



AUGUST 2013: ROB MACNEIL

Real Time Analytics in Asset Management

energy everywhere.™

Real Time Analytics

File Message Adobe PDF

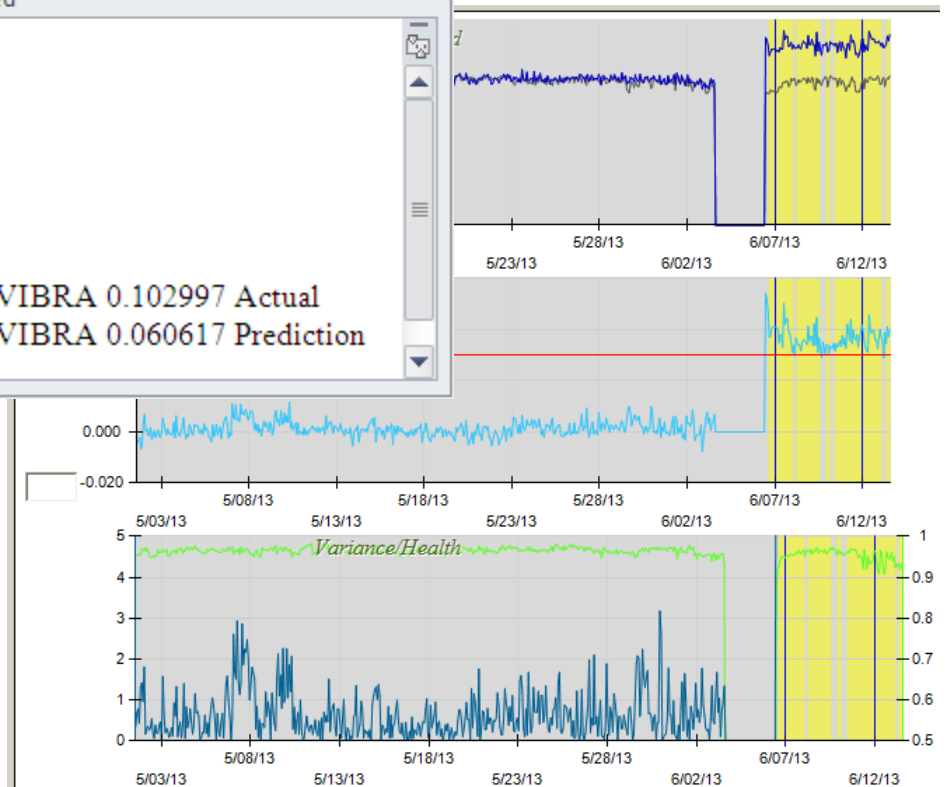
Delete Reply Reply All Forward Move Mark Unread Categorize Follow Up Translate Zoom

From: AMO_FMC Sent: Sun 8/4/2013 12:35 AM
To: dspencer2@curtisswright.com
Cc: CARLIN, GREG; DOREY, JORDAN; MCBRIDE, PATRICK; MACNEIL, ROBERT; snedrow@curtisswright.com; stmiles@curtisswright.com; RODGERS, WARREN
Subject: PdP Event: TUC2 Turbine BRG 1 P Vibration : 0.102997 Actual (0.060617 Predicted)

