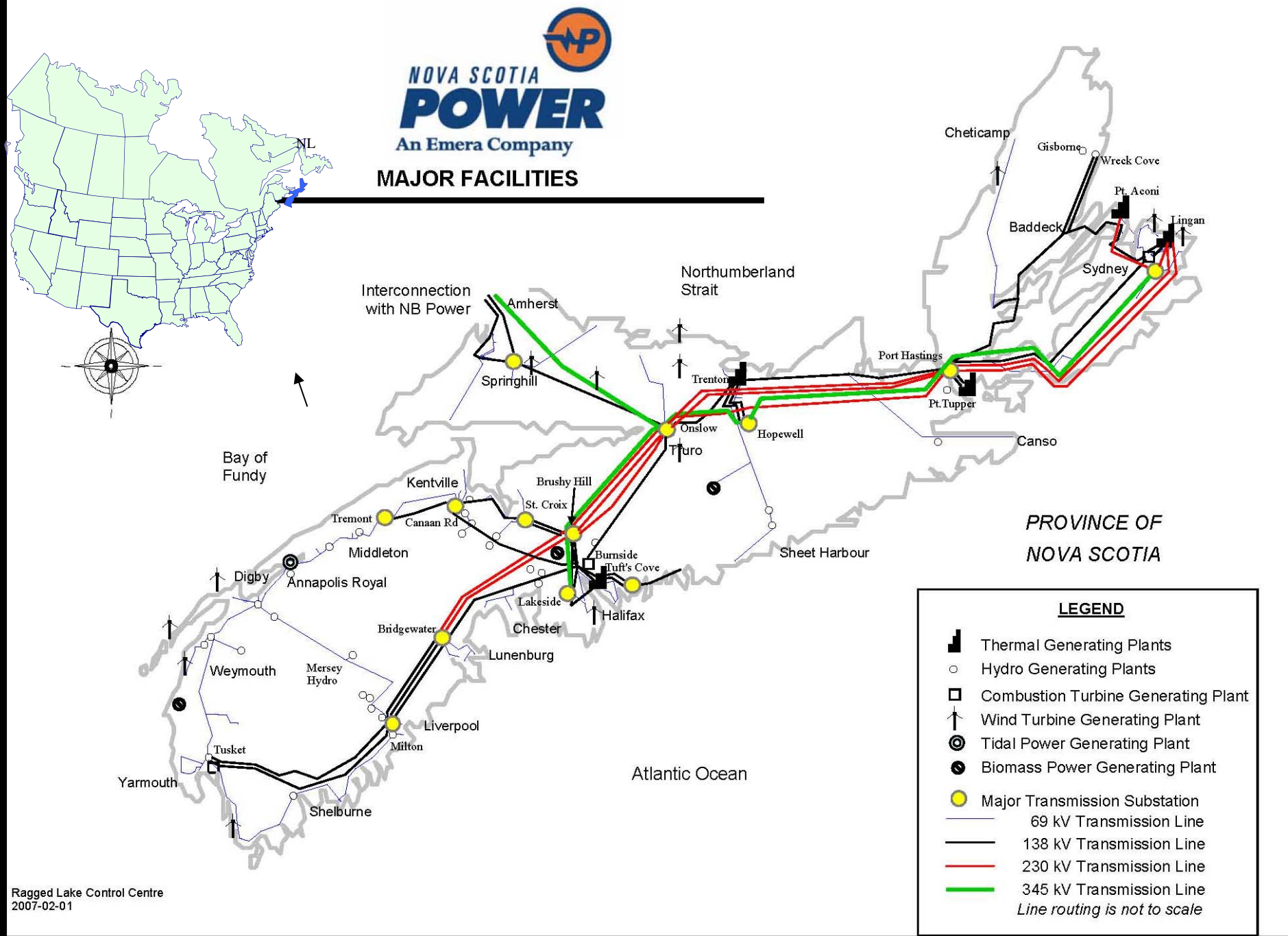


Nova Scotia Power Inc.

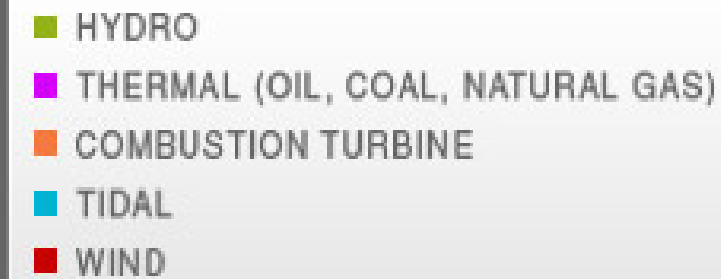
Fleet Asset Management



Nova Scotia Power: Generation

The map displays the following generation locations categorized by type:

- HYDRO (Green Squares):** Numerous locations across the province, including a large cluster in the central-western region (around Wolfville and Annapolis Royal), and several in the northern and eastern parts.
- THERMAL (OIL, COAL, NATURAL GAS) (Purple Squares):** Located near Pictou, Antigonish, and near Sydney.
- COMBUSTION TURBINE (Orange Squares):** Located near Dartmouth/Halifax and near Sydney.
- TIDAL (Blue Square):** Located near Annapolis Royal.
- WIND (Red Squares):** Located near Digby, Yarmouth, and in the northern part of the province.



