Driving Performance Improvement Initiatives using the PI System and iTi's Ekho Solution Framework

Presented by

Mark Collins and Parag Paleja

Presentation Abstract

- Inexcon Technologies Inc (iTi) is the developer of the Ekho Performance Management System – an application solution for industrial customers, built on the PI System. The software has been widely installed in Pulp & Paper, Mining & Metals, Food & Beverage, Chemicals, and Alternative Energy. Joint customers with OSIsoft include major corporations like Tembec, Appleton, Newpage, Algoma, AbitibiBowater, Mittal, Novelis, BP, Philip Morris, Essar and Smurfit.
- This presentation will focus on how BP Alternative Energy has utilized the PI System, and how they have used Ekho as an application layer on top of the PI System, to address specific application requirements. Examples will be given from other customers, to show how the same Ekho platform can be applied in any industrial environment.
- PI System components in use by these customers include: PI ProcessBook, PI DataLink, PI AF, PI ACE, PI MDB, PI Notifications and PI WebParts.
- PI was chosen by iTi and our customers because of the ability of the software to handle large volumes of real time data in a high performance manner; the value the PI System brings for real-time monitoring and alerting, reporting, and performance analysis; and the ability to easily integrate real time performance and event data into 3rd party applications such as iTi's Ekho software.

Speakers

Mark Collins

- Inexcon Technologies Inc
- Vice President

Parag Palega

- BP Alternative Energy
- Project Consultant

Agenda

- Introduction & Presentation Overview
- Inexcon Technologies Inc (iTi) and Ekho
- The use of the PI System and Ekho in BP Wind
  - BP Alternative Energy
  - Challenges in Wind Energy, in Operations and with Systems
  - Required Functionality in Wind Farm Management Systems
  - The Importance of the PI System
  - Implementation of the PI System and Ekho-for-Wind at BP
- The business case for a WFMS
- Use case examples from other industries
- Summary, and Q&A

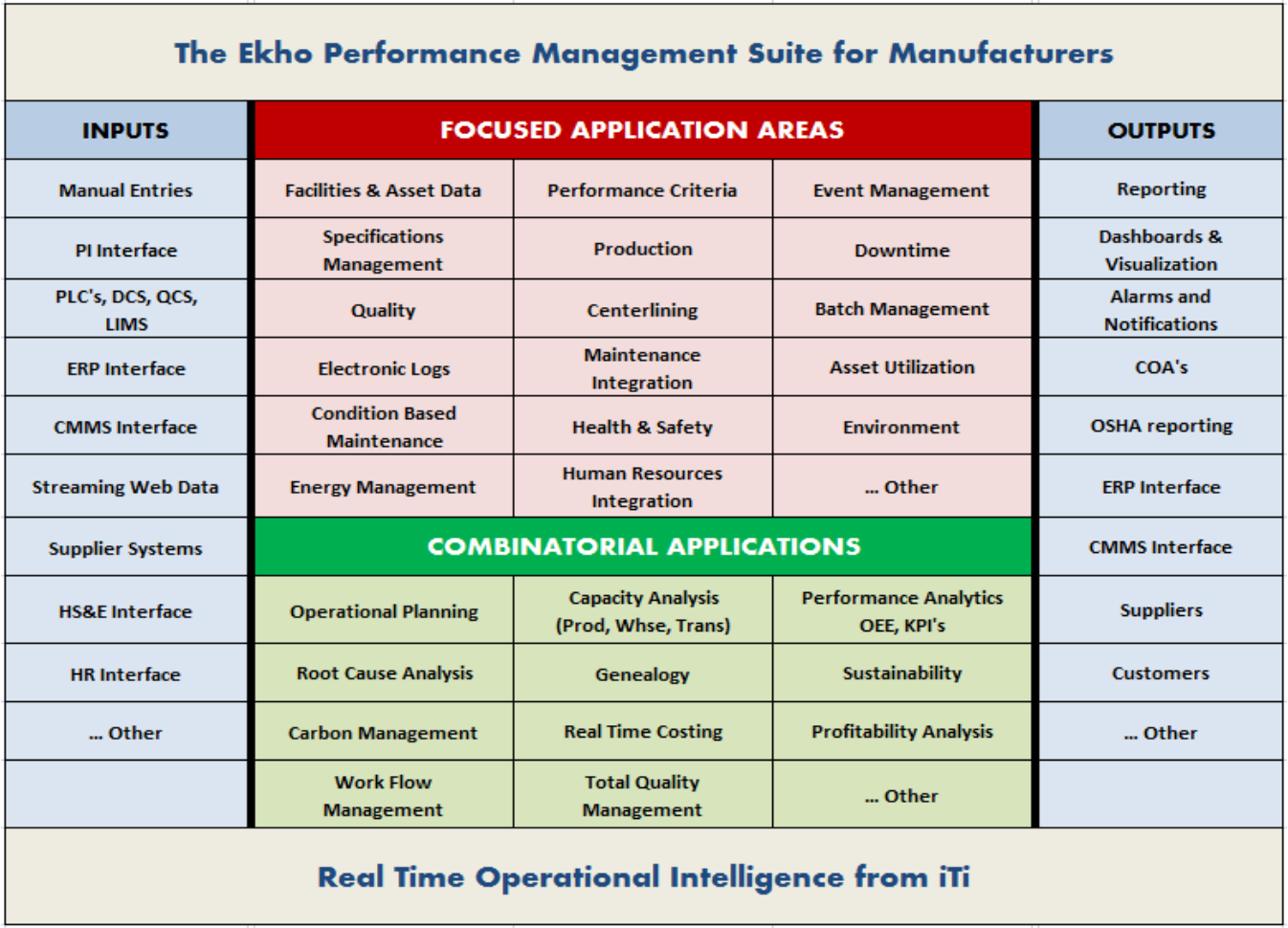
About Inexcon Technologies

- 12 year old Software Company
- Focused on Process Industries and Renewables
- Established customer base in Europe and North America
- Head office in Montreal, Sales offices in USA, UK and Europe

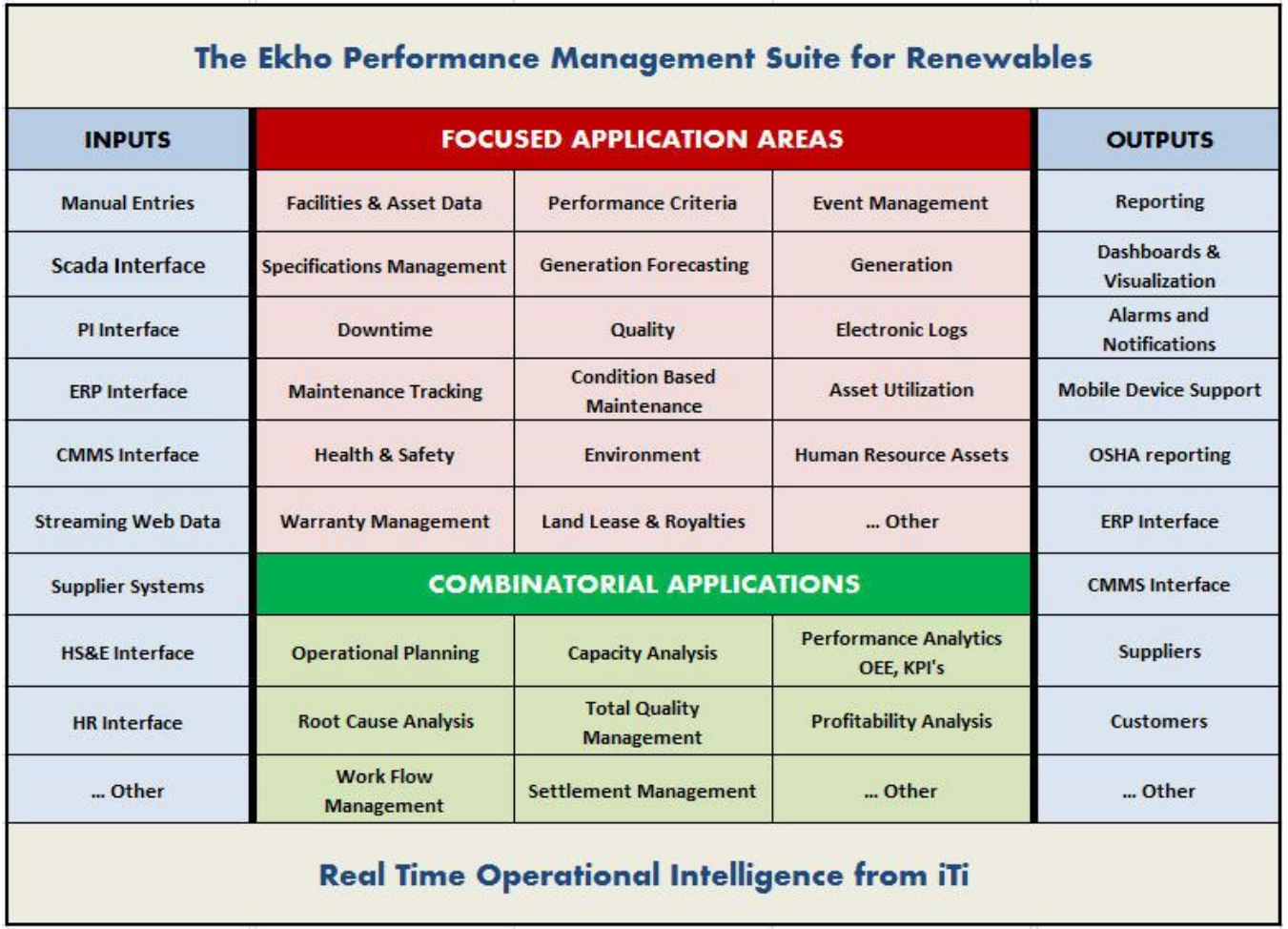
More About iTi

- iTi is the developer of the Ekho Performance Management software suite.
- Software is installed in Pulp & Paper, Mining & Metals, Food & Beverage, Chemicals and Renewable Energy
- In conjunction with the PI System, Ekho provides real time operational intelligence for driving performance management initiatives and increasing ROI
- iTi is a developer partner with OSIsoft and one of the early adopters of Event Frames

iTi's Solution Framework



iTi's Solution Framework for Renewables



Use of the PI System with Ekho at BP Wind

About BP Alternative Energy

- BP Alternative Energy has invested over $5 billion in the growing markets of Wind, Solar and Biofuels

- **Wind**
  - 10 Wind Farms ranging in capacity from 20MW to 300MW
  - Nearly 900 Turbines, and over 1,300 MW capacity in 8 States

About BP Alternative Energy

- **Solar**
  - In the business for 35 years
  - Shipped its 10 millionth module in 2009
  - Operating assets in China, Europe and North America
- **Biofuels**
  - Recent expansion in Brazil with CNAA acquisition brings annual capacity to 1.4 billion liters of Ethanol
  - On plan to invest $500 Million in Biofuels in the next decade.