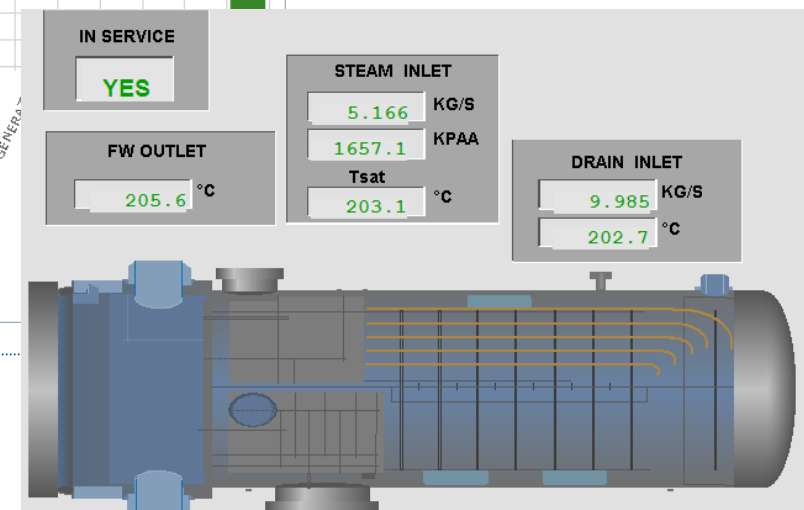
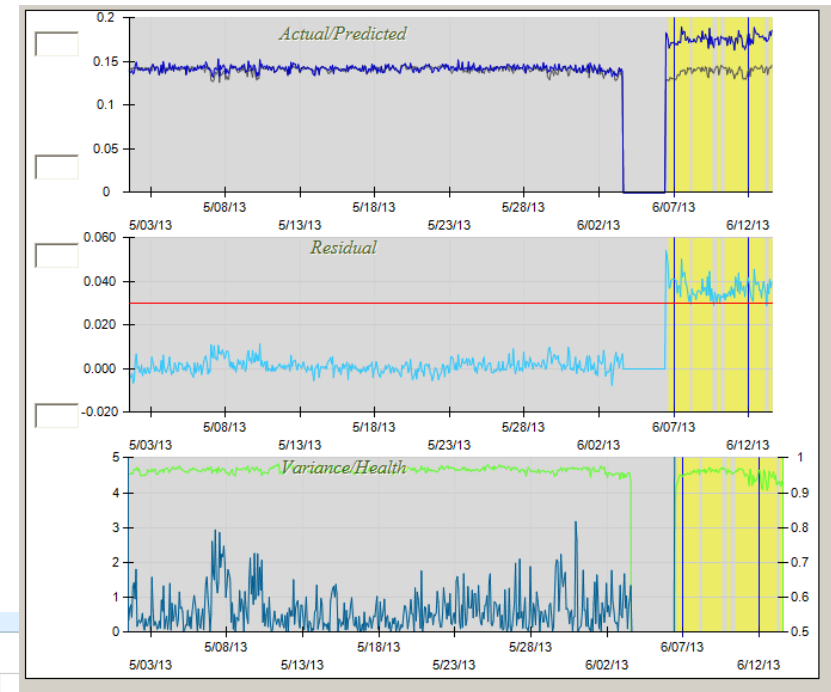
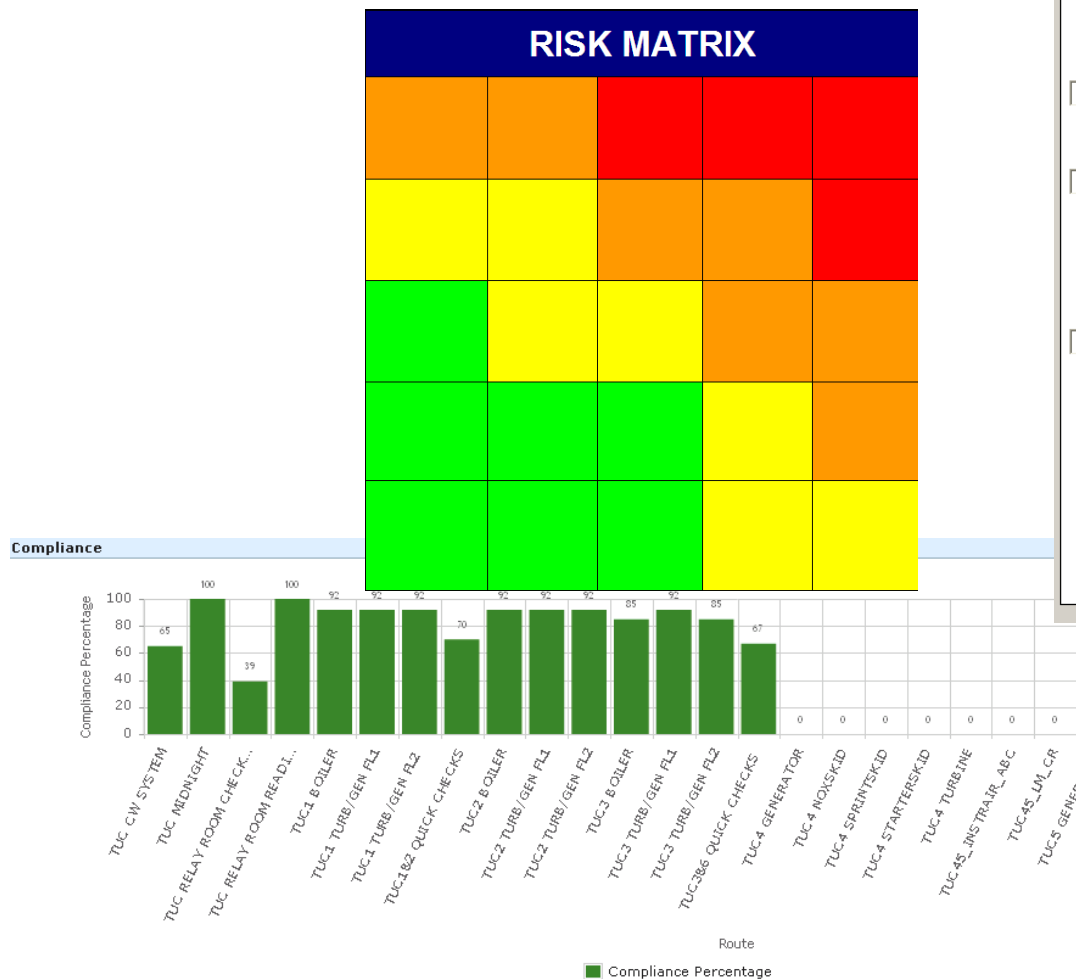
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Date: 04 Aug 2013 00:35:05

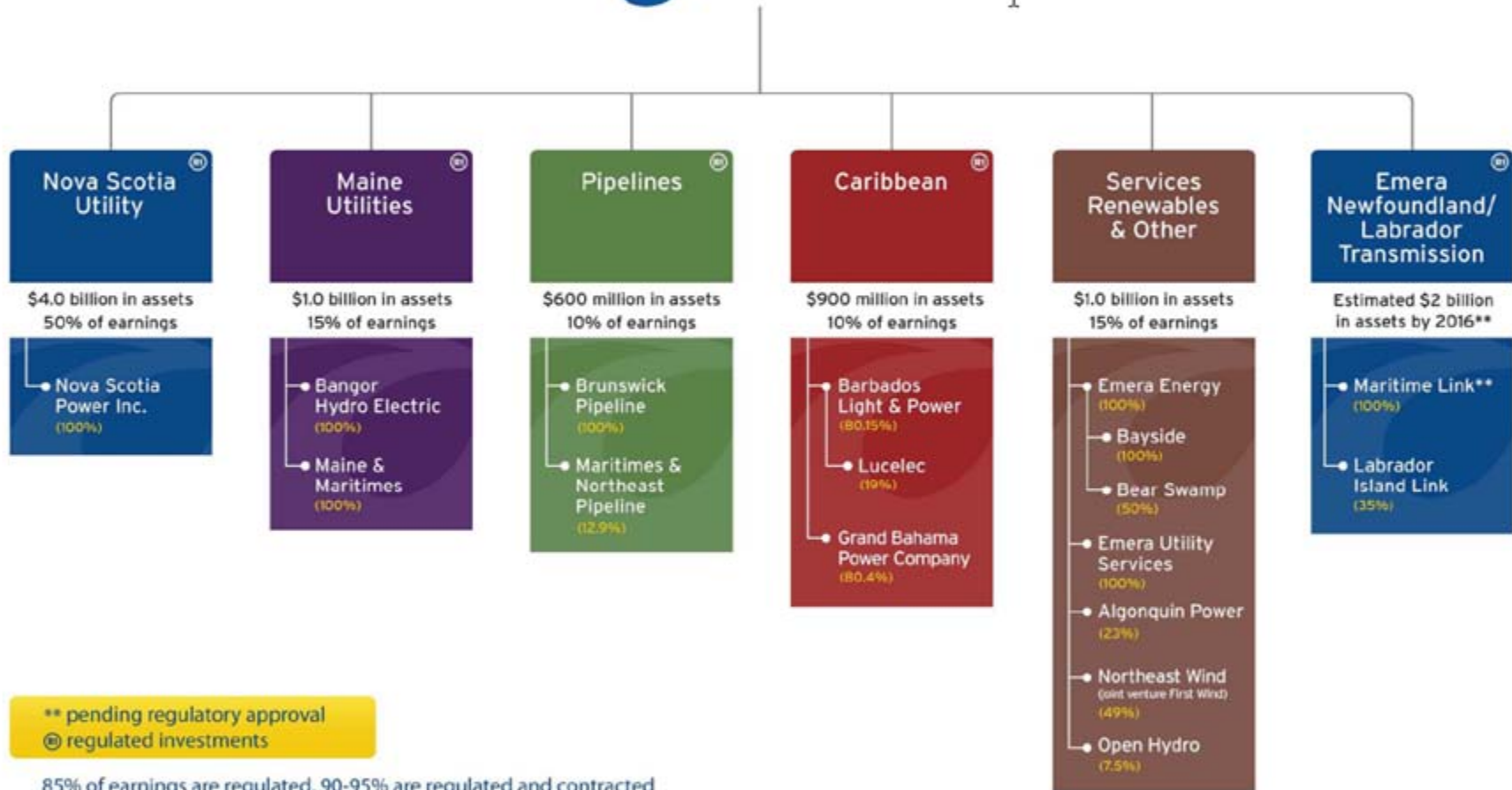
Message: [TUC2 Turbine BRG 1 P Vibration PdP Trend](#)

