Achieving Operational Efficiency at PowerStream

Presented by **Vince Polsoni, PowerStream Inc.**

Equipment Failures to Avoid

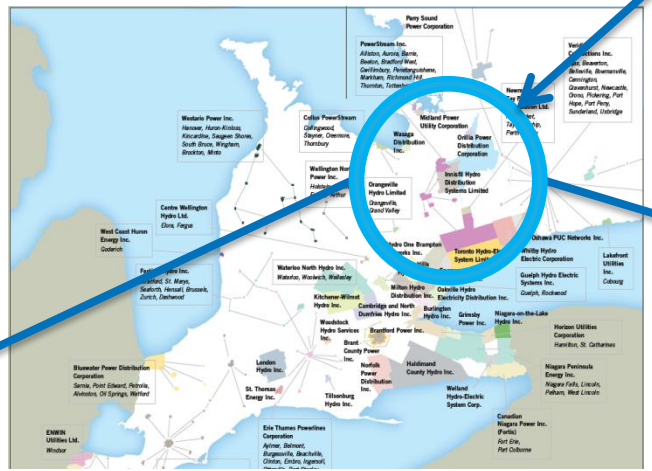
Your Last Failure Here

Agenda – Achieving Operational Efficiency

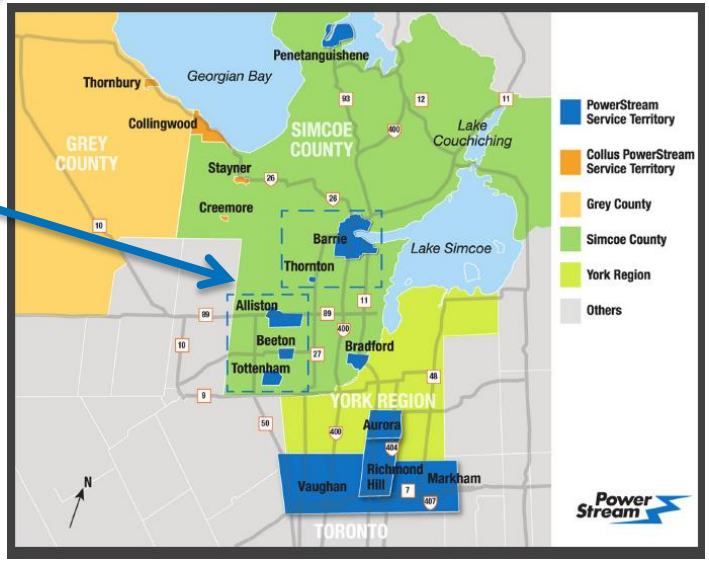
Operations - Asset & Maintenance Management

- PI System at PowerStream
- PI System integration with CMMS
- PI Data and Reporting Methods
- Technology and Innovation
- PI Dashboards

Where Are We?



Powerstream Service Territory



Ontario
1,068,587 km2

Germany
357,021 km2

Powerstream Service Territory

- 806 km2
- 11 Municipalities
- Located just North of Toronto

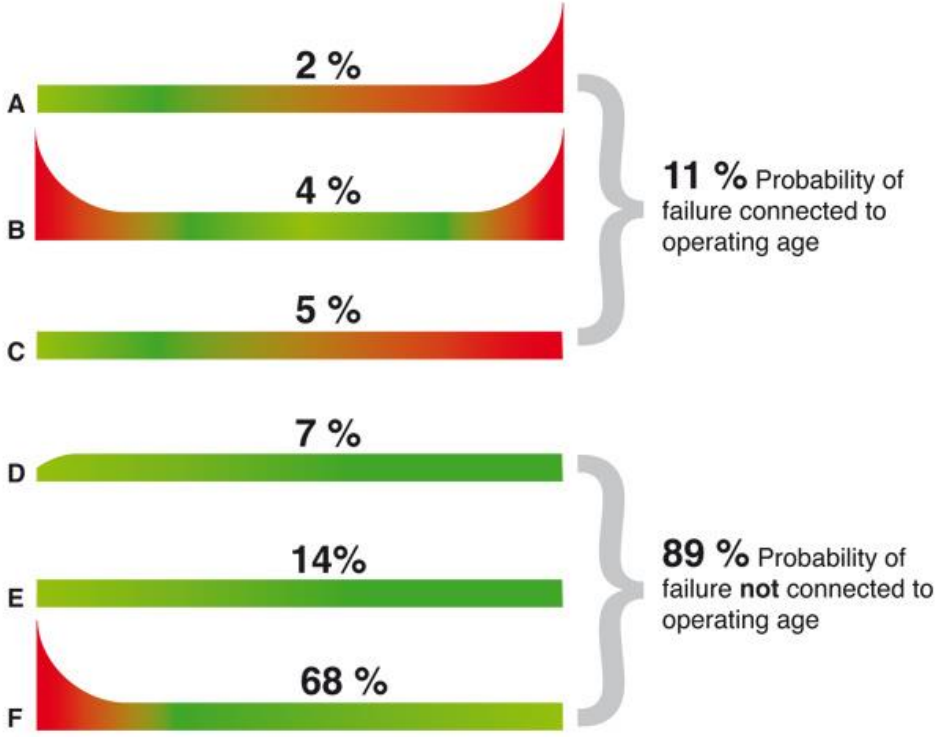
PowerStream Fast Facts

- **2nd Largest Municipally owned Local Distribution Co. (LDC) in Ontario, Canada**
- **Serving 11 Communities through Central Ontario (Serving over 1 million residents)**
- **550 Employees**
- **350,000 Customers** (Residential - 89%, Commercial Ind. - 11%)
- **Total Revenue:** **$788 Million**
- **Total Assets:** **$1,087.5 Million**
  - **Overhead Circuit Wires:** **2,500 km**
  - **Underground Cable:** **4,900 km**
  - **Transformer Stations (TS's):** **11**
  - **Municipal Substations (MS's):** **55**
  - **Distribution Transformers:** **43,000**
  - **Switchgears:** **1,800**
  - **Poles:** **40,000**
- **Peak Demand:** **1,972 MW**
- **Geographical Size of Service Territory:** **806 Sq. Km**
- **Distribution Voltages** **4kV, 8kV, 13.8kV, 27.6kV and 44kV**

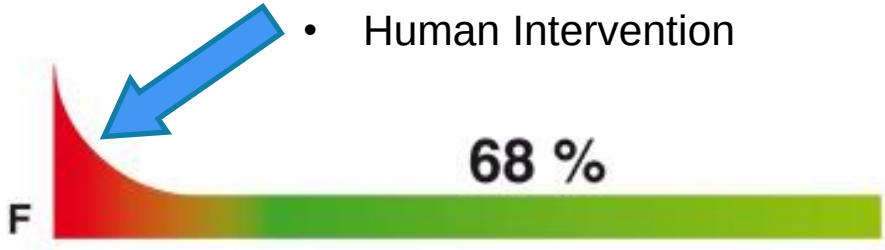
Station Assets Maintained by Station Sustainment and P&C

The Plan

Failure Curves – The “F Curve” is the One to Watch

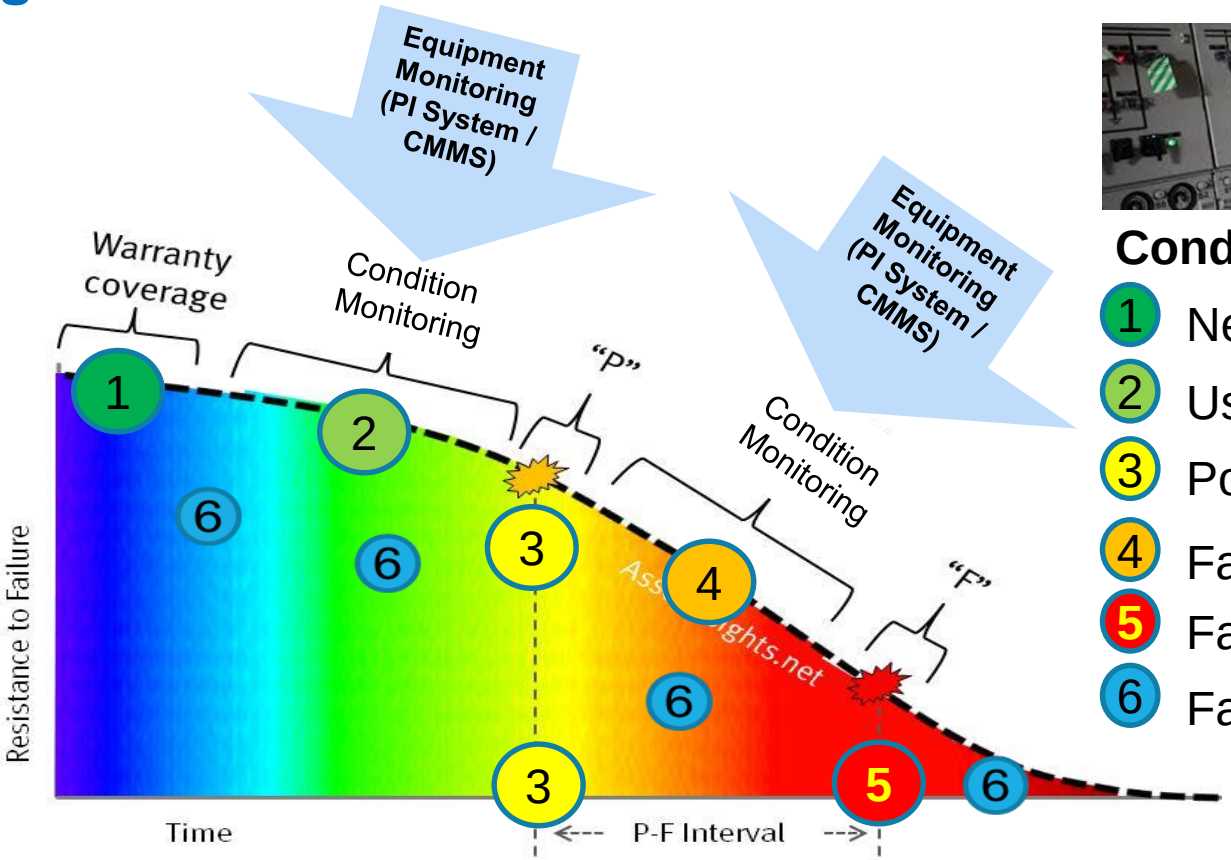


- Premature random failures
- Human Intervention



Source: RCM II by John Moubray, Industrial Press Inc, 1992

Using Potential Failure "PF" Curve – Condition Monitoring Scoring



Condition Score

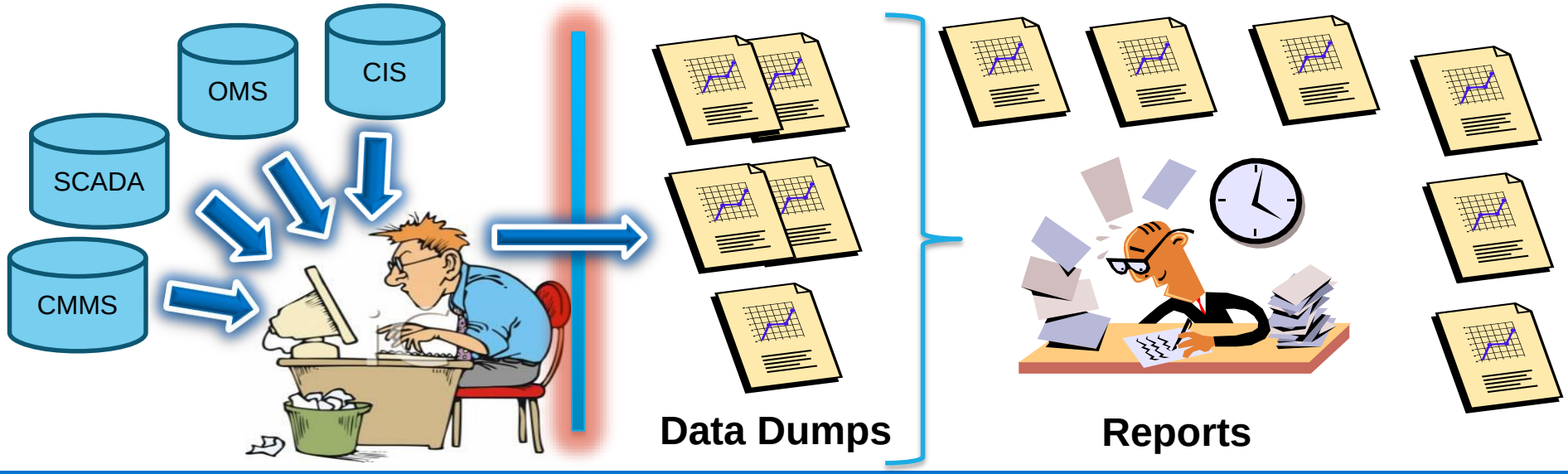
1. New
2. Used
3. Potential Failure
4. Failed – Schedule Repair
5. Failed – Emergency Repair
6. Failed – Repaired Onsite

Optimized Station Maintenance at PowerStream

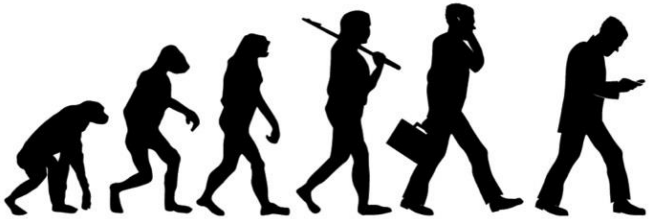
- Risk based Condition Based Maintenance (PI System and CMMS)
- RCM2 methodology incorporated into CMMS
- Instant Information (true real-time)
  - Instant Notifications from PI System (real-time)
  - Alerts from Computerized Maintenance Management System (CMMS)
  - PI System Reports
- Automatic Maintenance Work Orders triggered by Events in SCADA via the PI System
- Field staff aware of equipment condition/health/risk
- Better Reporting and Asset Health assessments
- One data source

Operations Reporting - Life Before the PI System

- Reports generated monthly
- Data is overwritten based on **frequency** of data point collection in some databases (e.g. SCADA)
- Archived/Historical data is often extracted and stored in flat files (spreadsheets)



PI System at Powerstream



2012

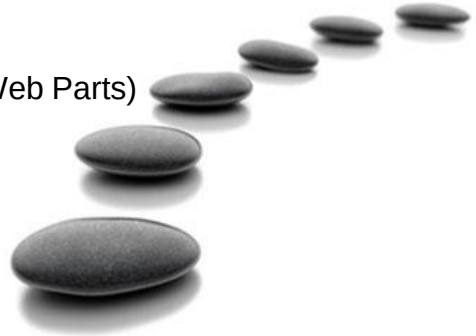
- Implementation – **5000 tags**, PI ProcessBook, PI DataLink
- Justified as part of Computerized Maintenance Management System (CMMS) implementation strategy

2013 to 2015

- **30,000 tags**
- Interfaces (**CMMS, OMS, HTML, UFL**)
- **PI Asset Framework**, Templates
- **PI Notifications**
- **Performance Equations, Data Sets, Asset Analytics, Tables**
- **Dashboards** (PI Coresight and PI Web Parts)
  - Operational Reports (PI ProcessBook, PI Coresight, PI DataLink, PI Web Parts)

2016

- PI System Review and upgrade
- **Event Frames**
- **PI Integrator for Esri ArcGIS, Merger (add new assets)**



PI System Products Used at Powerstream

30,000 tags
(and growing)

- PI ProcessBook
- PI Coresight
- PI WebParts
- PI DataLink
- PI Asset Framework (AF)
- PI SMT, PI Explorer, PI ICU
- PI HTML Interface
- PI UFL Interface
- PI RDBMS Interface
- PI Integrator for Esri ArcGIS
- Templates
  - Element
  - Notifications
  - Event Frames

Equipment Monitoring – Key for CBM

- Microprocessor Relays
- Online Transformer Gas in Oil Monitoring Units
  - (7 Gas) DGA monitors on 55/83 MVA and 75/125 MVA transformers
  - Hydrogen monitors on 5 to 20 MVA transformers
- Portable DGA testers
- Tap Changer Filtration Systems, Transformer Oil Dry-out Filtration System
- Online Bushing Monitoring Systems
- Maintenance Free Dehydrating Breathers
- Station Equipment Temperature Sensors

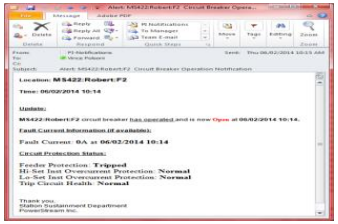
Leveraging PI System at Powerstream

- Interface to multiple databases/systems
  - SCADA, OMS/CIS, CMMS, MicroGrid
  - Integrators: PI HTML, PI UFL, PI RDBMS
- Operations Dashboards (Public Monitors, Tablets)
- PI Event Frames NEW!
- PI Integrator for Esri ArcGIS NEW!
- Forecasting NEW!
- Expand Notifications to stakeholders
- PI Asset Framework, Performance Equations and Asset Analytics

Leveraging PI System for Risk Based Condition Based Maintenance

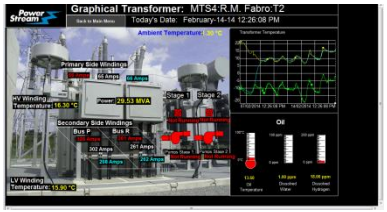
Integration

- Automatically Generate maintenance task in CMMS system from PI Data
- Data from CMMS and OMS into the PI System



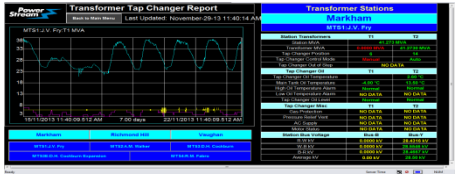
Real-time Alerting

- Notifications and Alerts (Real-time)
- Provide meaningful information to key Operations Staff



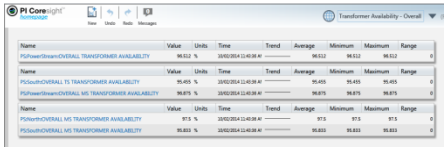
Asset Condition & Analytics

- Instant Asset Condition Assessment, Criticality, Health, Risk and Priority (PI System and CMMS)

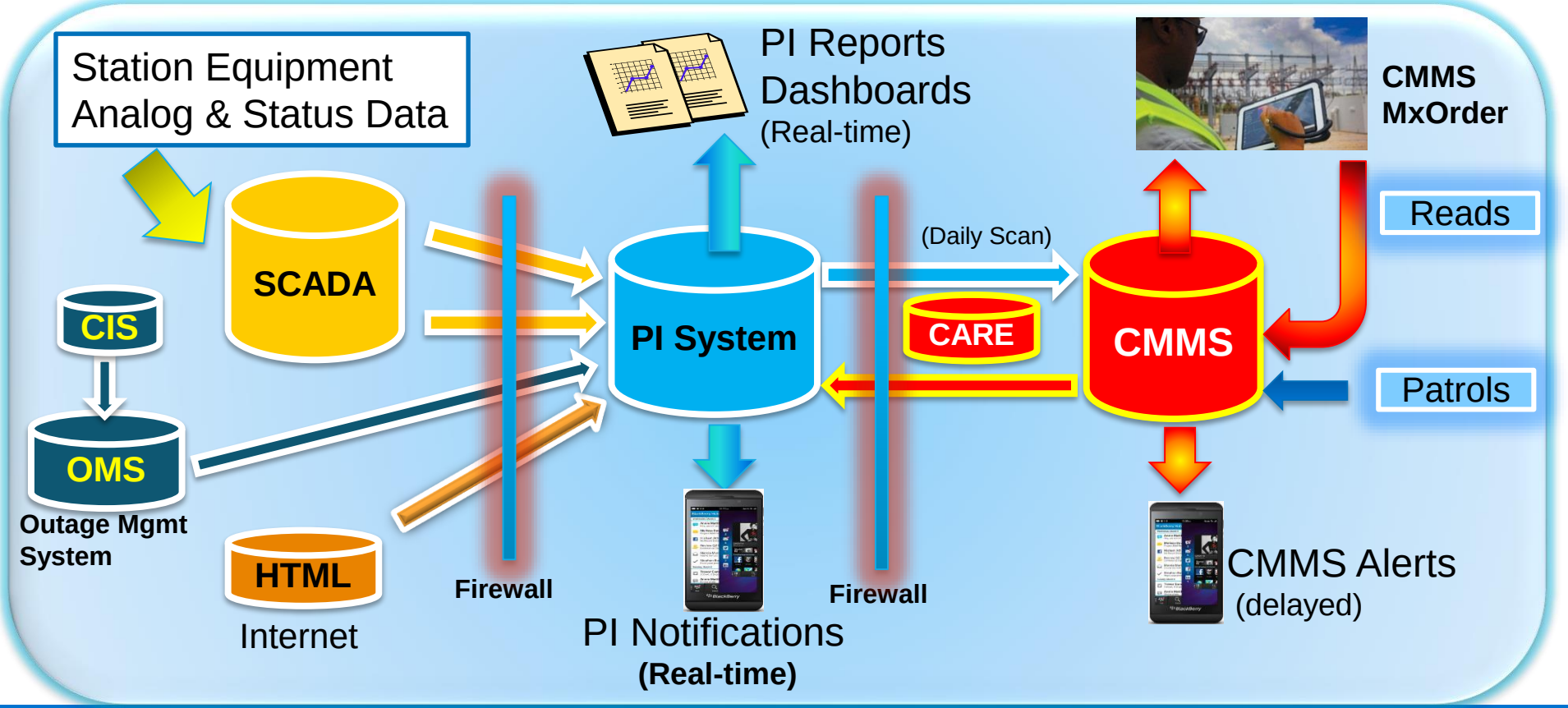


User Friendly Simple Tools

- PI Coresight / PI ProcessBook and PI DataLink
- PI Asset Framework (AF) and Templates
- PI Interfaces, Use various display tools



Condition Based Maintenance - Data Flow



PI Data Used in CMMS to Trigger Maintenance Tasks

Transformer:

- Loading, Oil Temperature
- Tap Positions (monthly max and min and if passed through neutral)
- Tap Changer Oil temperature vs main Tank Oil Temperature
- Bushing Monitoring Power Factor & Capacitance

Circuit Breaker:

- Operations in last 24 hours and last six months
- Max Amps
- Fault Current
- SF6 Gas Alarm

DC System:

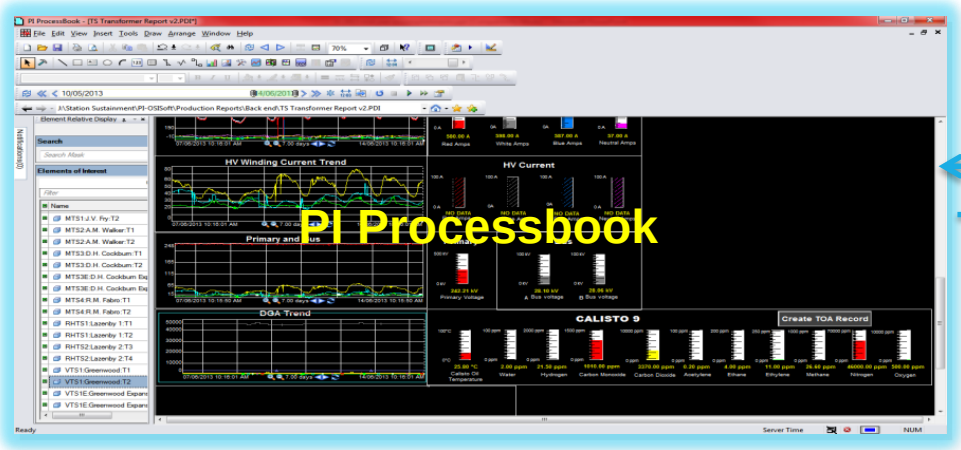
- Low Battery Alarm

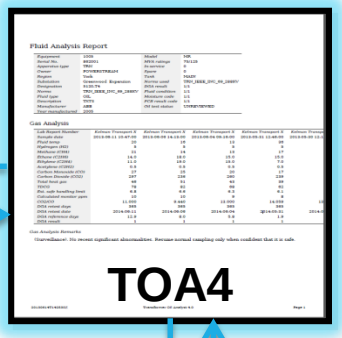
High Water Alarms

Integrated Products

Expert Systems Working in Unison

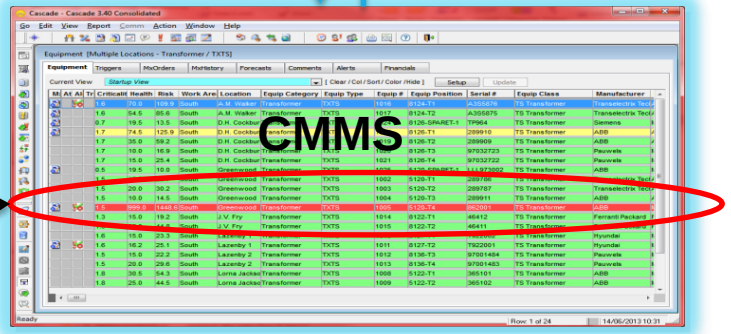
Dissolved Gas Analysis in Transformer
PI ProcessBook, TOA4 and CMMS





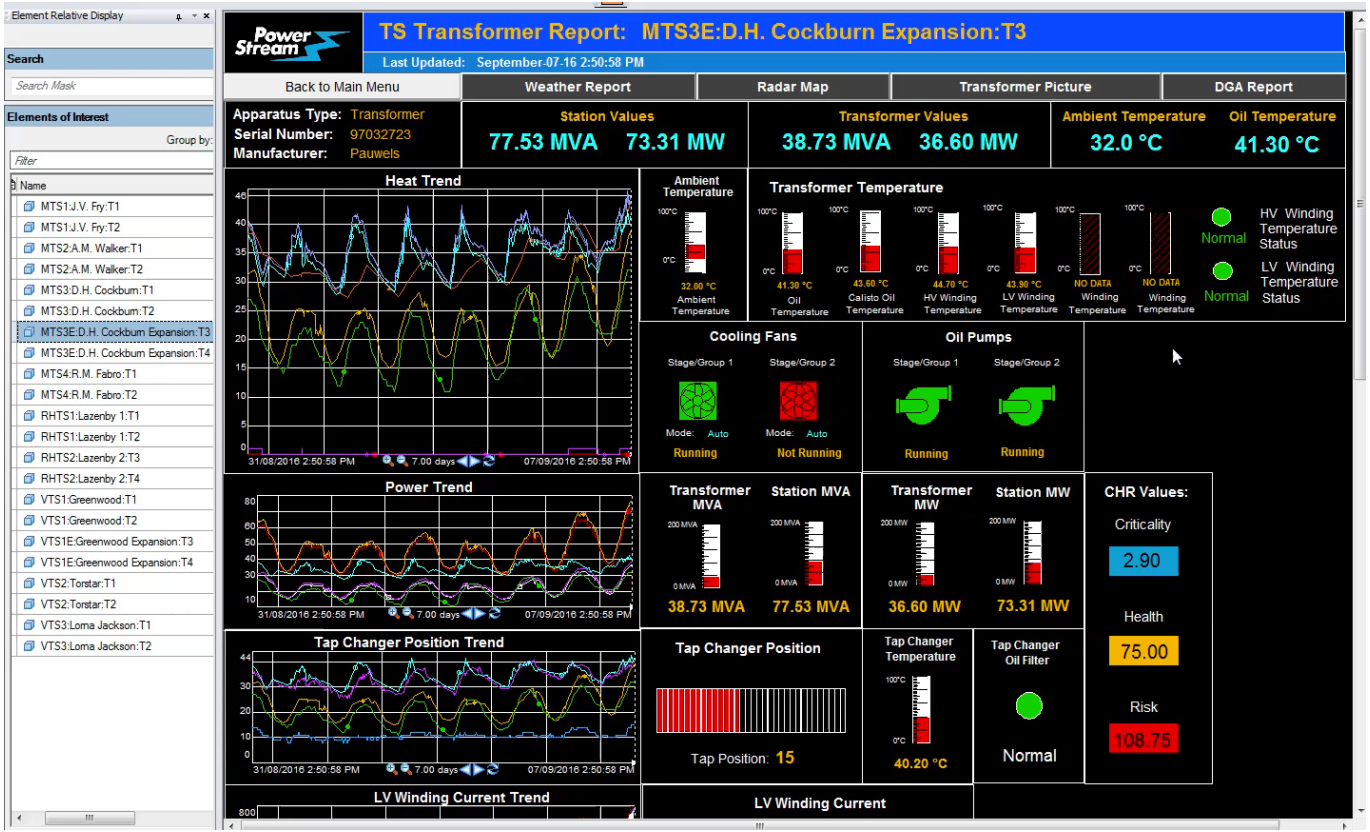
Daily Synch
or On Demand

Daily synch

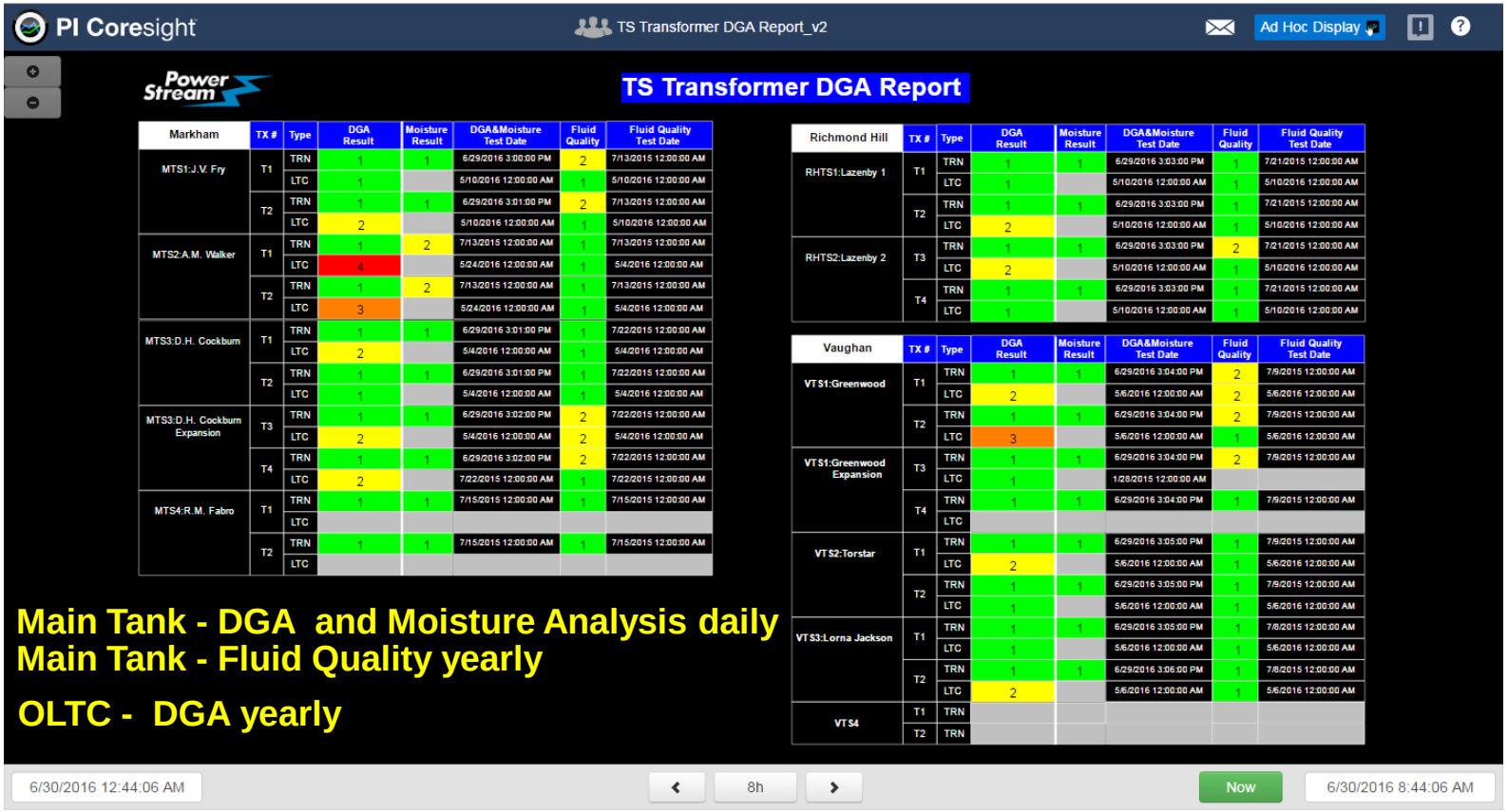


Transformer Problem Identified (Health and Risk Increase)
PI Notification, CMMS Alert and Auto Generated CM Work Order

Real-Time Transformer Oil Analysis - Video



TS Transformer Oil Condition Report

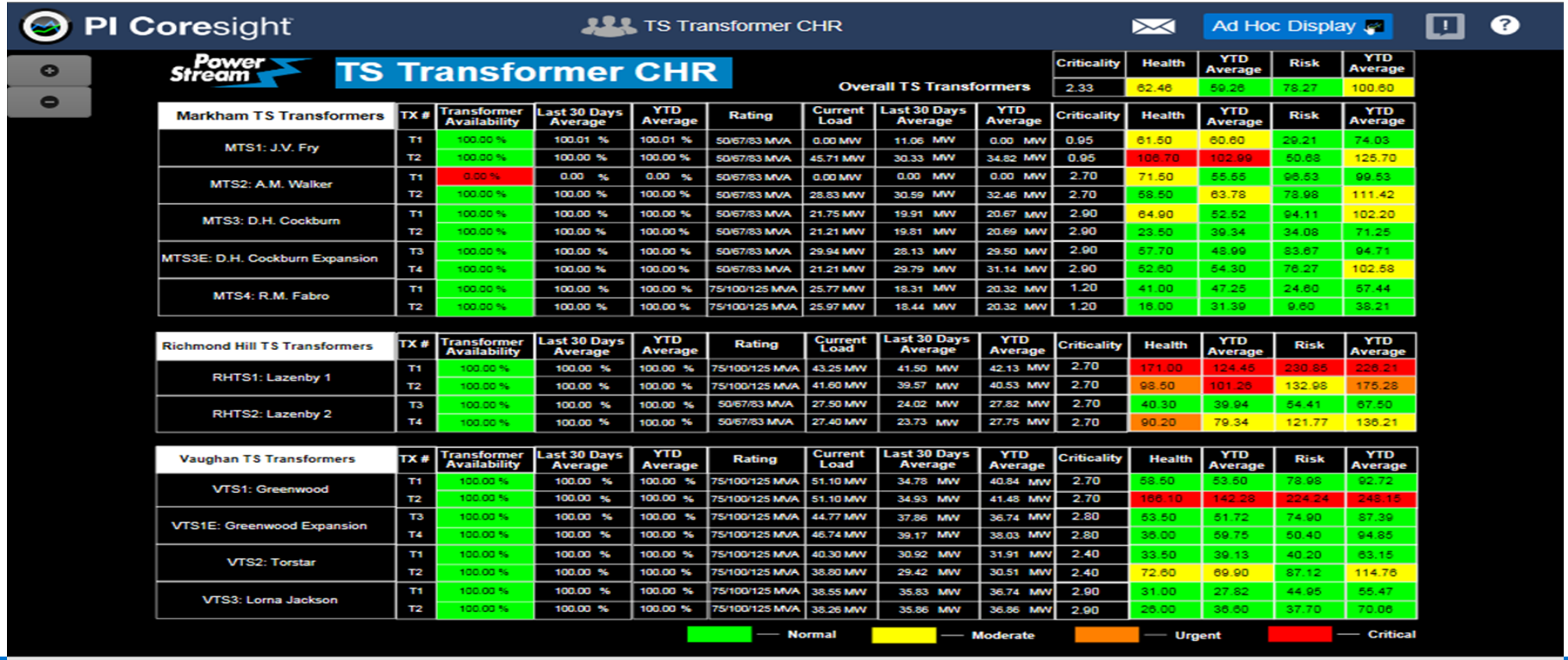


Markham	TX #	Type	DGA Result	Moisture Result	DGA&Moisture Test Date	Fluid Quality	Fluid Quality Test Date
MTS1:J.V. Fry	T1	TRN	1	1	6/29/2016 3:00:00 PM	2	7/13/2015 12:00:00 AM
		LTC	1		5/10/2016 12:00:00 AM	1	5/10/2016 12:00:00 AM
	T2	TRN	1	1	6/29/2016 3:01:00 PM	2	7/13/2015 12:00:00 AM
		LTC	2		5/10/2016 12:00:00 AM	1	5/10/2016 12:00:00 AM
MTS2:A.M. Walker	T1	TRN	1	2	7/13/2015 12:00:00 AM	1	7/13/2015 12:00:00 AM
		LTC	4		5/24/2016 12:00:00 AM	1	5/4/2016 12:00:00 AM
	T2	TRN	1	2	7/13/2015 12:00:00 AM	1	7/13/2015 12:00:00 AM
		LTC	3		5/24/2016 12:00:00 AM	1	5/4/2016 12:00:00 AM
MTS3:D.H. Cockburn	T1	TRN	1	1	6/29/2016 3:01:00 PM	1	7/22/2015 12:00:00 AM
		LTC	2		5/4/2016 12:00:00 AM	1	5/4/2016 12:00:00 AM
	T2	TRN	1	1	6/29/2016 3:01:00 PM	1	7/22/2015 12:00:00 AM
		LTC	1		5/4/2016 12:00:00 AM	1	5/4/2016 12:00:00 AM
MTS3:D.H. Cockburn Expansion	T3	TRN	1	1	6/29/2016 3:02:00 PM	2	7/22/2015 12:00:00 AM
		LTC	2		5/4/2016 12:00:00 AM	2	5/4/2016 12:00:00 AM
	T4	TRN	1	1	6/29/2016 3:02:00 PM	2	7/22/2015 12:00:00 AM
		LTC	2		7/22/2015 12:00:00 AM	1	7/22/2015 12:00:00 AM
MTS4:R.M. Fabro	T1	TRN	1	1	7/15/2015 12:00:00 AM	1	7/15/2015 12:00:00 AM
		LTC					
	T2	TRN	1	1	7/15/2015 12:00:00 AM	1	7/15/2015 12:00:00 AM
		LTC					

Richmond Hill	TX #	Type	DGA Result	Moisture Result	DGA&Moisture Test Date	Fluid Quality	Fluid Quality Test Date
RHTS1:Lazenby 1	T1	TRN	1	1	6/29/2016 3:03:00 PM	1	7/21/2015 12:00:00 AM
		LTC	1		5/10/2016 12:00:00 AM	1	5/10/2016 12:00:00 AM
	T2	TRN	1	1	6/29/2016 3:03:00 PM	1	7/21/2015 12:00:00 AM
		LTC	2		5/10/2016 12:00:00 AM	1	5/10/2016 12:00:00 AM
RHTS2:Lazenby 2	T3	TRN	1	1	6/29/2016 3:03:00 PM	2	7/21/2015 12:00:00 AM
		LTC	2		5/10/2016 12:00:00 AM	1	5/10/2016 12:00:00 AM
	T4	TRN	1	1	6/29/2016 3:03:00 PM	1	7/21/2015 12:00:00 AM
		LTC	1		5/10/2016 12:00:00 AM	1	5/10/2016 12:00:00 AM

Vaughan	TX #	Type	DGA Result	Moisture Result	DGA&Moisture Test Date	Fluid Quality	Fluid Quality Test Date
VTS1:Greenwood	T1	TRN	1	1	6/29/2016 3:04:00 PM	2	7/9/2015 12:00:00 AM
		LTC	2		5/6/2016 12:00:00 AM	2	5/6/2016 12:00:00 AM
	T2	TRN	1	1	6/29/2016 3:04:00 PM	2	7/9/2015 12:00:00 AM
		LTC	3		5/6/2016 12:00:00 AM	1	5/6/2016 12:00:00 AM
VTS1:Greenwood Expansion	T3	TRN	1	1	6/29/2016 3:04:00 PM	2	7/9/2015 12:00:00 AM
		LTC	1		1/28/2015 12:00:00 AM		
	T4	TRN	1	1	6/29/2016 3:04:00 PM	1	7/9/2015 12:00:00 AM
		LTC					
VTS2:Torstar	T1	TRN	1	1	6/29/2016 3:05:00 PM	1	7/9/2015 12:00:00 AM
		LTC	2		5/6/2016 12:00:00 AM	1	5/6/2016 12:00:00 AM
	T2	TRN	1	1	6/29/2016 3:05:00 PM	1	7/9/2015 12:00:00 AM
		LTC	1		5/6/2016 12:00:00 AM	1	5/6/2016 12:00:00 AM
VTS3:Lorna Jackson	T1	TRN	1	1	6/29/2016 3:05:00 PM	1	7/8/2015 12:00:00 AM
		LTC	1		5/6/2016 12:00:00 AM	1	5/6/2016 12:00:00 AM
	T2	TRN	1	1	6/29/2016 3:06:00 PM	1	7/8/2015 12:00:00 AM
		LTC	2		5/6/2016 12:00:00 AM	1	5/6/2016 12:00:00 AM
VTS4	T1	TRN					
	T2	TRN					

TS Transformer
Criticality, Health and Risk Report



Criticality, Health and Risk – PI System and CMMS

(From OMS to PI System to CMMS to PI Reports)

Criticality

- No of Transformers (1, 2 or more)
- Transfer Capability
- Oil Containment
- Key Customers
- Total No of Customers per Station

Health

- Inspections, Maintenance
- PI Data
- Oil Condition
- Insulation Condition
- Failure, Equipment status
- Number of Customers per Feeder/Station
- Number of Open Work Orders
- Age

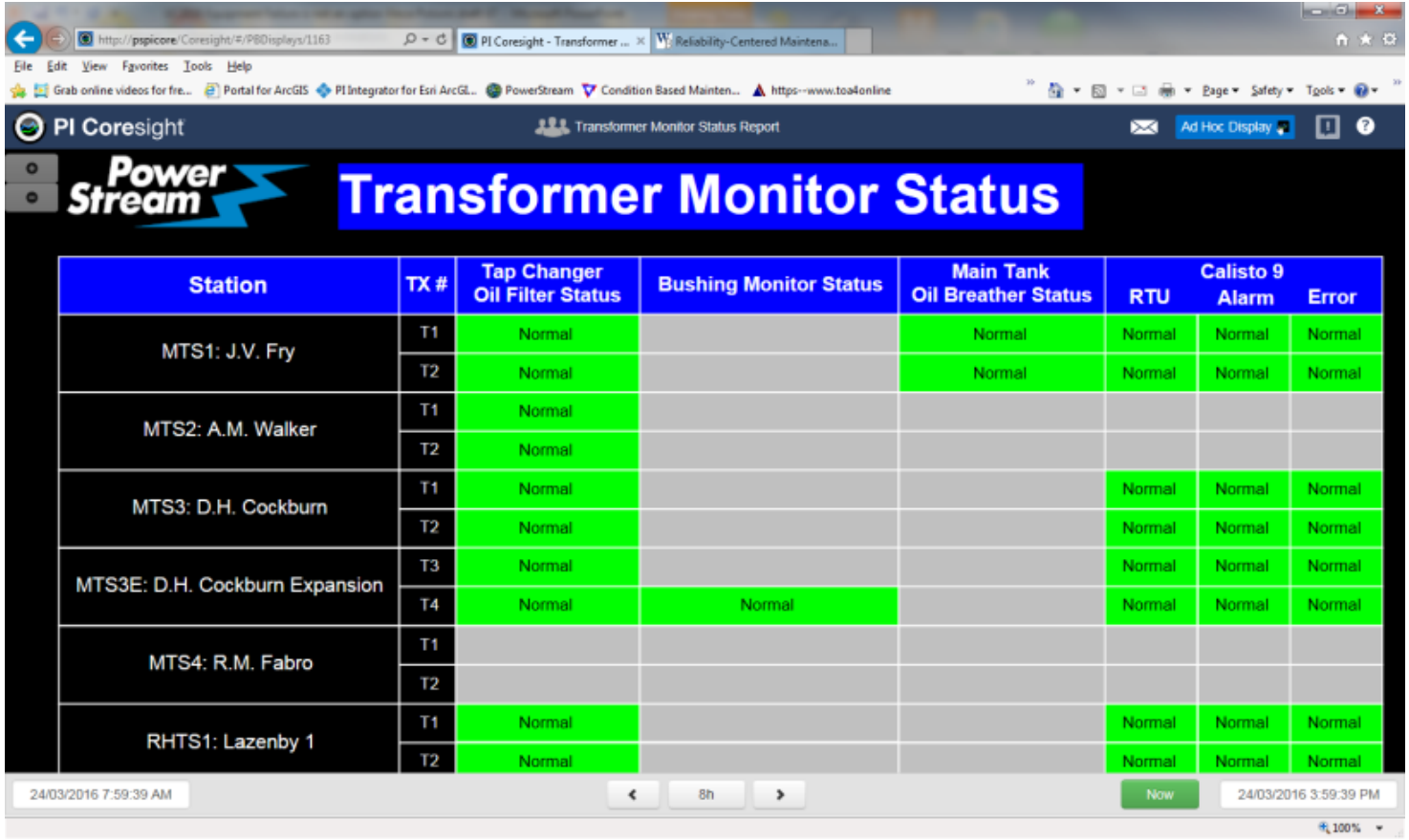
Risk

- Function of Criticality and Risk

Noticeable Changes to Maintenance Programs since implementation of PI System and CMMS

- Dramatic increase in Visibility and Awareness of Asset Condition and Status
- Decrease Emergency Maintenance Tasks
- Increase Corrective Maintenance Tasks
- Decrease in Preventive / Predictive Maintenance Tasks
- Detective Maintenance
- Equipment Reliability

