Threshold	CT	Completion Date
RMAT:	1.00E-06	181.78	01/19/2011 02:15	1.00E-07	593.77	02/05/2011 06:15
RICT:	1.00E-05	2174.41	04/12/2011 02:53	1.00E-06	6290.42	09/30/2011 14:54

Maintenance States:

Seq No	Current	Start Time	Maintenance State	Front Stop Exceeded	Duration	CDF	ICDP	LERF	ILERP
1	Y	01/09/2011 20:00	CHA HHA LHA		2.00	2.77E-05	5.17E-09	9.48E-07	1.11E-10
2	Y	01/09/2011 22:00	CCA CHA DGA EWA HHA LHA RHRA		38.48	4.46E-05	1.74E-07	1.85E-06	6.08E-09

Quantified

Unquantified

Send Unquantified Maintenance States to Risk Mgmt

Record: 1/2 ... <OSC>

RICTCal/RAsCal ENTRY SCREEN (RMTS USAGE IN JAN FOR UNIT 1)

RAFMAIN - RictCal and Rascal Main Form - T045119@PI0

Action Edit Query Block Record Field Favorites Help

Entry | RICTCal | RAsCal | CALC | RAsCal CALC

RictCal/Rascal Header: CLOSED

RA Seq No: 1546 Unit: 1 Used By: SRO - Actual

PRA Model: MAS_REV6 BOP Model: BOP_REV1 RAsCal Eval Start Date: 01/09/2011 20:00

Comments: UNIT 1 WORK WEEK 1/10/11 - 1/6/11

Curr Rict Start: Original Rict Start: 01/09/2011 20:00

PRA Maintenance:

Seq No	Risk Function	RMTS	Train	Inoperable Date	Operable Date	Front Stop Exceeded Date	Non Functional Date	Functional Date	View CRMG
1	CCA	Y	A	01/09/2011 22:00	01/16/2011 22:42	01/16/2011 22:00	01/09/2011 22:00	01/15/2011 08:52	▶
2	DGA	Y	A	01/09/2011 22:00	01/17/2011 10:12		01/09/2011 22:00	01/16/2011 04:42	▶
3	EWA	Y	A	01/09/2011 22:00	01/16/2011 22:42	01/16/2011 22:00	01/09/2011 22:00	01/15/2011 05:48	▶
4	CHA	Y	A	01/09/2011 20:00	01/16/2011 22:42	01/16/2011 20:00	01/09/2011 20:00	01/15/2011 08:51	▶
6	LHA	Y	A	01/09/2011 20:00	01/16/2011 22:42	01/16/2011 20:00	01/09/2011 20:00	01/10/2011 15:09	▶
7	SICA	Y	A	01/09/2011 20:00	01/16/2011 22:42	01/16/2011 20:00	01/11/2011 14:28	01/11/2011 15:21	▶
8	RHRA	Y	A	01/09/2011 22:00	01/16/2011 22:42	01/16/2011 22:00	01/09/2011 22:00	01/15/2011 08:52	▶

ALL OPEN

BOP Maintenance:

Seq No	Risk Function	Non Functional Date	Functional Date	View CRMG
1	OC11/21	01/17/2011 03:00	01/17/2011 10:18	▶
2	CD12/22	01/17/2011 09:00	01/17/2011 10:18	▶
				▶
				▶
				▶
				▶
				▶

ALL OPEN

Clone WC - Planned to WC - Planned

Clone SRO - Actual to WC - Planned

Merge WC - Planned to SRO - Actual

RICTCal User Manual

PRA Generic Guidelines

BOP General Information

RICTCal TAB

Entry | RICTCal | RAsCal | CALC | RAsCal CALC

RA Seq No: 1546 Unit: 1

SRO - MODE

Print RICTCal

Current Config: DGA

Time Now: 05/18/2011 12:14 Current Rict Start: Duration: 3088.23 ICDP (RICT): 7.82E-07

CDF: 1.67E-05 ICDP (Year): 1.16E-05 ICDP (Hour): 1.33E-09 ILERP (RICT): 2.77E-08

LERF: 1.18E-06 ILERP (Year): 7.16E-07 ILERP (Hour): 8.17E-11

RICT BSCT: 02/08/2011 20:00

For: CSA

Risk Informed: 03/02/2012 10:35

Bounded By: Backstop

CT: 02/08/2011 20:00

AT: N/A

	ICDP Threshold	CT	Completion Date	ILERP Threshold	CT	Completion Date
RMAT:	1.00E-06	163.69	05/25/2011 07:55	1.00E-07	885.02	06/24/2011 09:15
RICT:	1.00E-05	6934.35	03/02/2012 10:35	1.00E-06	11902.32	09/25/2012 10:32

Maintenance States:

Seq No	Current	Start Time	Maintenance State	Front Stop Exceeded	Duration	CDF	ICDP	LERF	ILERP
1		01/09/2011 20:00	CHA CSA LHA SICA		2.00	2.77E-05	5.17E-09	9.48E-07	1.11E-10
2		01/09/2011 22:00	CCA CHA CSA DGA EWA LHA RCFCA		166.00	4.46E-05	7.50E-07	1.85E-06	2.62E-08
3		01/16/2011 20:00	CCA CHA CSA DGA EWA LHA RCFCA	Y	2.00	4.46E-05	9.03E-09	1.85E-06	3.16E-10
4		01/16/2011 22:00	CCA CHA CSA DGA EWA LHA RCFCA	Y	.70	4.46E-05	3.16E-09	1.85E-06	1.11E-10
5		01/16/2011 22:42	DGA		11.50	1.67E-05	1.53E-08	1.18E-06	9.39E-10
6		01/17/2011 10:12	NO RMTS EQUIPMENT INOPERABLE		.00				

Quantified

Unquantified

Send Unquantified Maintenance States to Risk Mgmt

RMTS Case Studies at STP

RMTS CASE STUDIES

- The following case studies will describe actual plant operating experiences using RMTS.
- The case studies will show how RMTS has been used to perform On-Line Maintenance for important reliability improvements and for unplanned maintenance events.
- Operating experience in the form of lessons learned and feedback from station organizations is included.