Point Information & value
2TURBm (TUC2VID_VEB1PED2) TURBINE BRG 1 V PEDESTAL VIBRA 0.102997 Actual
2TURBm (TUC2VID_VEB1PED2) TURBINE BRG 1 V PEDESTAL VIBRA 0.060617 Prediction



Real Time Analytics in Asset Management





** pending regulatory approval
 © regulated investments

85% of earnings are regulated, 90-95% are regulated and contracted
Approximate earnings and assets as at December 31, 2012

Emera Investments

The consolidated picture



% of Emera Earnings:

Nova Scotia Power	50%
Maine Utilities	15%
Caribbean Utilities	10%
Pipelines	10%
Services, Renewable & Other	15%

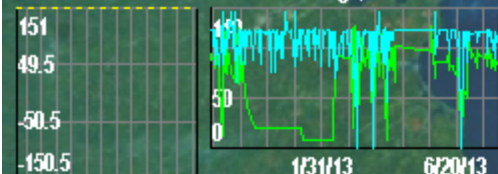


Algonquin and First Wind Portfolios

Algonquin owns a widely diversified portfolio throughout North America.



NS NB Interconnect NePool Pricing \$ CDN



Keswick Real Time FX Adjusted \$ 90.34 For Import Add \$7.00 on Peak & \$3.33 off Peak
 Keswick Hourly FX Adjusted \$ 115.57 For Export Subtract \$7.00 on Peak & \$3.33 off Peak

Synchronized Reserve 137
 10 Minute Reserve 443
 30 Minute Reserve 363
 Current Real Time Price \$46.76

Wreck Cove
 % Storage
BAD DATA

Gisborne 0
 * Wreck Cove 1 79 Auto
 * Wreck Cove 2 0 Off
 Wreck Cove Lake 1196
 Surge Lake 1194
 Inferred Value of Hydro \$Shutdown
 * Point Azumi 179 Manual \$ 21.90

ISO-NE Forecast Peak @ Hour Shutdown 68 MWs
 ISO-NE Surplus Commitment 95 MWs
 ISO-NE Instantaneous Load Shutdown MWs
 New Brunswick Instantaneous Load 16 MWs
 MECL Instantaneous Load 161 MWs

MERCO Schedule 667
 MERCO Tie Actual 667
 HQ-NB Madawaska-460
 HQ-NB Bel River -126

-151 *

Onslow Import 363
 Onslow South 427

Temperature 23
 CB Load 1076
 CB Export 293
 Stora Enso 126

Victoria Junction
 111 0
 112 0

Temperature 26
 Wind Speed Shutdown
 Direction Shutdown

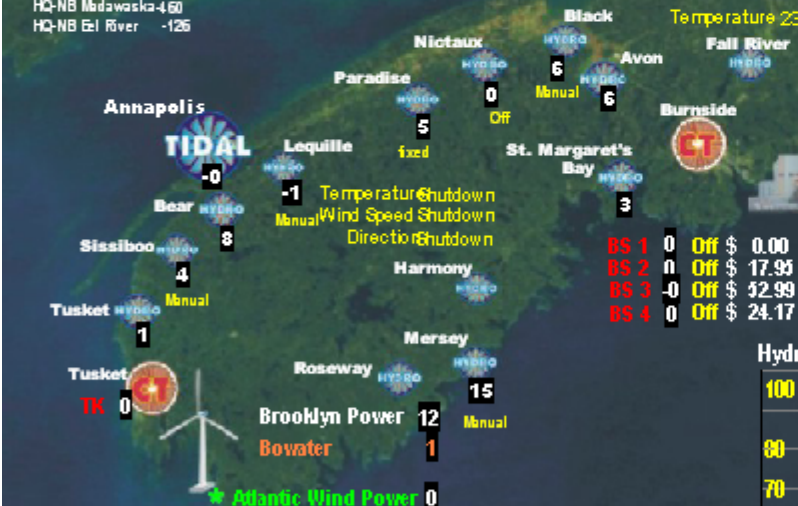
* Lin 1 121 Manual \$ 66.13
 * Lin 2 96 Manual \$ -0.00
 * Lin 3 66 Manual \$ 95.53
 * Lin 4 70 Manual \$ 95.04