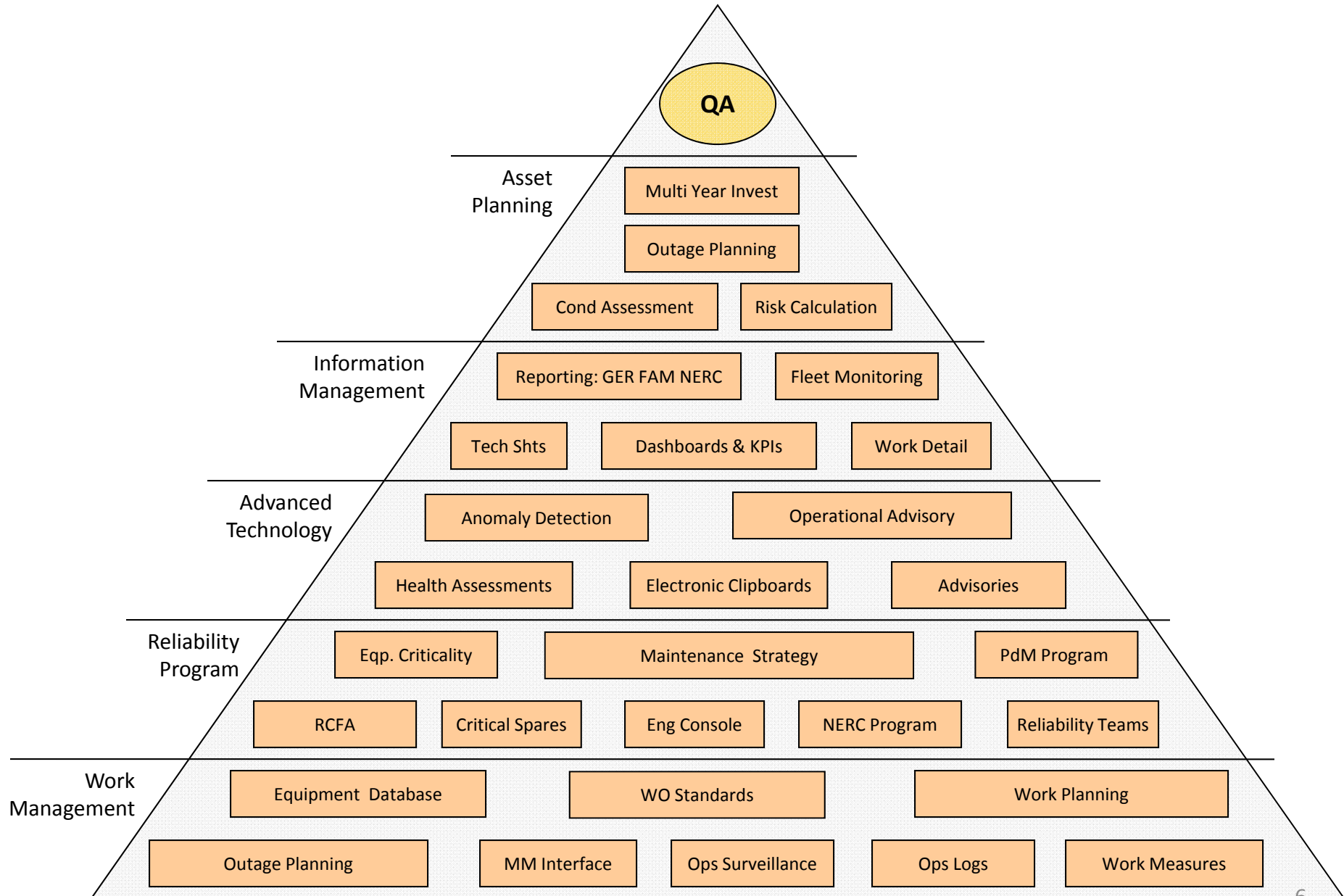
NSPI Challenges

- Aging Fleet
- Growing Knowledge Gap
- Planned “End of Life”
- Changing Generation Profile and Utilization
- Stakeholder Scrutiny

Fleet Asset Management

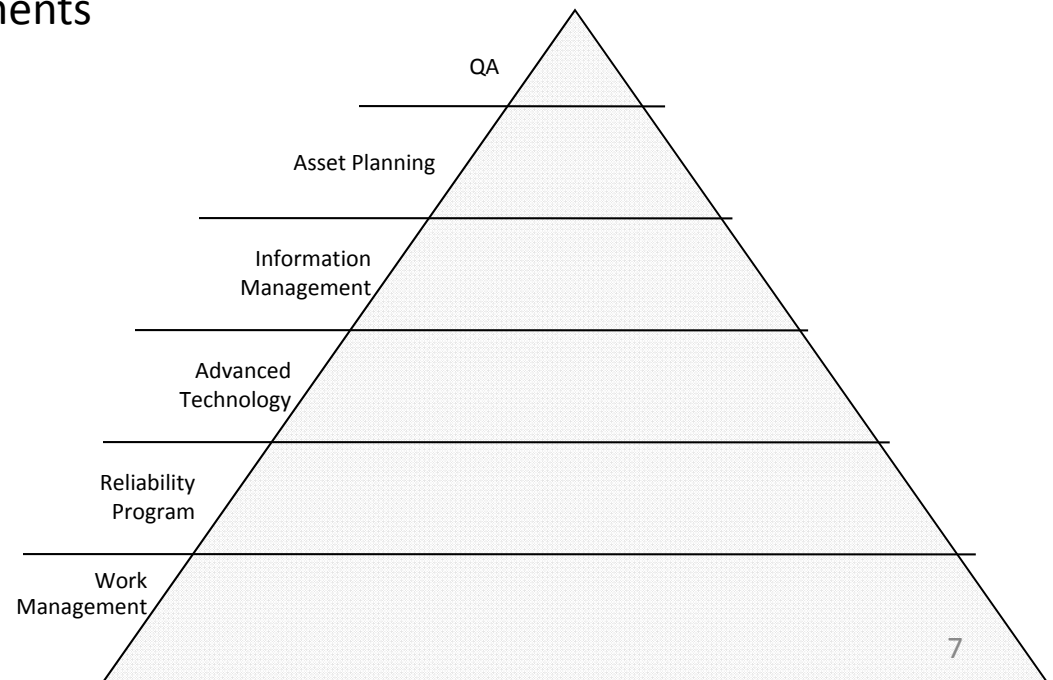
- 2010 – 2012 initiative to design and implement
- Asset Centric vs Plant Centric approach
- Standardized Work Management Approach
- Standardized Reliability Processes
- Asset Class Reliability Teams
- Advanced Technologies
- Fleet KPIs and Measures
- Fleet Recommendation Management
- Asset Planning

Asset Management



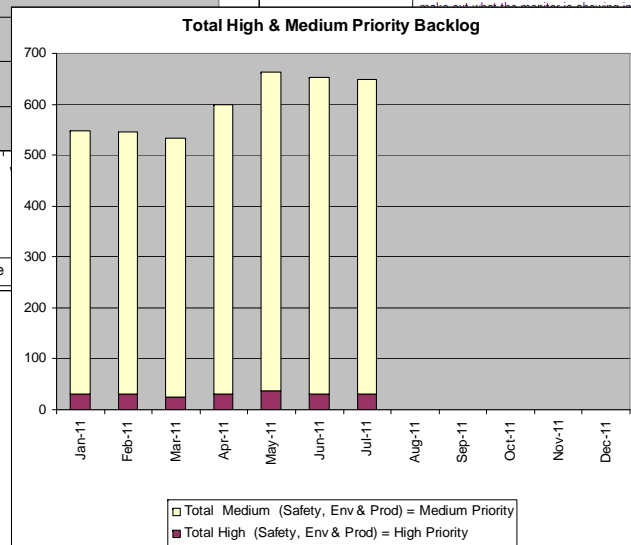
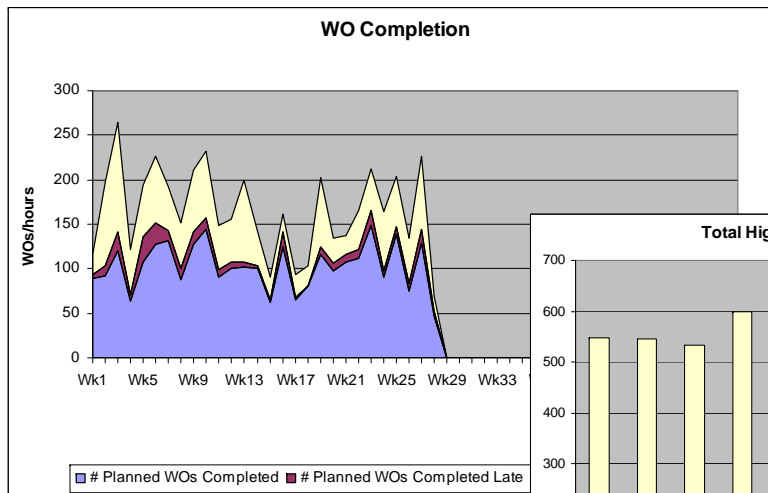
Asset Management Implementation: Layered Approach