Challenges in Optimizing Wind Farm Operations and Maintenance

Challenges in Wind Farm Management

- Assets are widely distributed and generally unmanned
- Component failures can run into ½ million dollars
- Ensuring peak asset performance in variable conditions
- Avoiding catastrophic failures and financial consequences
- Maintenance planning and downtime tracking
- Managing health & safety, and quality
- In-Warranty and Post-Warranty management
- Generation reporting and forecasting

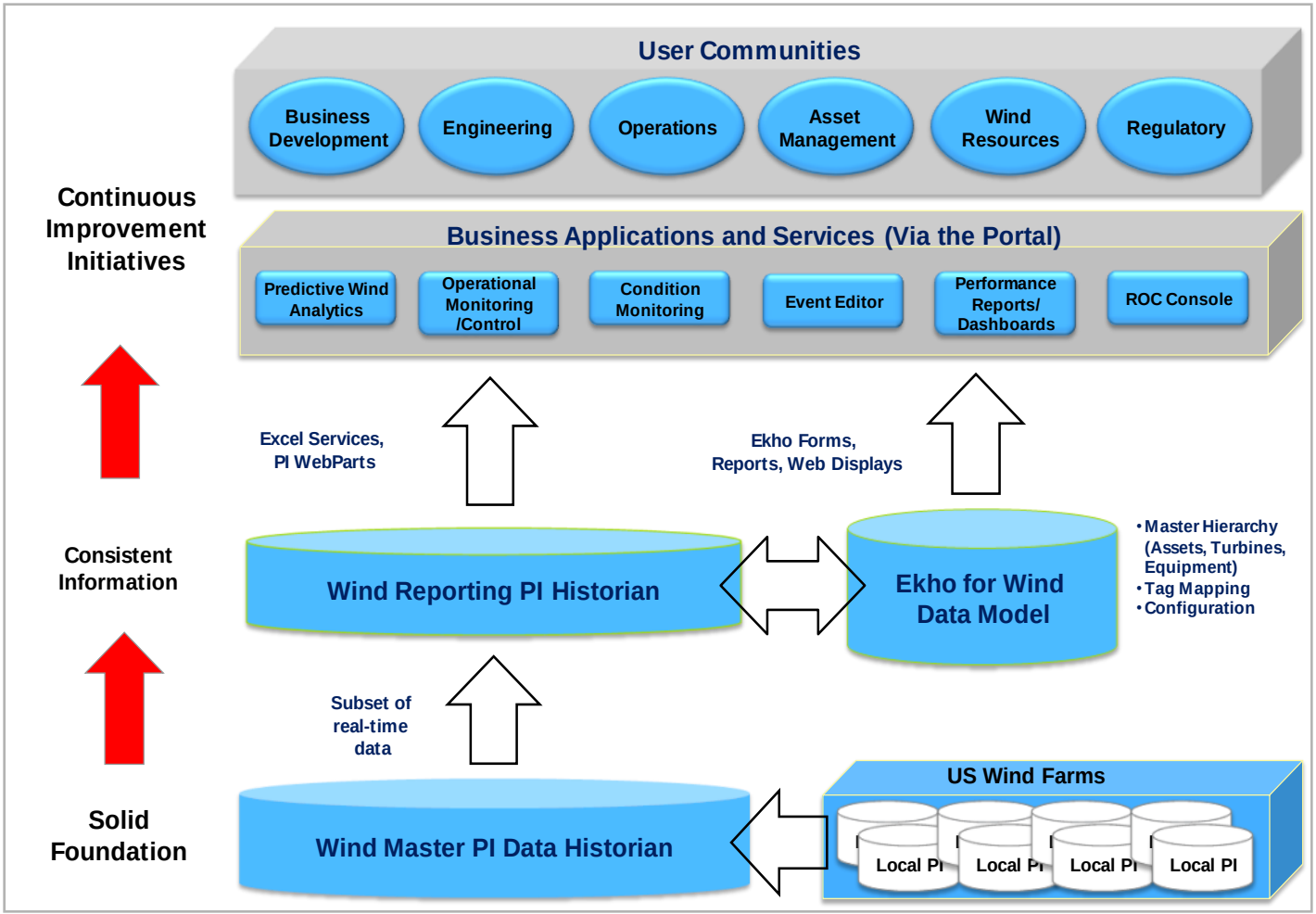
Systems Challenges in Wind Farms

- There are many diverse field systems
  - SCADA, Met Towers, Vibration and Condition Monitoring, etc
- There are also many related business systems
  - ERP, Maintenance, Quality, HR, Health, Safety and Environment
- Many different user perspectives
  - Planning, Operations, Maintenance, Performance Analysis, etc
- Need “broader” and “higher level” vision beyond SCADA
- Must support multiple vendors, but with vendor independence
- Need a real time historian
- Need an application system on top of the historian, for WFMS

Required Features for WFMS at BP

- Scalability – BP plans to grow from 1300 MW to 4000 MW
- Extensibility – Start in one area and expand across the organization
- Already configured for Wind – KPI’s, Displays, Reports
- User customizable displays and reports – Mandatory
- Microsoft centric – BP Standard
- PI System Centric – Required for capacity, performance and growth

BP's Solution Vision



System Functionality

Metrics (Generation, Availability, Wind Speed) are used in dashboard displays and reports

Fleet and Park Dashboards

- Generation, Availability, Wind Speed

Daily, Weekly, Monthly Reports

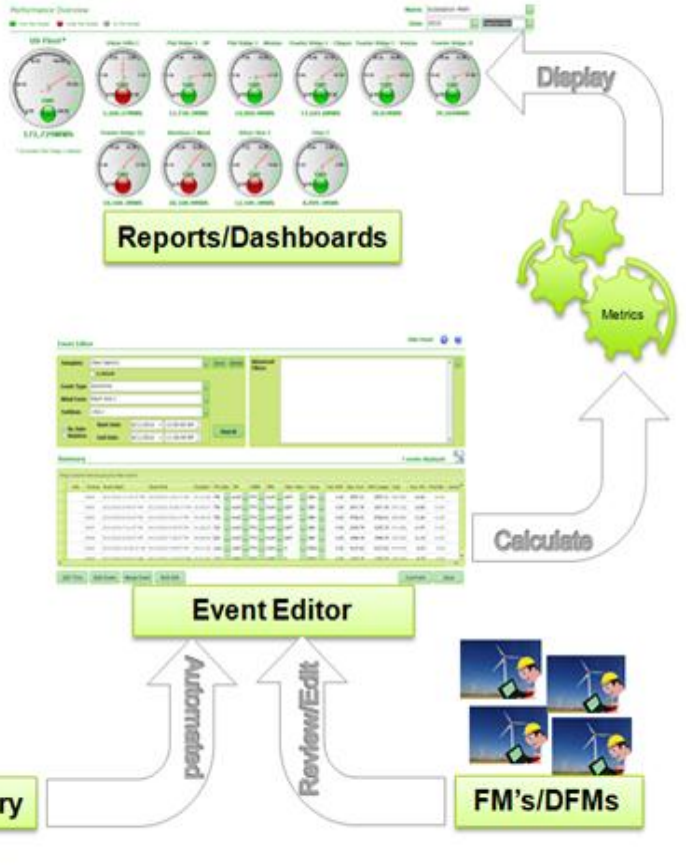
- Performance and Downtime Related by Park, Group, Turbine

Availability metrics are derived directly from edited, allocated downtime event data

Downtime events are captured via automation and rendered via the Downtime Editor

FMs/DFMs edit downtime if necessary to accurately allocate events

All FMs/DFMs have been trained along with follow up sessions and one-on-one reviews.

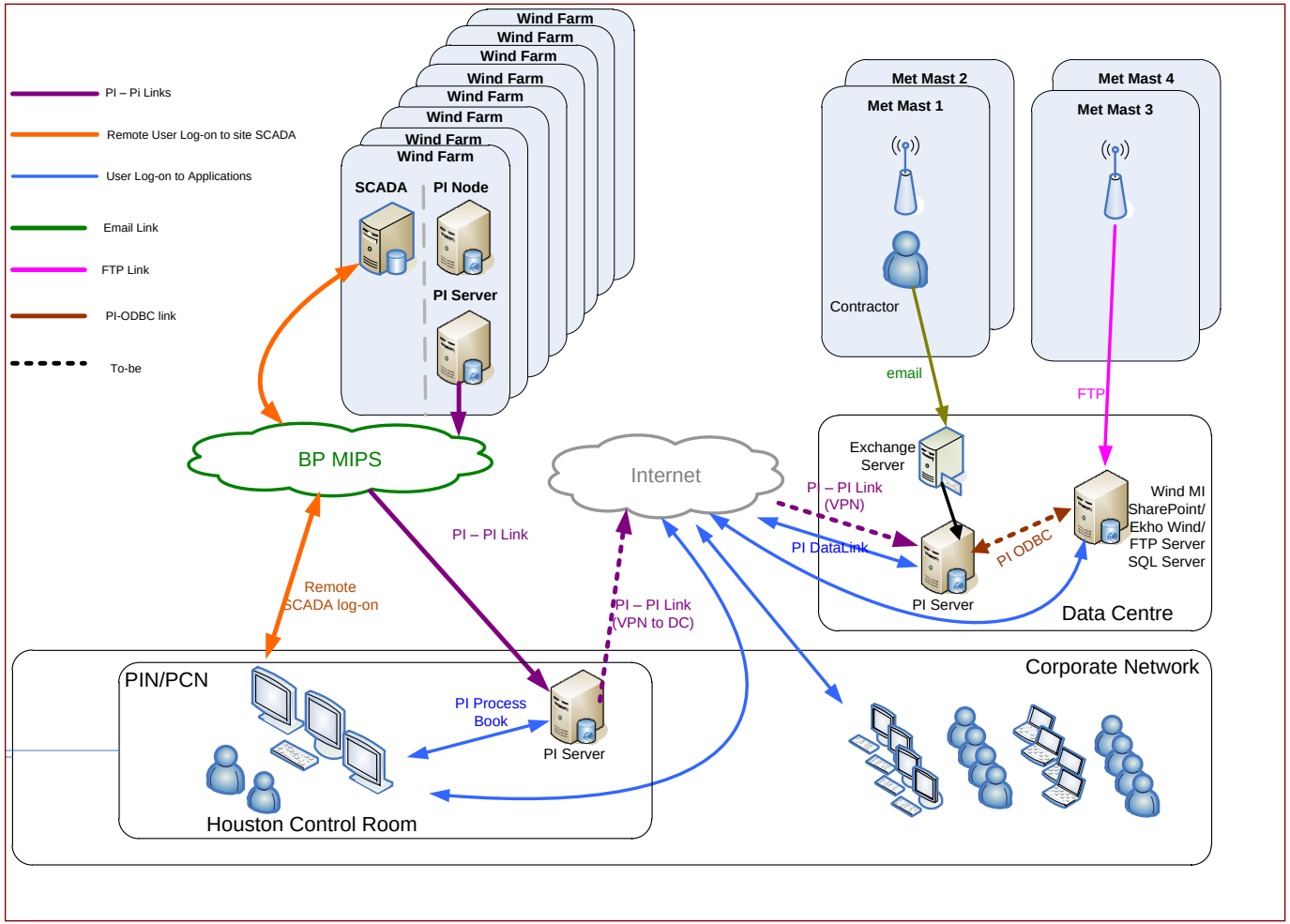


The Importance of the PI System

Why the PI System Was Chosen by BP

- The ability of the PI System to handle large volumes of real time data in an environment demanding reliability and high performance.
- The value the PI System brings to BP for real time monitoring and alerting, reporting, event editing and performance analysis.
- The ability to easily integrate real time performance and event data into 3rd party applications such as iTi's Ekho for Wind.
- This combination of systems provides BP with a level of insight not available with current SCADA solutions or business applications.

PI System Architecture



Use of the PI System at BP Alternative Energy

- Enterprise Agreement with BP
- PI System components in use include:
  - PI ProcessBook
  - PI DataLink
  - PI AF
  - PI ACE
  - PI MDB
  - PI WebParts

Implementation - Planned vs Actual Functionality, Schedule, Benefits and Value

Project Scope and Timeline

- PI System installed in 2008 - 2009
- Ekho for Wind installed in 2010 – 2011, featuring multiple short cycle projects, usually 3 - 4 months duration, including:
  - Asset Performance & Downtime Tracking
  - NERC / GADS Reporting
  - Royalty Payments & Wind Adjusted Energy
  - Wind Analytics & Extended Failure Tracking
  - Management Dashboards with Financials
- Major initiative now underway in 2011 and 2012 for Solar operations on a global scale.