Monitoring Our Station Equipment Monitoring Units



Station	TX #	Tap Changer Oil Filter Status	Bushing Monitor Status	Main Tank Oil Breather Status	Calisto 9 RTU	Calisto 9 Alarm	Calisto 9 Error
MTS1: J.V. Fry	T1	Normal		Normal	Normal	Normal	Normal
	T2	Normal		Normal	Normal	Normal	Normal
MTS2: A.M. Walker	T1	Normal					
	T2	Normal					
MTS3: D.H. Cockburn	T1	Normal			Normal	Normal	Normal
	T2	Normal			Normal	Normal	Normal
MTS3E: D.H. Cockburn Expansion	T3	Normal			Normal	Normal	Normal
	T4	Normal	Normal		Normal	Normal	Normal
MTS4: R.M. Fabro	T1						
	T2						
RHTS1: Lazenby 1	T1	Normal			Normal	Normal	Normal
	T2	Normal			Normal	Normal	Normal

How PI System Explorer is Used at PowerStream

PI Asset Framework (AF)

- Key Station Equipment and Distribution System Assets
- Outage and Other Event Information

PI AF Elements

- Attributes from PI Tags, CMMS, OMS, CIS, Web pages (HTML) and static data
- Longitude & Latitude (for ESRI Map Reports)
- Attributes used in many PI Reports

Library

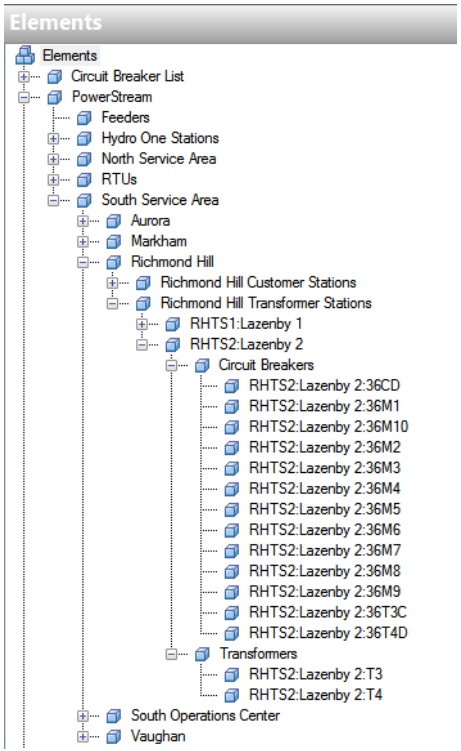
- Element Templates
- Notification Templates
- **Event Frame Templates**
- Tables (from OMS, CMMS)
- Analysis

Notifications

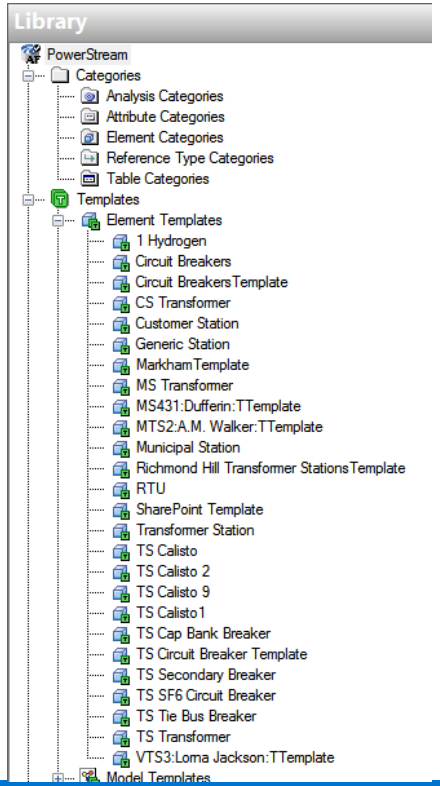
- Over 1600 notifications enabled and growing

PI System Explorer – PI Asset Framework (AF) – PowerStream

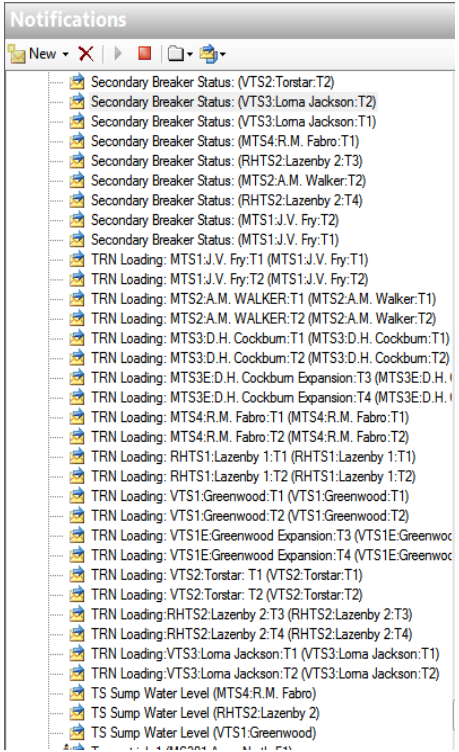
Elements



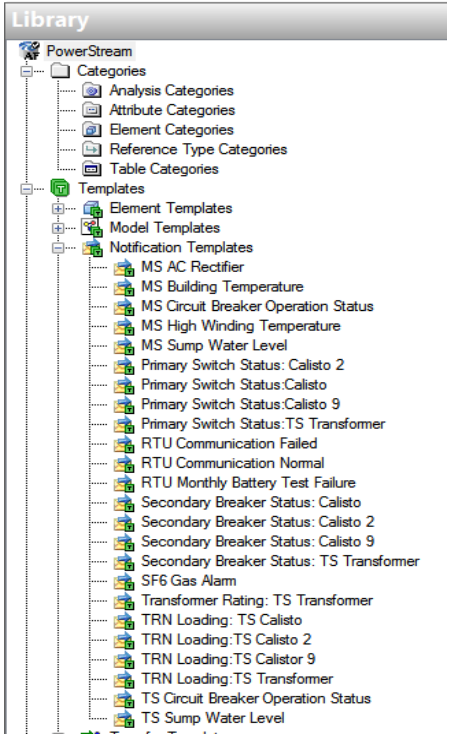
Element Templates



Notifications



Notification Templates

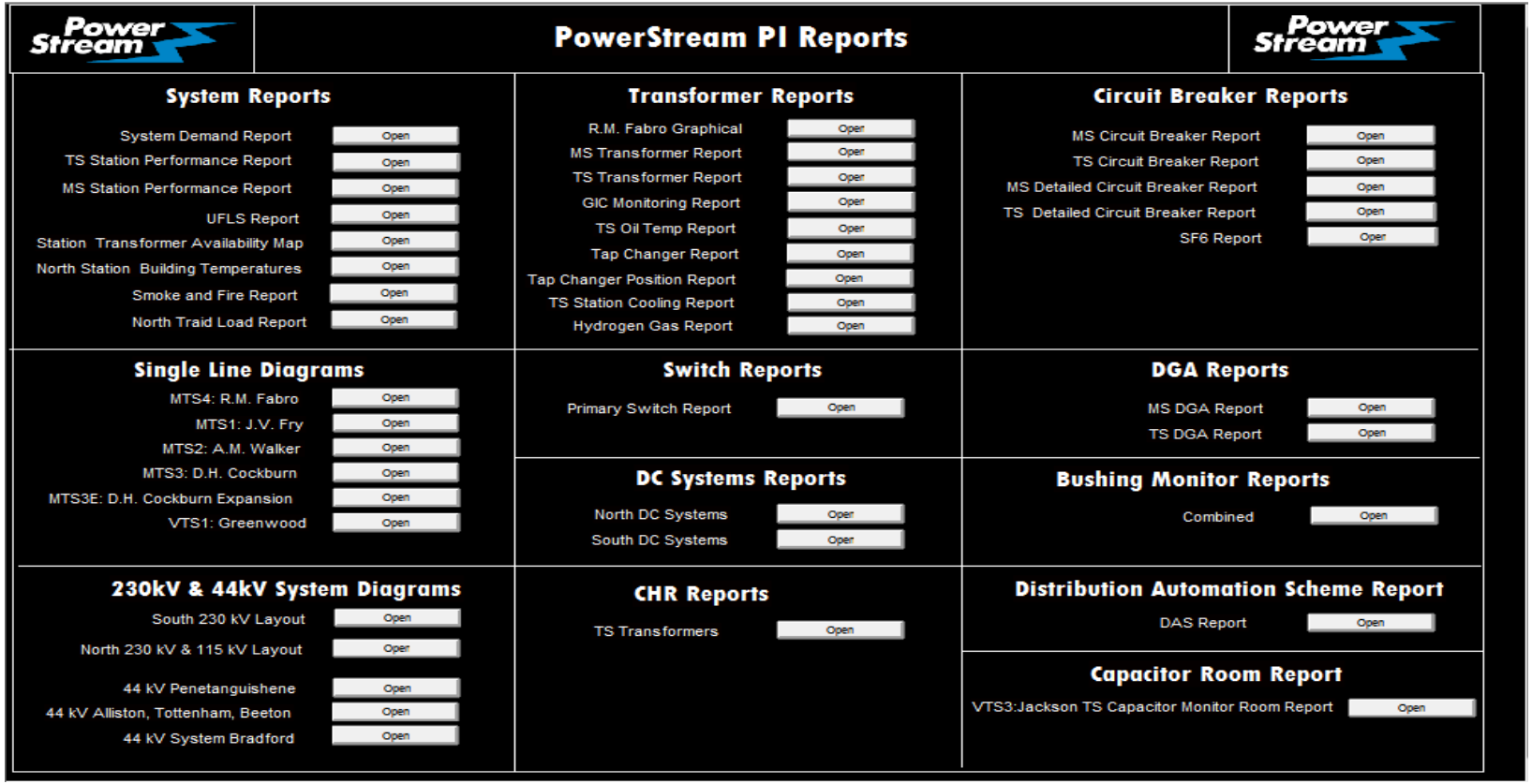


PI Coresight / PI ProcessBook Reports - Powerstream

- System Demand
- System Outages (Regional)
- Station Performance (Risk)
- Station Loading
- Equipment Health & Risk
- Transformer
  - Loading
  - Winding temperature
  - Oil Temperature and Cooling
  - Dissolved Gas and Hydrogen
  - Cooling

- Bus Availability
- Circuit Breaker Status and details
- GIC Monitoring
- Sump Water level
- Station Building Temperature
- Primary Switches
- Equipment Failures (history)
- Adhoc Reports

Real-Time Equipment Reports



TS Transformer Report – PI ProcessBook

Links:
- Weather report
- Radar Map Link

Equipment Attributes

Pictures

External Database/App

AF Elements

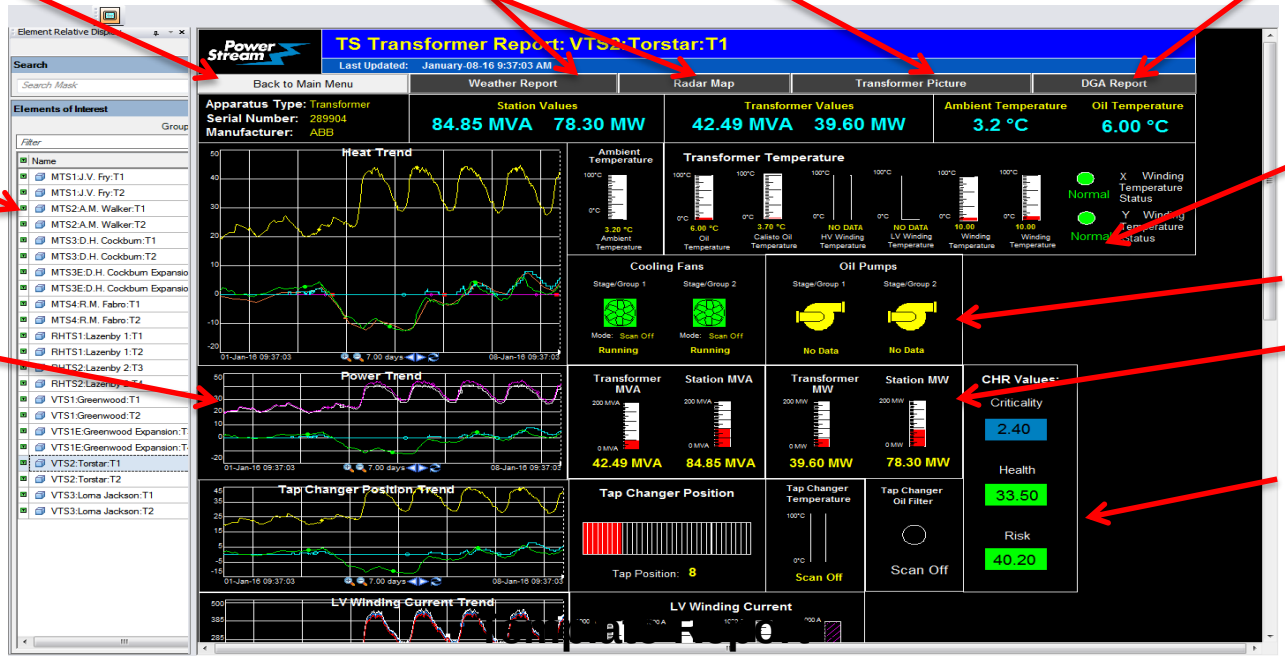
Status

Animations

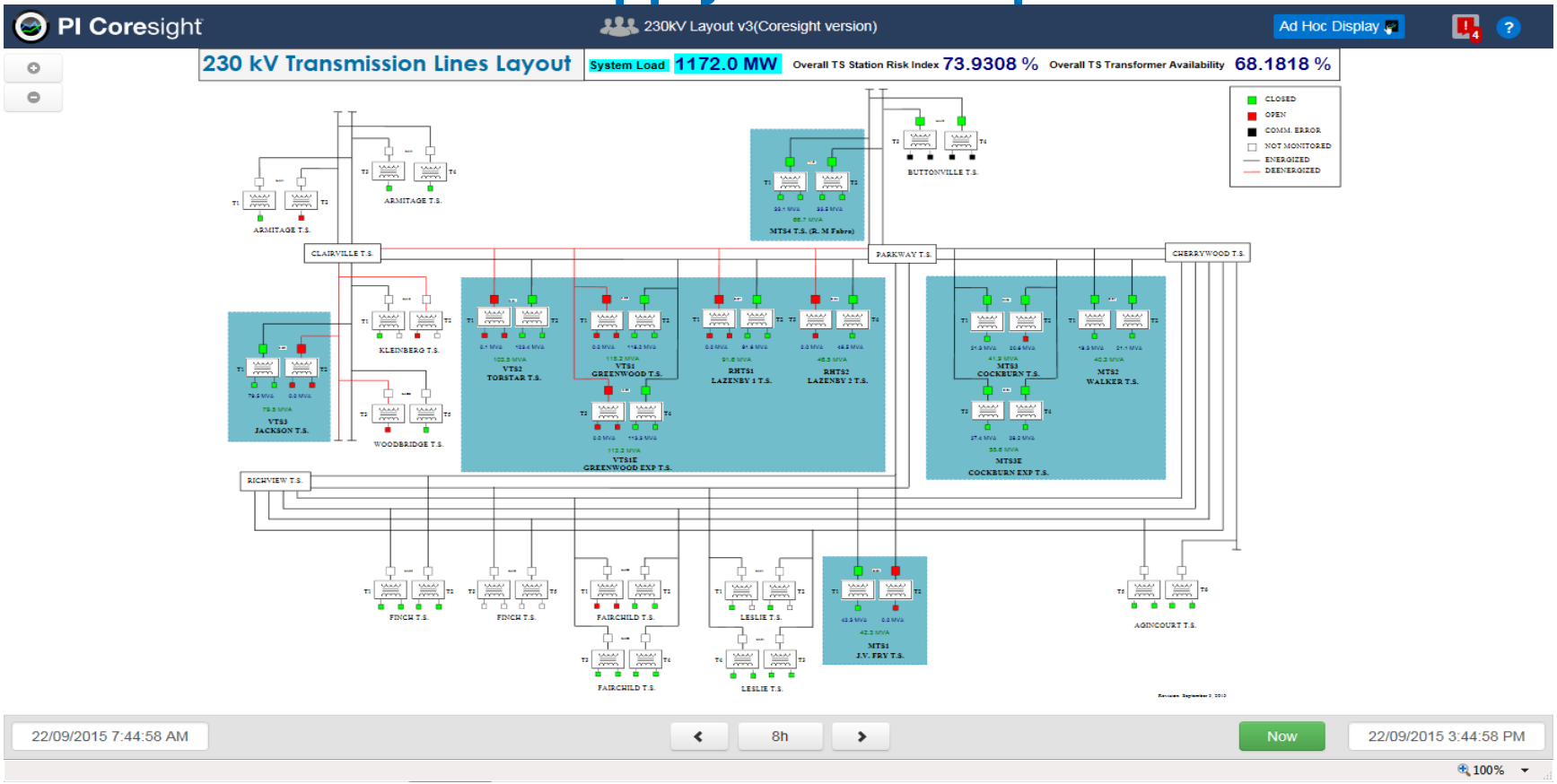
Trends

Gauges

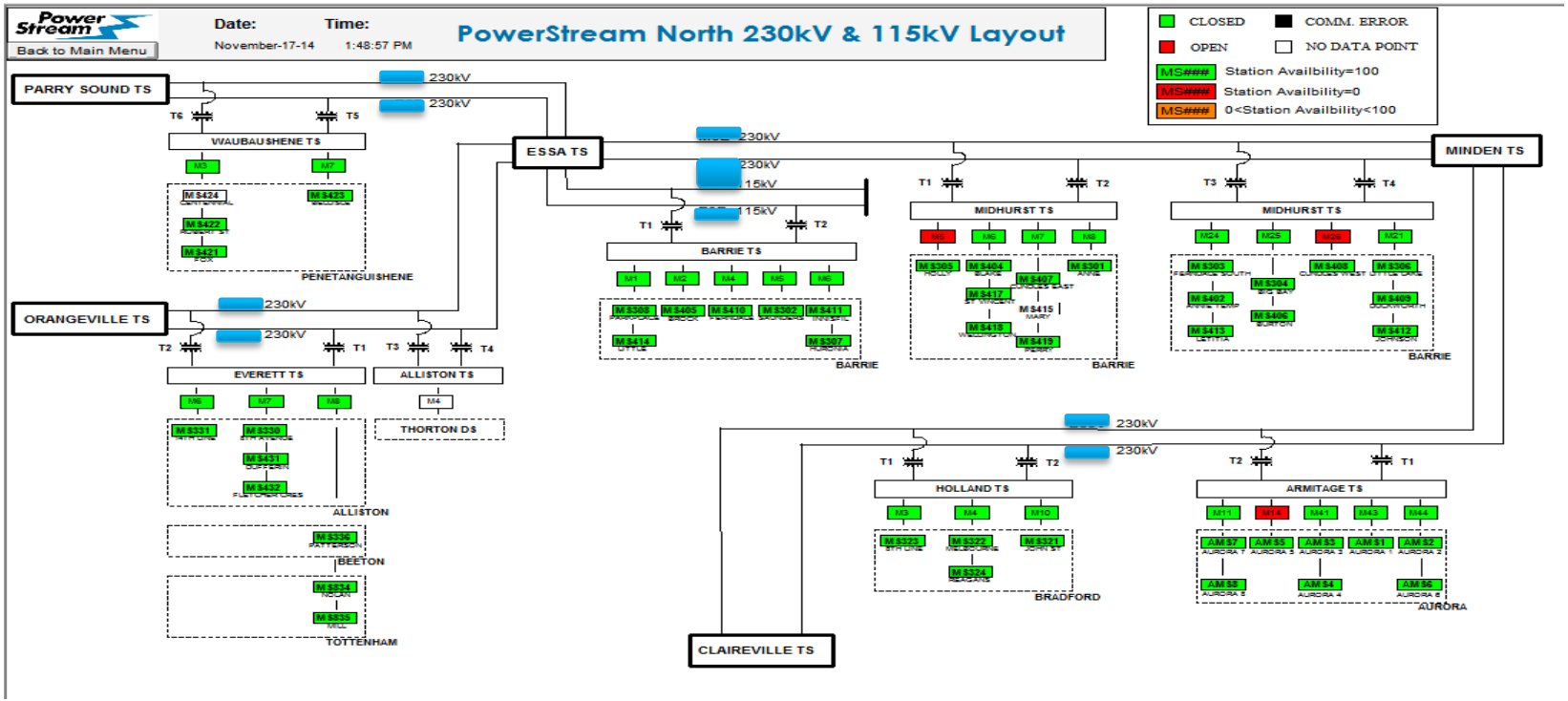
Heath and Risk Index



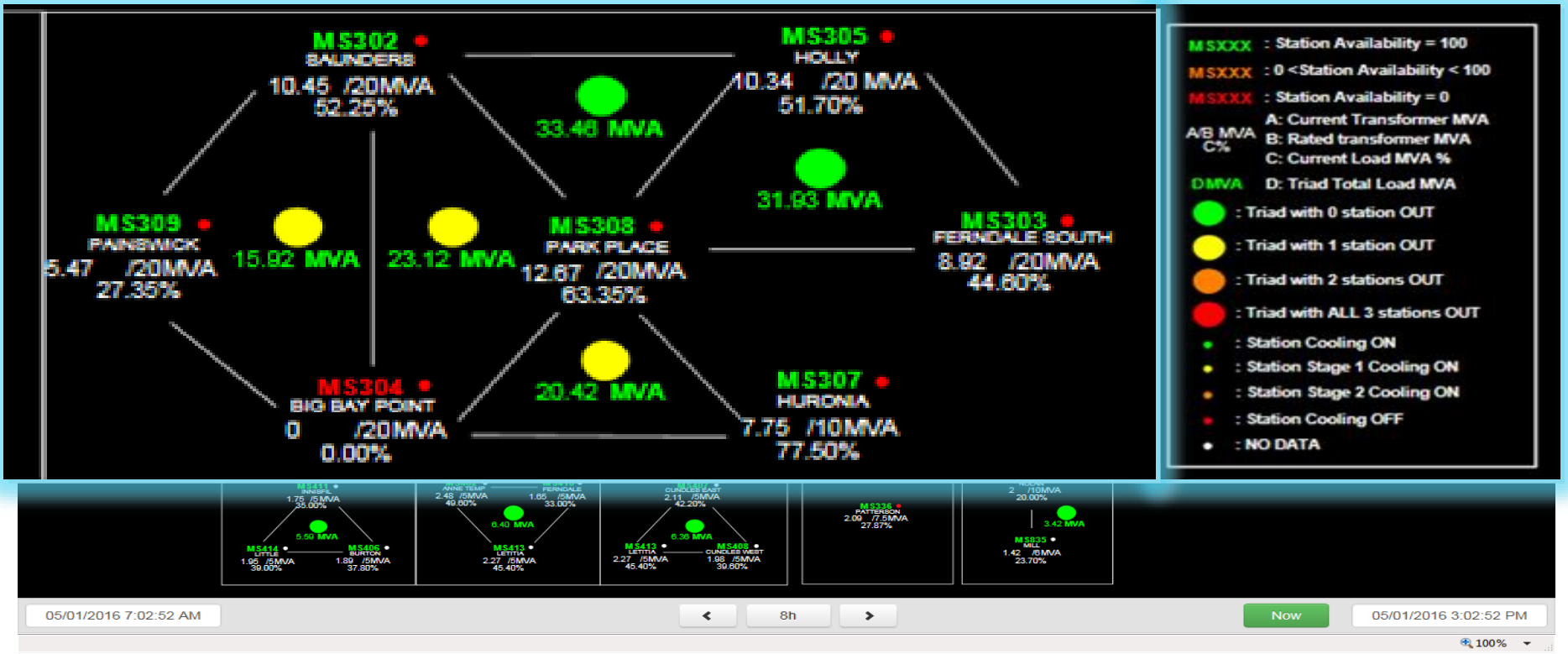
230kV Transmission Supply Status Report



Reports – Transmission System Supply - North



Substation Interconnection – Load Transfer Report



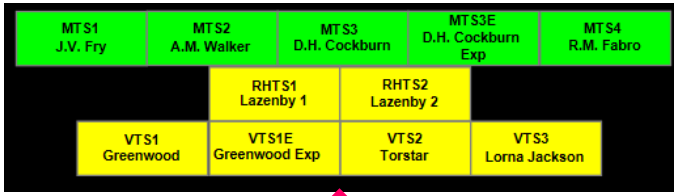
Station Performance Metrics (Example)