- Layers of Activity
- Independently Adding Value
- Value magnified as layers are integrated into AM Model
- Each layer “turning on” independently and in small steps
 - Minimum Organization Churn or Interruption
- Low Risk Approach
 - Staged Monetary Commitments
 - Controlled Resource Requirements
 - No single “Turn On Date”
 - Employing learning facilitated
- Max employee participation
 - Buy In
 - Knowledge Capture

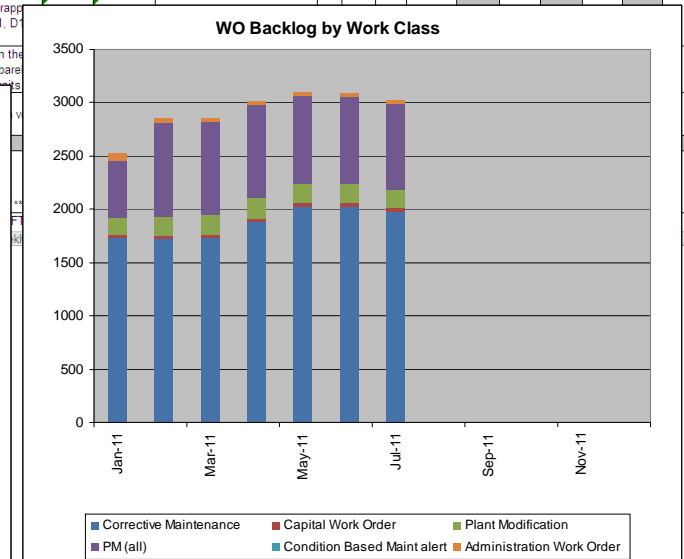


Work Management

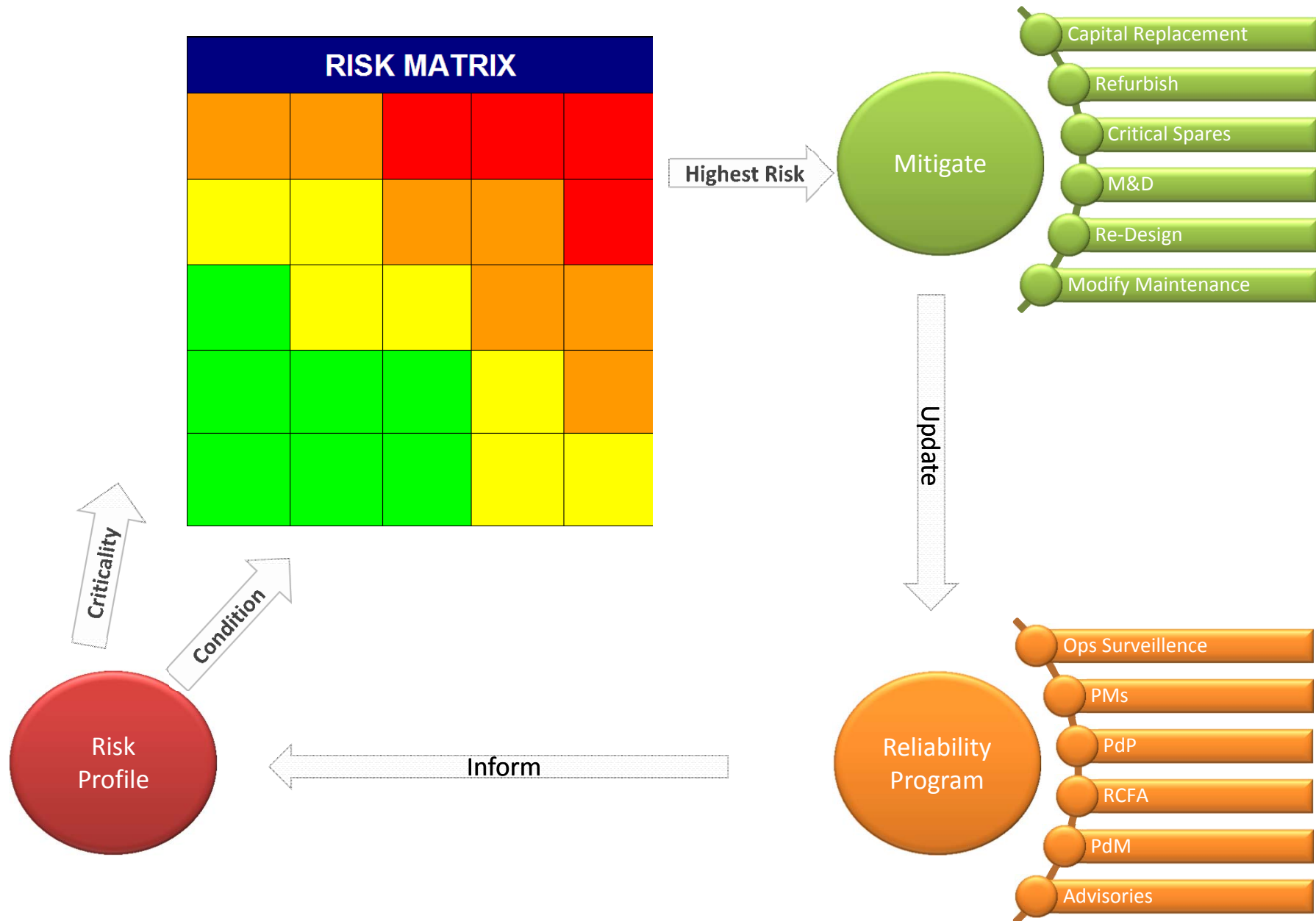
- Implemented within an AM context
- Asset Management Foundation
- Established Fleet Standardization Mindset
- Demonstrated Fleet Resolve
- Provides for Reliability Programming



Weekly Maintenance Schedule										July 1					
ELECTRICAL										106.25% Allocated					
Priority	Task	Work Order No.	Equip. No.	Equip Description	Isol	Type	Per	Est. Hrs		2011-07-11		2011-07-12		2011-07-13	
										Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
										Plan	Act	Plan	Act	Plan	Act
16	The turbine aux oil pump the breaker will not close	317387	24118001	MOTOR-TURBINE AUX OIL	L	C	1	4.00							
12	The dumper fire system is tripped, but we had no alarm on the fire panel in the control room. Please inspect and repair. Thank You.	310632	07149200	INDICATOR INSTRUMENTATION	L	MOD	1	4.00			4.00				
12	Local fire alarm in stores went off but did not alarm at fire panel in control room.	310913	07148001	EDWARDS FIRE PANELS	N	MOD	1	4.00			4.00				
12	Trouble alarm in on fire panel for Annex (Z-1). It was checked out with no issue found. Can you	315105	07149100	MISCELLANEOUS INSTRUMENTATION	L	C	1	4.00							
10	There are a number of ground wires off the raps on unit 3, 3rd floor. " D1B-2, D1C-1, D1E-1, D1F-1, D2F-3 & D2B-2. Also some														
10	The camera for detecting fly-ash leaks in the manutair building, is very dirty, you can bare														