* Pt. Tupper 2 0 Off \$106.46

* Trenton 5 0 Off \$ 95.20
 * Trenton 6 138 Manual \$ 50.75

Temperature Shutdown
 Wind Speed Shutdown
 Direction Shutdown

Thermal Units

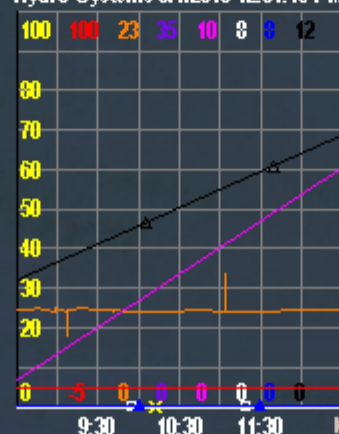


* TC 1 6 Off
 * TC 2 97 Manual
 * TC 3 0 Off
 * TC 4 41 fixed
 * TC 5 30 fixed

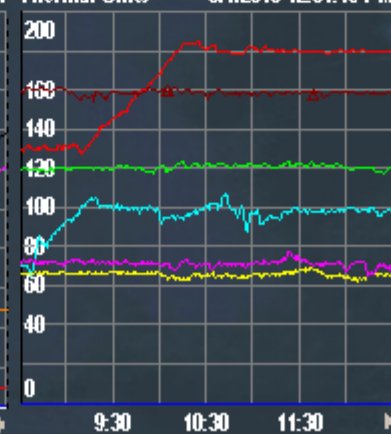
	HFO	GAS
* TC 1	\$23.91	\$ -83.94
* TC 2	\$21.00	\$ 0.00
* TC 3	\$186.00	\$ Shutdown
* TC 4		\$ -59.49
* TC 5		\$ 37.06

BS 1 0 Off \$ 0.00
 BS 2 0 Off \$ 17.95
 BS 3 0 Off \$ 52.99
 BS 4 0 Off \$ 24.17

Hydro Systems 8/4/2013 12:31:49 PM



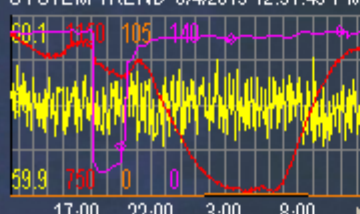
Thermal Units 8/4/2013 12:31:49 PM



Pubnico Point Wind Farm



SYSTEM TREND 8/4/2013 12:31:49 PM





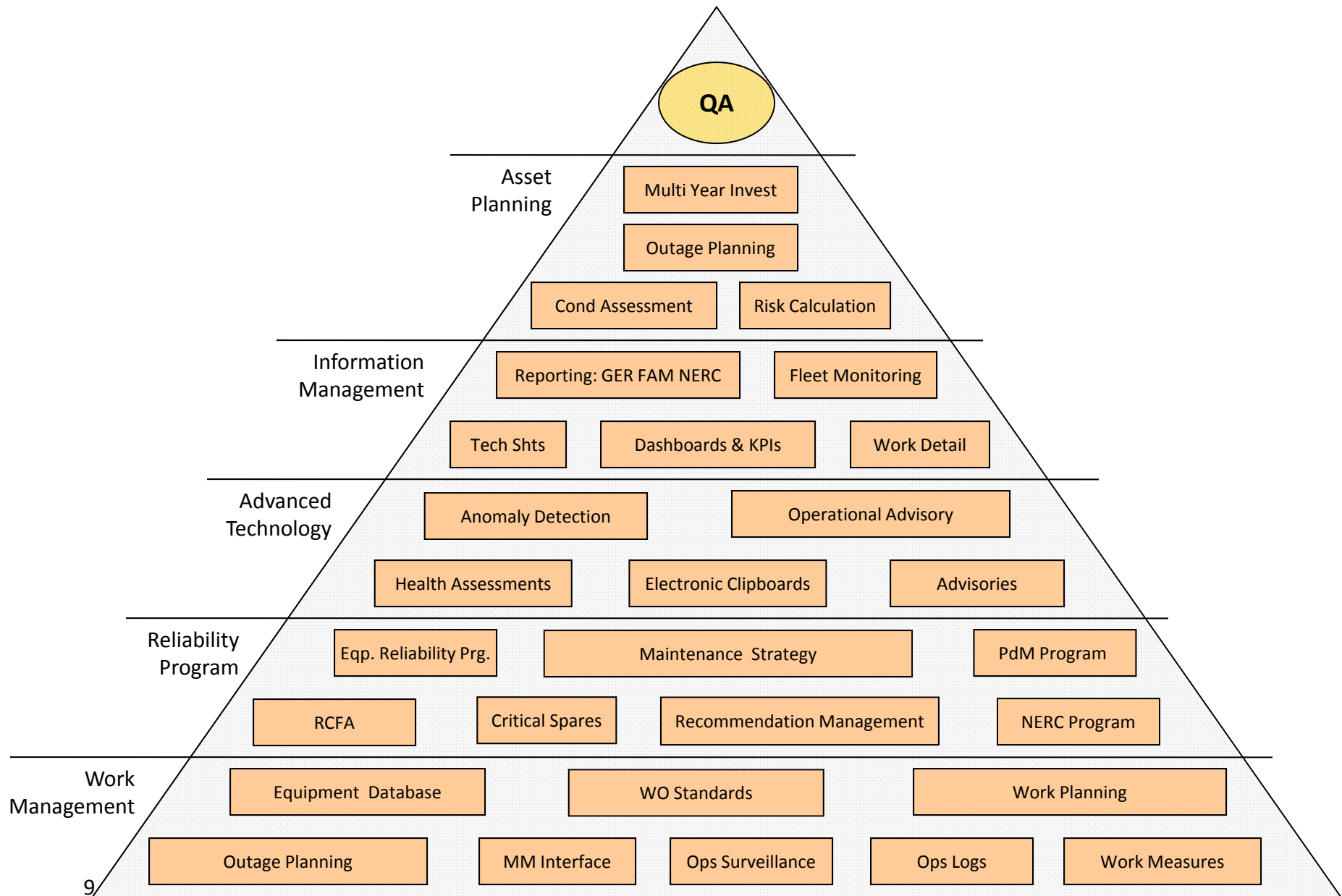
Real Time Analytics in Asset Management

- Asset Management?
- Real Time Analytics?