Overall TS Station Performance	
Overall TS Station Risk Index	79.61 %
Overall TS Transformer Availability	72.7273 %
Overall TS Bus Availability	100 %
Feeder TS Breakers "Closed"	92.36 %

Performance Indicators
(Performance Equations)

MTS3:D.H. Cockburn	
Station Status	On
Station Risk Index	100
Transformer Availability	100
Bus Availability	100
Bus E Availability	LIVE
Bus E Voltage	28.65
Bus Z Availability	LIVE
Bus Z Voltage	28.67
Feeder Breakers Closed (%)	100

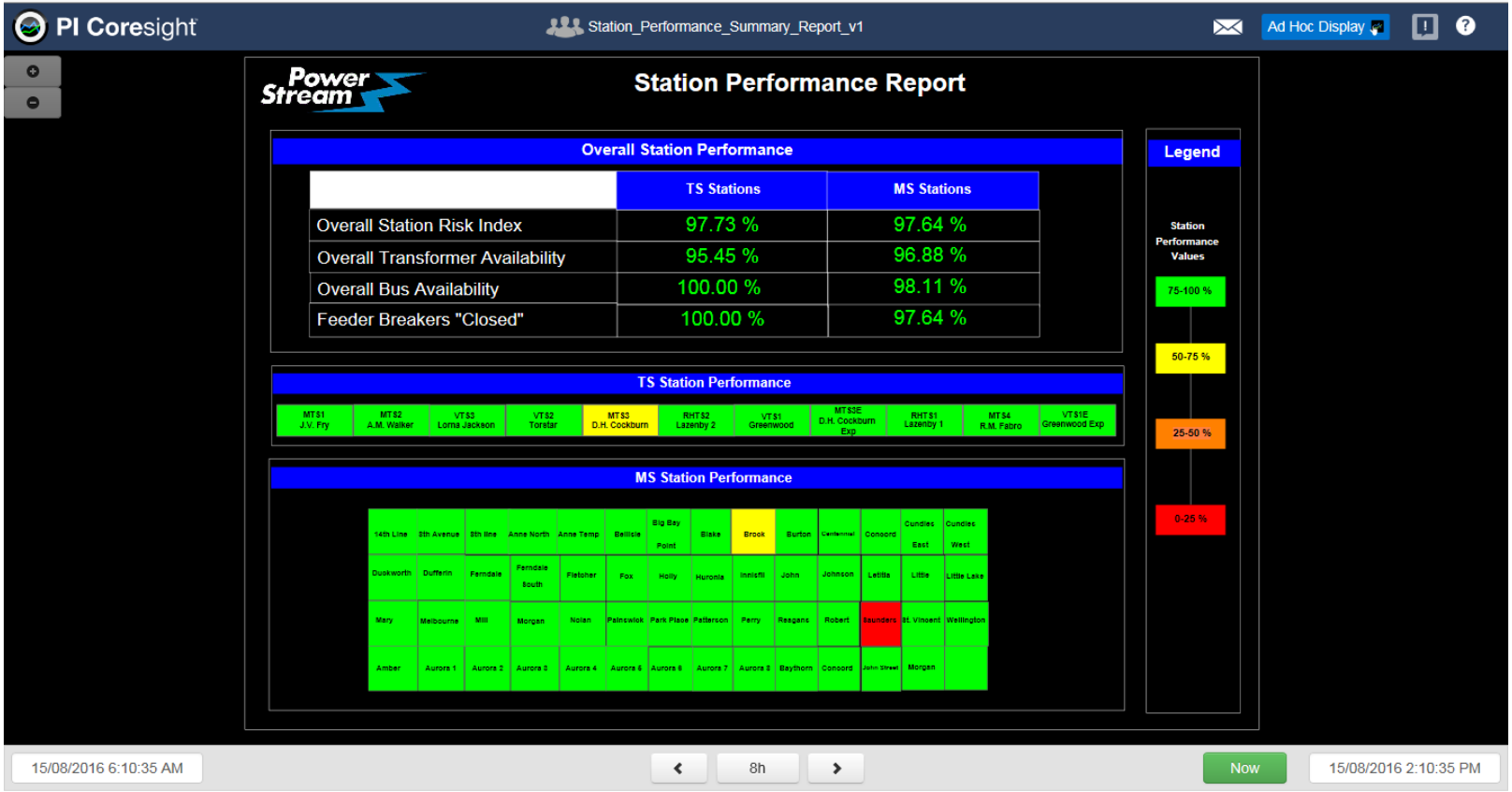
RHTS2:Lazenby 2	
Station Status	On
Station Risk Index	65.625
Transformer Availability	50
Bus Availability	100
Bus C Availability	LIVE
Bus C Voltage	28.32
Bus D Availability	LIVE
Bus D Voltage	28.28
Feeder Breakers Closed (%)	87.5



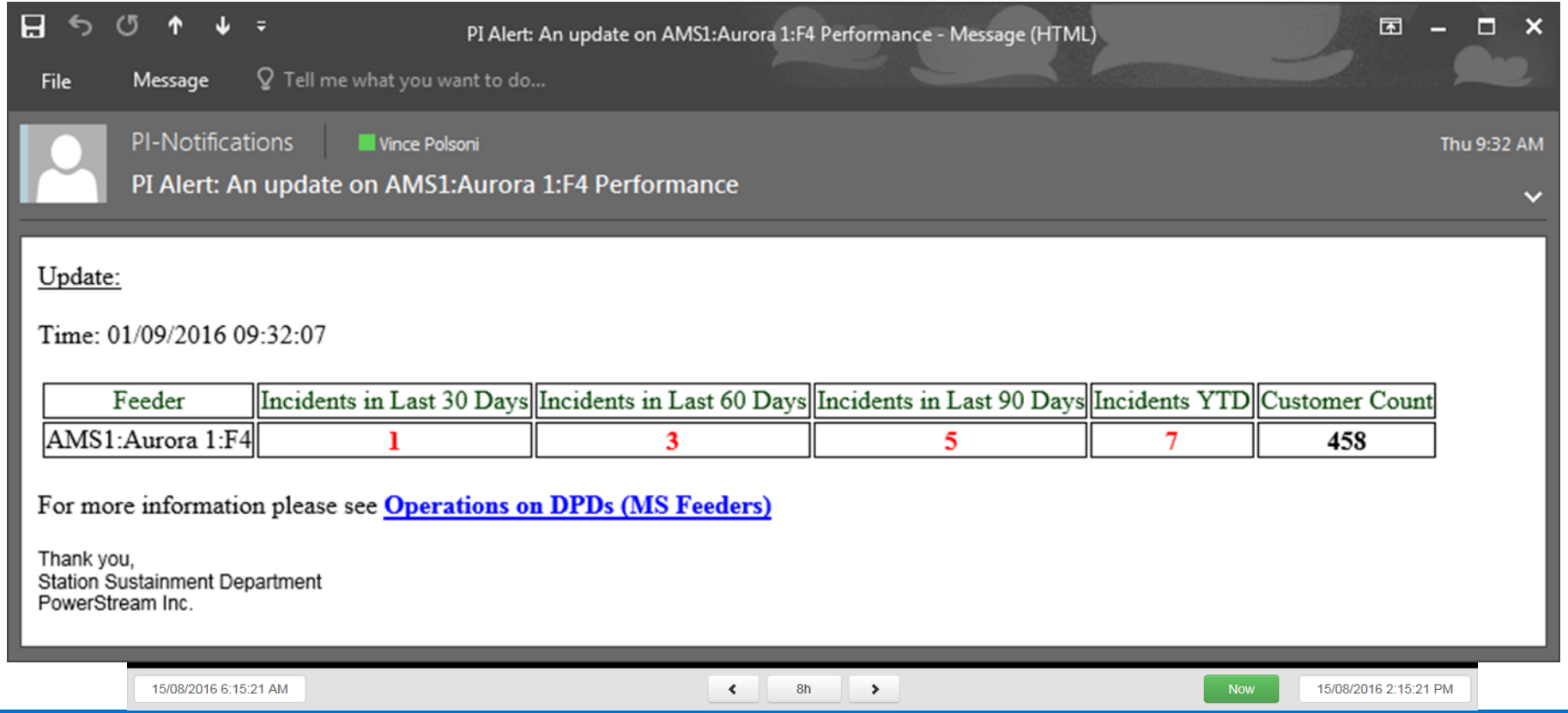
Multi States

Algorithms
(Performance Equations)

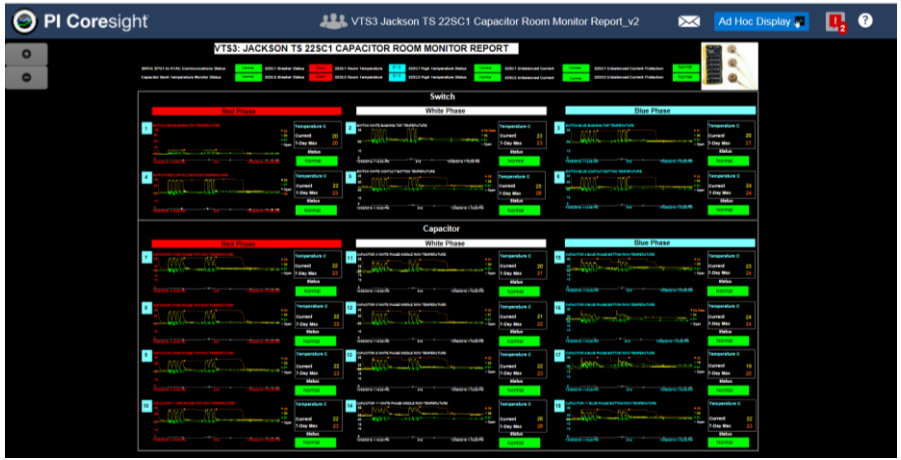
Substation Availability (Risk) Report

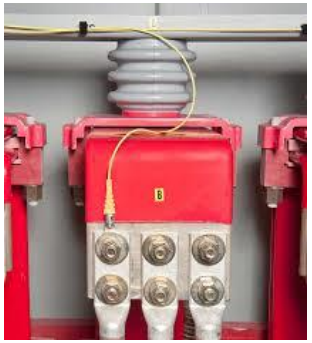


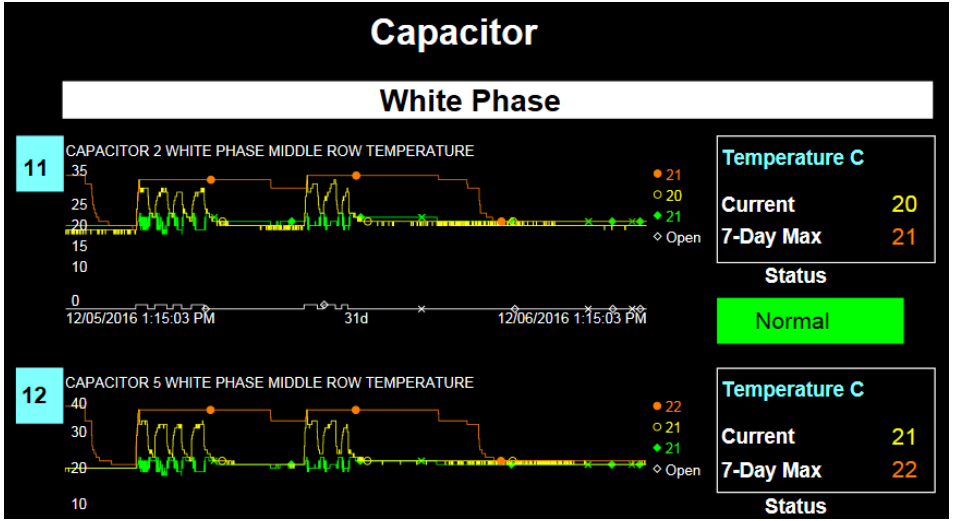
Feeder Availability Report – Risk



Temperature Sensor Monitoring

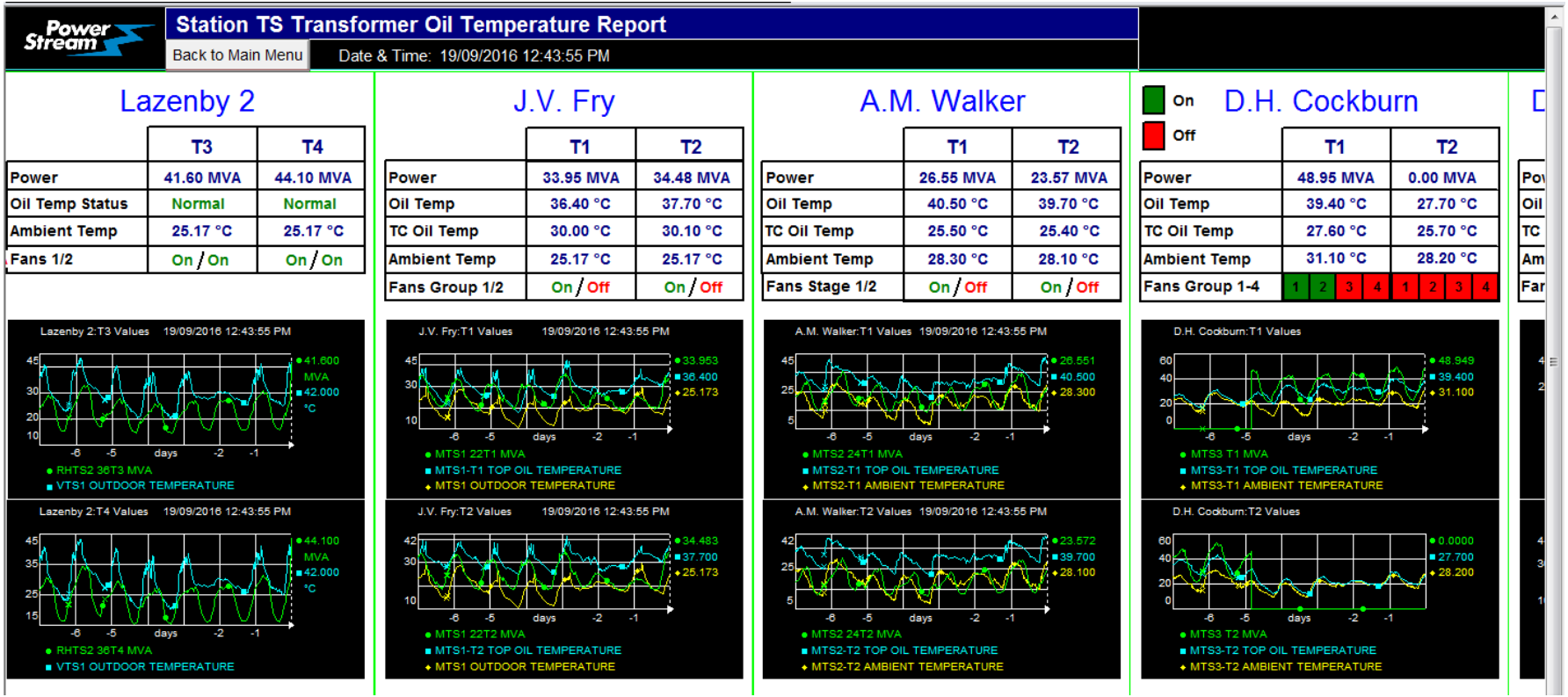




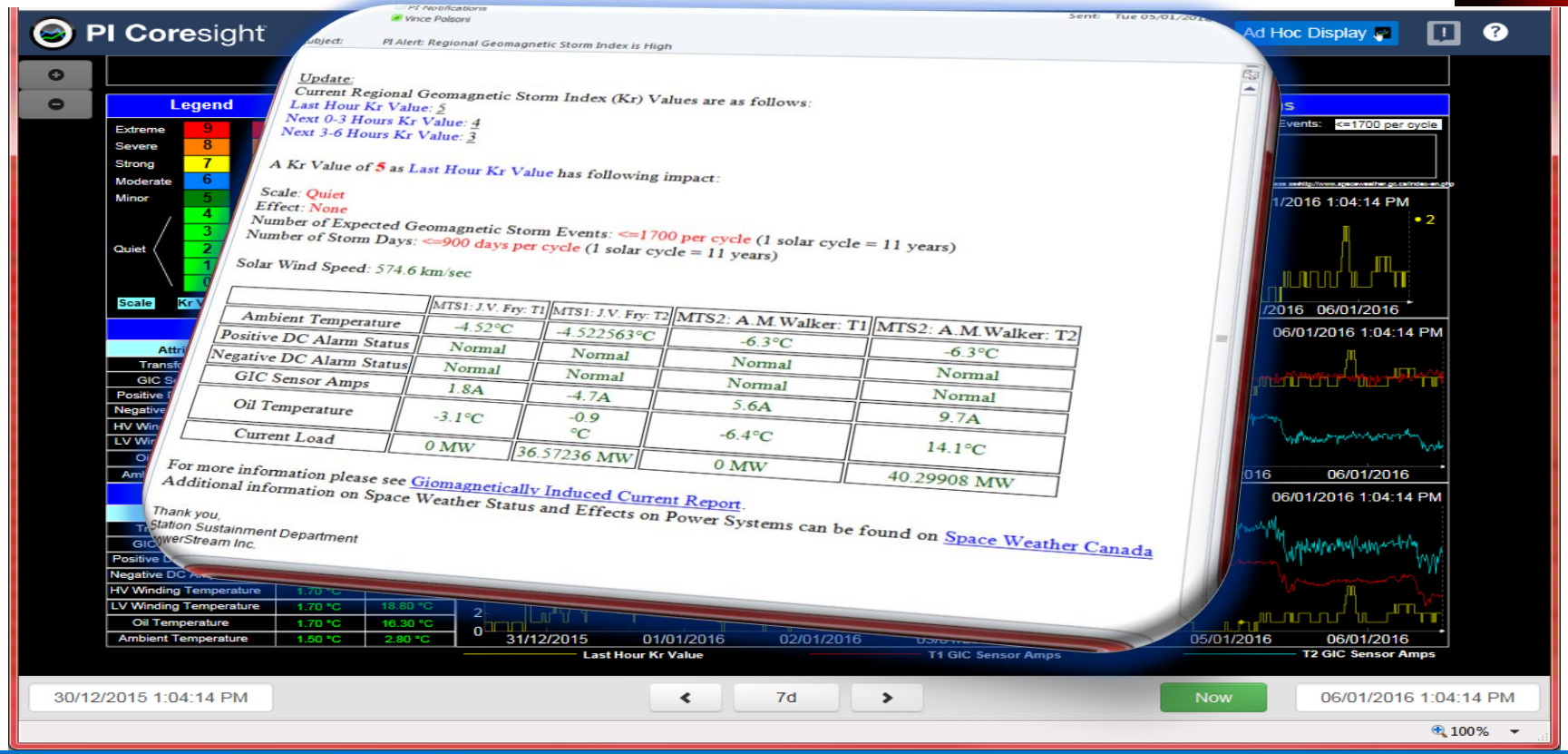


- **Monitors temperature of Switch Contacts, Switch Bushings, Individual Capacitors and Room**

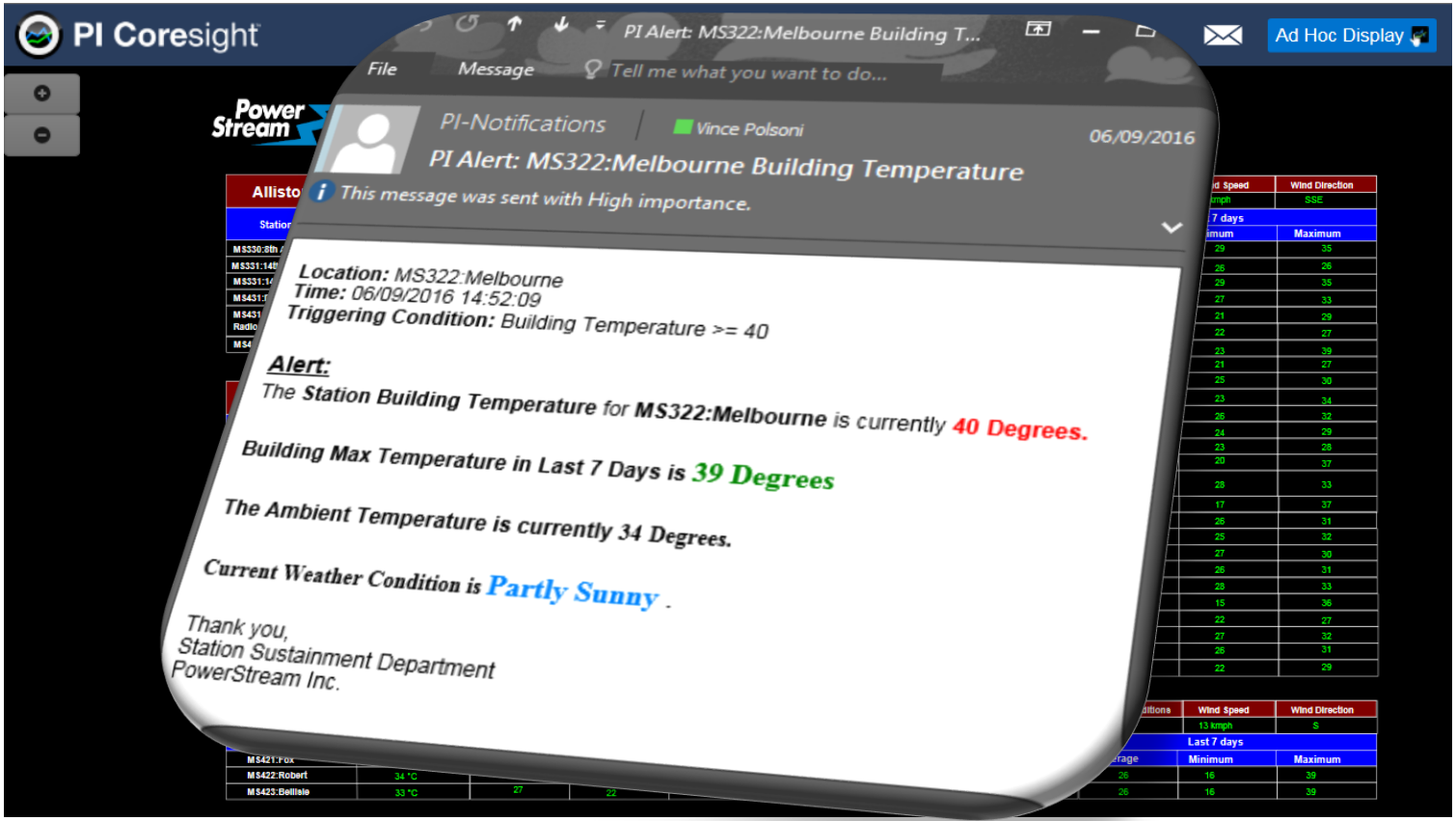
Station Transformer Oil Temperature Report