NSPI Equipment Reliability Process

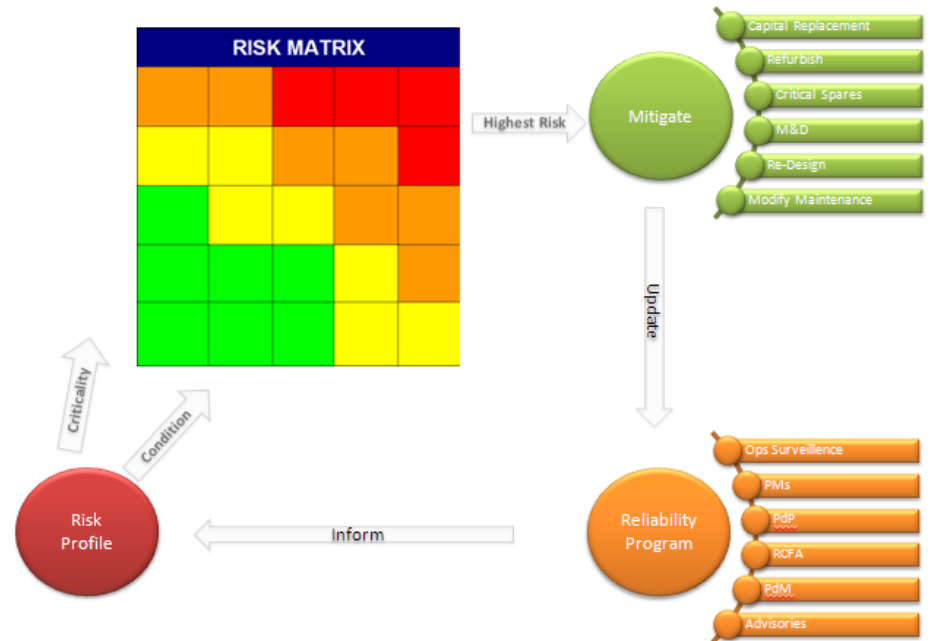


Reliability Program

- Asset Class Reliability Teams

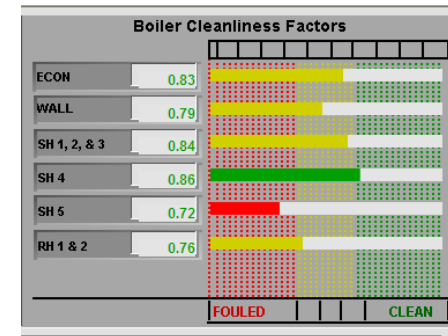
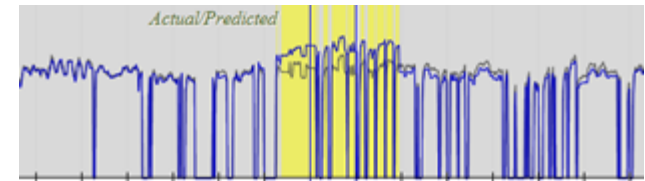
- Criticality Rating
- Condition Assessment
- Risk Profiling
- Risk Mitigation
- Maintenance Strategies
- Multiyear Plans

- Fleet PdM Program
- Fleet RCFA Program
- Compliance Reporting
- Annual Process Cycle



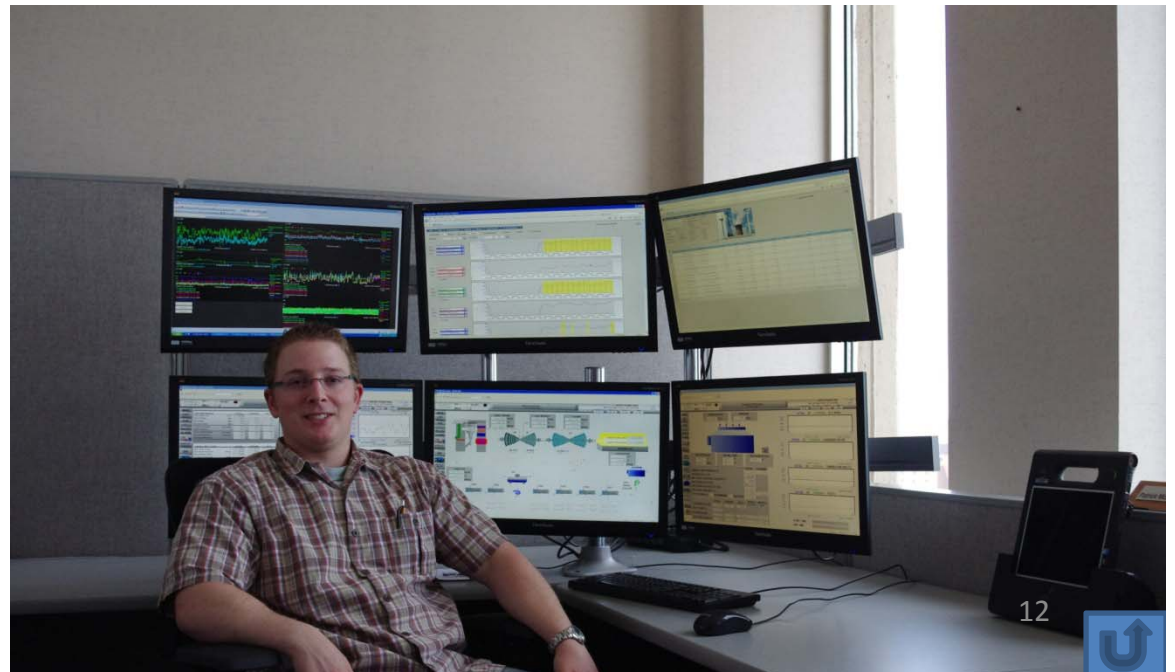
Advanced Technologies

- PdP
 - 11 of 14 units
 - Finding issues
 - Influencing Maintenance Strategy
- PMAX
 - 5 of 12 units
 - Informing operators
 - Replacing Unit Efficiency System
- Mobile Devices
 - Operator surveillance
 - Operator field connectivity



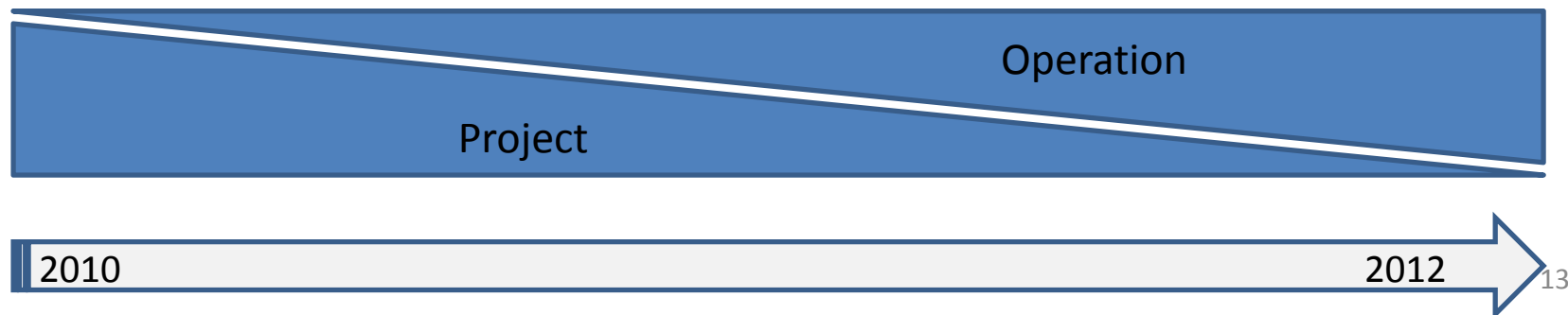
Fleet Monitoring

- Centralized monitoring of Fleet Health
 - PdP
 - PdM
 - Action Management (RCFA, Eng Advisories, OEM Advisories)
 - Dashboards, Measures, Reporting
 - Meridium Tools
- PdP primary monitoring by Scientech
- Plant Interface crucial
 - Work Orders
 - Eng Actions