STP RMTS Experience

Date	Tech Spec & Component	TS Front Stop	RMAT	RICT	Actual Inop Time	Actual ICDP	Actual ILERP
3/17/08	TS 3.8.3.1 Class 1E Instrument Inverter #1203 Unit 1	24 Hr	> 30 days	30 day Backstop	29.1 Hr	9.7E-09	7.2E-10
3/23/09	TS 3.8.3.1 Train C 1E Battery Unit 1	2 Hr	2 weeks	30 day Backstop	3.6 days	2.7E-07	1.8E-08
3/30/09	TS 3.8.3.1 Train C 1E Battery Unit 2	2 Hr	2 weeks	30 day Backstop	3.6 days	2.7E-07	1.8E-08
4/6/09	TS 3.8.3.1 Train A 1E Battery Unit 1	2 Hr	2 weeks	30 day Backstop	6.6 days	4.4E-07	2.7E-08
4/13/09	TS 3.8.3.1 Train A 1E Battery Unit 2	2 Hr	2 weeks	30 day Backstop	3.5 days	2.3E-07	1.4E-08

Stations with 2 divisions/trains would realize increased operational flexibility, most likely 2/3 that of a 3 train station.

STP RMTS Experience

Date	Tech Spec & Com	TS FS	RMAT	RICT	Actual INOP Time	Actual ICDP	Actual ILERP
3/29/2011	T.S. 3.7.1.2 AFW 14 Unit 1	72 hr	2 weeks	30 day	3.5 Days	2.16E-07	1.18E-09
8/3/2010	T.S. 3.7.3 B Train Sequencer Unit 2	24 hr	1 week	30 day	20 hr	5.50E-07	2.70E-08
1/16/2011	T.S. 3.7.4 ECW A Unit 1	7 days	3 days	30 day	7.1 days	7.82E-07	2.77E-08
5/14/2011	T.S. 3.8.3.1	8 hr	1.5 weeks	30 day	18 hours	1.94E-07	1.19E-08

Stations with 2 divisions/trains would realize increased operational flexibility, most likely 2/3 that of a 3 train station.

RMTS Use for Replacing Class 1E Inverters On-Line

Problem Statement:
Activities associated with changing capacitors and relay/meter calibration in Inverter EIV1203 will exceed the 24 hour Technical Specification front stop Completion Time (CT) for the Limiting Condition for Operation for DP1203 powered from its inverter with a battery backup. This will require implementation of Risk Managed Technical Specifications (RMTS) when the front stop is exceeded.

Operational Impact
When the front stop CT is exceeded Operations will have to implement RMTS.

****** First use of RMTS at STP ******

RMTS Use for Replacing Class 1E Inverters On-Line

<u>Facts/Discussion</u>

•Governing/Implementing RMTS procedures reviewed by implementing Shift Manager prior to implementation:

- 0POP01-ZO-0006 (Risk Managed Actions)
- 0PGP03-ZA-0091 (Configuration Risk Management Program),
- 0PGP03-ZG-RMTS (Risk-Managed Technical Specification Program)
- 0PGPO3-ZO-0039 (Operations Configuration Management)

•The calculated RMAT and RICT were determined to both be bounded by the Large Early Release Frequency (LERF) values as follows:

- Calculated RMAT completion date = 09/10/2008 @ 16:05
- Calculated RICT completion date = 01/24/2013 @ 01:58

Therefore, per RMTS requirements, the RMTS RICT for replacing Class 1E Inverter (EIV 1203) is the 30-day backstop which is 04/16/2008 @ 08:00.

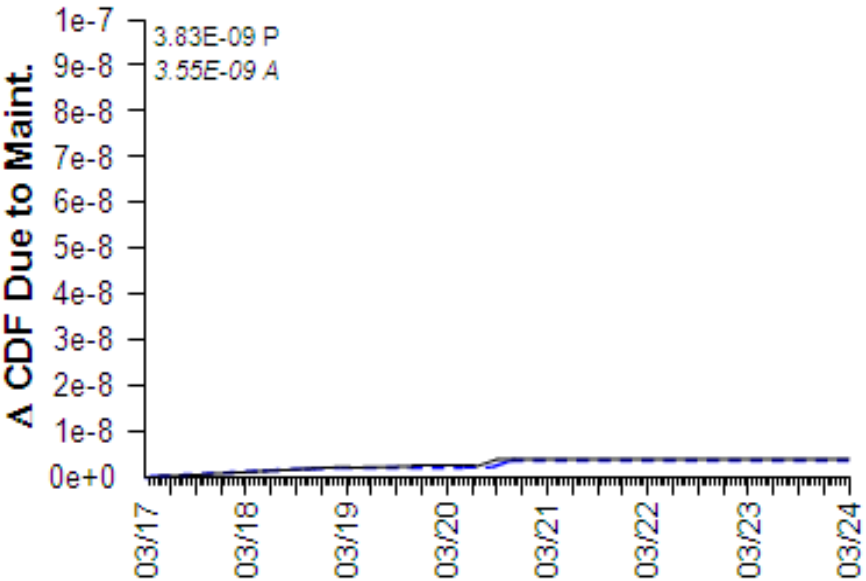
Considerations & Compensatory Measures

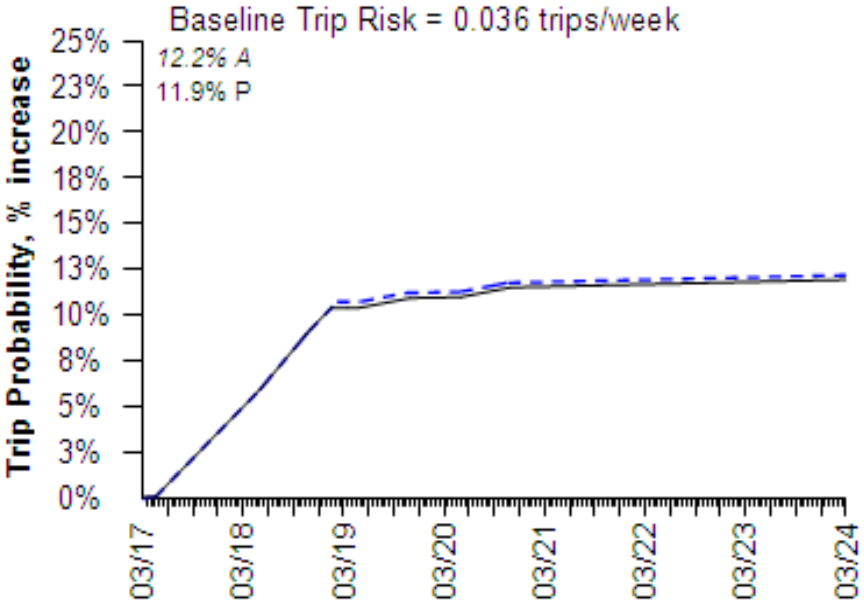
- EIV 1203 maintenance activity - not a first time evolution.
- Replacement parts tested/verified prior to work; adequate spare parts verified on hand.
- Mock-up training performed using a spare inverter.
- Activity duration based on previous performance
- Planned work schedule screened for conflicts
- Protected trains, channels & equipment were designated with admin controls.
- Other Maintenance & Operation's activities scheduled around declaring EIV-1203 OPERABLE.
- Contingencies developed in the event EIV was not returned to service as scheduled
- NRC performed inspection activity & QA performed audit