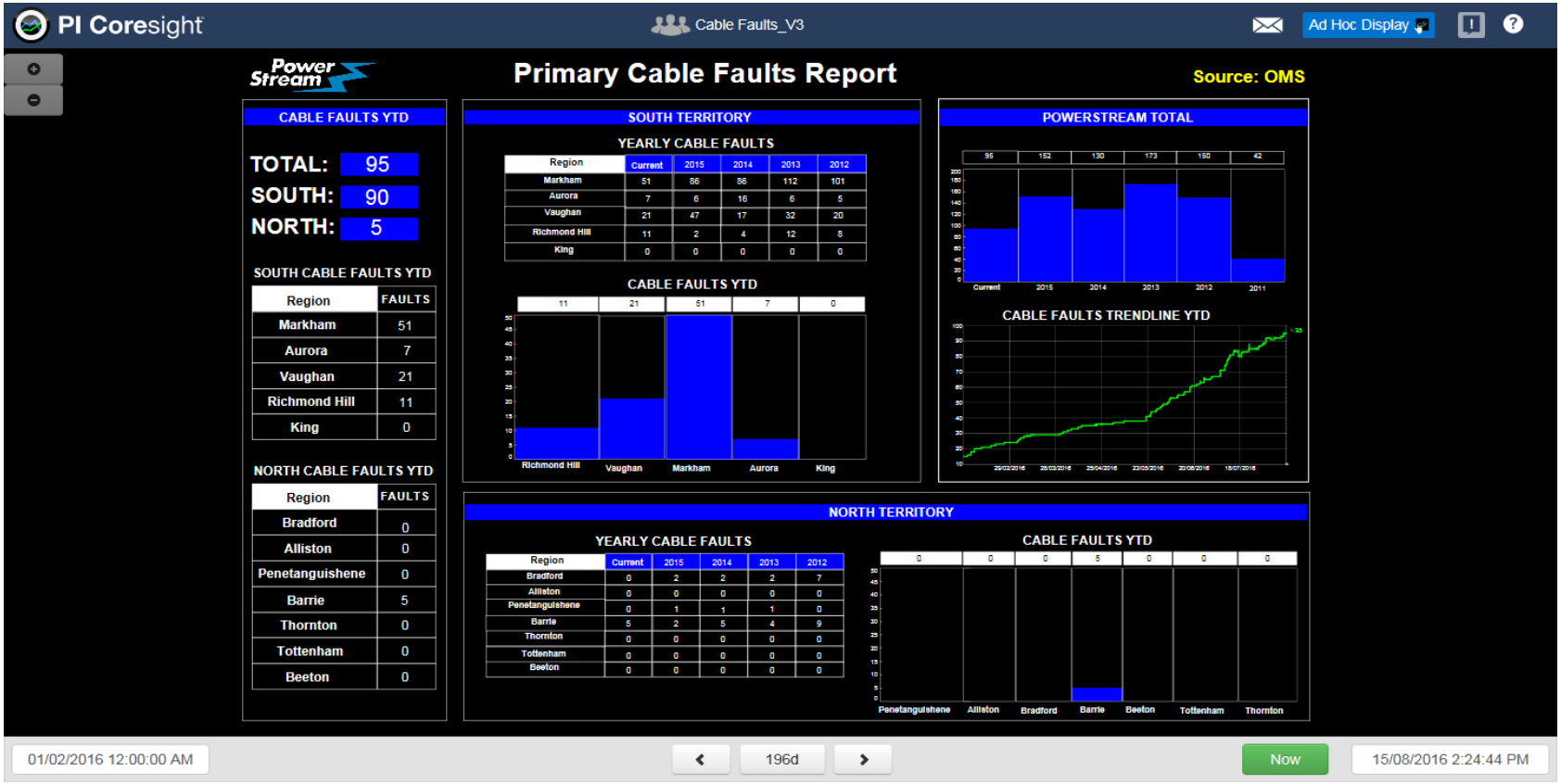
Geomagnetically Induced Current Report



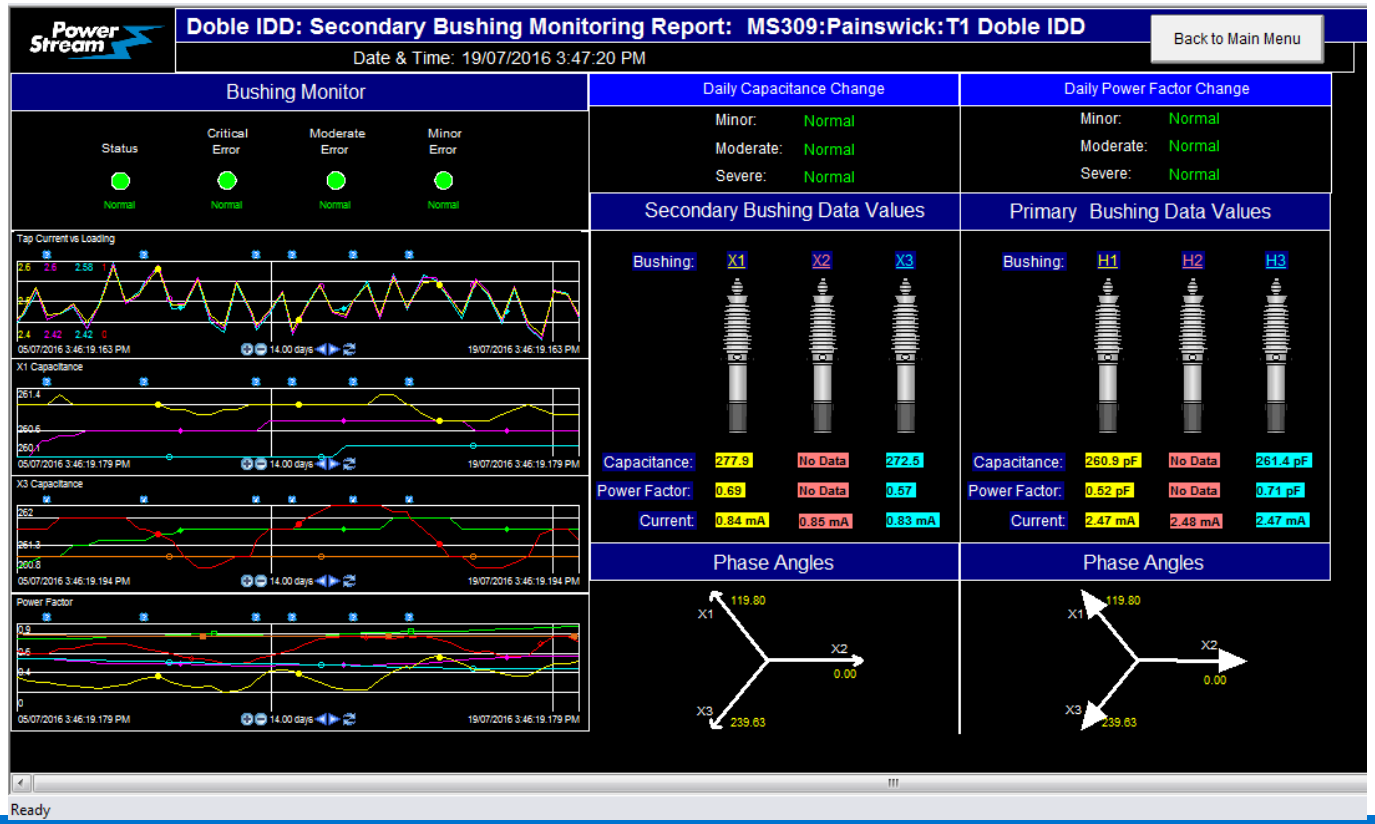
Station Building Temperature Report



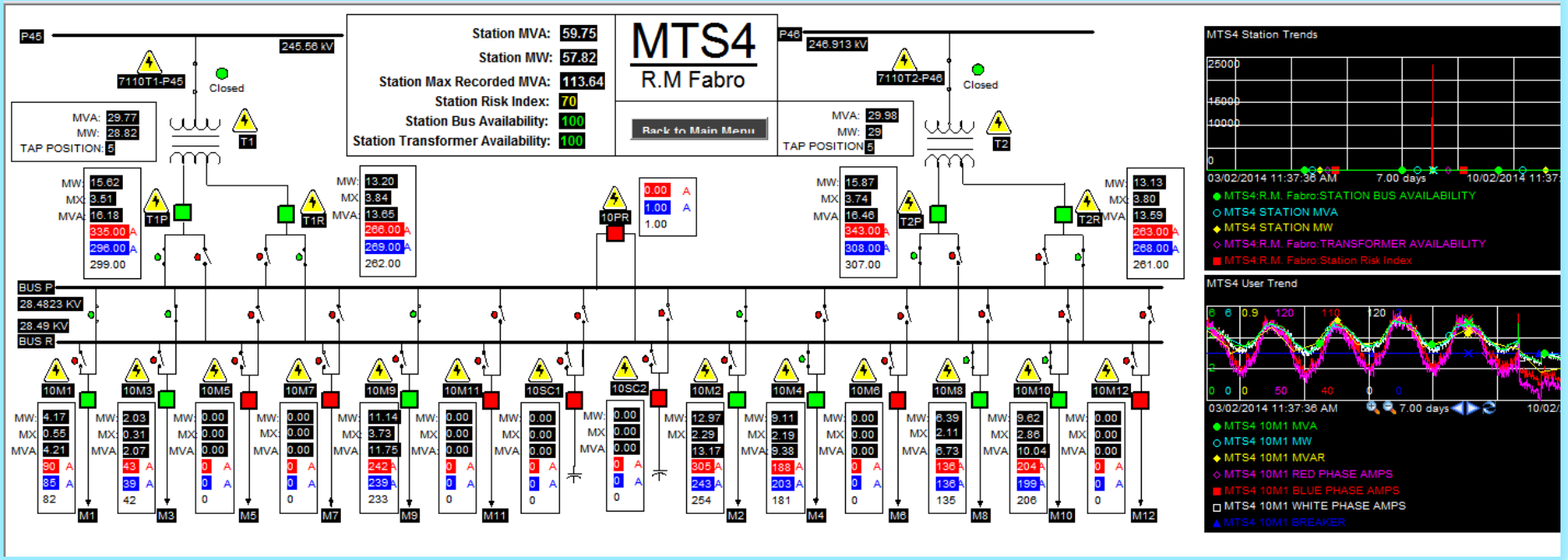
Primary Cable Fault Report



Transformer Online Bushing Report

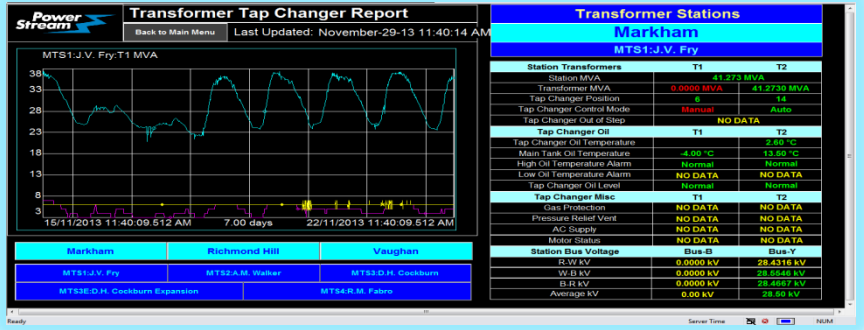


PI ProcessBook – Station Single Line



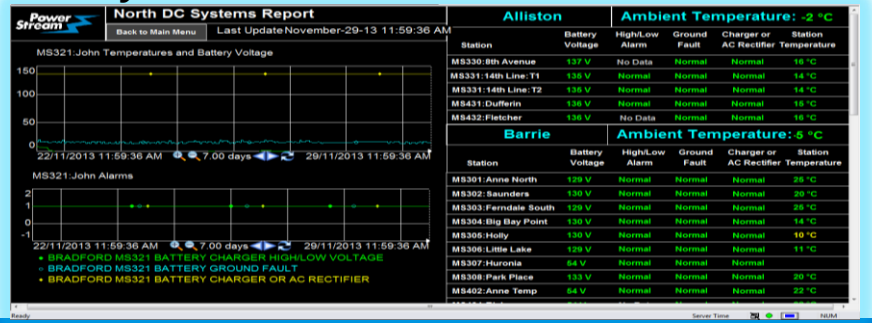
PI ProcessBook Reports

Tap Changer



230 kV Primary Switch Status

DC Systems



Circuit Breaker Status

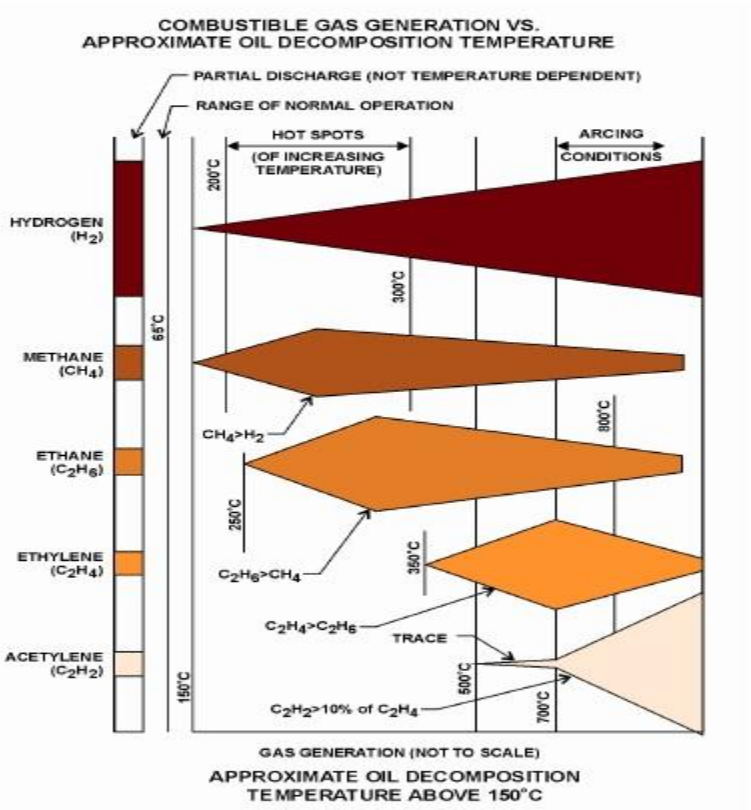
Substation Transformer Hydrogen Gas Alarm Report

PI Coresight

Power Stream

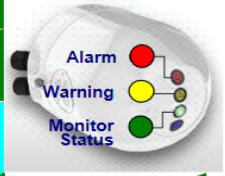
Anne North MS301: T1 — Normal	Saunders MS302: T1
Little Lake MS306: T1 — Normal	Huronia MS307: T1 — Normal
Melbourne MS322: T1	8th Line MS323: T1 — Normal
14th Line MS331: T2 — Normal	Patterson MS336: T1 — Normal
Burton MS406: T1 — Normal	Cundles East MS407: T1
Innisfil MS411: T1 — Normal	Johnson MS412: T1
St Vincent MS417: T1	Wellington MS418: T1
Bellisle MS423: T1	Centennial MS424: T1 — Normal

19/07/2016 7:43:12 AM



SOUTH

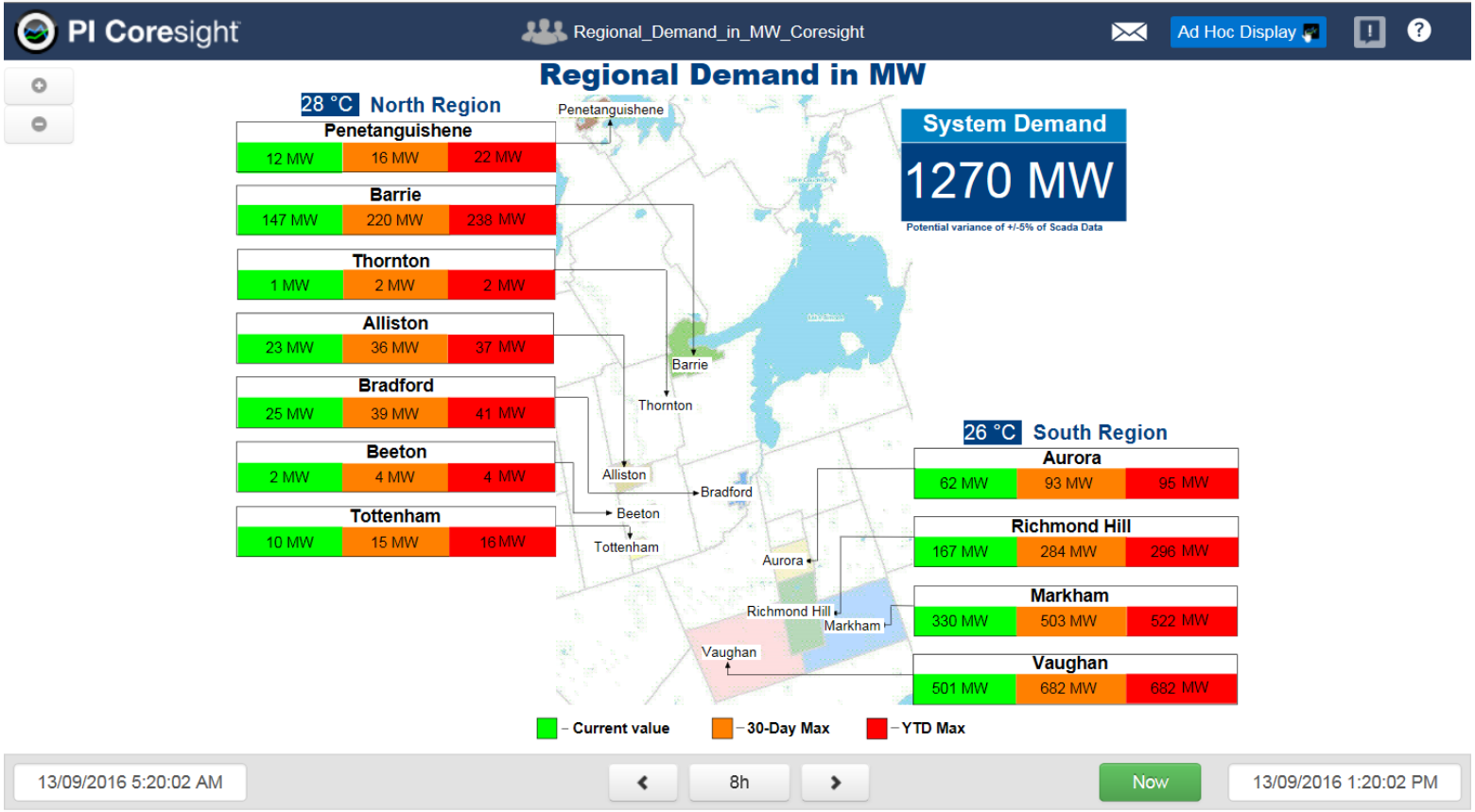
Amber Amber: T2 — Normal	Intellix GLA 100
Aurora 1 AMS1: T2 — Normal	
Aurora 3 AMS3: T1	
Aurora 4 AMS4: T1 — Normal	Aurora 4 AMS4: T2 — Normal
Aurora 5 AMS5: T2 — Normal	Aurora 6 AMS6: T1 — Normal
Aurora 7 AMS7: T1	Aurora 8 AMS8: T1
Baythorn Baythorn: T2	John Street John: T1
Morgan Morgan: T1	Morgan Morgan: T2



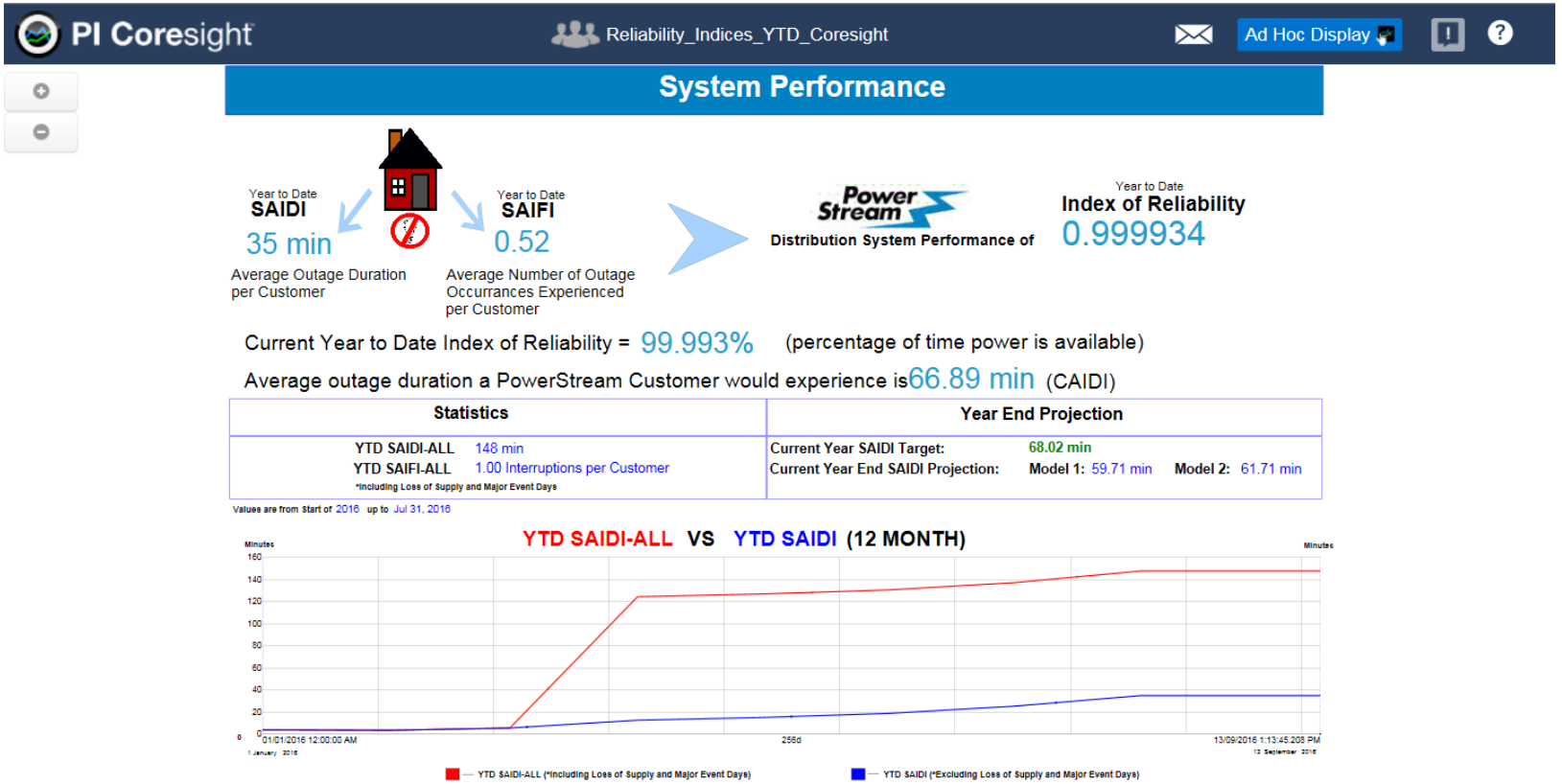
Now

19/07/2016 3:43:12 PM

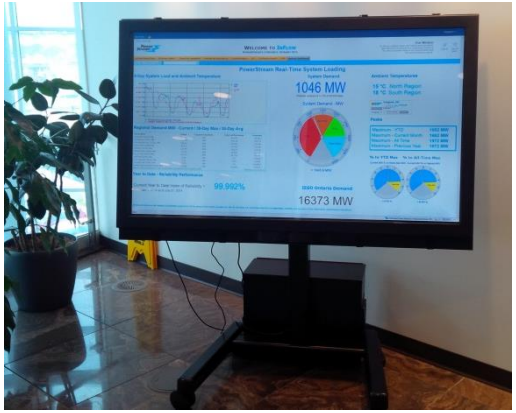
Regional Demand: Current, 30 Day & Year to Date Maximums