Asset Management Office (AMO)

- The mandate of the Asset Management Office:
 - Design Asset Management methodology
 - Install necessary tools
 - Implement processes
 - Manage NSPI's Asset Management Model within the Generation Business.
- 2010:
 - Design of Asset Management methodology
 - Implementation of Work Management
- 2011:
 - Ongoing implementation of Asset Management tools and processes
 - Increased activity in operational aspects of Asset Management.
- 2012:
 - Complete Implementation
 - AMO fully operational



PP Asset Management Implementation: Status Dec 2011

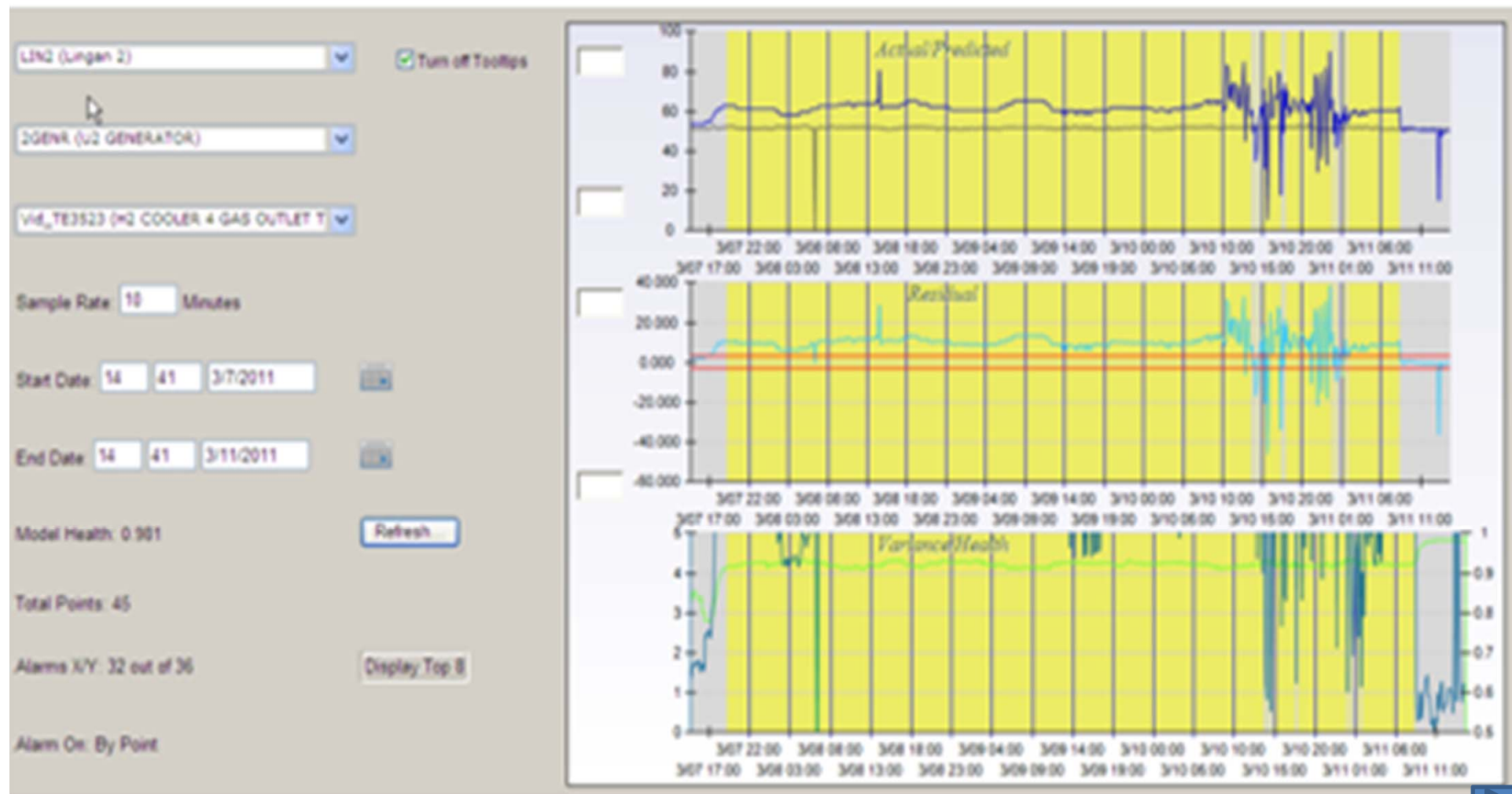
PP Asset Management Implementation: Status Dec 2011								
			Tools					
	Item	Process/Method	DL	PI	e-Clipboard	Predictive Pattern Recognition (PdP)	Process Performance Analysis (PMAX)	Asset Management Facility (Meridium)
Work Management	Equipment Database	DB Developed	DB Installed	DB Installed and Tags Applied	Rounds IDd and Cross-Referenced to PI			Mapped
	Operator Surveillance	Rounds Identified	Interfaced to PI Auto WO Generation	Threshold Calculations	Interfaced to PI	Capable		Standards Managed in Meridium
	Work Order Standards	WO Types, Priorities, Status, Eqp Classes	Standards Installed					
	Weekly Planning	Weekly Planning, Scheduling	Standard Scheduling Installed		Scoping Document			
	Outage Planning	Defined	Use of Project Management Module					
	Work Order Reporting	Weekly/Monthly Reports Designed	Standard Reports In Place					KPIs and Dashboards
Reliability Program	Predictive Maint. (PdM) Program	Master Lists per Tech. Provisioning in place	Rounds and PMs Established	Interface to Provider		PdM Data to Models		Interface to Provider
	Reliability Plans	Asset Class Plans Designed	Installed in PMs	PM Check Lists Tagged	PM Check Lists	PM Data to Models		Interface to Data Source
	RCFA	Defined	Tracking Reporting					
	Recommend... Management	Defined	Tracking Reporting					Implemented in Meridium
	Ops Console	Concept	Interface	Interface				Shift Reporting to GER
Intelligence	Reporting KPIs / Dashboards	Concept	Reports in DL, Monthly Reporting					Standard KPIs and Dashboards
	Compliance Reporting	As Reliability Programs deploy.	Reports in DL					GER/FAM/NERC
	Fleet Monitoring	Emergent Issues Warning Process Tech Reports	Auto WO Generation, Fleet WO Entry	PI Calcs to PM Module	Rounds Data to PI	Results to PdP		Fleet Overview
Planning	Condition Assessment	Reliability Teams Annual Exercise (by Asset Class)						Integrated Data. Assessment Reporting
	5 Yr Plans	AMO Consolidation of Cond Assess and Strategy						Consolidated Reports