Considerations & Compensatory Measures

- Work Start - Monday (Work Week 10) – 48 hour round-the-clock schedule duration
- If the work activity were to have continued into the following work week; the Work Week schedule would have been evaluated prior to the start of Work Week 11.
- Specifically noted – unplanned failure of cross-train equipment would require completing a RICT assessment prior to exceeding the most limiting applicable Tech Spec Frontstop Completion time (i.e.,1 hour per T.S. 3.8.3.1.d or be in at least Hot Standby within the next 6 hours.
- Detailed Plan of Action developed with activity owners and responsible organizations

Actual Risk Profiles for Unit 1 Week of 03/17/2008





PRA Component	Planned Time Non-Functional	Planned Time Functional	Duration (hh:mm)		Actual Time Non-Functional	Actual Time Functional	Duration (hh:mm)
IA13/23	03/18/2008 04:00	03/18/2008 15:00	011:00		03/18/2008 04:00	03/18/2008 13:37	009:37
IV-1203	03/17/2008 08:00	03/19/2008 01:00	041:00		03/17/2008 01:00	03/18/2008 05:07	028:07
PORVB	03/20/2008 07:00	03/20/2008 12:00	005:00		03/20/2008 10:32	03/20/2008 15:23	004:51
QDPSB	03/20/2008 07:00	03/20/2008 12:00	005:00		03/20/2008 12:36	03/20/2008 14:27	001:51

BOP Component	Planned Time Non-Functional	Planned Time Functional	Duration (hh:mm)		Actual Time Non-Functional	Actual Time Functional	Duration (hh:mm)
CHG1A	03/20/2008 04:00	03/20/2008 16:00	012:00		03/20/2008 04:00	03/20/2008 15:05	011:05
CHG1B	03/18/2008 04:00	03/18/2008 16:00	012:00		03/18/2008 04:00	03/18/2008 15:45	011:45
CHG2B	03/19/2008 04:00	03/19/2008 16:00	012:00		03/19/2008 04:20	03/19/2008 15:00	010:40
CW12/22	03/17/2008 00:00	03/24/2008 00:00	168:00		03/17/2008 00:00	03/24/2008 00:00	168:00
MFWP14/24	03/17/2008 03:00	03/18/2008 21:00	042:00		03/17/2008 03:00	03/18/2008 22:30	043:30
OC11/21	03/17/2008 00:00	03/24/2008 00:00	168:00		03/17/2008 00:00	03/24/2008 00:00	168:00

RMTS Use for Replacing Class 1E Batteries On-Line

Problem Statement:
Activities associated with changing Class 1E 125V. Battery Banks will exceed the 2 hour Technical Specification front stop Completion Time (CT) for the Limiting Condition for Operation. This will require implementation of Risk Managed Technical Specifications (RMTS) when the front stop is exceeded.

Operational Impact
When the front stop CT is exceeded Operations will have to implement RMTS.

****** Subsequent use of RMTS at STP ******

Strategy & Compensatory Measures

- Scope - Two Class 1E Battery Banks per Unit (Trains A and C)
- Battery Replacements performed in selected weeks (5 day work window)
- No ESF Diesel-Generator work performed during these evolutions

http://oracleprod.corp.stpegs.net - PRD2 Oracle Application Server Forms Services - WebUtil - Microsoft Internet Explorer provi

RAFMAIN - RictCal and Rascal Main Form - T045067@PI0

Action Edit Query Block Record Field Favorites Help

Entry | RICTCal

RA Seq No: 1138 Unit: 1

SRO - MODE

Print Report | CALC

Current Config: PORVA

Time Now:	06/02/2009 08:16	Current Rict Start:		Duration:	1367.27	ICDP (RICT):	4.49E-07
CDF:	1.06E-05	ICDP (Year):	3.13E-06	ICDP (Hour):	3.58E-10	ILERP (RICT):	2.72E-08
LERF:	4.37E-07	ILERP (Year):	2.11E-07	ILERP (Hour):	2.41E-11		

	CDF Threshold	CT	Completion Date	LERF Threshold	CT	Completion Date
RMAT:	1.00E-06	1541.34	08/05/2009 13:36	1.00E-07	3016.04	10/06/2009 00:18
RICT:	1.00E-05	26705.72	06/19/2012 01:59	1.00E-06	40315.21	01/07/2014 03:28

RICT BSCT: 05/06/2009 09:00
For: BATTA
Risk Informed: 06/19/2012 01:59
Bounded By: Backstop

CT: 05/06/2009 09:00

Maintenance States:

Seq No	Start Time	Maintenance State	Front Stop Exceeded	Duration	CDF	ICDP	LERF	ILERP
2	04/06/2009 10:00	BATTA CCA DGA IV-1201	Y	1.00	3.14E-05	2.74E-09	1.69E-06	1.67E-10
3	04/06/2009 11:00	BATTA CCA DGA IV-1201	Y	142.12	3.14E-05	3.89E-07	1.69E-06	2.37E-08
4	04/12/2009 09:07	BATTA CCA DGA IV-1201 PORVA	Y	7.72	3.45E-05	2.38E-08	1.69E-06	1.29E-09
5	04/12/2009 16:50	AFA BATTA CCA DGA IV-1201 PORV	Y	.58	3.56E-05	1.88E-09	1.71E-06	9.89E-11
1	04/06/2009 09:00	BATTA CCA DGA IV-1201		1.00	3.14E-05	2.74E-09	1.69E-06	1.67E-10
6	04/12/2009 17:25	BATTA CCA DGA IV-1201 PORVA	Y	2.67	3.45E-05	8.23E-09	1.69E-06	4.44E-10
7	04/12/2009 20:05	PORVA		1.58	1.06E-05	5.66E-10	4.37E-07	3.82E-11
8	04/12/2009 21:40	DGA PORVA		.08	2.75E-05	1.91E-10	1.47E-06	1.18E-11
9	04/12/2009 21:45	PORVA		55.38	1.06E-05	1.98E-08	4.37E-07	1.34E-09
10	04/15/2009 05:08	NO RMTS EQUIPMENT INOPERABLE		.00				