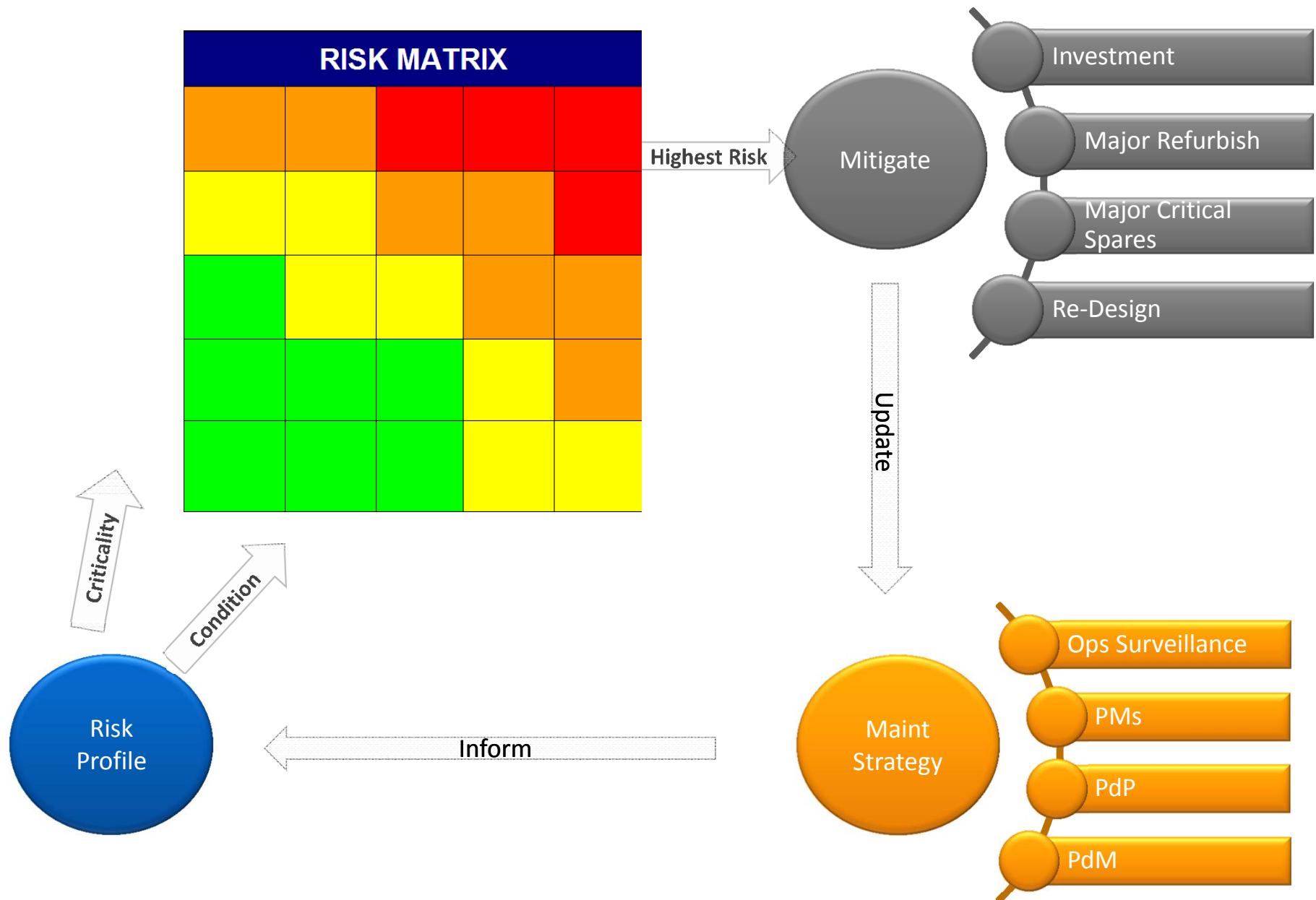
Asset Management Business Drivers

- Utilization of generation assets: dynamic
- Future planning: complex
- Demographics: knowledge gap
- Stakeholder scrutiny: increasing
- Transparency: expectation
- Business pressures: cost, production

Asset Management

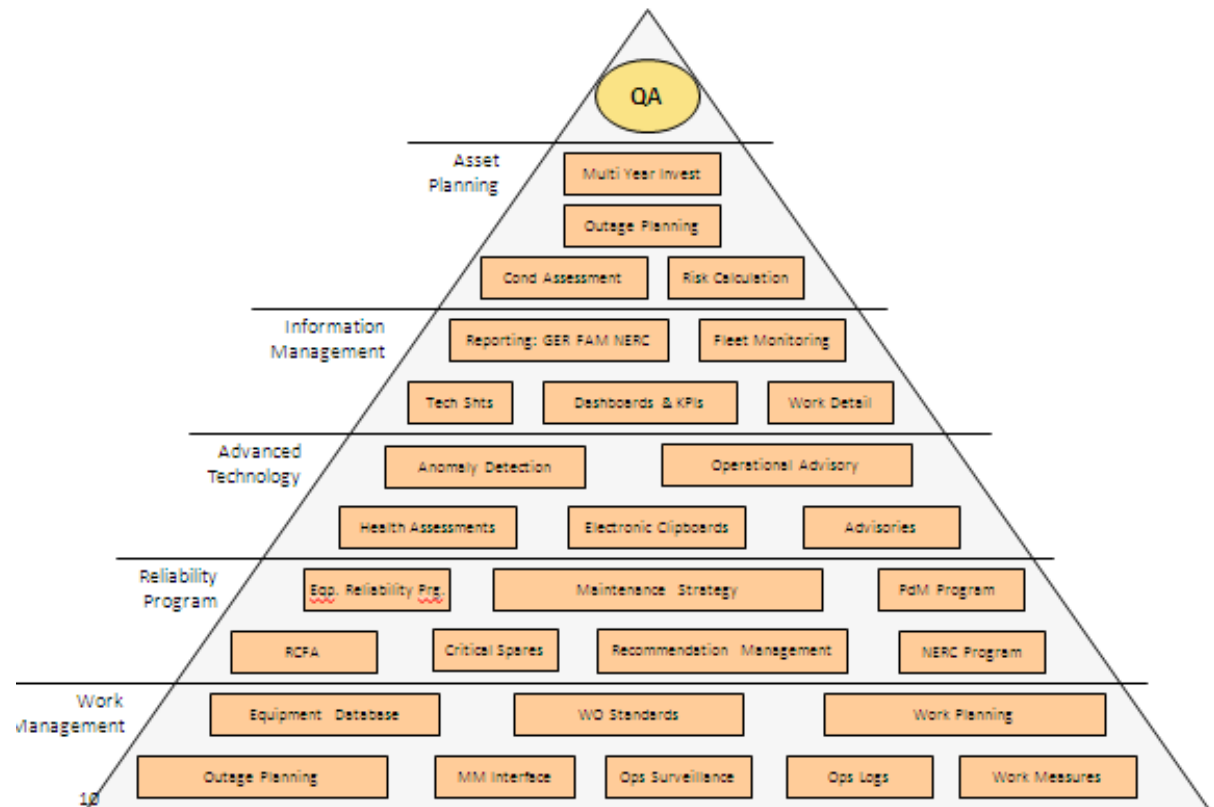


Equipment Reliability Process



Analytics in Asset Management

- Work Management
 - Planned vs. Unplanned
 - Proactive Work Identification
 - Productivity and Schedule Attainment
- Maintenance Strategy and Compliance
 - PM & PdM
 - Ops Rounds
- Fleet Monitoring
 - PdP
 - PMAX
 - Health Assessment
 - Risk Profiling
- RCFA
- Asset Decision Making
- Asset Planning