System Reliability Report using PI Coresight / PI ProcessBook

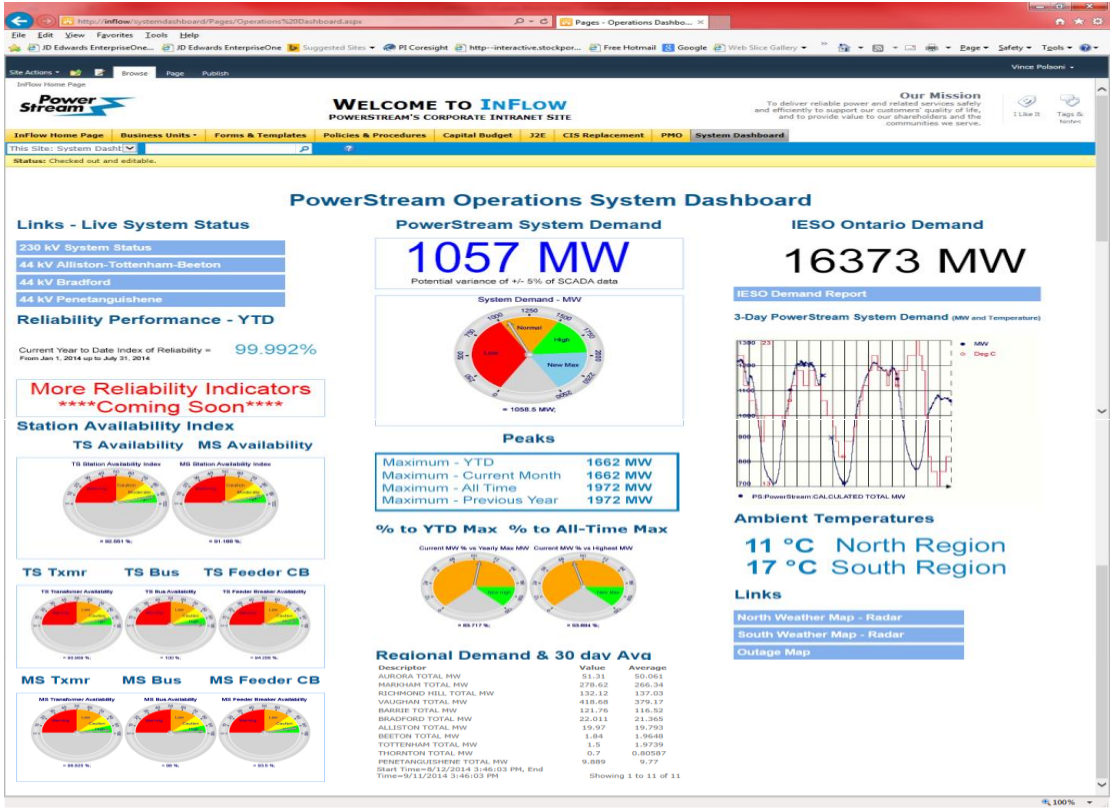


Corporate / Operations Dashboards

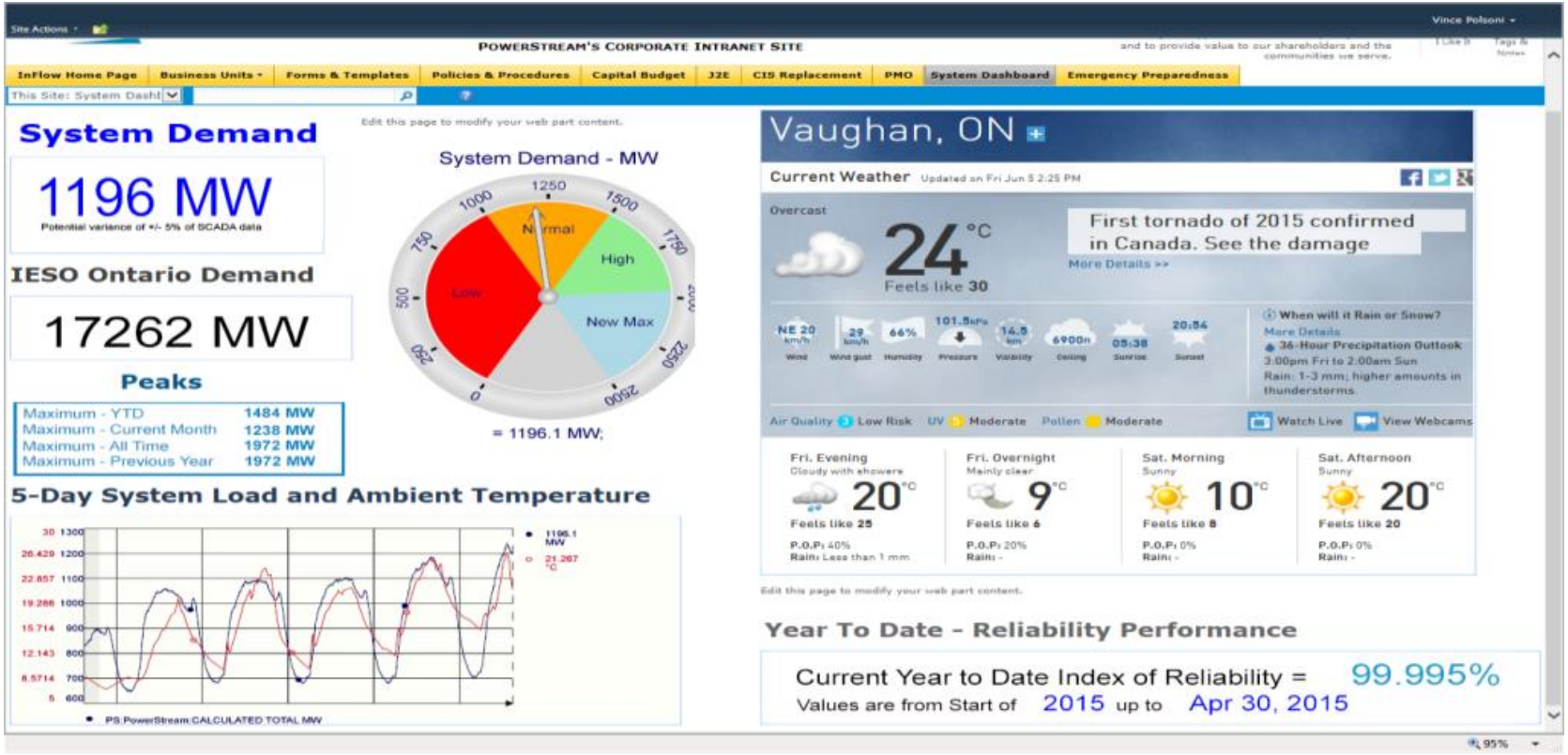


PITV – Public Area

PITV – Office



System Loading Dashboard



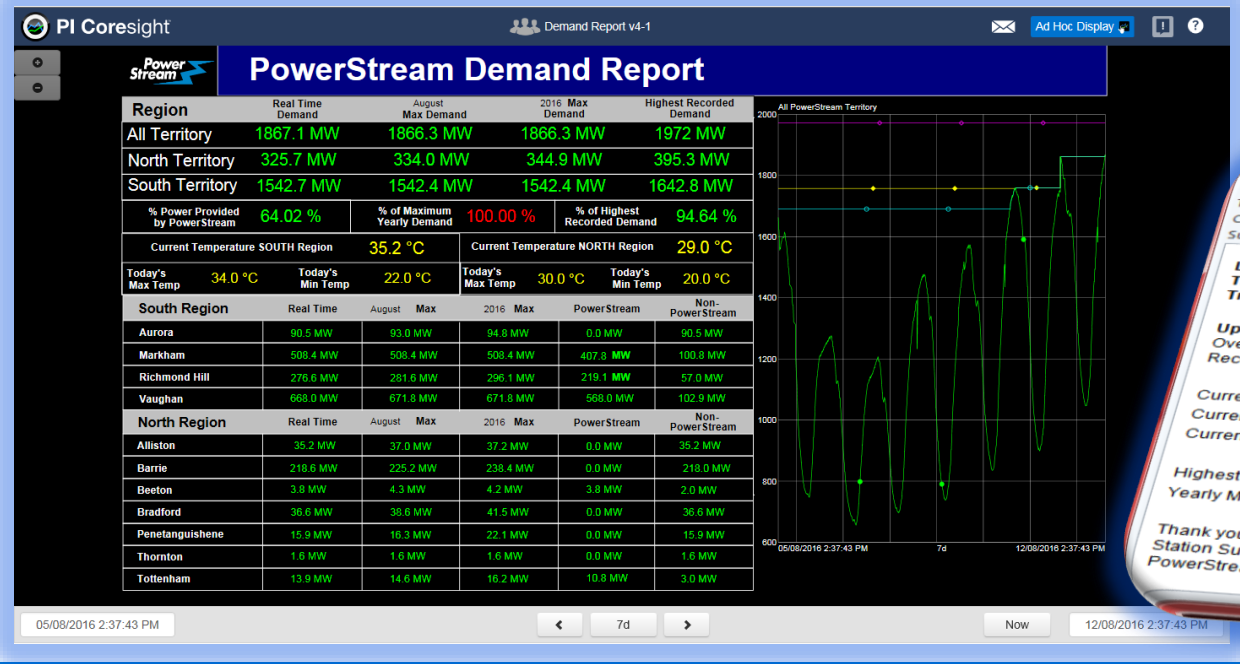
PI Notifications – Real-time Information

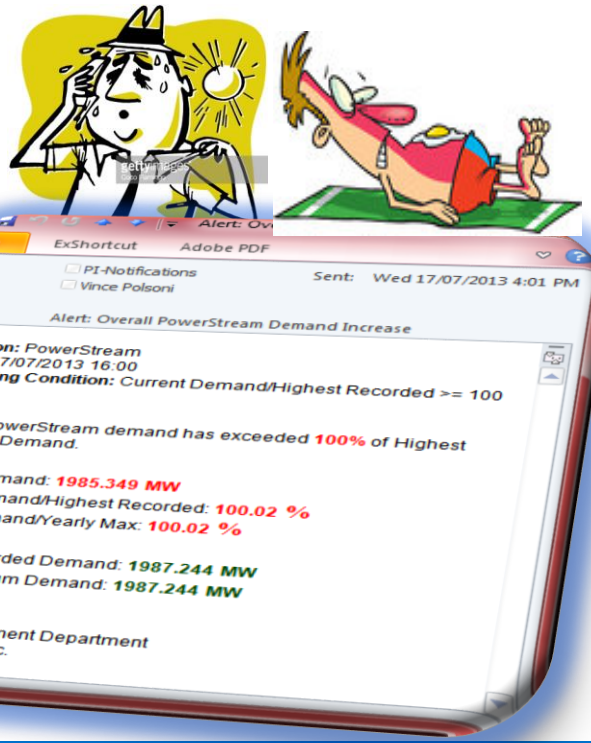
- Current Total Outages by Region
- Circuit Breaker Operation
- Low SF6 Gas
- Station Building Temp
- DC System
- Battery Low Voltage
- Calisto 9 General Alarm
- System Demand

- Transformer Online / Offline
- Transformer Oil Temp/Cooling
- Tap Changer Oil Filtration Alarm
- Feeder Protection Trip
- Secondary Txmr Breaker Operation
- Primary Switch Operation
- High Sump Water Level

System Demand Report

Use PI System to monitor the System Demand as it approaches and reaches PowerStream's "All-Time" peak and notify when it reaches >95% of all time peak

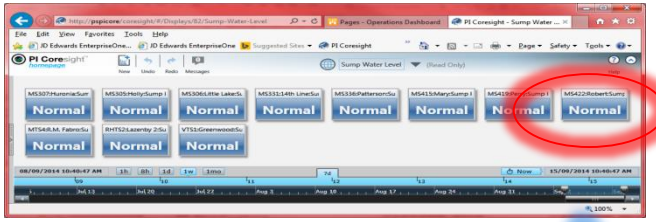




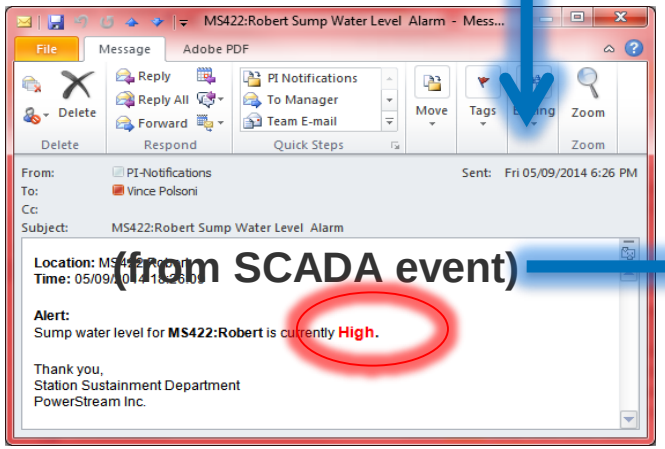
SCADA – PI System – CMMS Working as One

PI Report (High Water Alarm)

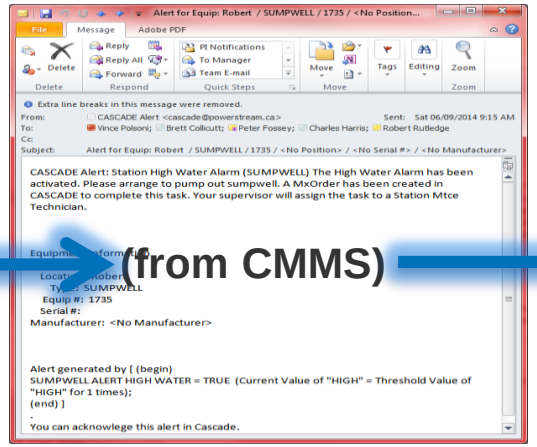
PI Report (High Water Alarm Cleared)



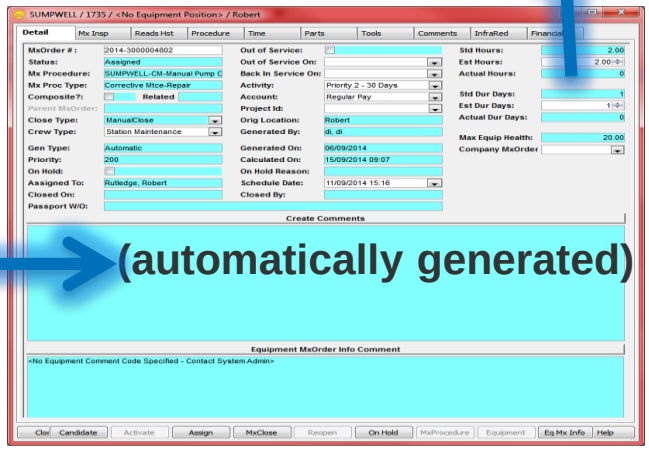
PI Notification



CMMS Alert



CMMS Work Order



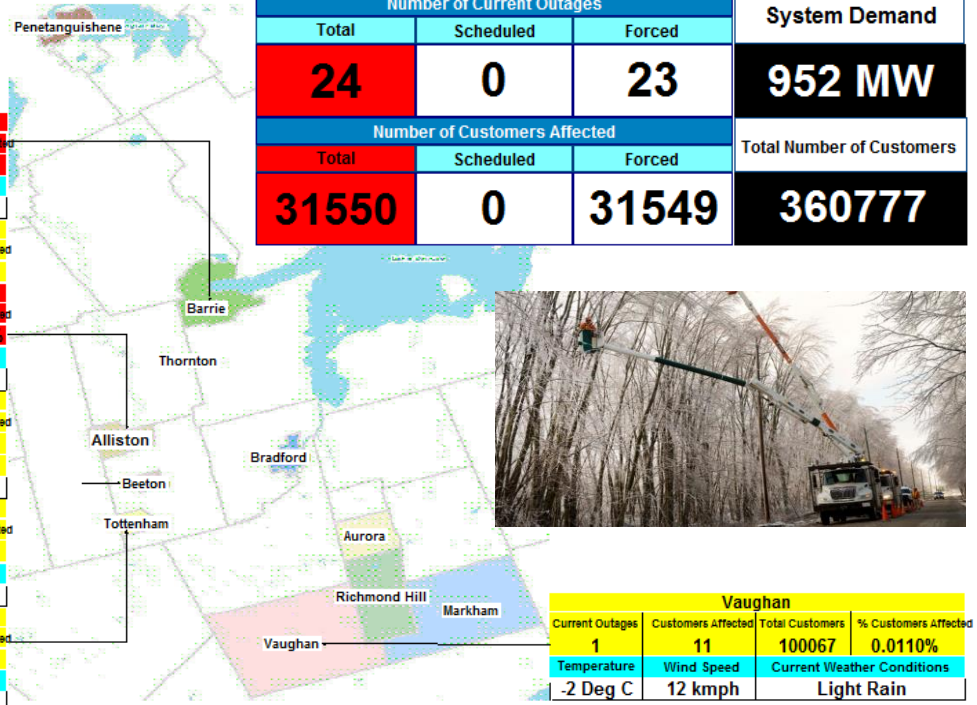
(from SCADA event) (from CMMS) (automatically generated)

Current Outages By Region – Ice Storm March 24-25, 2016

Current Outage Information

Number of Current Outages			System Demand
Total	Scheduled	Forced	
24	0	23	952 MW

Number of Customers Affected			Total Number of Customers
Total	Scheduled	Forced	
31550	0	31549	360777



Barrie

Current Outages	Customers Affected	Total Customers	% Customers Affected
13	23546	53652	43.8865%
Temperature	Wind Speed	Current Weather Conditions	
-2 Deg C	8 kmph	Snow	

Thornton

Current Outages	Customers Affected	Total Customers	% Customers Affected
2	2	464	0.4310%

Alliston

Current Outages	Customers Affected	Total Customers	% Customers Affected
4	7952	7722	102.9785%
Temperature	Wind Speed	Current Weather Conditions	
-2 Deg C	3 kmph	Snow	

Bradford

Current Outages	Customers Affected	Total Customers	% Customers Affected
1	1	9304	0.0079%
Temperature	Wind Speed	Current Weather Conditions	
-2 Deg C	8 kmph	Light Rain	

Beeton

Current Outages	Customers Affected	Total Customers	% Customers Affected
2	37	1521	2.4326%
Temperature	Wind Speed	Current Weather Conditions	
-1 Deg C	5 kmph	Light Rain	

Tottenham

Current Outages	Customers Affected	Total Customers	% Customers Affected
1	1	2371	0.0422%
Temperature	Wind Speed	Current Weather Conditions	
-1 Deg C	5 kmph	Light Rain	

Vaughan

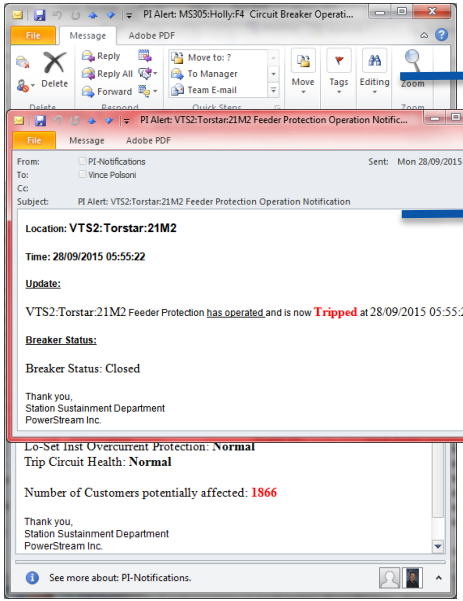
Current Outages	Customers Affected	Total Customers	% Customers Affected
1	11	100067	0.0110%
Temperature	Wind Speed	Current Weather Conditions	
-2 Deg C	12 kmph	Light Rain	

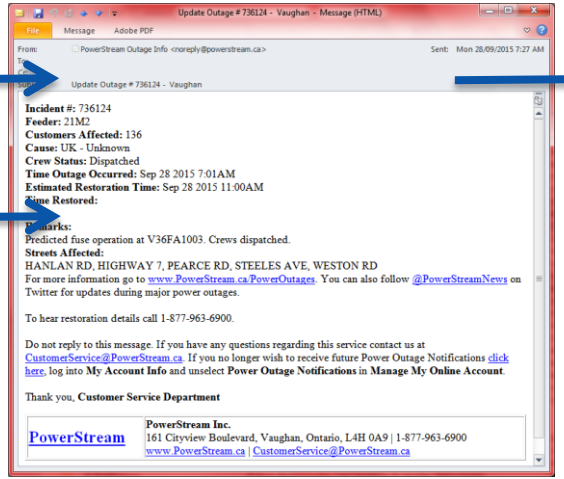
Outage Information Flow with PI System

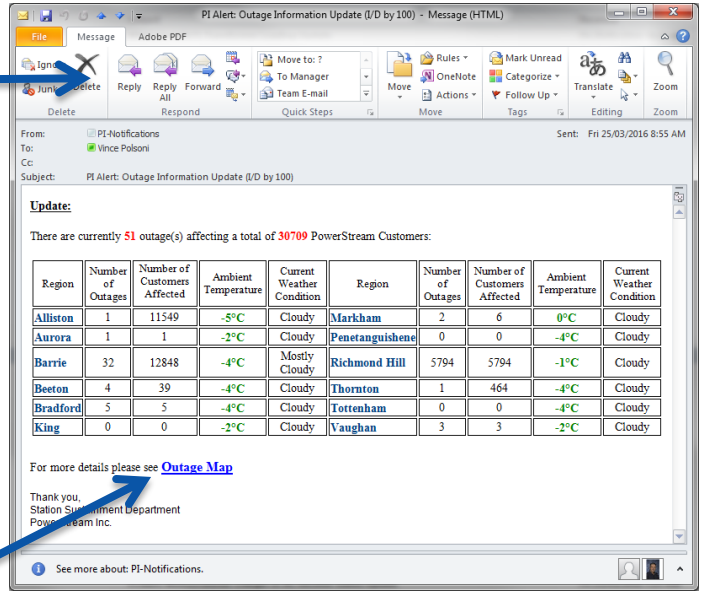
PI Notifications -
Feeder Protection Trip
& Circuit Breaker Operation

Email - Outage
Management System

PI Notification
Outage Counts by Region







Link to view PI Coresight Report

Feeder Outage Performance Notification

PI Alert: An update on AMS1:Aurora 1:F4 Performance - Message (HTML)

File Message Tell me what you want to do...