Hard Benefits from WFMS

- Improved asset performance
- Immediate insight into issues impacting operations and revenue
- Improved response to revenue impacting incidents
- Ability to anticipate failures and schedule maintenance accordingly
- Lower maintenance costs and spares inventory levels
- Improved equipment reliability and extending the life of assets
- Independent control over Warranty claims
- Lowering costs and improving profitability
- Increasing reliability of generation forecasts
- Reduced labor costs for gathering data, conducting analyses and generating reports

Soft Benefits from WFMS

- Minimally invasive, easy to use, industry specific solution.
- Improved insight into the overall operations
- Better understanding of the relationship between performance metrics
- Everyone is working with the same information
- Providing a simplified user interface when compared to control systems
- Improved employee morale
- Roll-out in baby steps – no need for a big bang approach
- PI System and Ekho provide a scalable and extensible solution
- Platform for continuous improvement initiatives (Lean, Six Sigma, TQM)
- Vendor independent view

Five Takeaways from BP's Perspective

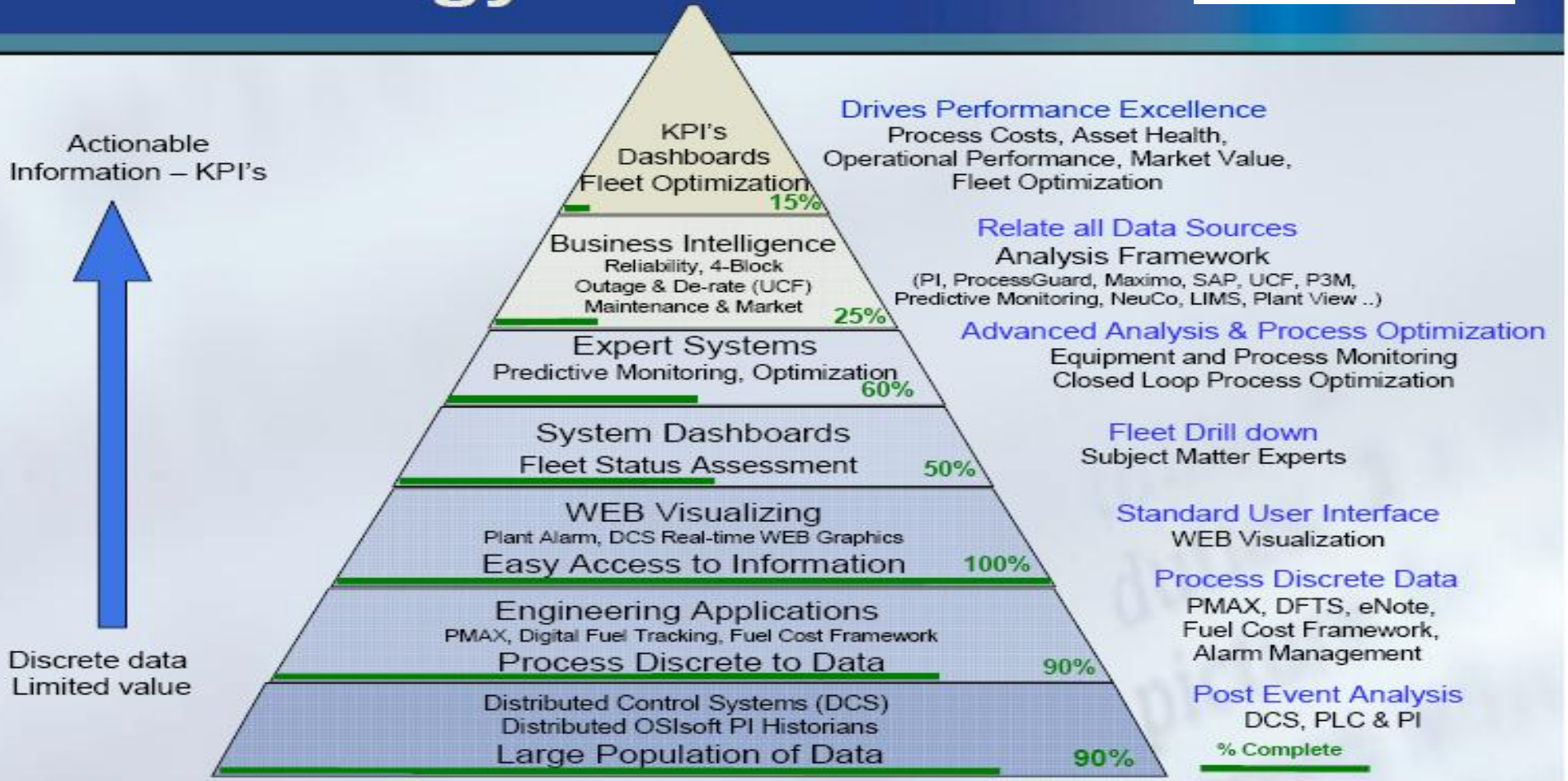
- Wind Farm Management Systems are coming of age
- There are three key components in a successful solution
  - Field level systems (SCADA, Met Data, Condition Monitoring, etc)
  - The PI System for real-time information about processes and events
  - The application software required to address business requirements
- The full solution is required to provide the necessary visibility for performance improvement initiatives
- The benefits to be derived from a successful system are very significant, and can easily tally in the millions – even for small operators
- You could not do what we have done without the PI System providing the infrastructure and framework for the overall WFMS.

Why was Ekho Chosen as the Application Layer

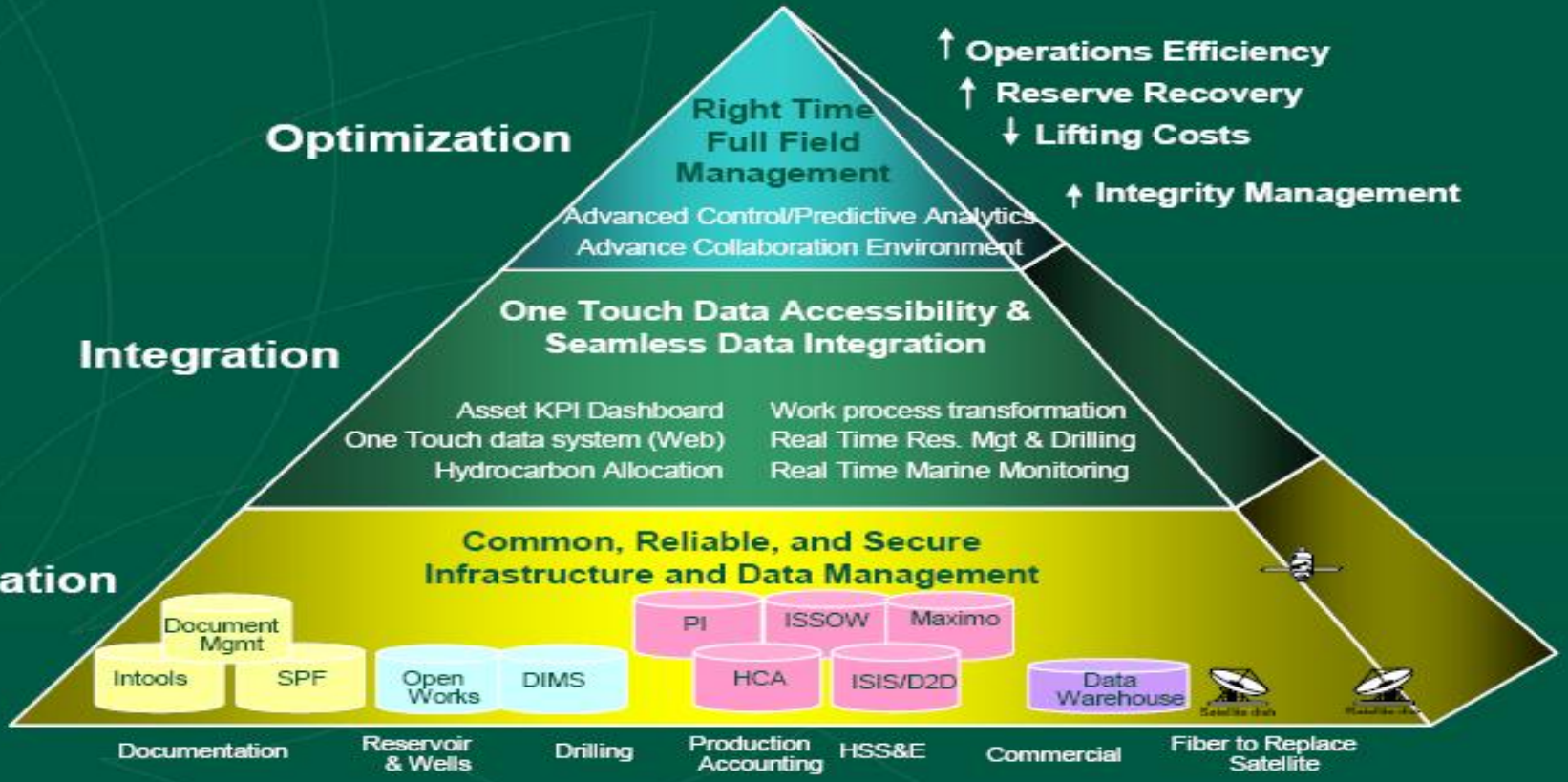
	PI System	Ekho
Similarities		
Scalability	✔	✔
Extensibility	✔	✔
Applicability	✔	✔
Framework	✔	✔
Differences		
Primary Focus	**Infrastructure**	**Applications**

Technology Framework

DTE Energy



GoM Information Management Strategic Framework



Ekho For Wind

Bringing it all together as Operational Intelligence for Performance Improvement initiatives.

1. Aggregate
2. Contextualize
3. Analyze
4. Visualize
5. Utilize
6. Propagate


Planning

Operations

Maintenance

Human Resources


Procurement

Warranty


Accounting & Finance


Performance Analysis


Reporting

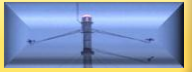

Condition Monitoring


Communications & Security


Streaming Internet Data


Wind Farms SCADA


Substations SCADA


Meteorological Towers


ERP System


Asset Database


Maintenance System


Spares Inventory

Environment, Health & Safety

Quality System

EKHO APPLICABILITY MATRIX

Inexcon Technologies

Functional Areas	Description of Opportunity Areas
Planning	Ekho can be used to provide full visualization over operations, incorporating data from SCADA, Maintenance, the Internet, ERP, etc
Production	All generation data is tracked into Ekho by individual asset, and visible in real time displays
Downtime	All downtime events - planned or unplanned, imposed or self induced can be tracked in Ekho, with related coding for regulatory reporting
Safety	Safety guidelines can be built into Ekho, and all incidents tracked and reported
Root Cause Analysis	RCA functionality is built into the system, and can be invoked on any event - safety incident, equipment failure, etc
Quality	Ekho can be used for performing quality tests and tracking results against specifications, for material quality, paper quality, batch properties, etc
Environment	Environmental incidents can be tracked from automatic sources for air and water discharge, or from manual entries (oil spill).
Total Quality (TQM)	Ekho provides a platform for all Continuous Improvement Initiatives - setting targets, measuring performance and reporting progress
Predictive Analytics	Mine the data and information in Ekho to perform predictive analytics on potential increases in revenue, or possible equipment failures
Energy	Use Ekho with PI to track and analyze energy consumption relative to operations, performance and quality.
Compliance	Regulatory compliance, Contractual compliance, Best practices compliance
Reporting	Reporting for Management, Operations, Landowners, Owners / Investors, and Regulatory reporting
... Other	Tackle additional areas as they become business priorities

Where is the Payback in Wind Energy

Where is the Payback (Industry examples)

- A 1% improvement in performance across a 150 MW wind farm can result in additional annual revenue of **$1.5 million**

- A gearbox failure can cost anywhere from **$300K - $500K** when you include repair / replacement costs plus the lost revenue