Real Time Analytics: Early Warning & Immediate Warning

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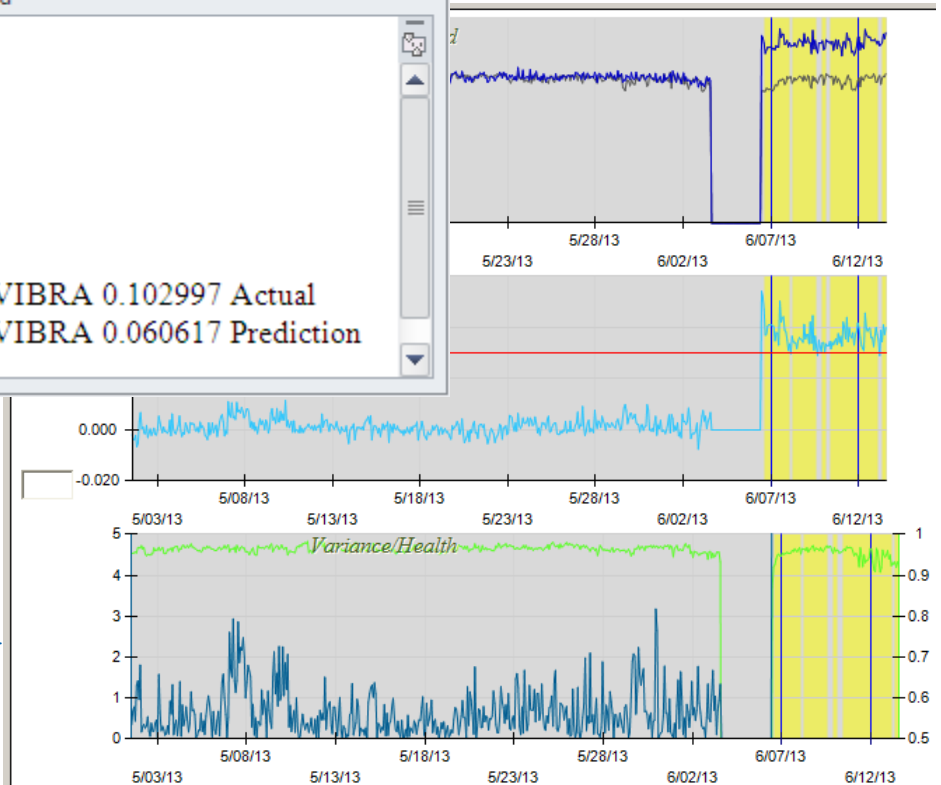
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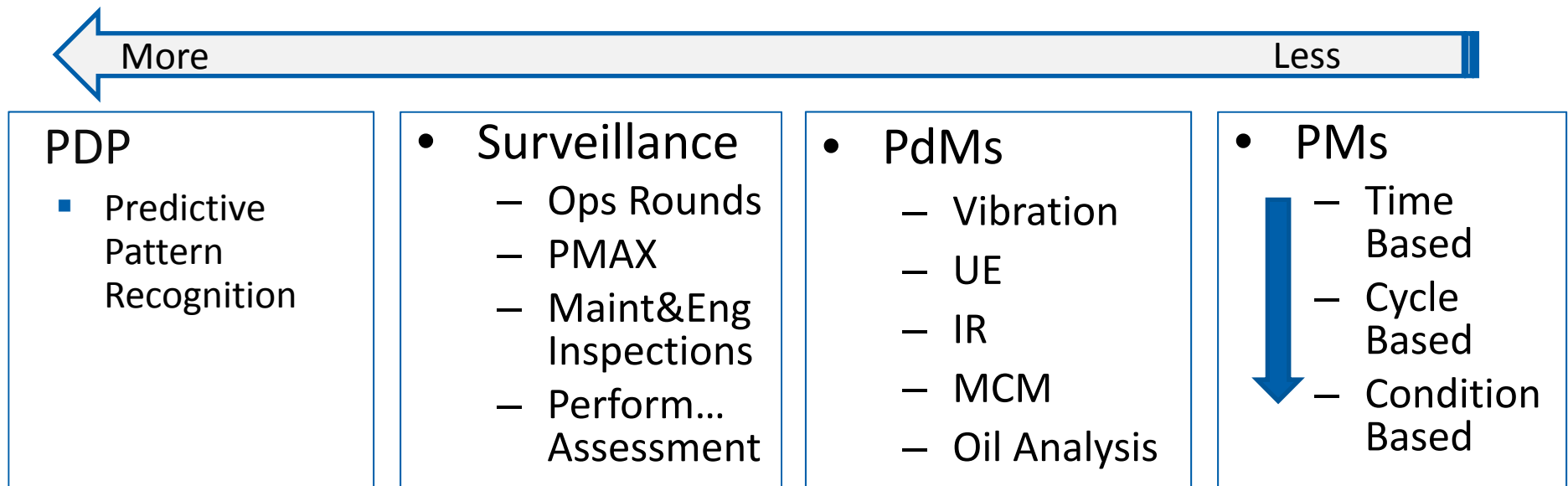
Add PMAX