Quantified
Unquantified

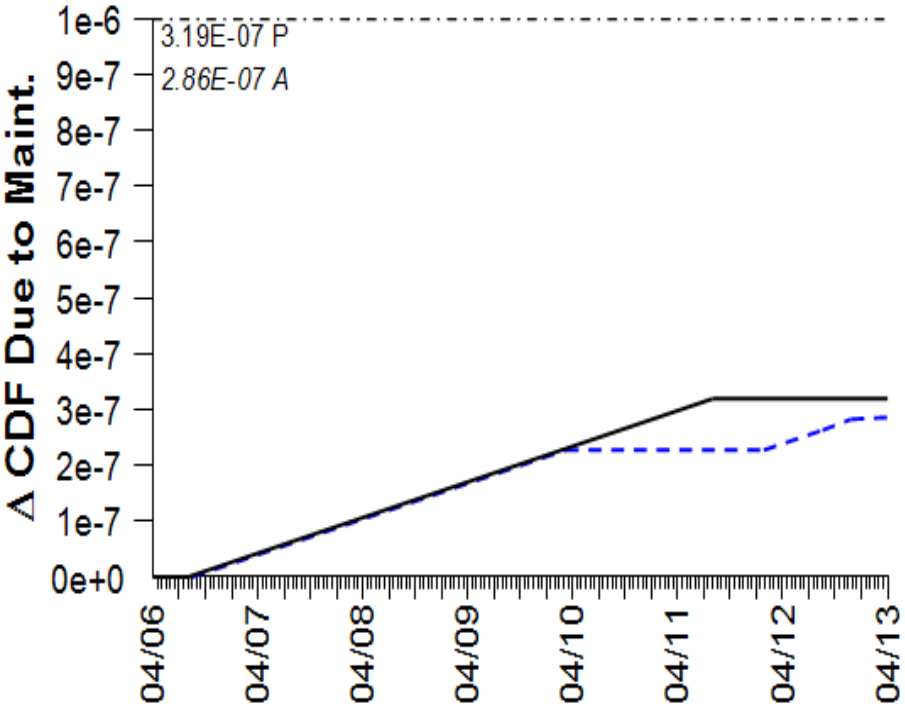
Send Unquantified Maintenance States to Risk Mgmt