- Information to support “in warranty” claims, and “end of warranty” inspections can easily save **$100K - $200K**

Where is the Payback (Industry examples)

- Freeing up personnel to work on other tasks or projects
  - Handling wind analytics on the PI System with Ekho can save one FTE
  - Preparing Daily, Weekly, Monthly reports requires one FTE
  - BP has seen a reduction of 90% manual labor in several areas

- T

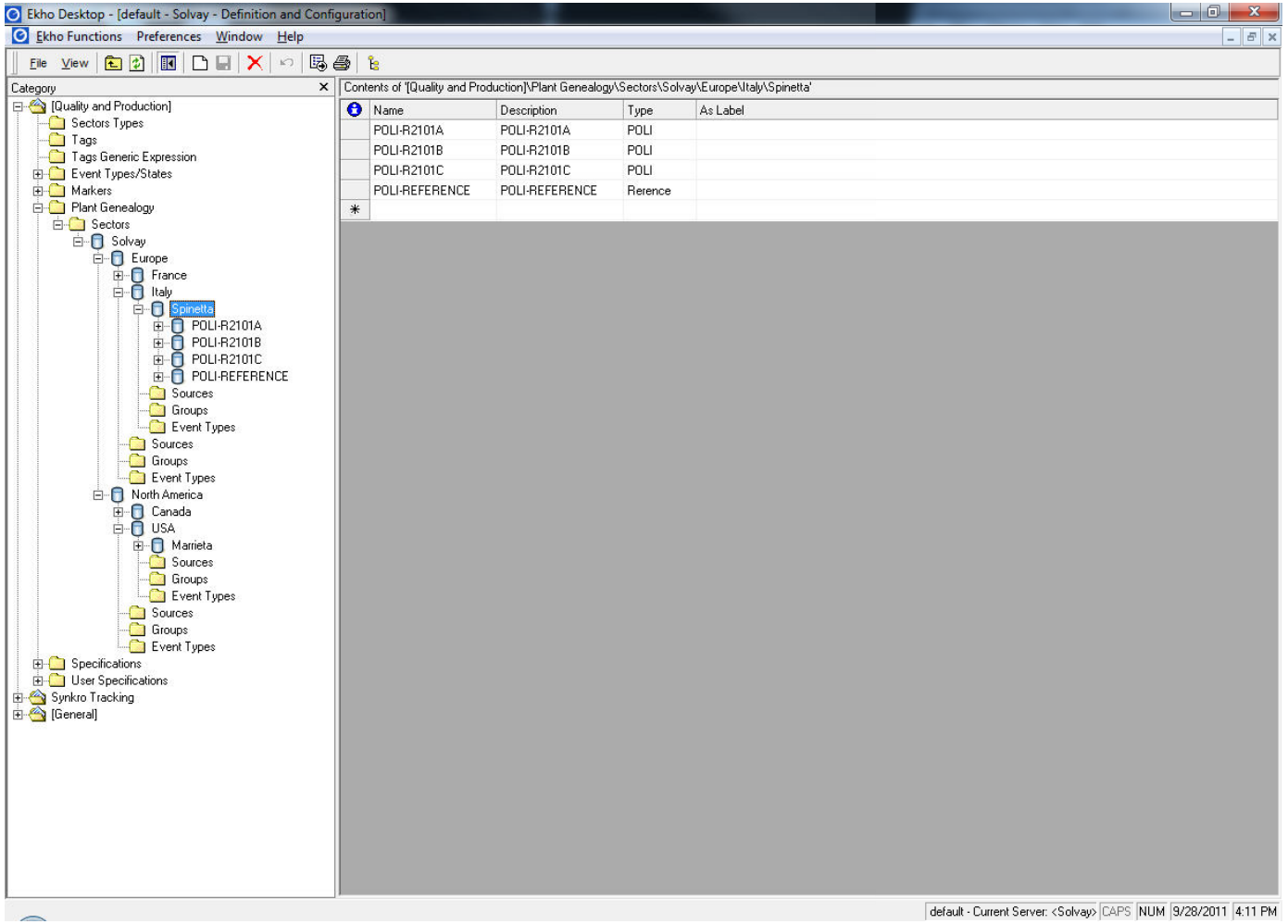
Capacity	Regular price	Crisis price	Hourly income
150 MW	$70		$10,500
150 MW		$3,000	$450,000
Profit Improvement Potential		**4,286%**	

Ekho in Other Industries

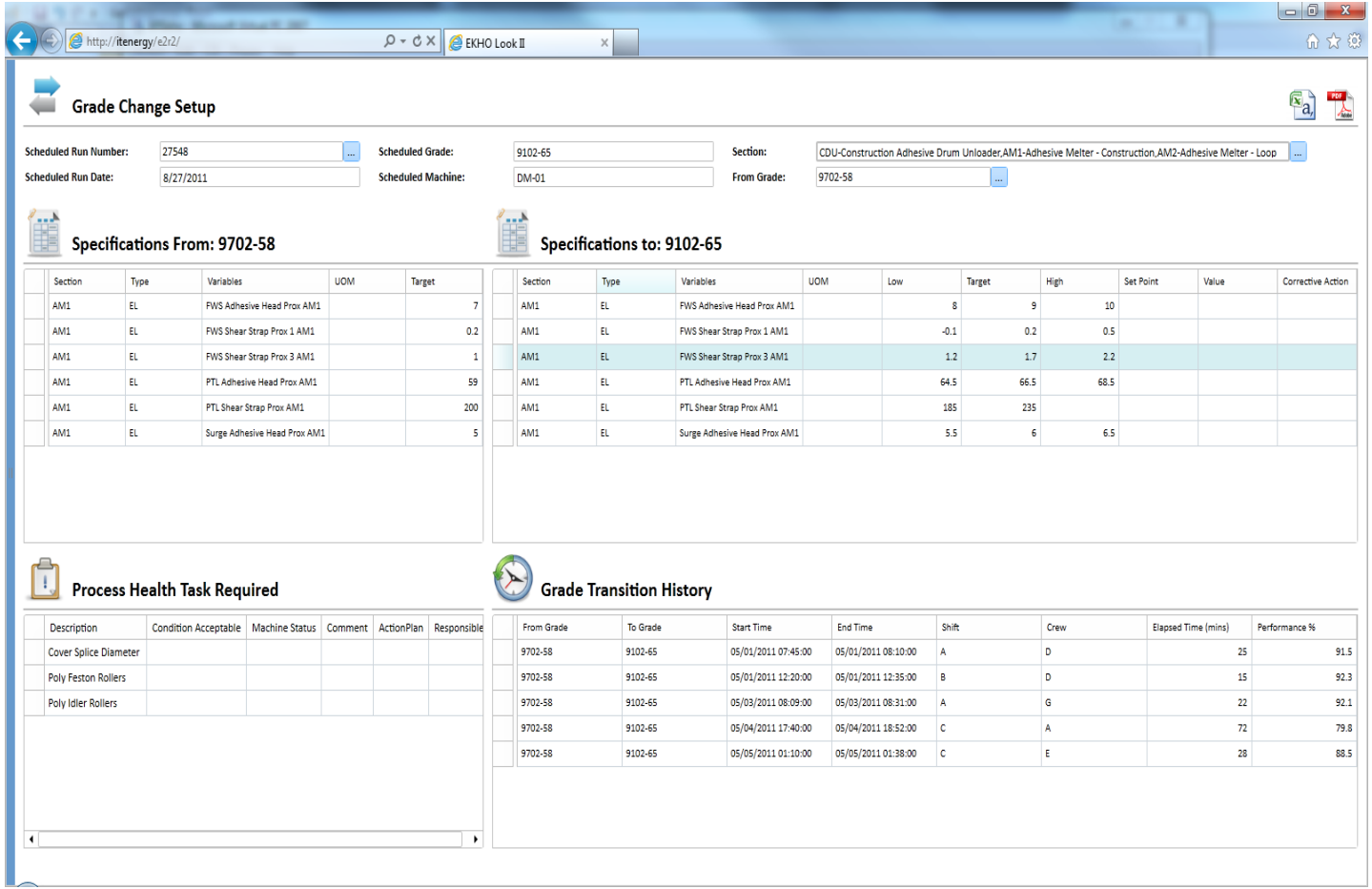
iTi's Solution Framework for Manufacturers

Some of iTi's Corporate Customers

Asset Framework



Specifications



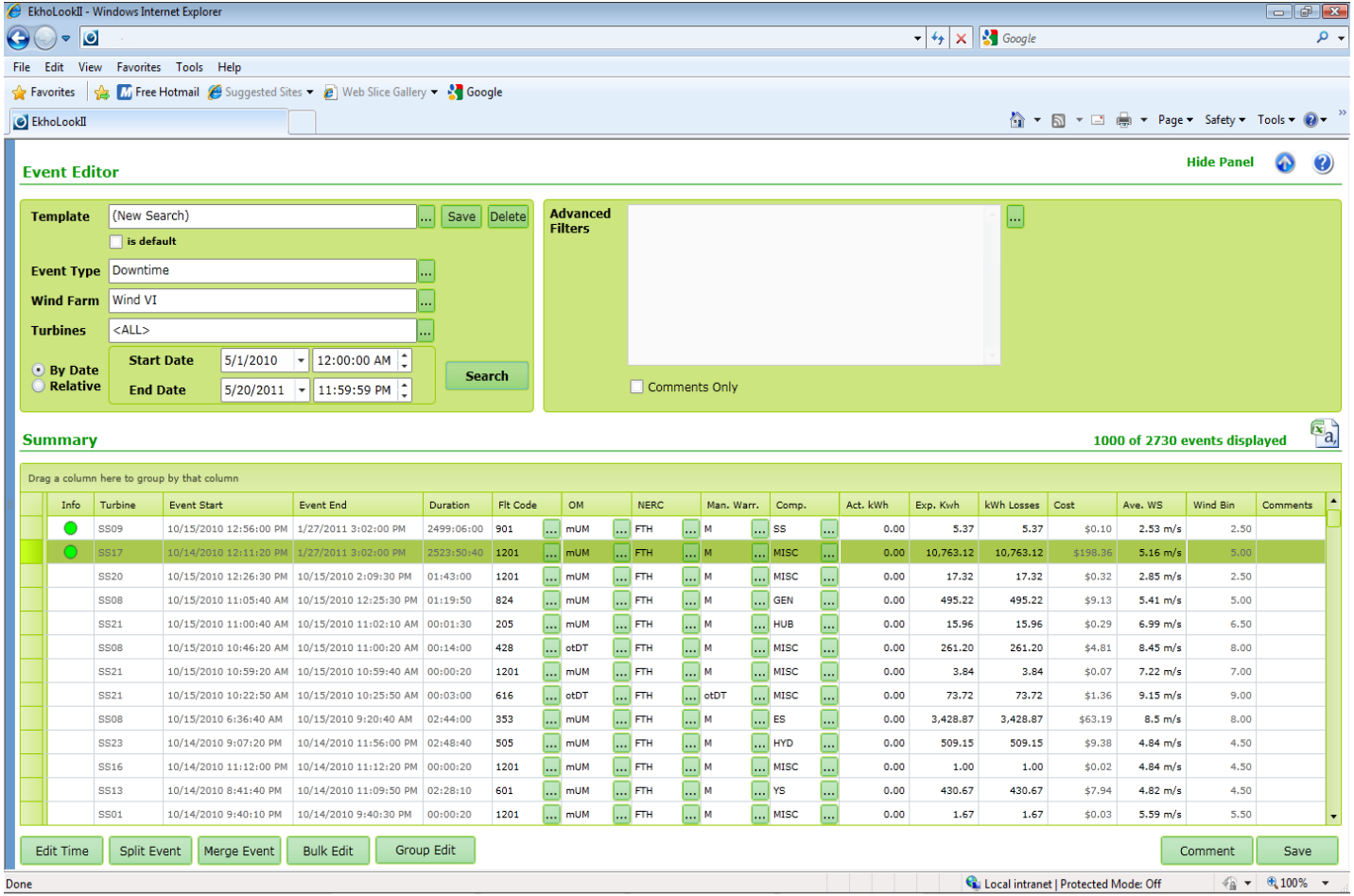
Section	Type	Variables	UOM	Target
AM1	EL	FWS Adhesive Head Prox AM1		7
AM1	EL	FWS Shear Strap Prox 1 AM1		0.2
AM1	EL	FWS Shear Strap Prox 3 AM1		1
AM1	EL	PTL Adhesive Head Prox AM1		59
AM1	EL	PTL Shear Strap Prox AM1		200
AM1	EL	Surge Adhesive Head Prox AM1		5