Appendix

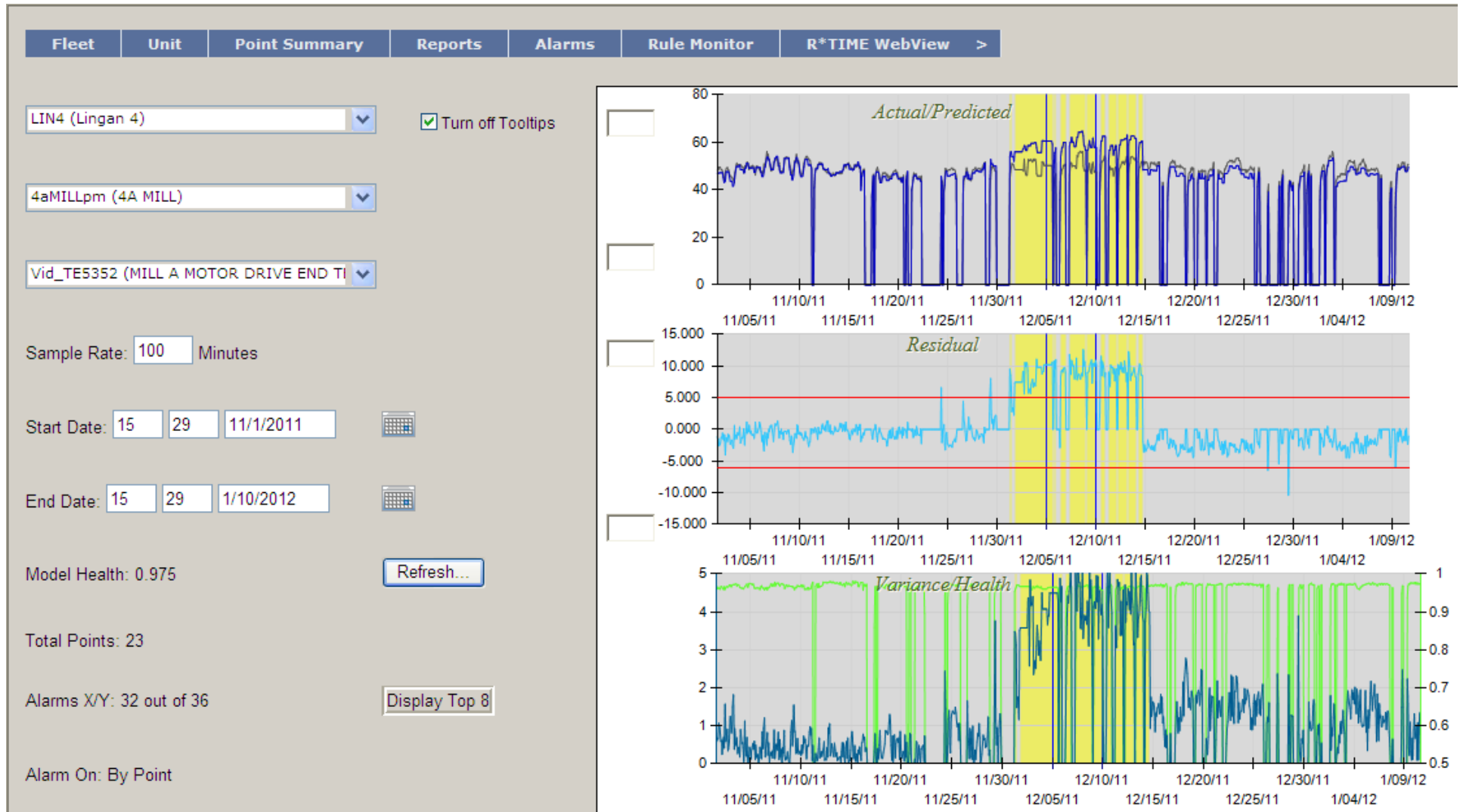
- PdP Finds
- PdP Reports to Plant
- PMAX
- Mobile Devices

Advanced Technology: PdP (Real Time Analysis and Alerts)