Real Time Analytics Role in WO Identification

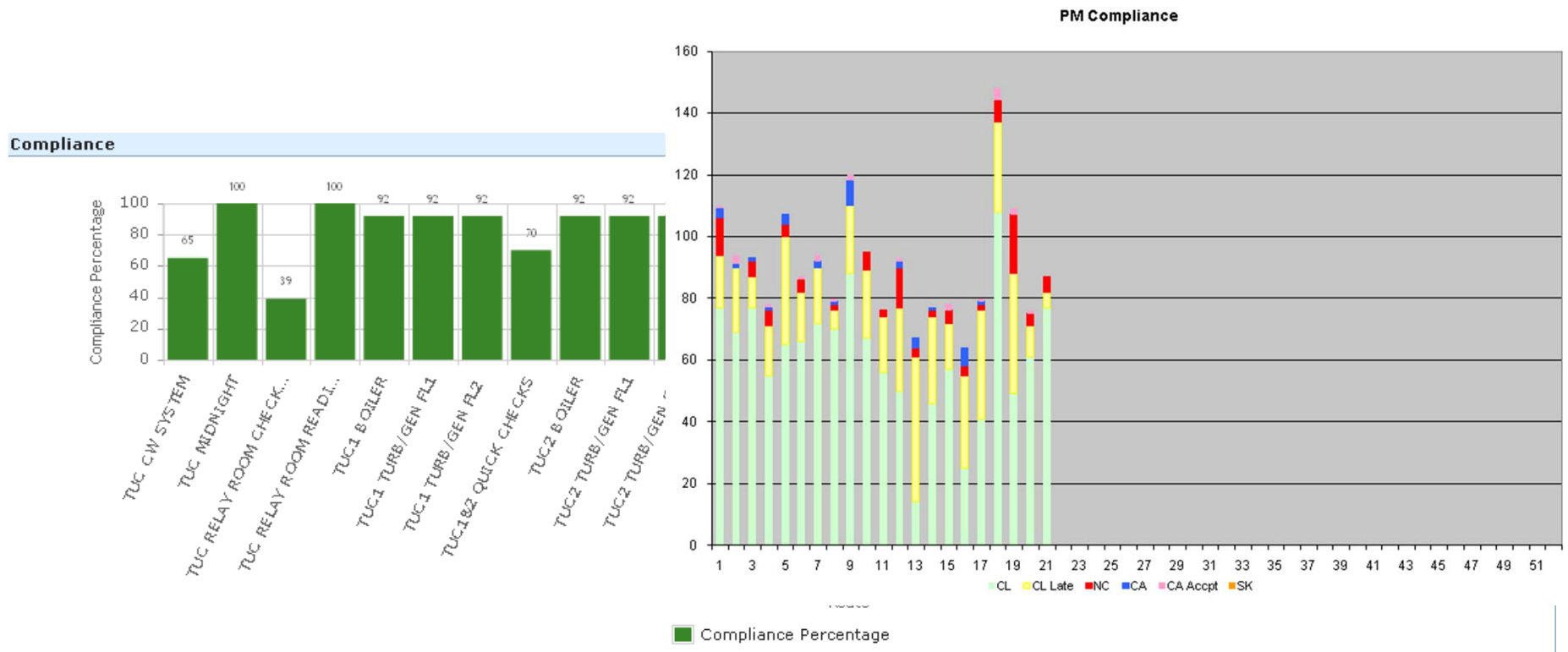
- Operators using PMAX to identify Maintenance Work
 - Early identification
 - Losses determine urgency
 - Enables proper consideration in planning process
 - PdP used to Recommend Ops and Maintenance Action
 - Early Identification
 - Analysis and Report
 - WO recommendation
 - WO process must support
-
- Early and accurate work identification
 - Enables planning
 - Increases proactive % of work

Real Time Analytics Role in Maintenance Strategy Optimization



Real Time Analytics: Maintenance Strategy Compliance

- Compliance measures crucial to program management
- Magnified Where Real Time Analytics deployed





Real Time Analytics supporting RCFA

- Root Cause Analysis:
 - Data Rich
 - PdP: rapid review for anomalies
 - PdP: Post event models
 - Program Compliance Review
 - PM, PdM, Ops Surveillance
 - Operator Log Review
 - History and Losses Review
-
- Time savings
 - Deductive support
 - Narrow investigative focus

Real Time Analytics: Supporting Risk Calculation

Condition Summary

4160V Motor

ID	Plant	Description	Condition	Criticality	Risk	
BE	Tuft's Cove	FAN Forced Draft Fan - SOUTH	33328200	3	4	12

Condition Rating Criteria

Program Compliance

PM	PdM	Ops Serv	Corrective
Good	Excellent	Good	Moderate

History

Environment	History	Age:	Last Refurb
Clean	Moderate	25	1998

Performance

Losses	Corr B/L
Moderate	Moderate

CBM Program

PdP	Vibration	Oil Analysis	MCM	IR	P.I.	UE
No Issue	0.019	Alert	Normal	Good	No Issues	NTR

Real Time Analytics: Risk Calculation

Condition Summary 4160V Motor

ID	Plant	Description	Condition	Criticality	Risk	
3E	Tuft's Cove	FAN Forced Draft Fan - SOUTH	33328200	3	4	12

Condition Rating Criteria

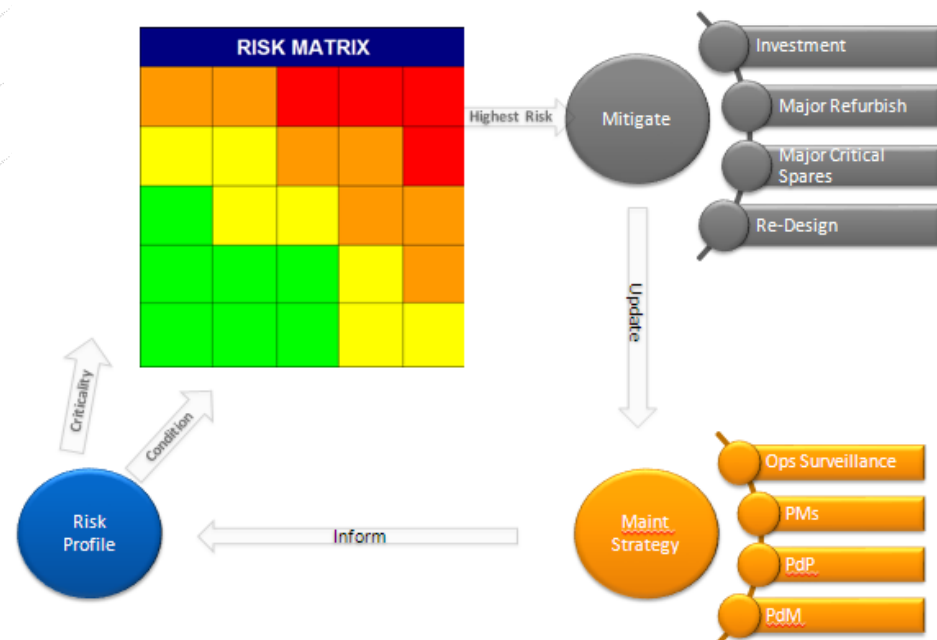
Program Compliance			
PM	PdM	Ops Serv	Corrective
Good	Excellent	Good	Moderate