Section	Type	Variables	UOM	Low	Target	High	Set Point	Value	Corrective Action
AM1	EL	FWS Adhesive Head Prox AM1		8	9	10			
AM1	EL	FWS Shear Strap Prox 1 AM1		-0.1	0.2	0.5			
AM1	EL	FWS Shear Strap Prox 3 AM1		1.2	1.7	2.2			
AM1	EL	PTL Adhesive Head Prox AM1		64.5	66.5	68.5			
AM1	EL	PTL Shear Strap Prox AM1		185	235				
AM1	EL	Surge Adhesive Head Prox AM1		5.5	6	6.5			

Description	Condition Acceptable	Machine Status	Comment	ActionPlan	Responsible
Cover Splice Diameter					
Poly Feston Rollers					
Poly Idler Rollers					

From Grade	To Grade	Start Time	End Time	Shift	Crew	Elapsed Time (mins)	Performance %
9702-58	9102-65	05/01/2011 07:45:00	05/01/2011 08:10:00	A	D	25	91.5
9702-58	9102-65	05/01/2011 12:20:00	05/01/2011 12:35:00	B	D	15	92.3
9702-58	9102-65	05/03/2011 08:09:00	05/03/2011 08:31:00	A	G	22	92.1
9702-58	9102-65	05/04/2011 17:40:00	05/04/2011 18:52:00	C	A	72	79.8
9702-58	9102-65	05/05/2011 01:10:00	05/05/2011 01:38:00	C	E	28	88.5

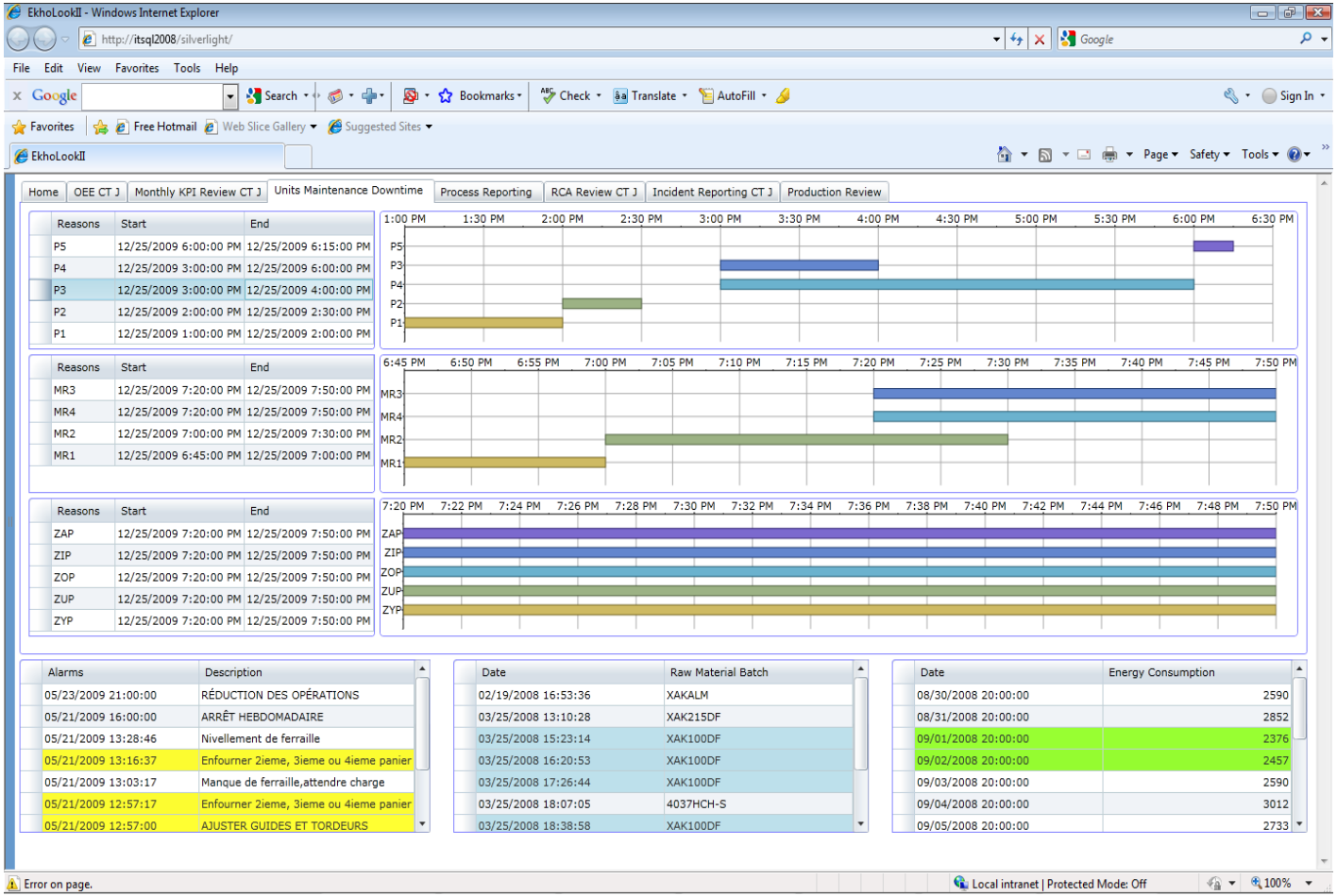
Event Management



Production


EkhoLookII - Windows Internet Explorer
File Edit View Favorites Tools Help
Favorites Free Hotmail Suggested Sites Web Slice Gallery Google
EkhoLookII
Page Safety Tools
Performance Highlight
Over Plan Budget
Under Plan Budget
No Plan Budget
Project Wind I (Project)
Date 2010 September
Generation
Gross Avail
Contract Avail
Project Avail
Commercial Avail
GWh
%
22,146.5MWh
95.12%
97.47%
98.05%
97.88%
Generation
Availibility
Gross MWh
Date
Actual Budget
Date = 5
Gross = 93.75
Contract = 95.64
Project = 95.56
Commercial = 92.20
Gross Contract Project Commercial
Done
Local intranet | Protected Mode: Off
100%