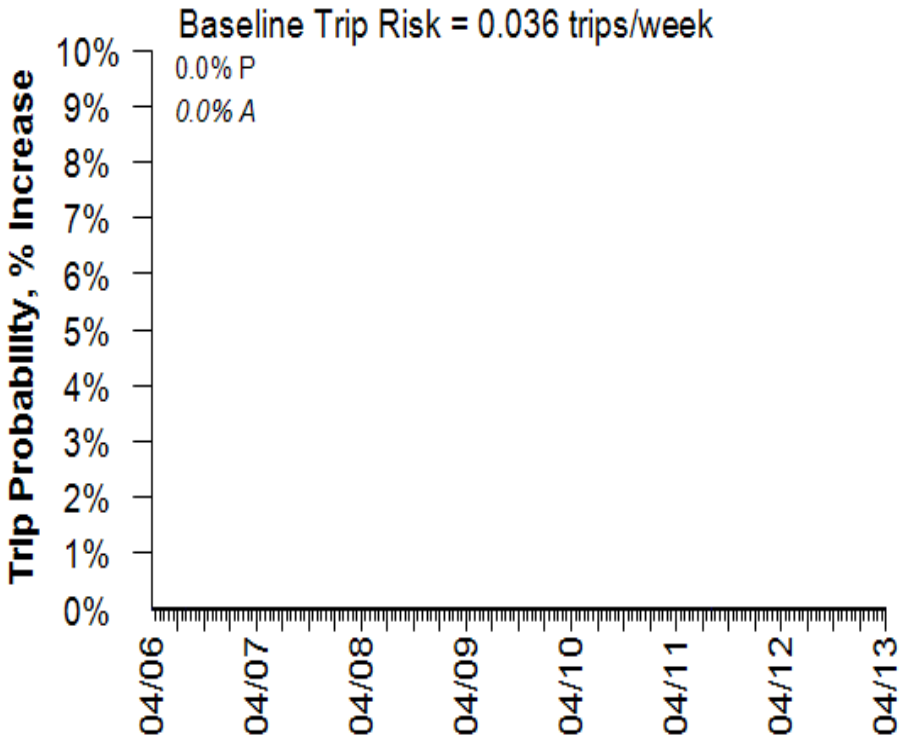
Record: 1/10 ... <OSC>

Applet oracle.forms.engine.Main started

Internet

Actual Risk Profiles for Unit 1 Week of 04/06/2009

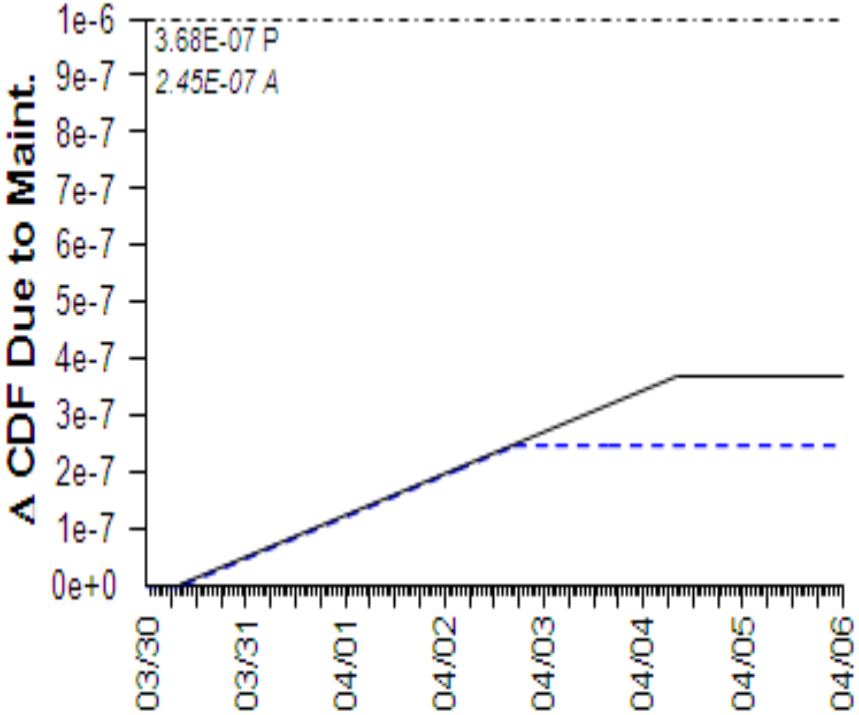


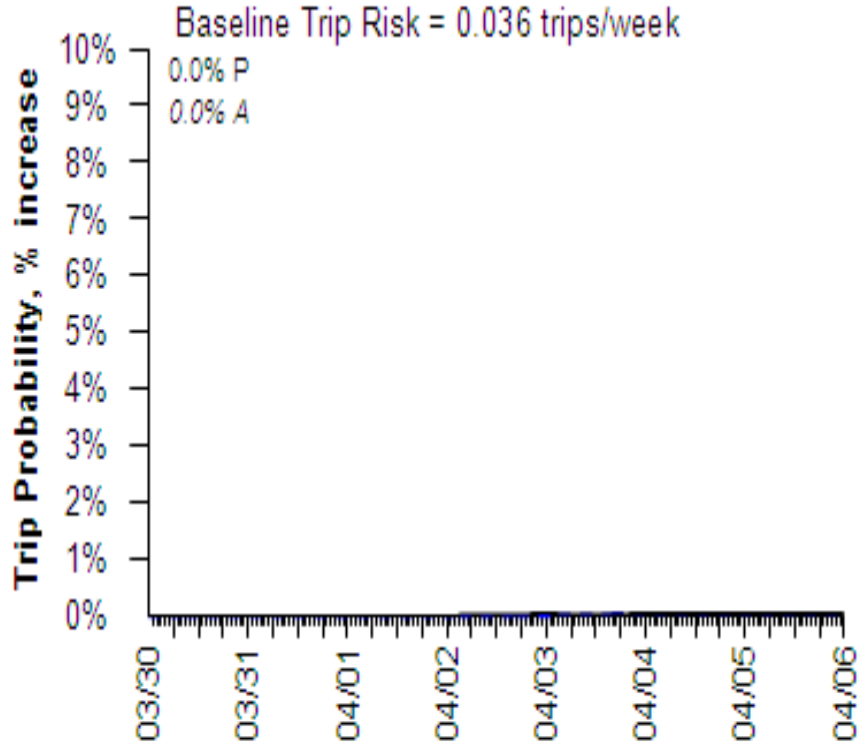


PRA Component	Planned Time Non-Functional	Planned Time Functional	Duration (hh:mm)		Actual Time Non-Functional	Actual Time Functional	Duration (hh:mm)
BATTA	N/A	N/A	N/A		04/11/2009 19:42	04/12/2009 15:41	019:59
BATTA	04/06/2009 08:00	04/11/2009 08:00	120:00		04/06/2009 09:00	04/09/2009 22:25	085:25
PORVA	N/A	N/A	N/A		04/12/2009 09:07	04/12/2009 23:59	014:52

BOP Component	Planned Time Non-Functional	Planned Time Functional	Duration (hh:mm)		Actual Time Non-Functional	Actual Time Functional	Duration (hh:mm)
NONE			N/A				

Actual Risk Profiles for Unit 2 Week of 03/30/2009





PRA Component	Planned Time Non-Functional	Planned Time Functional	Duration (hh:mm)		Actual Time Non-Functional	Actual Time Functional	Duration (hh:mm)
BATTC	03/30/2009 08:00	04/04/2009 08:00	120:00		03/30/2009 08:53	04/02/2009 16:50	079:57

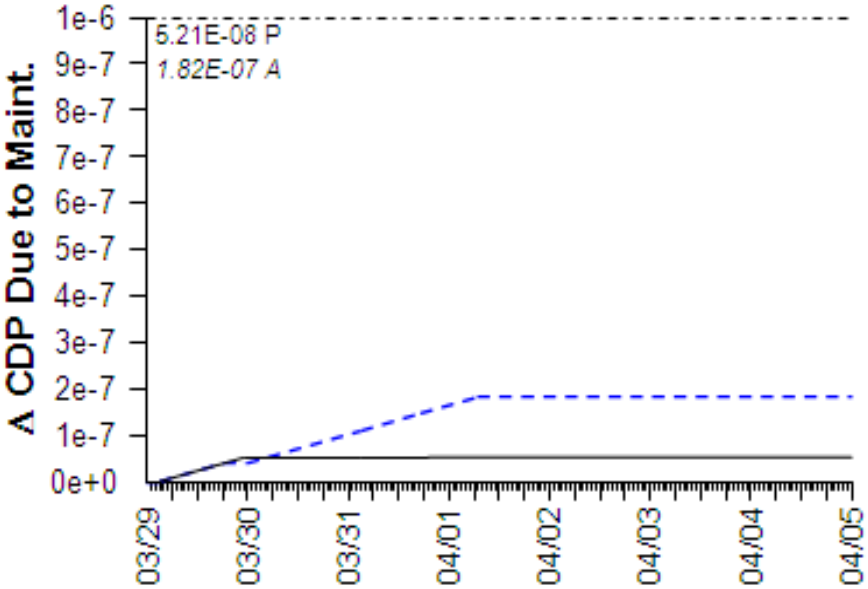
BOP Component	Planned Time Non-Functional	Planned Time Functional	Duration (hh:mm)		Actual Time Non-Functional	Actual Time Functional	Duration (hh:mm)
OC12/22	04/02/2009 03:00	04/02/2009 20:00	017:00		04/02/2009 03:00	04/02/2009 16:39	013:39
OC13/23	04/03/2009 03:00	04/03/2009 20:00	017:00		04/03/2009 03:00	04/03/2009 15:42	012:42