Cooler returns to normal after Intervention



Mill Motor Drive End Bearing: Lubrication Issue



Anomaly Detection Report

Station : Lin

Unit : 1

Model : 1bFDFNp

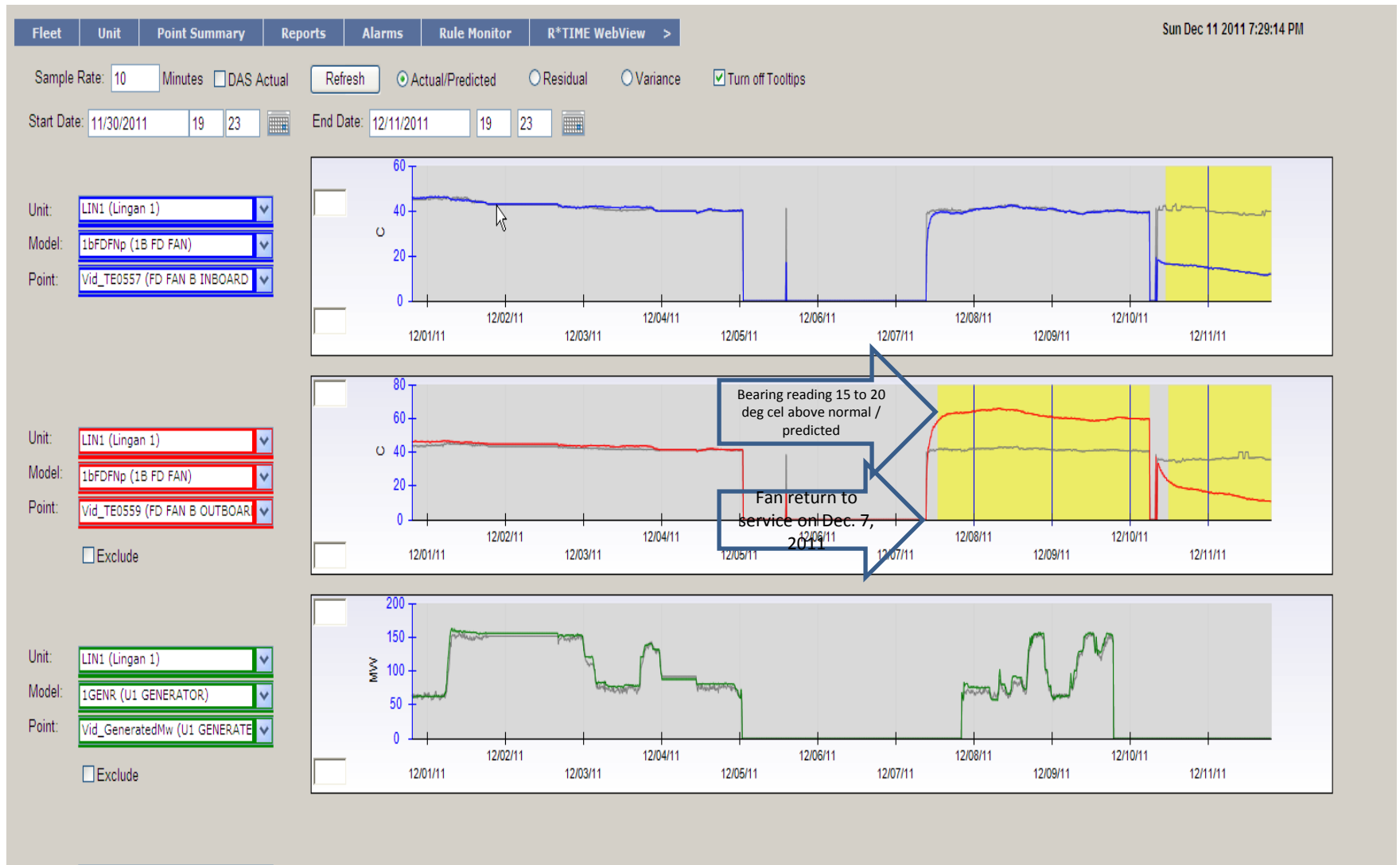
PI Point : LG1VID_TE0559

Date : DEC 11, 2011

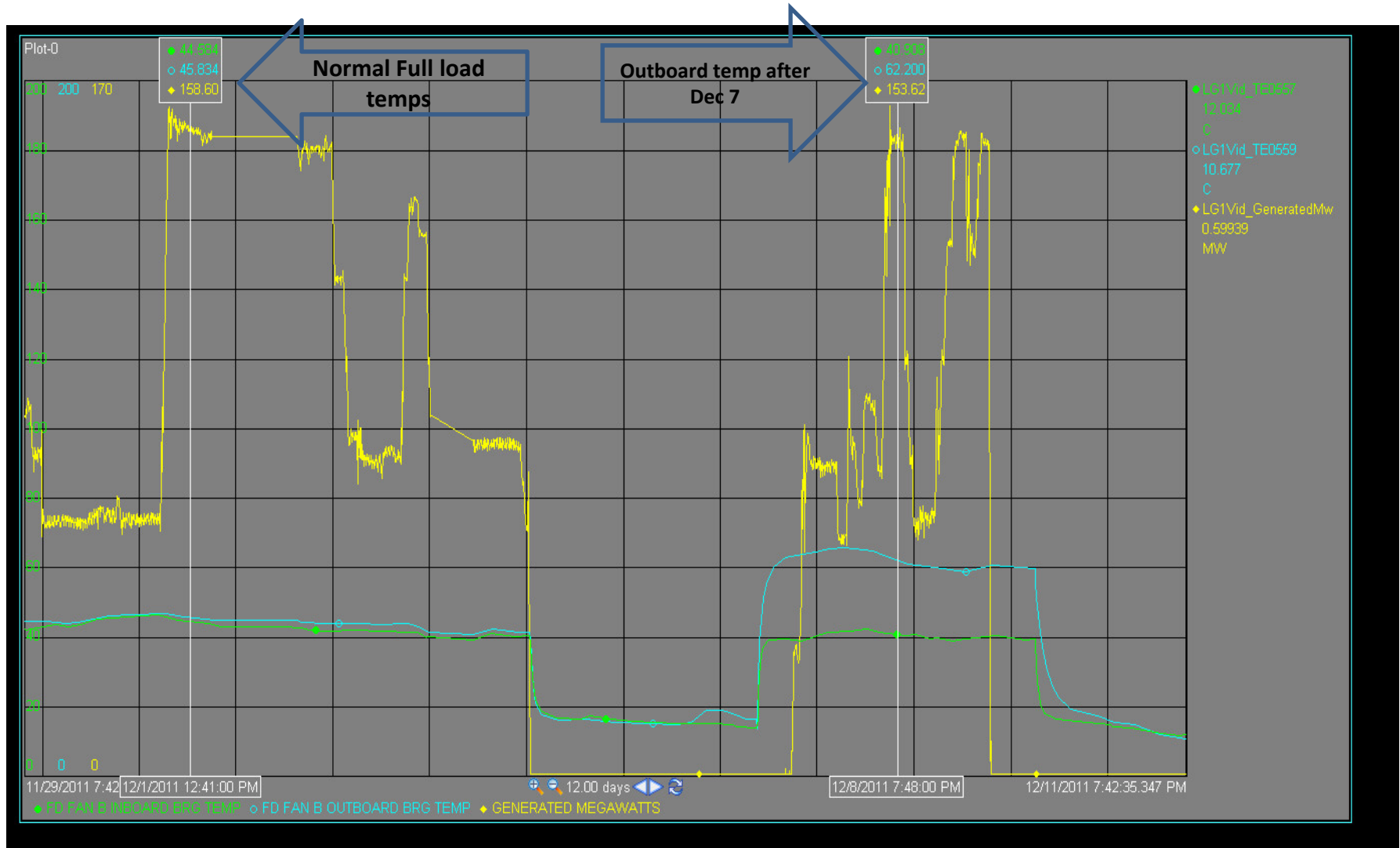
Anomaly : FD Fan B outboard bearing temp increased ~15 DegC On 12/7/11 after a restart of the fan.



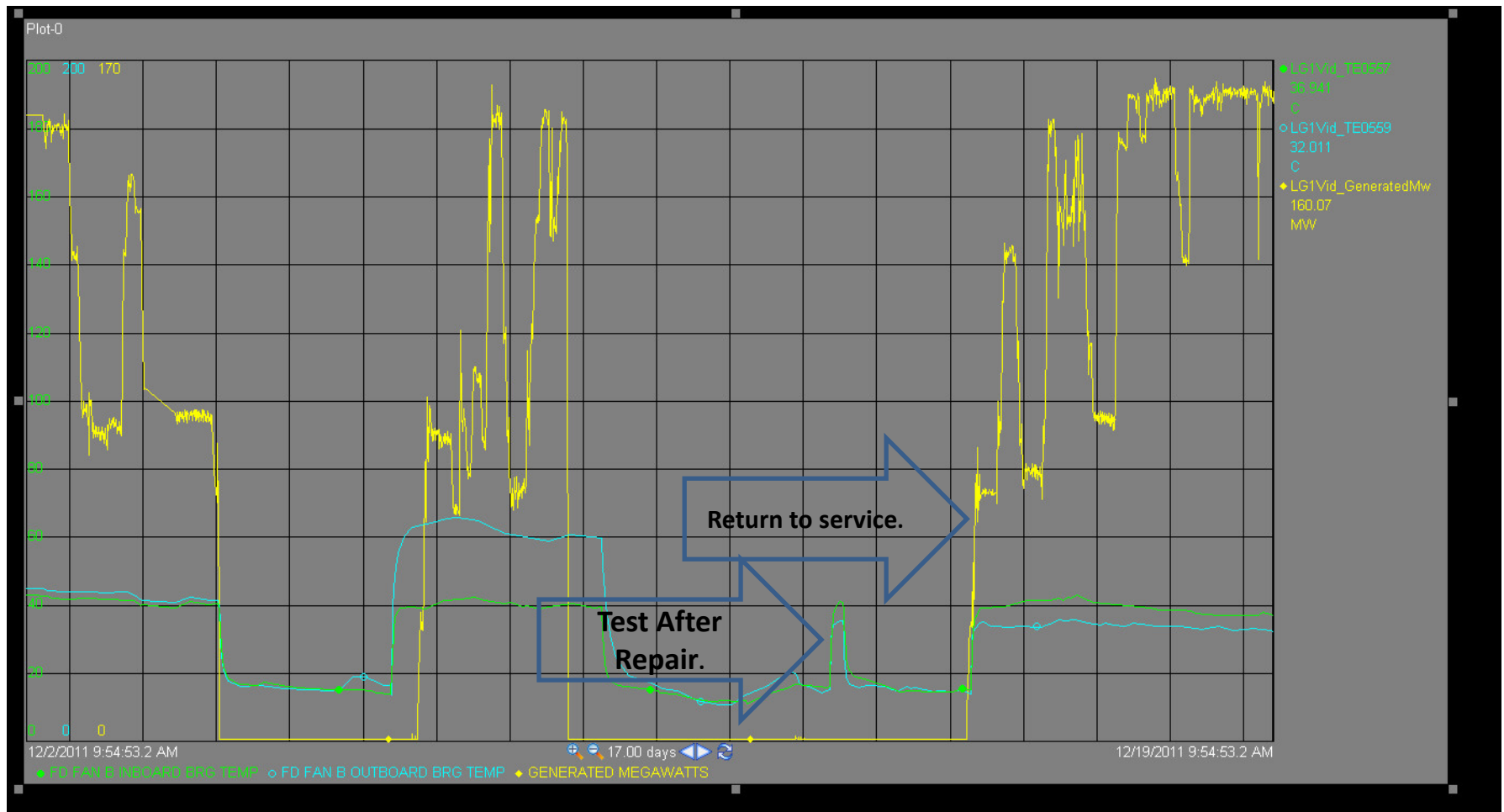
PDPWebviewer trend.