Downtime


EkhoLookII - Windows Internet Explorer
http://itsql2008/silverlight/
EkhoLookII
Home
OEE CT J
Monthly KPI Review CT J
Units Maintenance Downtime
Process Reporting
RCA Review CT J
Incident Reporting CT J
Production Review
Reasons Start End
P5 12/25/2009 6:00:00 PM 12/25/2009 6:15:00 PM
P4 12/25/2009 3:00:00 PM 12/25/2009 6:00:00 PM
P3 12/25/2009 3:00:00 PM 12/25/2009 4:00:00 PM
P2 12/25/2009 2:00:00 PM 12/25/2009 2:30:00 PM
P1 12/25/2009 1:00:00 PM 12/25/2009 2:00:00 PM
1:00 PM 1:30 PM 2:00 PM 2:30 PM 3:00 PM 3:30 PM 4:00 PM 4:30 PM 5:00 PM 5:30 PM 6:00 PM 6:30 PM
P5 P3 P4 P2 P1
Reasons Start End
MR3 12/25/2009 7:20:00 PM 12/25/2009 7:50:00 PM
MR4 12/25/2009 7:20:00 PM 12/25/2009 7:50:00 PM
MR2 12/25/2009 7:00:00 PM 12/25/2009 7:30:00 PM
MR1 12/25/2009 6:45:00 PM 12/25/2009 7:00:00 PM
6:45 PM 6:50 PM 6:55 PM 7:00 PM 7:05 PM 7:10 PM 7:15 PM 7:20 PM 7:25 PM 7:30 PM 7:35 PM 7:40 PM 7:45 PM 7:50 PM
MR3 MR4 MR2 MR1
Reasons Start End
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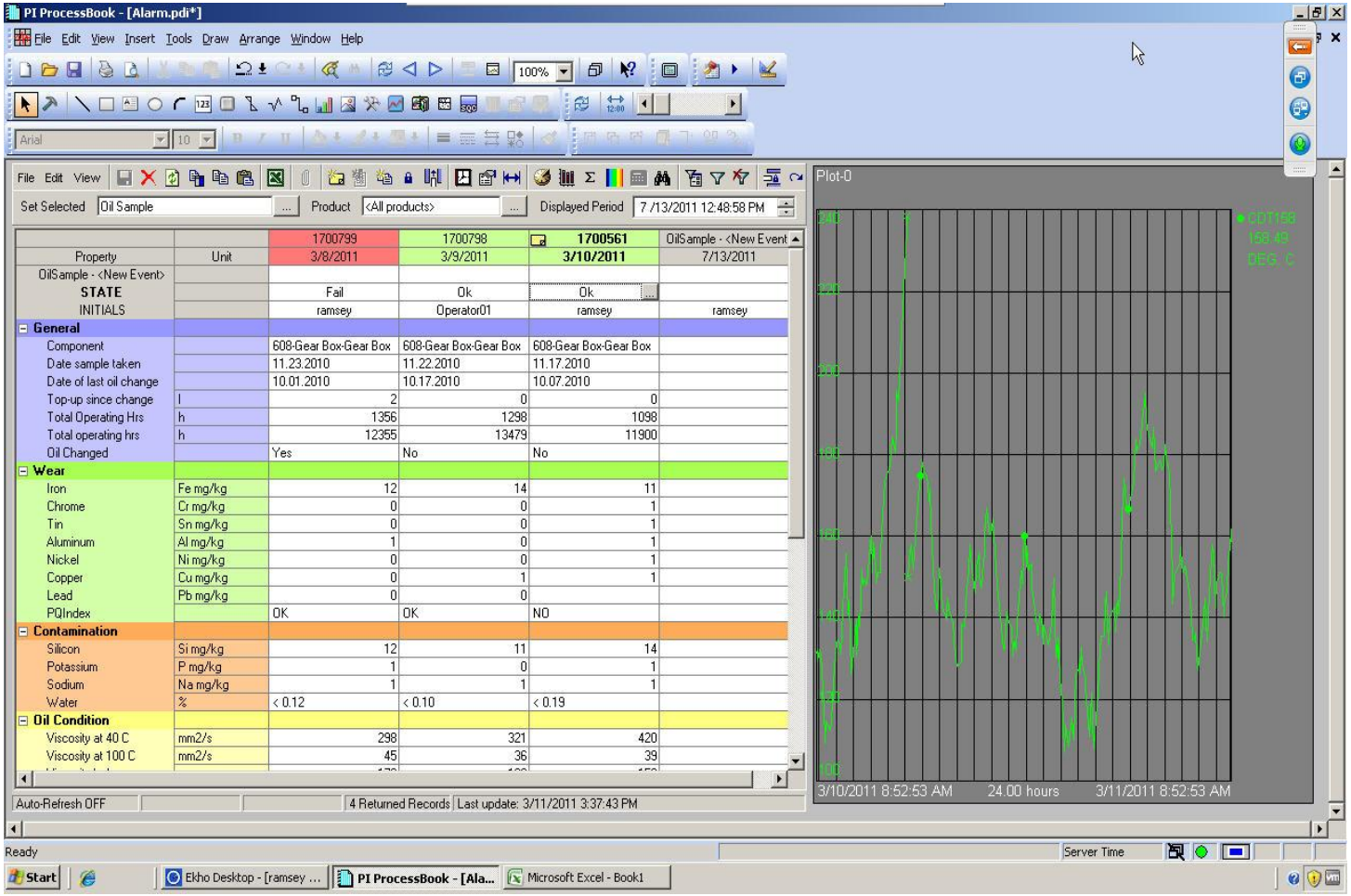
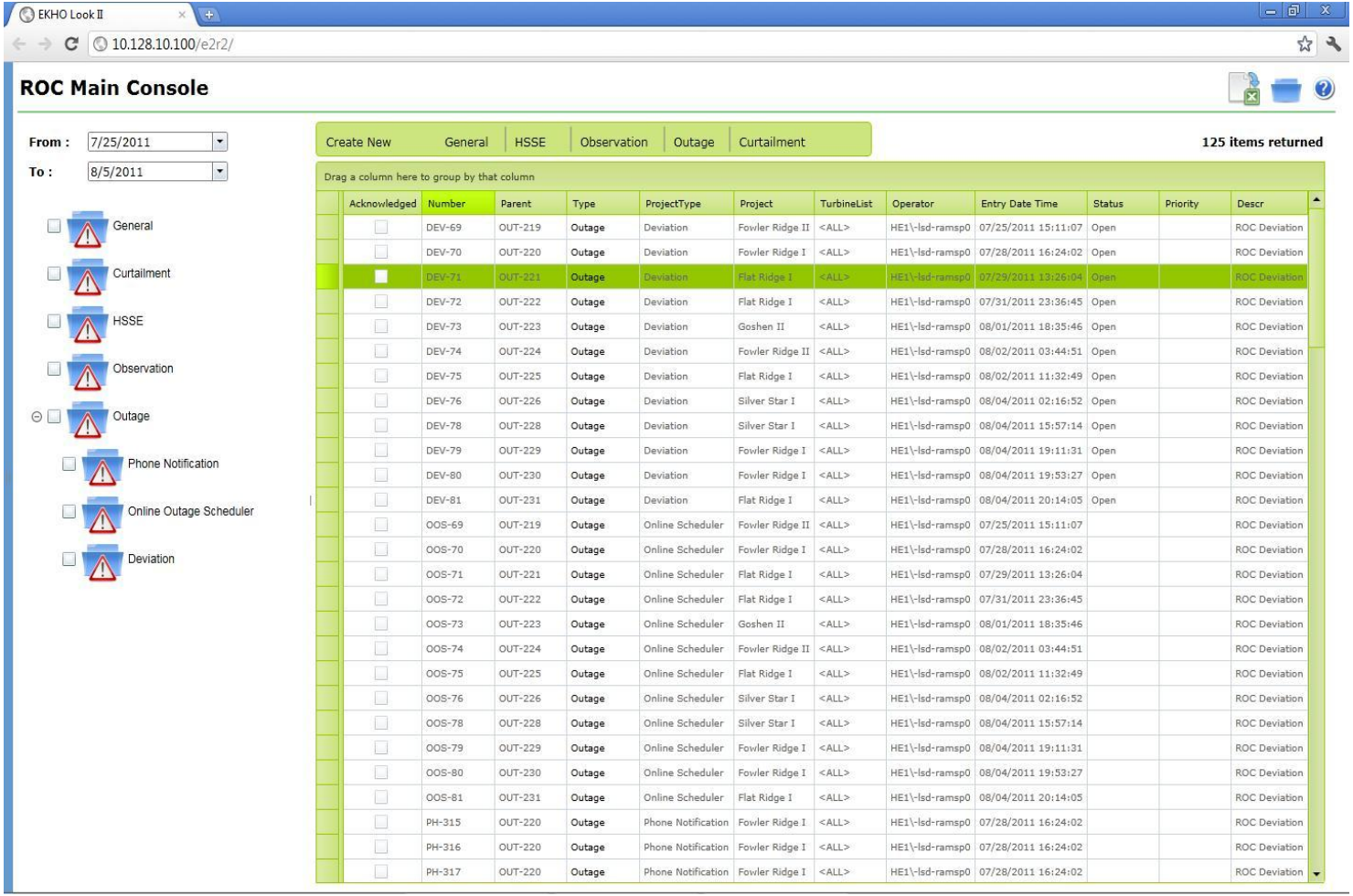
ZIP 12/25/2009 7:20:00 PM 12/25/2009 7:50:00 PM
ZOP 12/25/2009 7:20:00 PM 12/25/2009 7:50:00 PM
ZUP 12/25/2009 7:20:00 PM 12/25/2009 7:50:00 PM
ZYP 12/25/2009 7:20:00 PM 12/25/2009 7:50:00 PM
7:20 PM 7:22 PM 7:24 PM 7:26 PM 7:28 PM 7:30 PM 7:32 PM 7:34 PM 7:36 PM 7:38 PM 7:40 PM 7:42 PM 7:44 PM 7:46 PM 7:48 PM 7:50 PM
ZAP ZIP ZOP ZUP ZYP
Alarms Description
05/23/2009 21:00:00 RÉDUCTION DES OPÉRATIONS
05/21/2009 16:00:00 ARRÊT HEBDOMADAIRE
05/21/2009 13:28:46 Nivellement de ferraille
05/21/2009 13:16:37 Enfourner 2ieme, 3ieme ou 4ieme panier
05/21/2009 13:03:17 Manque de ferraille,attendre charge
05/21/2009 12:57:17 Enfourner 2ieme, 3ieme ou 4ieme panier
05/21/2009 12:57:00 AJUSTER GUIDES ET TORDEURS
Date Raw Material Batch
02/19/2008 16:53:36 XAKALM
03/25/2008 13:10:28 XAK215DF
03/25/2008 15:23:14 XAK100DF
03/25/2008 16:20:53 XAK100DF
03/25/2008 17:26:44 XAK100DF
03/25/2008 18:07:05 4037HCH-S
03/25/2008 18:38:58 XAK100DF
Date Energy Consumption
08/30/2008 20:00:00 2590
08/31/2008 20:00:00 2852
09/01/2008 20:00:00 2376
09/02/2008 20:00:00 2457
09/03/2008 20:00:00 2590
09/04/2008 20:00:00 3012
09/05/2008 20:00:00 2733
Error on page.
Local intranet | Protected Mode: Off
100%

Quality

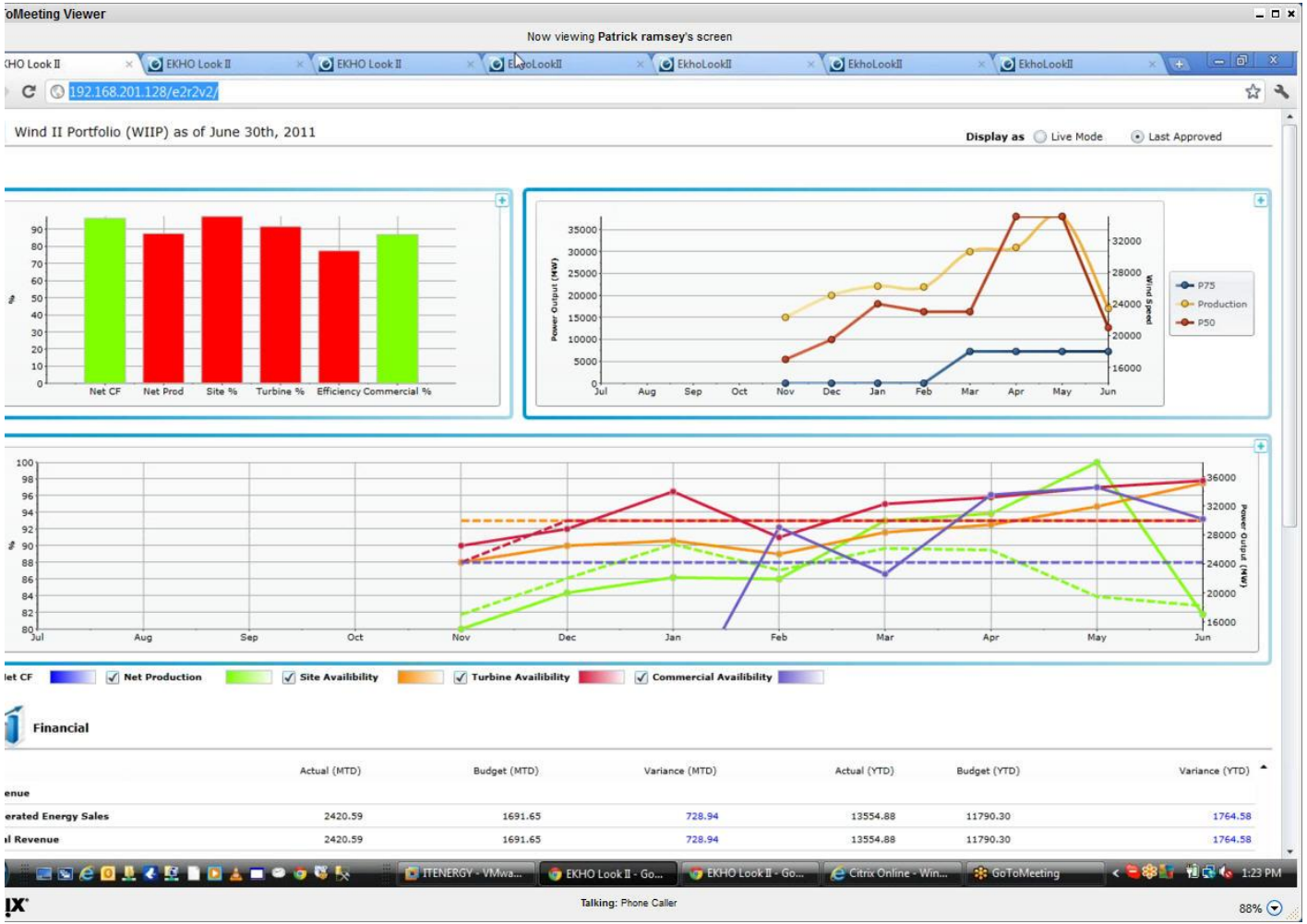


Property	Unit	1700799 3/8/2011	1700798 3/9/2011	1700561 3/10/2011	OilSample - <New Event 7/13/2011
OilSample - <New Event>					
STATE		Fail	Ok	Ok	
INITIALS		ramsey	Operator01	ramsey	ramsey
General					
Component		608-Gear Box-Gear Box	608-Gear Box-Gear Box	608-Gear Box-Gear Box	
Date sample taken		11.23.2010	11.22.2010	11.17.2010	
Date of last oil change		10.01.2010	10.17.2010	10.07.2010	
Top-up since change	l	2	0	0	
Total Operating Hrs	h	1356	1298	1098	
Total operating hrs	h	12355	13479	11900	
Oil Changed		Yes	No	No	
Wear					
Iron	Fe mg/kg	12	14	11	
Chrome	Cr mg/kg	0	0	1	
Tin	Sn mg/kg	0	0	1	
Aluminum	Al mg/kg	1	0	1	
Nickel	Ni mg/kg	0	0	1	
Copper	Cu mg/kg	0	1	1	
Lead	Pb mg/kg	0	0		
PQIndex		OK	OK	NO	
Contamination					
Silicon	Si mg/kg	12	11	14	
Potassium	P mg/kg	1	0	1	
Sodium	Na mg/kg	1	1	1	
Water	%	< 0.12	< 0.10	< 0.19	
Oil Condition					
Viscosity at 40 C	mm2/s	298	321	420	
Viscosity at 100 C	mm2/s	45	36	39	