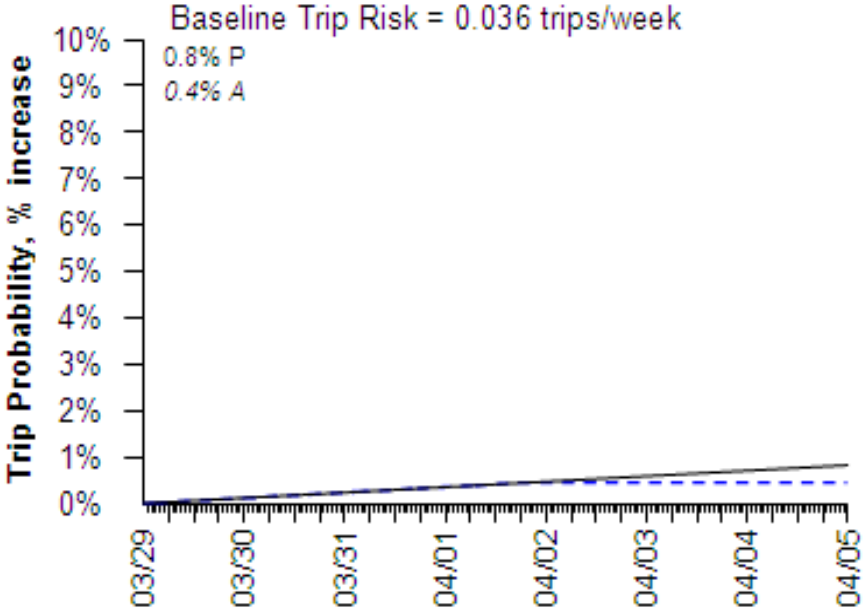
RMTS Use for Emergent Turbine-Driven Auxiliary Feedwater Pump

- Condition Report 10-6694, ENTERED Configuration Risk Management Program (CRMP) FOR TS 3.7.1.2, AFW 14, PER RISK MANAGED TECH SPECS. (04/01/2010; 0300)
- LOG BOOK ENTRY 4/1/2010 AT 0115 WITH QUANTITATIVE RISK ASSESSMENT.
- ENSURE REQUIRED INFORMATION DOCUMENTED FOLLOWING TECH SPEC ACTION EXIT. Attached:
    - 1) RICTCAL REPORT FORM FROM RMS AND
    - 2) THE RICTCAL SCREEN AT 0300 4/1/10 UPON CRMP ENTRY.

****** First unplanned use of RMTS at STP ******

Actual Risk Profiles for Unit 1 Week of 03/29/2010





PRA Component	Planned Time Non-Functional	Planned Time Functional	Duration (hh:mm)		Actual Time Non-Functional	Actual Time Functional	Duration (hh:mm)
AFD	N/A	N/A	N/A		03/29/2010 23:50	04/01/2010 06:57	055:07 **
AFD	03/29/2010 03:00	03/29/2010 23:00	020:00		03/29/2010 03:00	03/29/2010 18:13	015:13
IA14/24	03/31/2010 03:00	03/31/2010 19:00	016:00		03/31/2010 03:00	03/31/2010 17:12	014:12

BOP Component	Planned Time Non-Functional	Planned Time Functional	Duration (hh:mm)		Actual Time Non-Functional	Actual Time Functional	Duration (hh:mm)
CW14/24	03/29/2010 00:00	04/05/2010 00:00	168:00		03/29/2010 00:00	04/01/2010 17:30	089:30 *

*** There was unplanned additional maintenance required on the latch mechanism for Auxiliary Feedwater Pump 14, which resulted in the actual risk value for the week ending higher than the planned risk value. CR 10-6359*

** Circulating Water Pump 14 was returned to service within the scheduled timeframe resulting in the BOP cumulative trip risk value ending lower than the planned risk value.*