History			
Environment	History	Age	Last Refurb
Clean	Moderate	25	1998

Performance	
Losses	Corr Bl
Moderate	Moderate

CBM Program						
PdP	Vibration	Oil Analysis	MCM	IR	P.I.	UE
No Issue	0.019	Alert	Normal	Good	No Issues	NTR

Equipment Reliability Process



Real Time Analytics: Operating Risk Calculation

Condition Summary 4160V Motor

ID	Plant	Description	Condition	Criticality	Risk	
BE	Tuft's Cove	FAN Forced Draft Fan - SOUTH	33328200	3	4	12

Condition Rating Criteria

Program Compliance			
PM	PdM	Ops Serv	Corrective
Good	Excellent	Good	Moderate

History			
Environment	History	Age:	Last Refurb
Clean	Moderate	25	1998

Performance	
Losses	Corr B/L
Moderate	Moderate

CBM Program						
PdP	Vibration	Oil Analysis	MCM	IR	P.I.	UE
No Issue:	0.019	Alert	Normal	Good	No Issues	NTR

Program Status

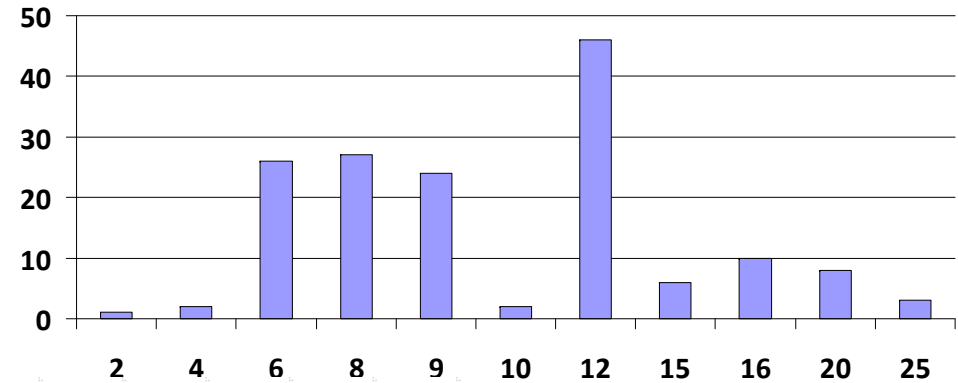
History and Perf

Condition Based

Calculated
Operating
Risk

- Calculated risk including all know asset information
- Enabled by analytical tools and highly integrated asset management systems
- Supporting and simplifying planning daily

Real Time Operating Risk Calculation



Risk Summary

ID	Asset Class	Application	Plant	Equipment	Description	Condition	Criticality	Risk
2E	4160V Motor	BFP	Trenton	643181001	6A BFP Motor	5	5	25
2E	4160V Motor	BFP	LINGAN	24318001	(MOTOR) A-BOILER FEED PUMP	5	5	25
2E	4160V Motor	BFP	Tuft's Cove	24318200	Boiler Feed Pump - SOUTH	5	5	25
2E	4160V Motor	BFP	Tuft's Cove	34318200	Boiler Feed Pump - SOUTH	4	5	20
2E	4160V Motor	BFP	Tuft's Cove	34318100	Boiler Feed Pump - NORTH	4	5	20
2E	4160V Motor	BFP	Tuft's Cove	14318200	Boiler Feed Pump - SOUTH	4	5	20
2E	4160V Motor	BFP	Tuft's Cove	14318100	Boiler Feed Pump - NORTH	4	5	20
2E	4160V Motor	BFP	Trenton	543181003	Boiler Feed Pump Motor No. 2 No. 5 Boiler	4	5	20
2E	4160V Motor	BFP	Point Tupper	24318018	#1 NBFP MOTOR	5	4	20
3E	4160V Motor	FAN	Trenton	533181001	I.D. Fan Motor No. 1 No. 5 Boiler	4	5	20
2E	4160V Motor	BFP	LINGAN	24318002	(MOTOR) B-BOILER FEED PUMP	4	5	20
2E	4160V Motor	CW	LINGAN	34228001	MOTOR-CIRCULATING WATER PUMP (A)	4	4	16
2E	4160V Motor	CW	Tuft's Cove	24228200	C.W.Pump - SOUTH	4	4	16
3E	4160V Motor	FAN	Point Tupper	23318001	NORTH FORCED DRAFT FAN MOTOR	4	4	16
2E	4160V Motor	CW	Trenton	542281001	CW Pump Motor No. 1 No. 5 M/C	4	4	16



Summary

- Real Time Analytics: Early Success
 - improved issue identification
 - Integrated with work processes
- Growing support for other AM Process
 - Factor in determining equipment health and calculating risk
 - Supporting asset planning: investment , refurbish, outage
- Asset Strategy Optimization
 - Increasing proactive approach
 - Earlier issue ID
 - Fewer PMs
- Growth area: Continued integration in AM processes
 - Operating Risk ID
 - Daily/Weekly work Planning
 - Planning process improvement

Outlook

- Greater real time analytical capability
- Improving infrastructure to manage data and produce intelligence
- More holistic thinking about Asset Management integrating
 - all activities related to equipment performance
 - strategic purpose
- Inevitable push toward Fleet Approach
- Innovation race: to address business drivers

- Utilization of generation assets: dynamic
- Future planning: complex
- Demographics: knowledge gap
- Stakeholder scrutiny: increasing
- Transparency: expectation
- Business pressures: cost, production