PI-Notifications | Vince Polsoni Thu 9:32 AM

PI Alert: An update on AMS1:Aurora 1:F4 Performance

Update:

Time: 01/09/2016 09:32:07

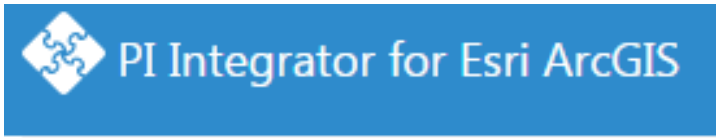
Feeder	Incidents in Last 30 Days	Incidents in Last 60 Days	Incidents in Last 90 Days	Incidents YTD	Customer Count
AMS1:Aurora 1:F4	1	3	5	7	458

For more information please see **Operations on DPDs (MS Feeders)**

Thank you,
Station Sustainment Department
PowerStream Inc.

Expanded Use of PI System at PowerStream

- Corporate and Operations Dashboards
- PI Integrator for ESRI ArcGIS

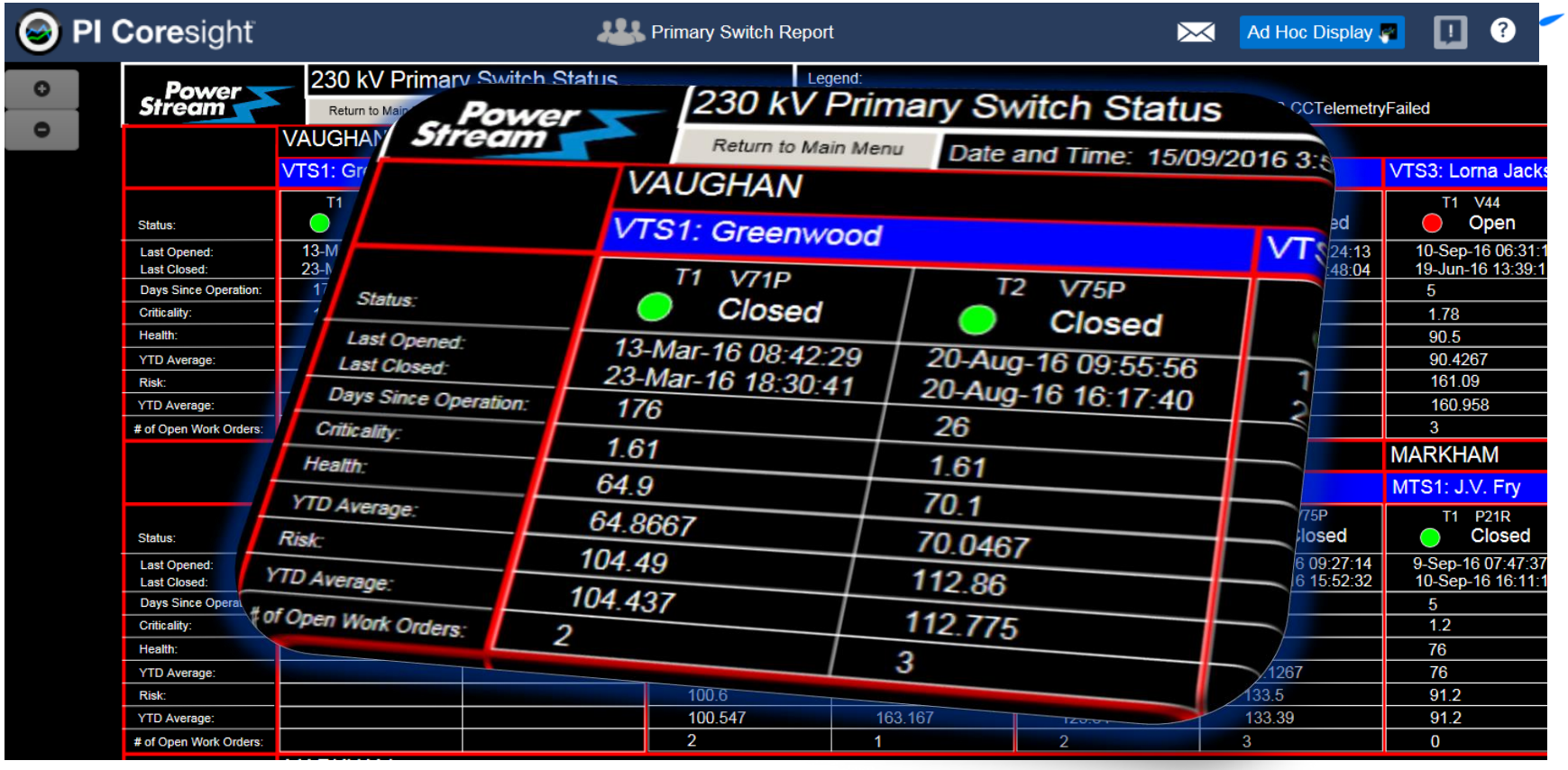


- Event Frames
- Asset Analytics
- CMMS - Work Force Performance / Failure Reporting
- Micro Grid Reporting
  - 2 Micro Grid installations
- Merger (PI System expansion)

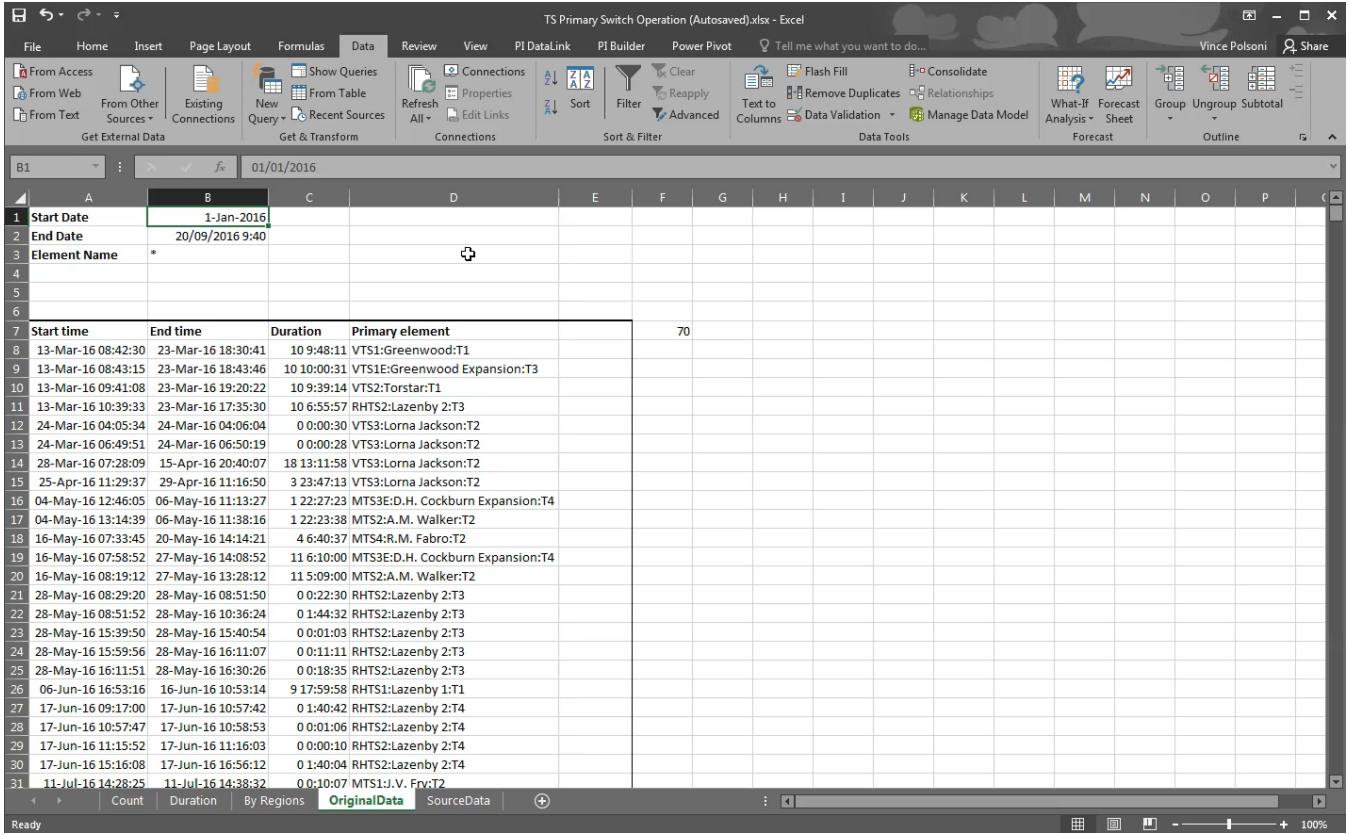
Exploring Event Frames – PowerStream

- Exploring PI Event Frames
  - Utilizing PI DataLink 2016
- Challenging in the beginning
  - Great Support from OSIsoft
- Utilizing templates in PI AF
- Auto updating of Event Frame reports/charts for Dashboards

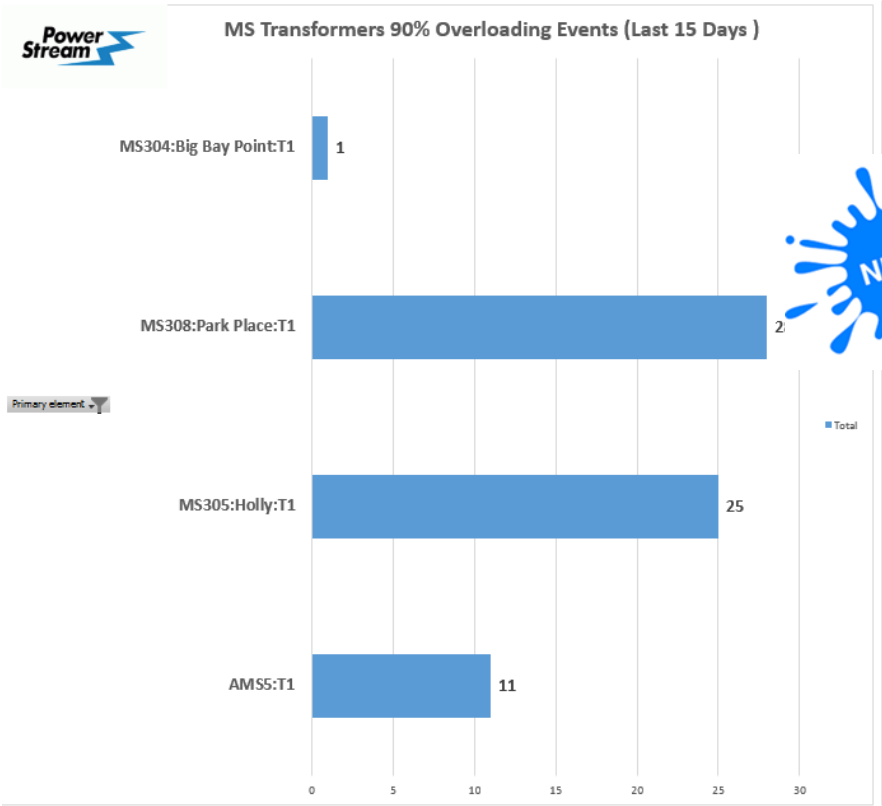
230kV Primary Switch Performance Report



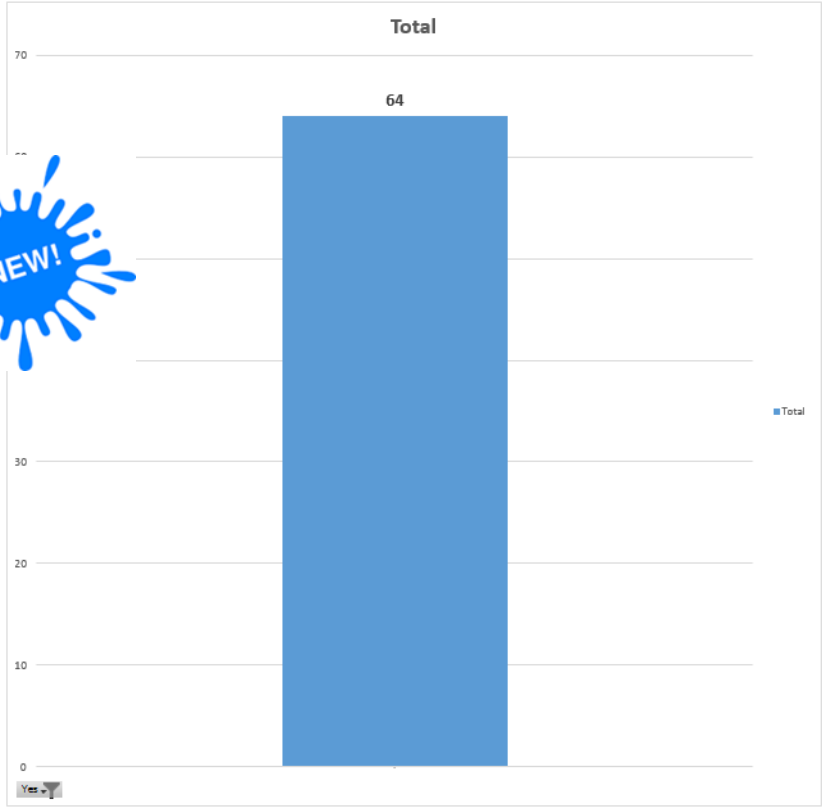
230kV Primary Switch Open-Close Report
(PI Event Frames)



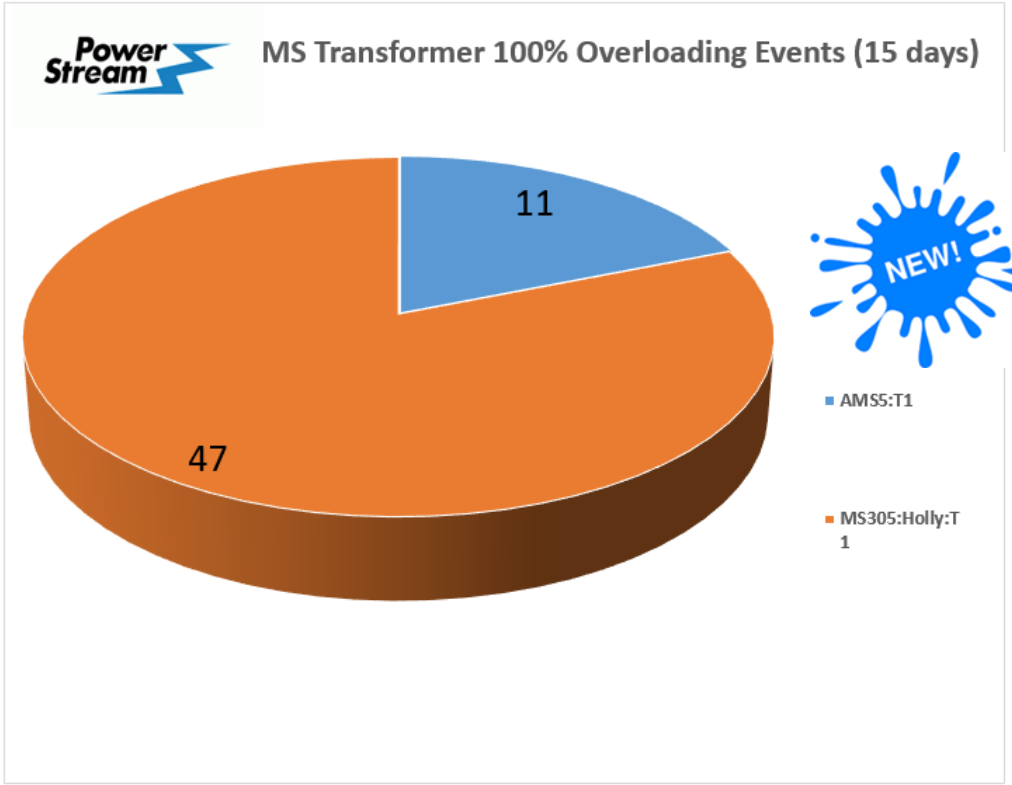
Transformer 90% Loading Events



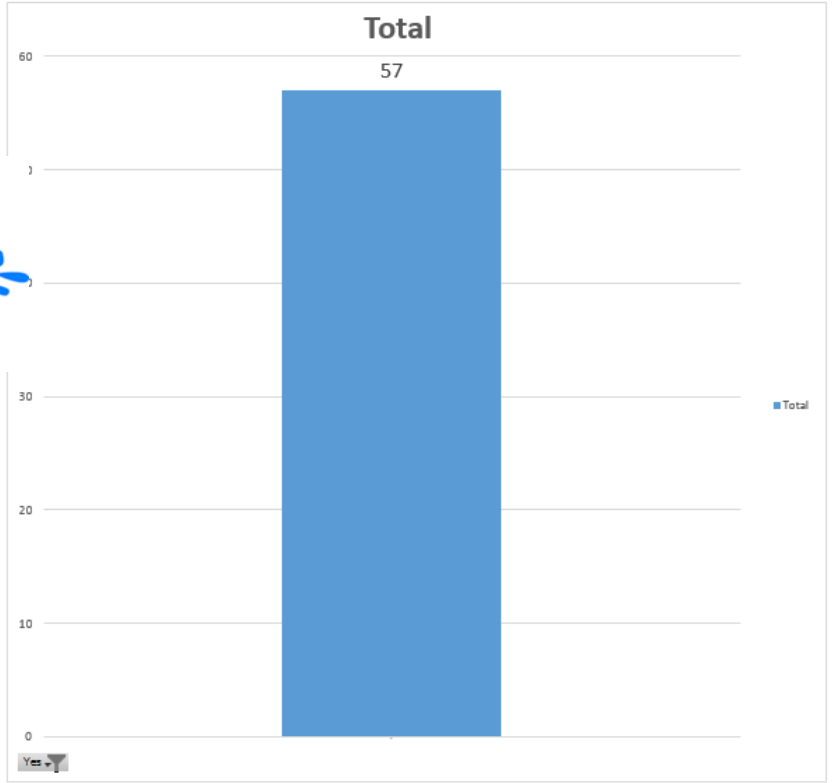
NEW!



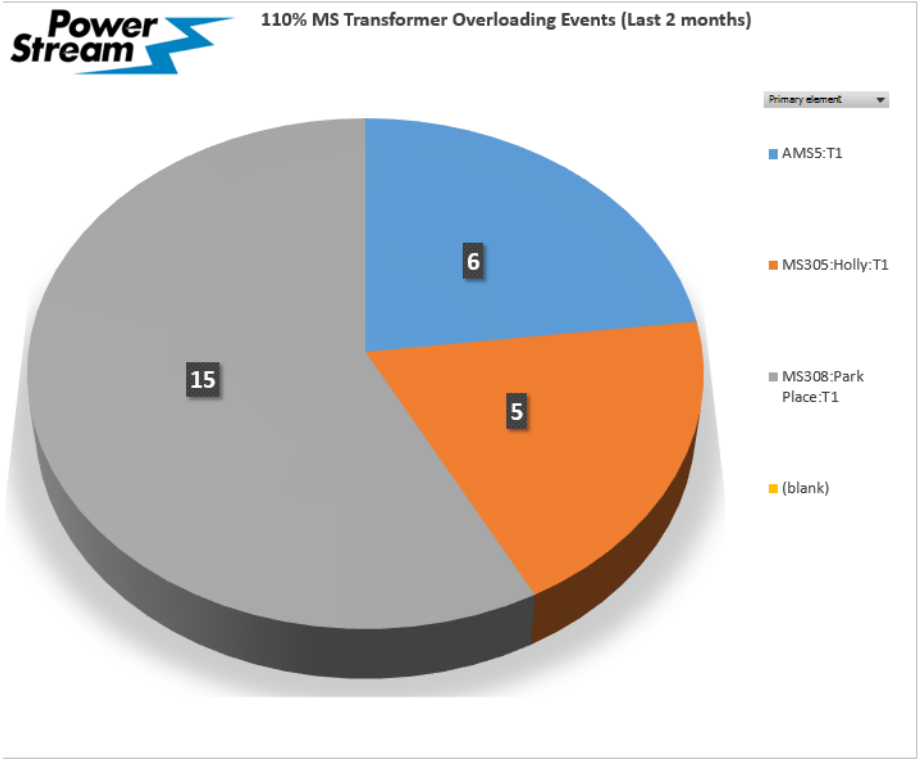
Transformer 100% Overloading Events

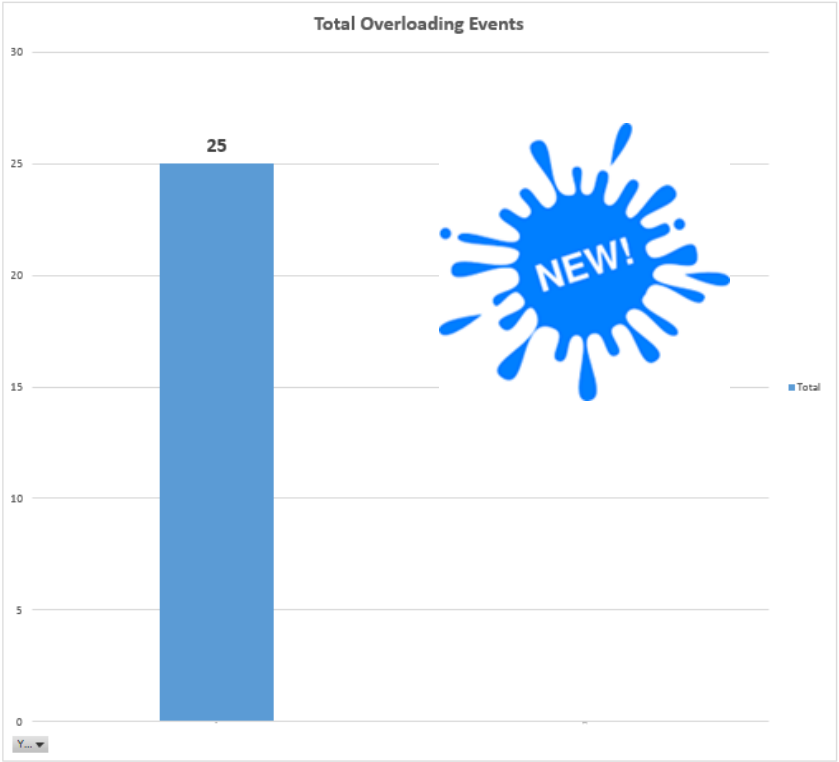


NEW!