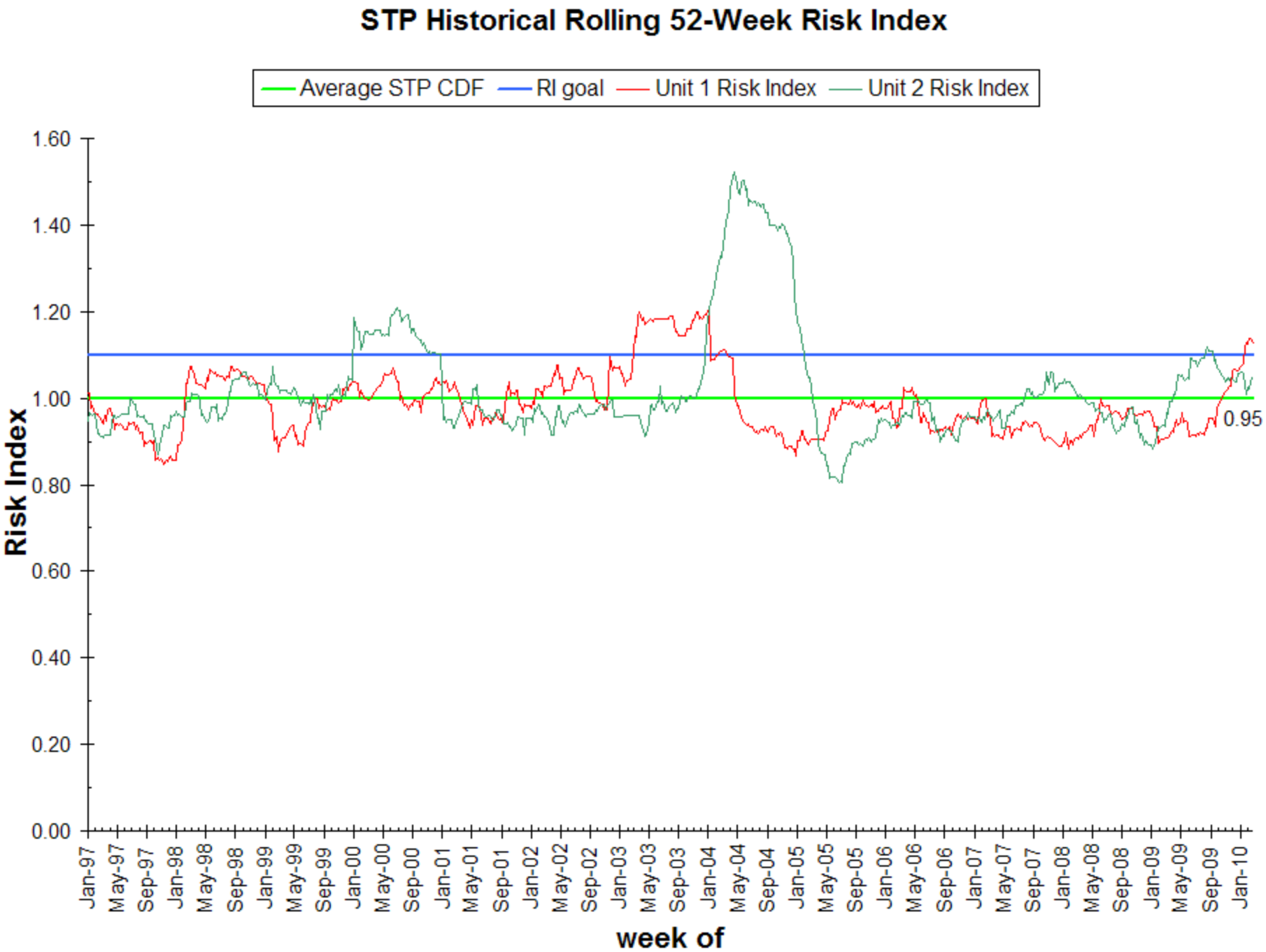
Cumulative Effects of RMTS Entries

Cumulative Risk from 2009 RMTS Entries

Time Period: From January 1st 2009 to January 1st 2010**							
Reference Model: MAS_RV51							
Seq. No.	i (FSE=Y)	Maintenance State	Duration (hr)	CDF_i (/yr)	ICDP	$LERF_i$ (/yr)	ILERP
1133	1	BATTC CCC DGC IV-1204	22	3.46E-05	6.82E-08	2.07E-06	4.63E-09
	2	BATTC CCC DGC IV-1204	61.98	3.46E-05	1.92E-07	2.07E-06	1.31E-08
1138	3	BATTA CCA DGA IV-1201	1	3.14E-05	2.74E-09	1.69E-06	1.67E-10
	4	BATTA CCA DGA IV-1201	142.12	3.14E-05	3.89E-07	1.69E-06	2.37E-08
	5	BATTA CCA DGA IV-1201 PORVA	7.72	3.45E-05	2.38E-08	1.69E-06	1.29E-09
	6	AFA BATTA CCA DGA IV-1201 PORVA	0.58	3.56E-05	1.88E-09	1.71E-06	9.89E-11
	7	BATTA CCA DGA IV-1201 PORVA	2.67	3.45E-05	8.23E-09	1.69E-06	4.44E-10
TOTAL	n=7				6.86E-07		4.34E-08
Reg Guide 1.174 Region					III-Very Small Changes, More Flexibility WRT Baseline CDF, Track Cum Impacts		III-Very Small Changes, More Flexibility WRT Baseline LERF, Track Cum Impacts
Limited by ICDP							

Risk Index

- Alternate method for assessing cumulative effects (Tier 1 Perf. Indicator at STP)
- Ratio of actual risk levels to predicted risk
  - Actual Risk = Actual Configuration Risk
  - Predicted Risk = Current Level 1 CDF avg. annual estimate
- All CRMP equipment unavailability collected
- Can tie traces to equipment and processes


STP Historical Rolling 52-Week Risk Index
Average STP CDF
RI goal
Unit 1 Risk Index
Unit 2 Risk Index
Risk Index
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.95
Jan-97
May-97
Sep-97
Jan-98
May-98
Sep-98
Jan-99
May-99
Sep-99
Jan-00
May-00
Sep-00
Jan-01
May-01
Sep-01
Jan-02
May-02
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May-03
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Jan-04
May-04
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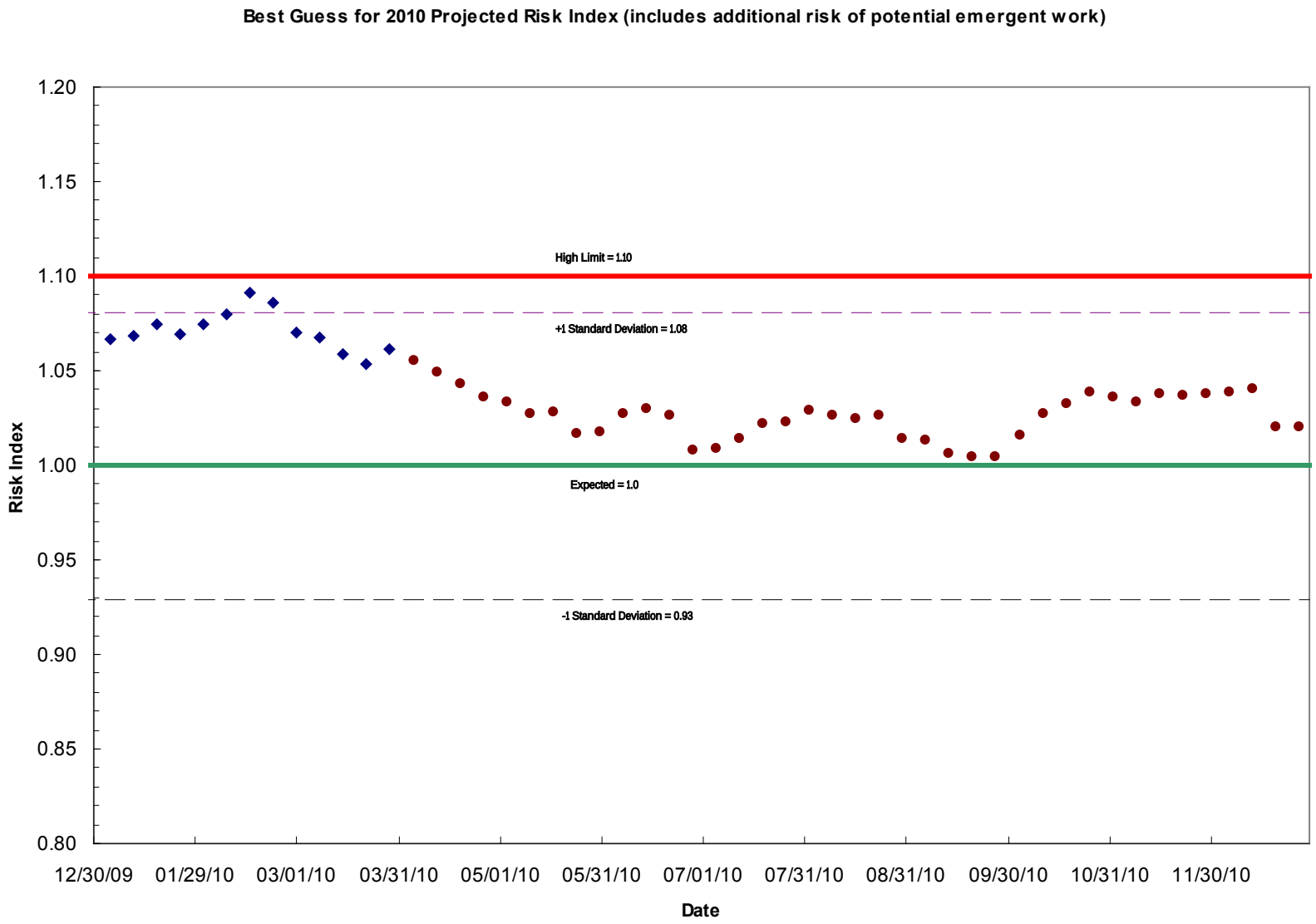
May-05
Sep-05
Jan-06
May-06
Sep-06
Jan-07
May-07
Sep-07
Jan-08
May-08
Sep-08
Jan-09
May-09
Sep-09
Jan-10
week of