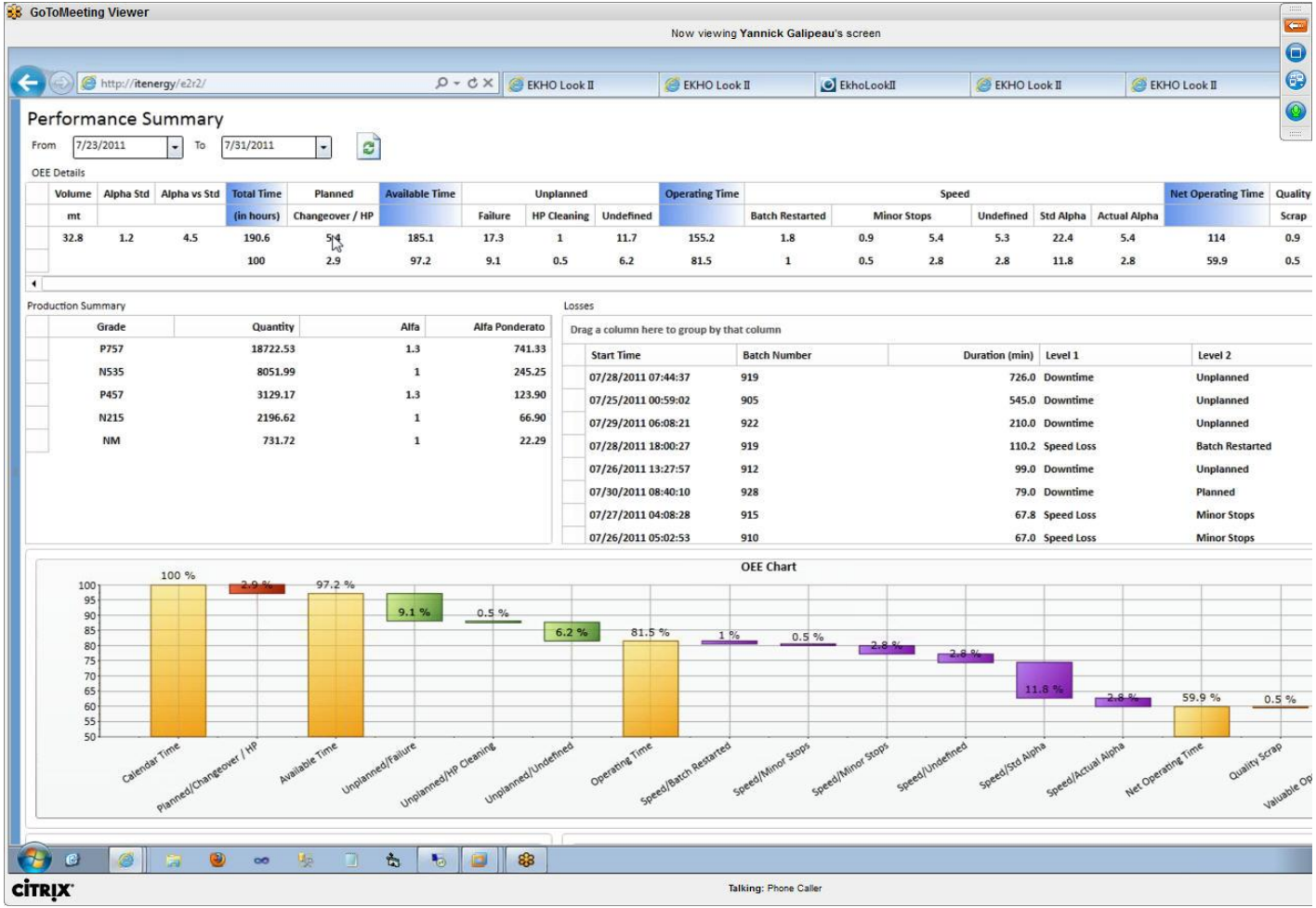
Electronic Logs



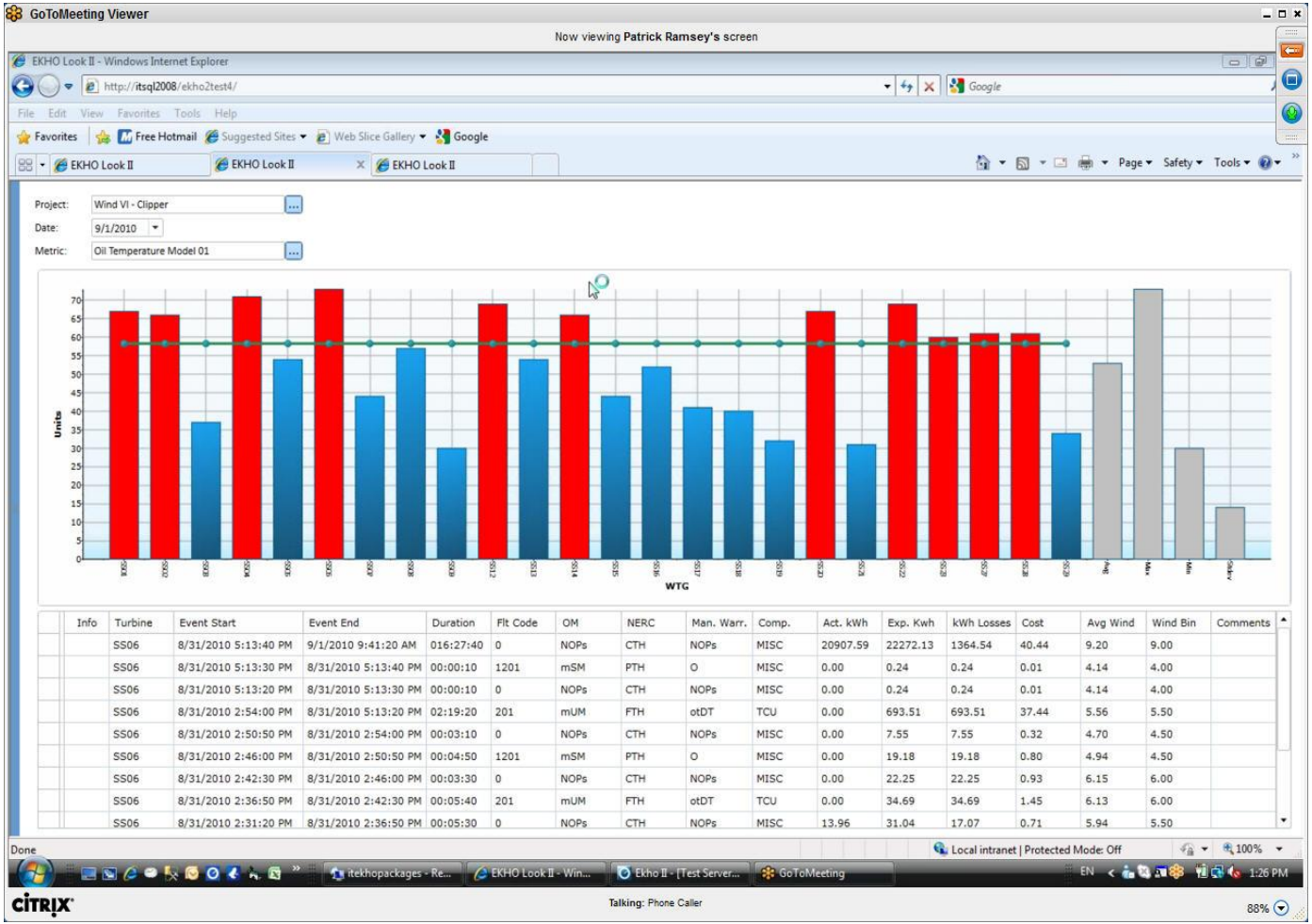
Performance Analytics and KPI's



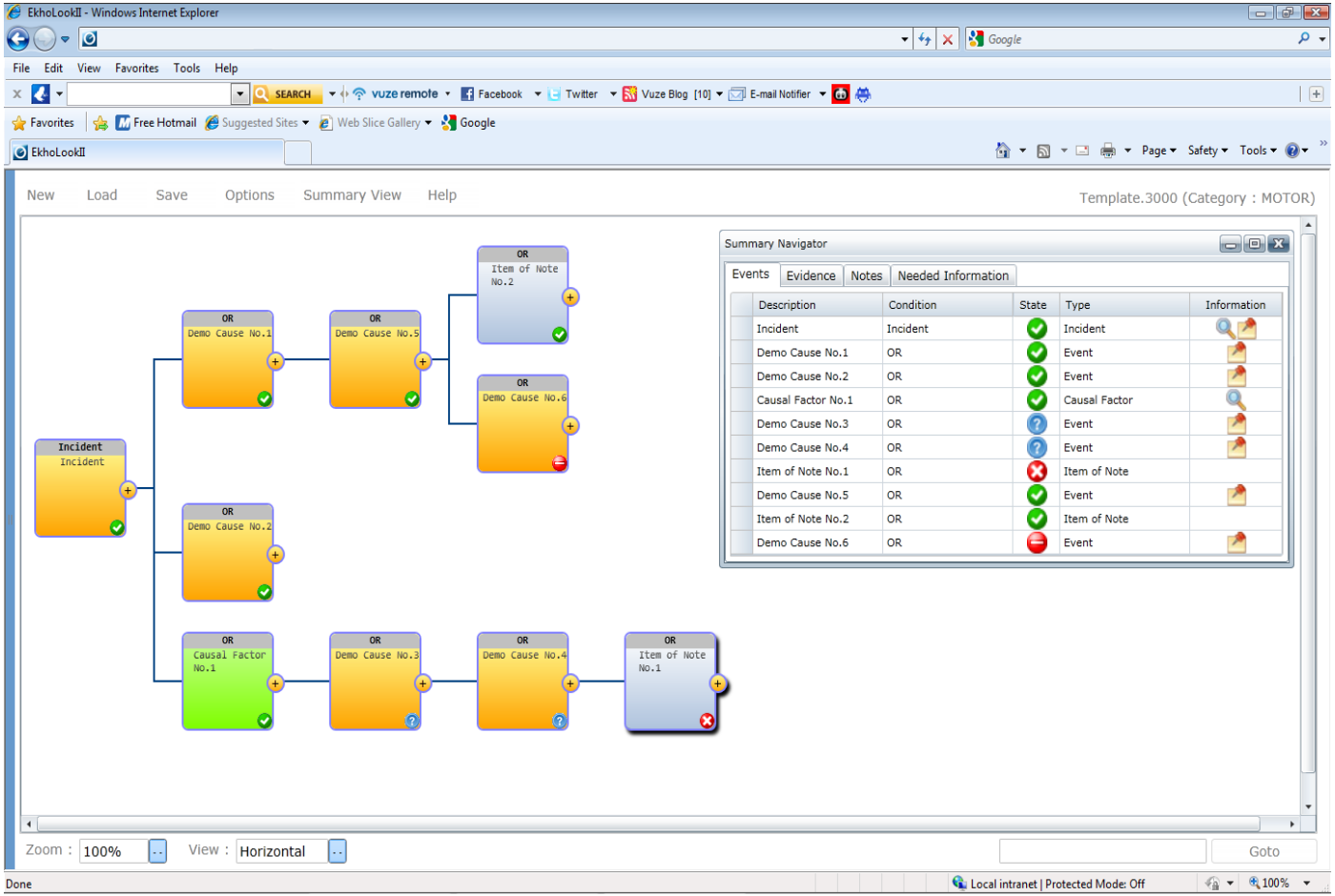
Overall Equipment Effectiveness (OEE)