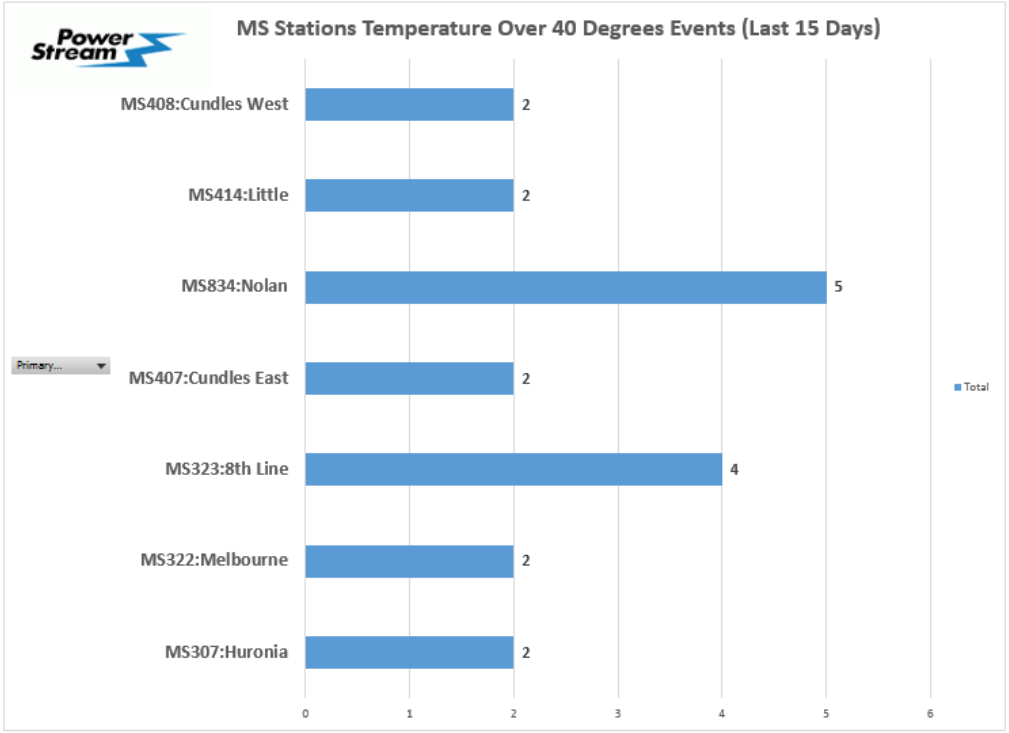


Substation Transformer 110% Overloading Events

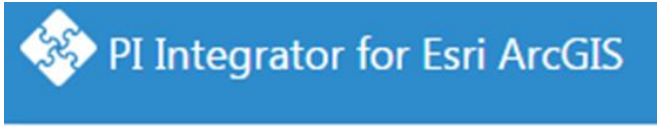




Substation Building Temperatures Over 40°C Events



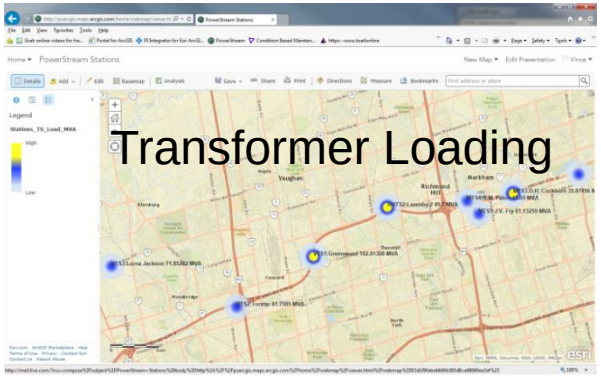
PI Integrator for ESRI ArcGIS

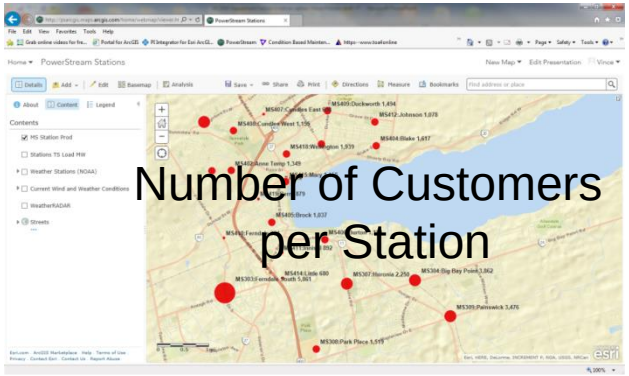


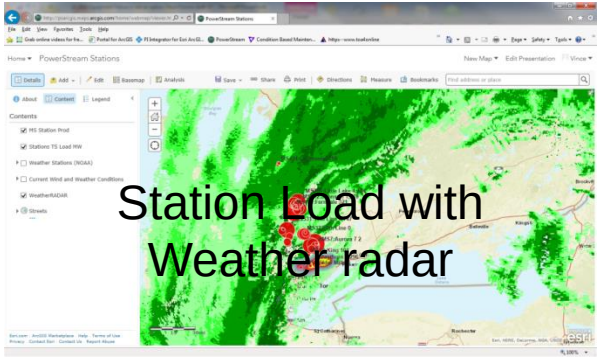
- New installation – August 2016
  - Successful Pilot Project
  - Used to demonstrate capabilities of leveraging PI System and GIS system (ESRI)

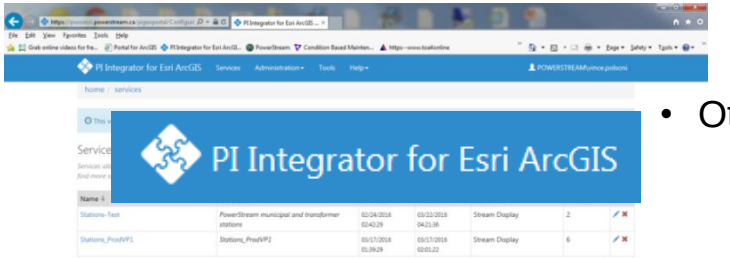
- Overall very satisfied, lots of potential
  - Initially a few challenges for a non ESRI user
  - PI Integrator for ESRI ArcGIS easy tool to learn
  - Fast learning curve with excellent support by both OSIsoft and ESRI

Sample PI-ESRI Reports









- ArcGIS Online
- ArcGIS Portal

- Users of ESRI reports:
  - System Planning
  - Engineering
  - Operations

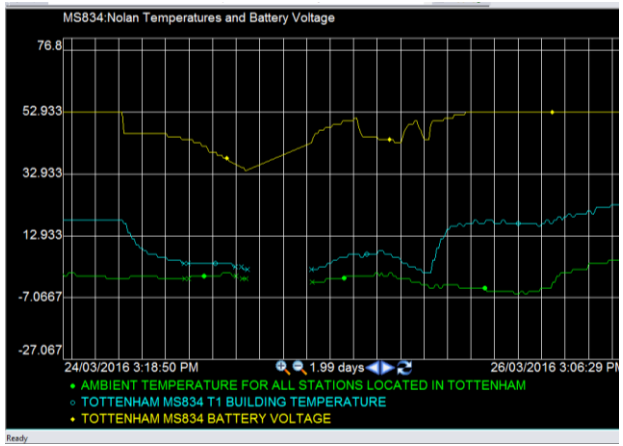
- Other reports:
  - **Outages with Weather Radar and Wind**
  - **Transformer Health**
  - **High Water Alarms**
  - **Number of Circuit Breaker Operations in Last 30 days**

Benefits of PI System

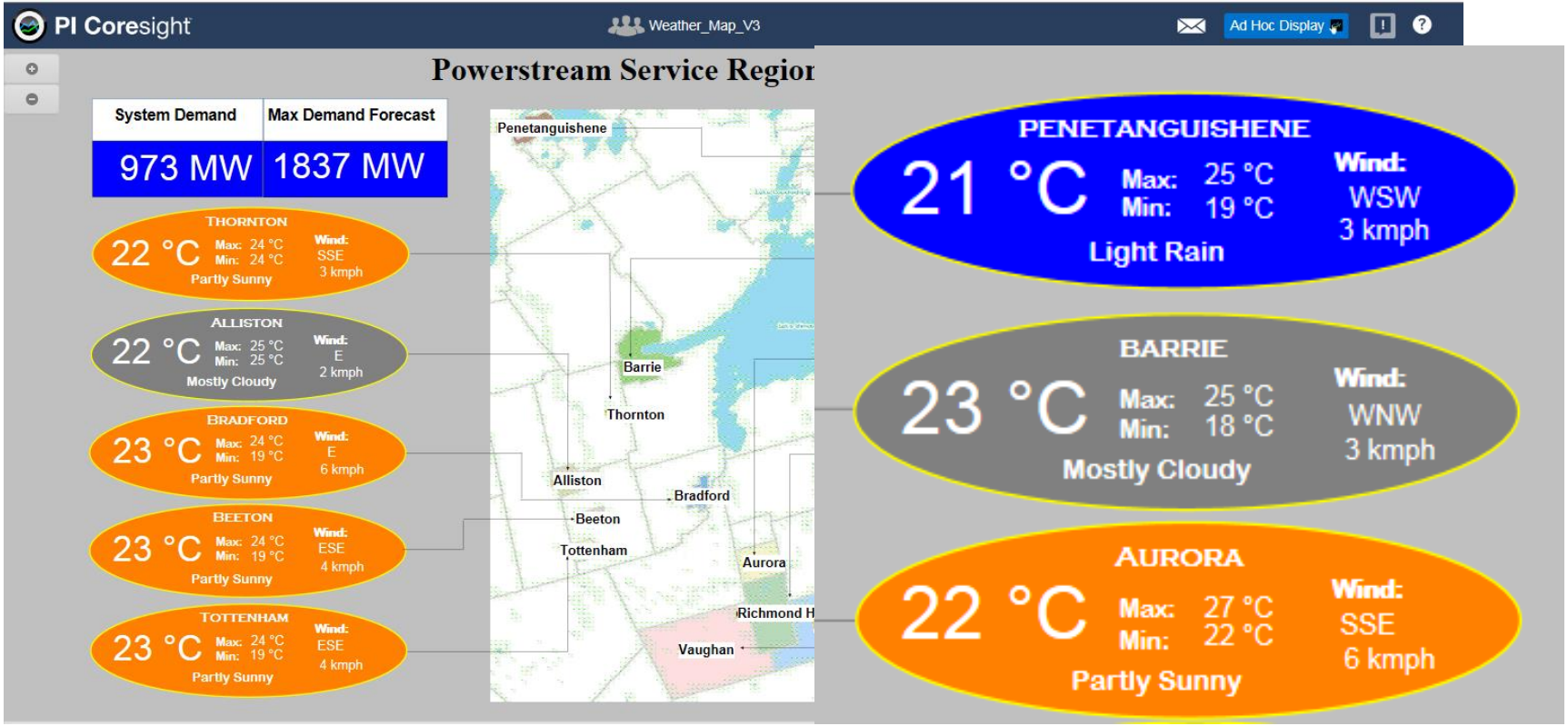
- True Condition Based Maintenance enabler
- Maintenance Optimizer
- Stores Key Information for Asset Management Decision Making
- Innovation stimulant
- Instant Information to those who need it
- Fast learning curve
    - OSIsoft YouTube, Manuals, Support, Training

Ice Storm March 24, 2016 – PI System Benefits

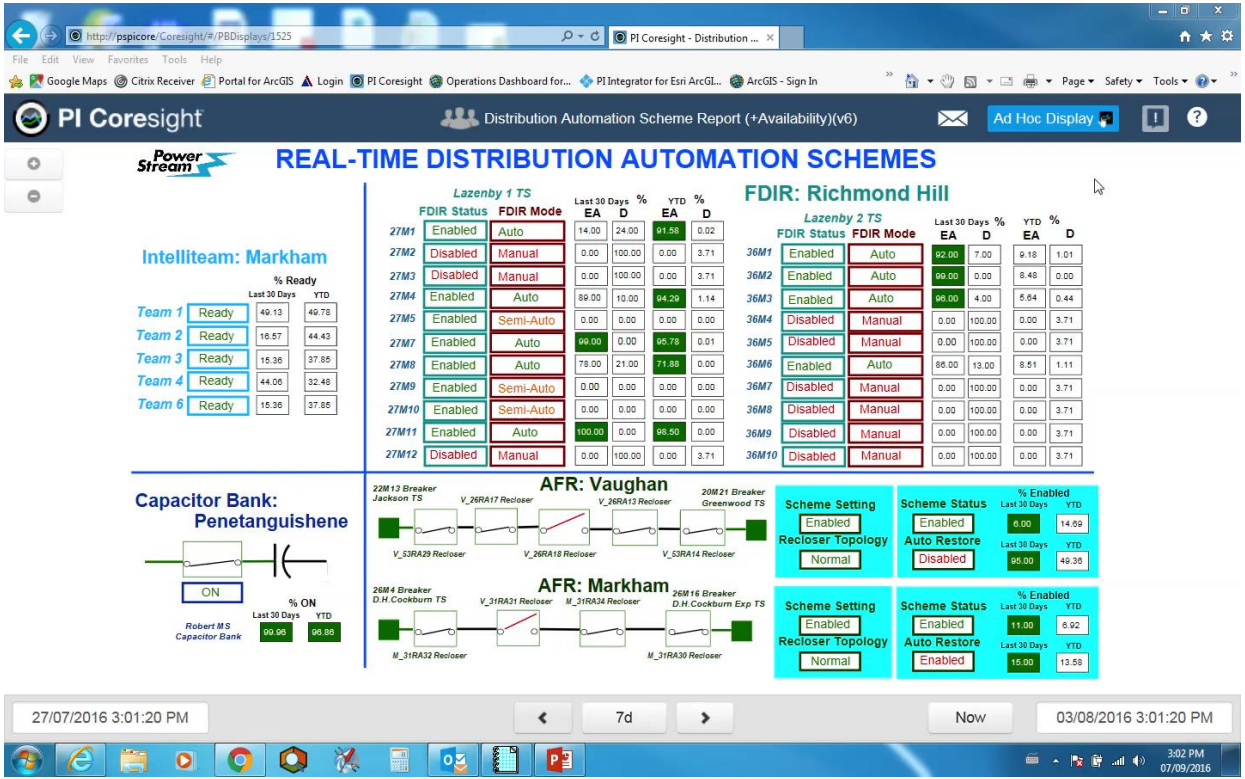
- Up to 50,000 customers affected
- Used PI System and **PI Notifications** to monitor system and station equipment
  - Number of outages and Customers affected by Region
  - Breaker Operations
  - Transformer de-energization/energization
  - Protection “trips”
  - Battery charger status and battery voltages



PowerStream Service Territory Weather Report

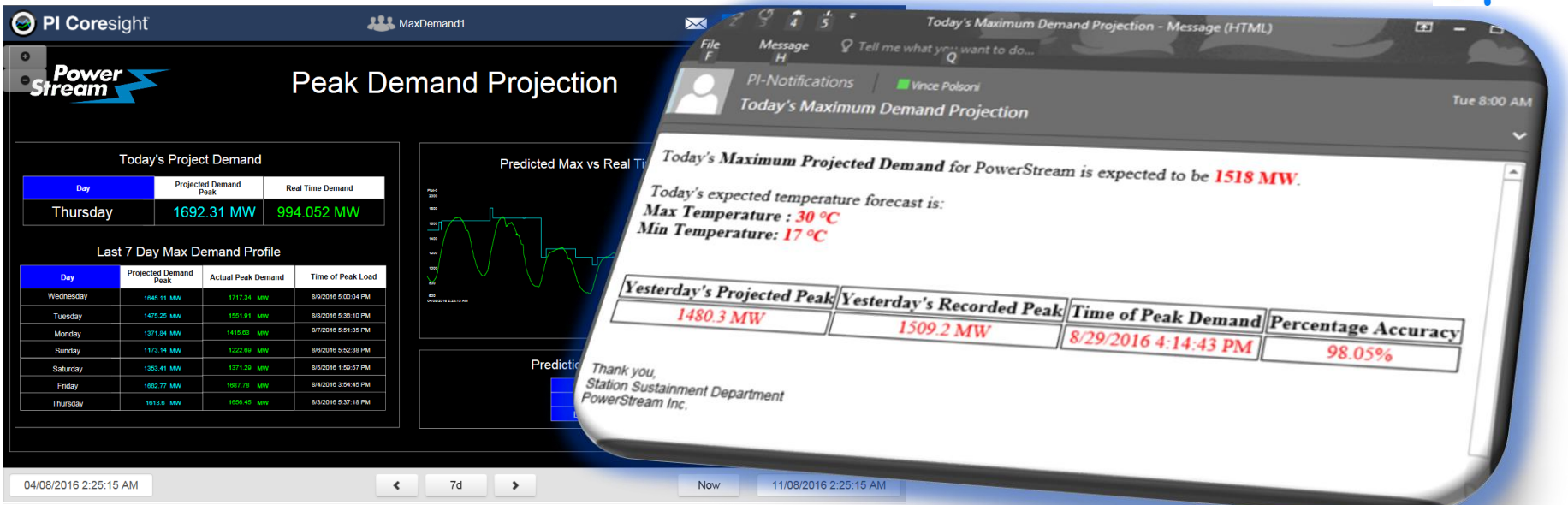


Real-Time Distribution Automation Schemes Performance Report



NEW!

Daily Peak Projection Report



- Uses Historical load and Weather data
- Built in adjustment for summer and winter temperatures
- Calculated in PI AF Analysis
- Daily Notification at 8:00am

OSIsoft PI System: Achieving Operational Efficiency

COMPANY and GOAL

PowerStream Inc. is a progressive distribution utility company that focuses on Innovation and Technology to achieve operational efficiencies that contribute to **maintenance optimization and reduction of equipment failures**.

CHALLENGE

Operational data is not readily available for all business units who need it.

- Data not available on corporate network
- Data is not easily accessible
- Archive data difficult to access and query

SOLUTION

Used the PI System as a means of enabling corporate system to allow access to operational data.

- Implemented PI System and built PI Reports
- Integrated to CMMS system to enable True Condition Based Maintenance
- Developed PI Dashboards utilizing PI Coresight for specific audiences.

RESULTS

System and equipment condition awareness increased across complete organization.

- Improved System Reliability
- Improved Response Time to Equipment Abnormalities
- Increased Equipment Availability
- Savings in OPEX Costs

Contact Information

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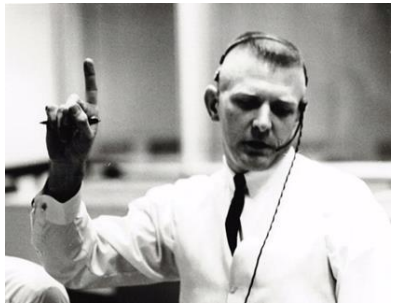
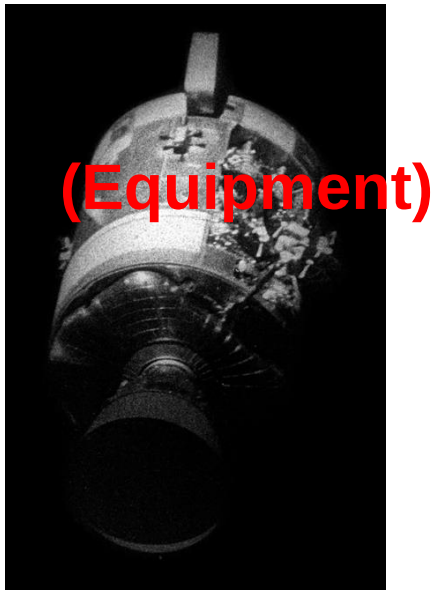
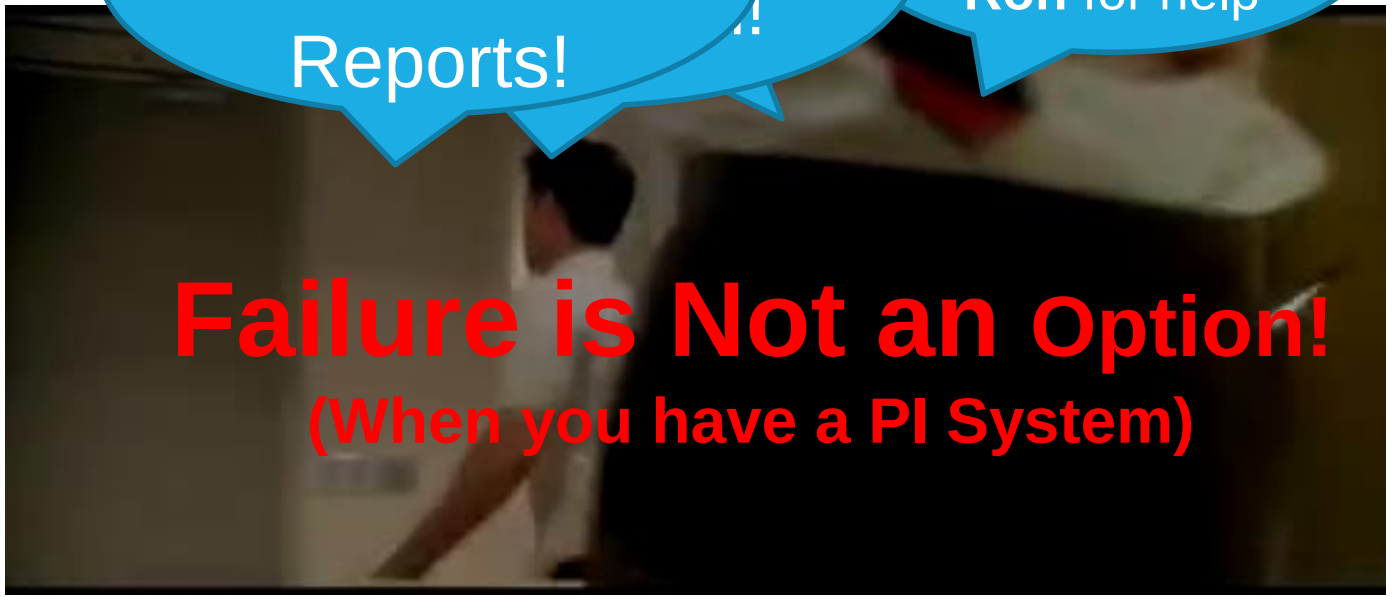
PowerStream Inc.





(Equipment)



Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session

http://ddut.ch/osisoft

감사합니다

谢谢

Danke

Gracias

Merci

Thank You

ありがとう

Спасибо

Obrigado