The Risk Index (PRA Revision 6) for 2010 is predicted to be 1.02 when unplanned maintenance is added to the Work Control estimates



RMTS Lessons Learned

STP RMTS Lessons Learned

- **Utility and NRC process stabilities**
  - RMTS has improved the quality of the station's working environment by providing a significantly improved process for addressing Tech Spec equipment issues
- **Internal organizational benefits exist**
  - STP's RMTS experience shows that there are organizational benefits as well as a "calming" effect (NOED process, overtime, more focus on equipment reliability than licensing/regulatory approval process
- **RMTS has improved equipment reliability**
  - Equipment issues addressed sooner rather than later (less AOT panic)

STP RMTS Lessons Learned

- **Create a Site Policy on RMTS & Implementing procedures**
  - Establish an RMTS working group with regular meetings to develop training, programs, procedures, and policies.
- **Important to train on new concepts**
  - Examples: "PRA Functional", RMAT, and RICT.
  - Target Operations, Work Control, Management, and Engineering.

STP RMTS Lessons Learned

- **SCOPE of Tech Specs & RMTS is DIFFERENT!**
  - Safety Functions (Systems/Equipment) included in design basis but not modeled in PRA. Examples are:
    - Control Room HVAC: Dose Function is <u>not</u> in RMTS scope since it is <u>not</u> modeled in PRAs.
      - Plant specific issues may impose some limitations for using RMTS for some systems and components (charcoal bed filter efficiency –humidity control assumed in Design Basis).
      - User Guidance has been updated
      - Licensing is also involved in resolving this conflict
    - Tech Spec Equipment not modeled in PRA with AOTs < 72 hours
      - Feedwater Isolation Valves (FWIVs) – Operations wants it included which may mean a PRA model change and Tech Spec Change in include in the scope of the RMTS program.

STP RMTS Lessons Learned

- **Configuration Risk Management Issues**
  - For RMTS, plant configuration risk based on **OPERABLE**
    - "Mindset" for Operators for risk related issues was set to **functional/non-functional** for Maintenance Rule (a)(4) risk assessment purposes
  - Establish process to clearly define which components will be "Inoperable" for RMTS situations
    - Operations Dept. needs consistency between Work Control and On-Shift Operating Crews
    - CRMPs should be structured consistent with ECO boundaries
    - Crew-to-Crew agreement on components "inoperable" (including applicable cascading) for input into RMTS software program
    - Configuration Risk Management Program (CRMP) System Guidelines developed for Operations communication and to document system PRA risk bases
      - components modeled in PRA,
      - failure modes modeled,
      - system/train CRMP software designator

STP RMTS Lessons Learned

- **Configuration Risk Management Issues**
  - RMTS Exit Time
    - Per the NEI guidance and STP RMTS procedure, RMTS is exited when
      - All RMTS=Y equipment in RICTCal is back to OPERABLE status
      - The equipment that exceeded the TS AOT (frontstop) is back to OPERABLE status
  - RICTCal “sequence” can be closed and associated quality records are created after meeting the first option above
  - All except the last RMTS usage at STP met the first condition. During last usage, RICTCal sequence was still open although RMTS was exited

STP RMTS Lessons Learned Software Platform (+)

- Advantages with RMTS code (RICTCal) being based off the configuration risk monitoring tool (RAsCal)
- **Important:** PRA Basic Events & Equipment ID (i.e., Tag #) cross-reference
- RICTCal (and RAsCal) built around the concepts of “Risk Function”, “Maintenance State”, and “Equipment Clearance” program in a pre-quantified database lookup scheme
  - Results immediately available to users,
  - Unquantified Maintenance States added as they occur
- RICTCal & RAsCal are custom-made software tools designed by Operations and Work Control (could be made available if there is interest)

STP RMTS Lessons Learned Software Platform (+)

- RICTCal & RAsCal were combined and incorporated into STP enterprise database management system (ORACLE)
- Business enterprise platform is more appropriate for deployment of regulatory compliance software
  - Maintenance, backup, availability, user roles and configuration control
  - Automatically sending necessary quality records to Records Management with electronic signature
  - Latest revisions of the documents in Records Management are available on click of a button, like user manuals, guidance documents and procedures
  - Connection to other enterprise tools is possible like CAP and WAN databases, Operator Log, etc.
  - Automated e-mail feature

STP RMTS Lessons Learned Software Platform (-)

- The enterprise platform at STP is limited in some cases
  - Graphics interfaces
  - Initial data upload problems
  - Implementation of complicated technical calculations
  - Some forms are not user friendly
- Software coding was more complicated and challenging than expected in order to meet RMTS & User requirements

STP RMTS Lessons Learned Software Platform (-)

- Users were familiar with RAsCal features so familiarization with RICTCal was less of a challenge
  - RICTCal/RAsCal application has more fields for user entry
  - RICTCal calculations are different than RAsCal:
    - Operates on OPERABLE/INOPERABLE entries
    - BOP designators (From BOP Model) have no effect on RICTCal calculations
    - RICTCal tracks ILERP (RAsCal does not quantify)
  - Confusion about making entries
    - Cascading equipment
    - RMTS=N equipment affecting RICTCal results (used for conservative RICT calculations)

Keys to Success

- Need support from all levels of management (Top-Down)
- Work Control & Operations involvement during planning and implementation phases (accepts and owns new paradigm)
- Operations is program owner and sponsor; takes responsibility and assumes ownership of “operational risk”
  - Responsible for recording the “actual” work week risk profile
  - Configuration Risk Monitoring software tool in the Control Room and used by Control Room crews
- Beta testing period for CRMP software tool
- Training
- User feedback

SUMMARY

- RMTS is a significant process and technological improvement for nuclear power plant operation & maintenance
- RMTS improves safety margins by supporting equipment reliability with planned maintenance evolutions thus reducing exposure times with inoperable or non-functional equipment
- It is also a quality of life/work enhancement
- It facilitates safety and reliability improvements by managing the risk of plant maintenance and testing configurations
- STP's Operating Experience validates the above no adverse impacts to station performance or equipment reliability
- All US risk management groups should have RMTS in their respective strategic plans for both current and future nuclear power plants