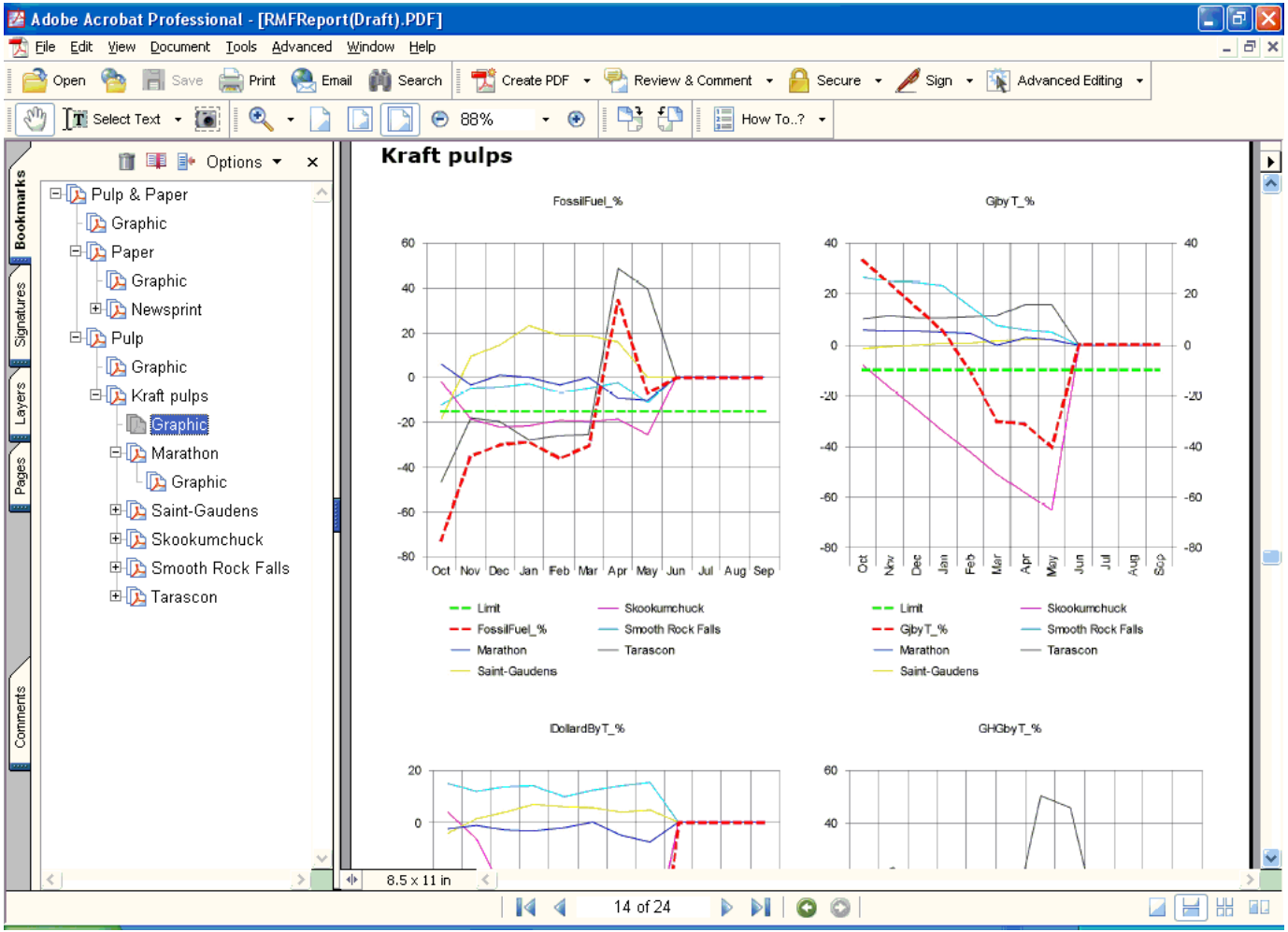
Condition Monitoring

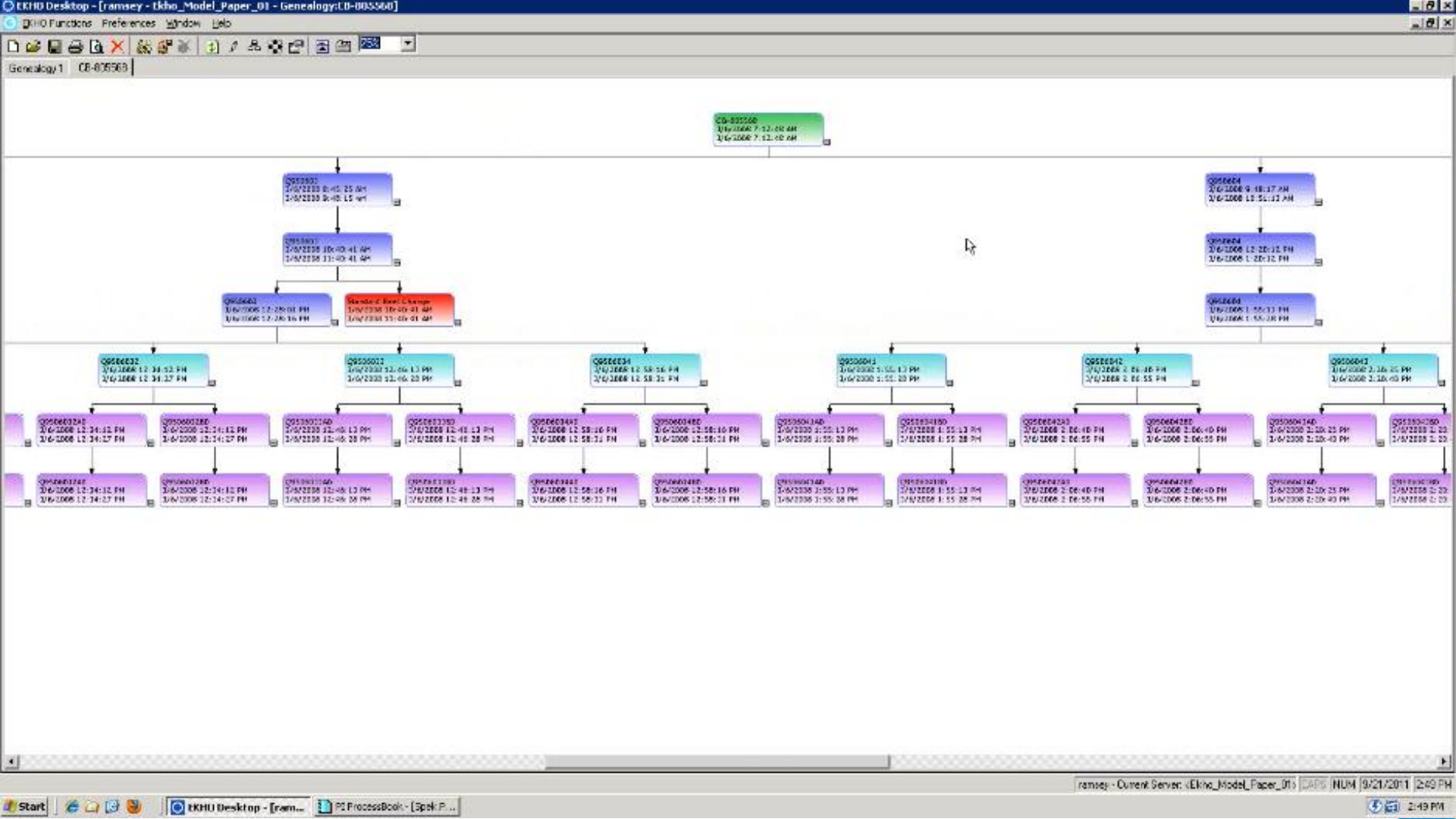


Root Cause Analysis

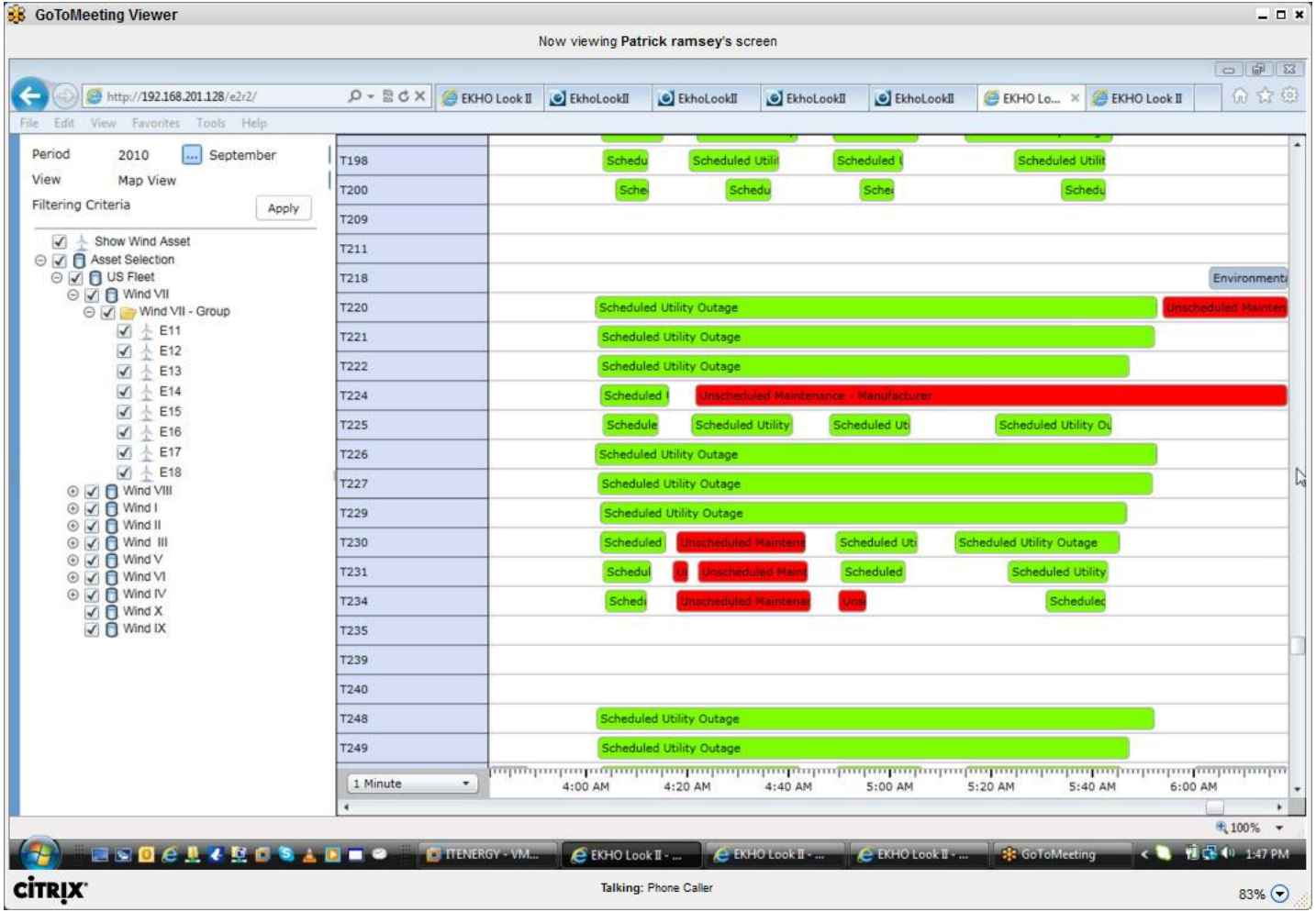


Carbon and Energy Management




EKHO Desktop - [ramsey - Ekho_Model_Paper_01 - Genealogy:CB-005560]
EKHO Functions
Preferences
Window
Help
Genealogy 1
CB-005560
ramsey - Current Server: <Ekho_Model_Paper_01>
CAPS
NUM
9/21/2011
2:49 PM
Start
EKHO Desktop - [ram...
PI ProcessBook - [Spell P...
2:49 PM

Event Viewer



iTi's Solution Framework for Manufacturers

Question Period

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Thank you