PI ProcessBook trend.



PI ProcessBook trend.



Log Data.

Email from Rick,

Hi John,

We did do some work on this bearing to correct a vibration issue. The vibration issue is fixed - not sure why the temperature has increased so much. I will check into this.

Rick

From: ETHERIDGE, RICK
Sent: Friday, December 16, 2011 10:31 AM
To: ROPER, JOHN; MCKINNON, M J; MACNEIL, KEVIN
Cc: MACNEIL, ROBERT; MCBRIDE, PATRICK; DOREY, JORDAN
Subject: RE: 4A Mill motor drive bearing temperature.

Hi John,

Just some feedback on a couple of anomalies from last week:

1B FD Fan Outboard Bearing - We disassembled the bearing, cleaned cooling water ports and replaced a couple of deteriorated cooling water o-ring seals. This seems to have corrected the problem - in fact the outboard bearing is now running about 7 C cooler than the inboard bearing.

4A Mill Motor DE Bearing - This bearing was found to be low on lubricating oil. Added oil as required and temperature has returned to normal range.

These were good pick-ups - thanks for the heads-up!

Rick



Conclusions.

An O-ring issue after a vibration repair caused cooling water to enter the lubricating oil. Repaired and returned to service ok.

JR

Name your file as follows: YYYY-MMM-DD UNIT_DESCRIPTION OF ANAMOLY

Upload file

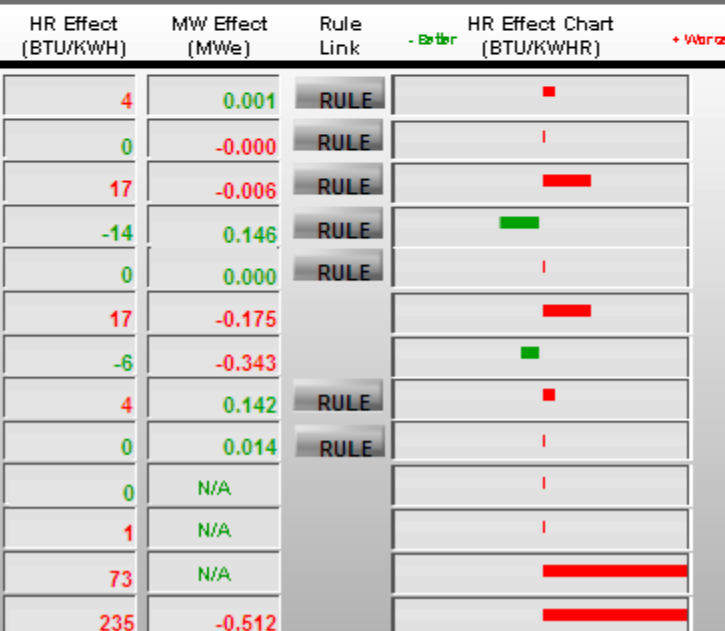
Select unit from drop down

Enter Model name, eg. 1aBFPpm

Enter RCID # (this will come later once Patrick has it setup, for now leave blank)



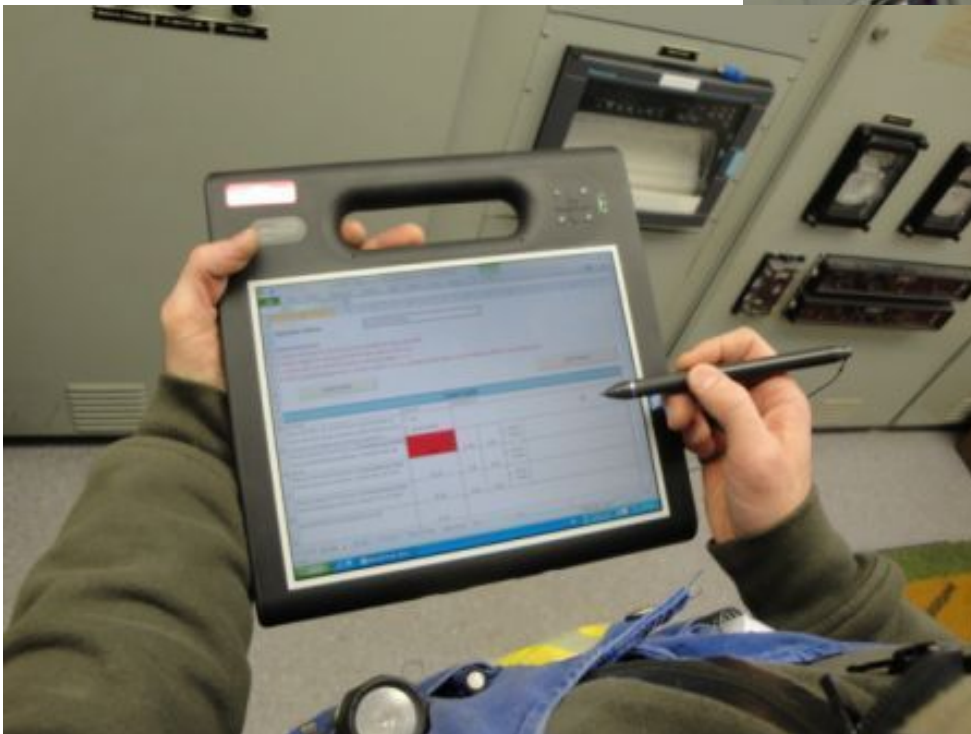
FWF



Operators View of Asset Management

- Equipment Surveillance

- Electronic Rounds
- Connected to PI
- Direct WOs
- History Review
- New historical data
- Future Opportunities



Planners/Maintainers View of Asset Management

- Work Scoping using e-clipboards
- Work detail collected with e-clipboards
- Well prioritized WOs from Ops
- Well identified WOs from Ops
- CBM work orders from Fleet Monitoring
- Reduction in PMs
 - Specified requirements
 - From Reliability Plans
- Standard PMs
- Standard weekly schedules
- Standard reports and measures:
 - weekly , month, compliance
- Quality Work Planning resulting in
 - Planned vs Unplanned improvement
 - Proactive vs Reactive improvement

