



Utilizing OSIsoft PI in Electric Distribution at Duke Energy

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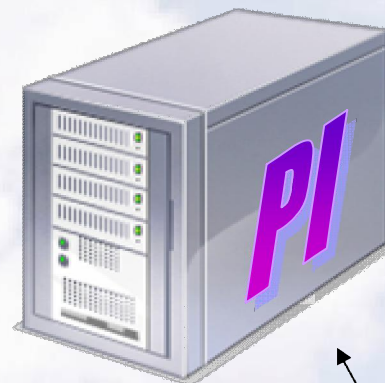


Business Challenges

- Bring data back from field devices and provide it to those who need it in a usable manner
- Interface with other data and hardware systems
- Develop user interfaces
- Develop users

Components

**Field IEDs @
Line Capacitors
Substations
Reclosers**



**Meter System
SCADA
OMS**

Solutions

- Digital Cell Technology
- OSIssoft PI
- ProcessBooks
- Existing Field Devices
 - ▶ Substation Relays
 - ▶ Line Capacitors
- Existing Metering System

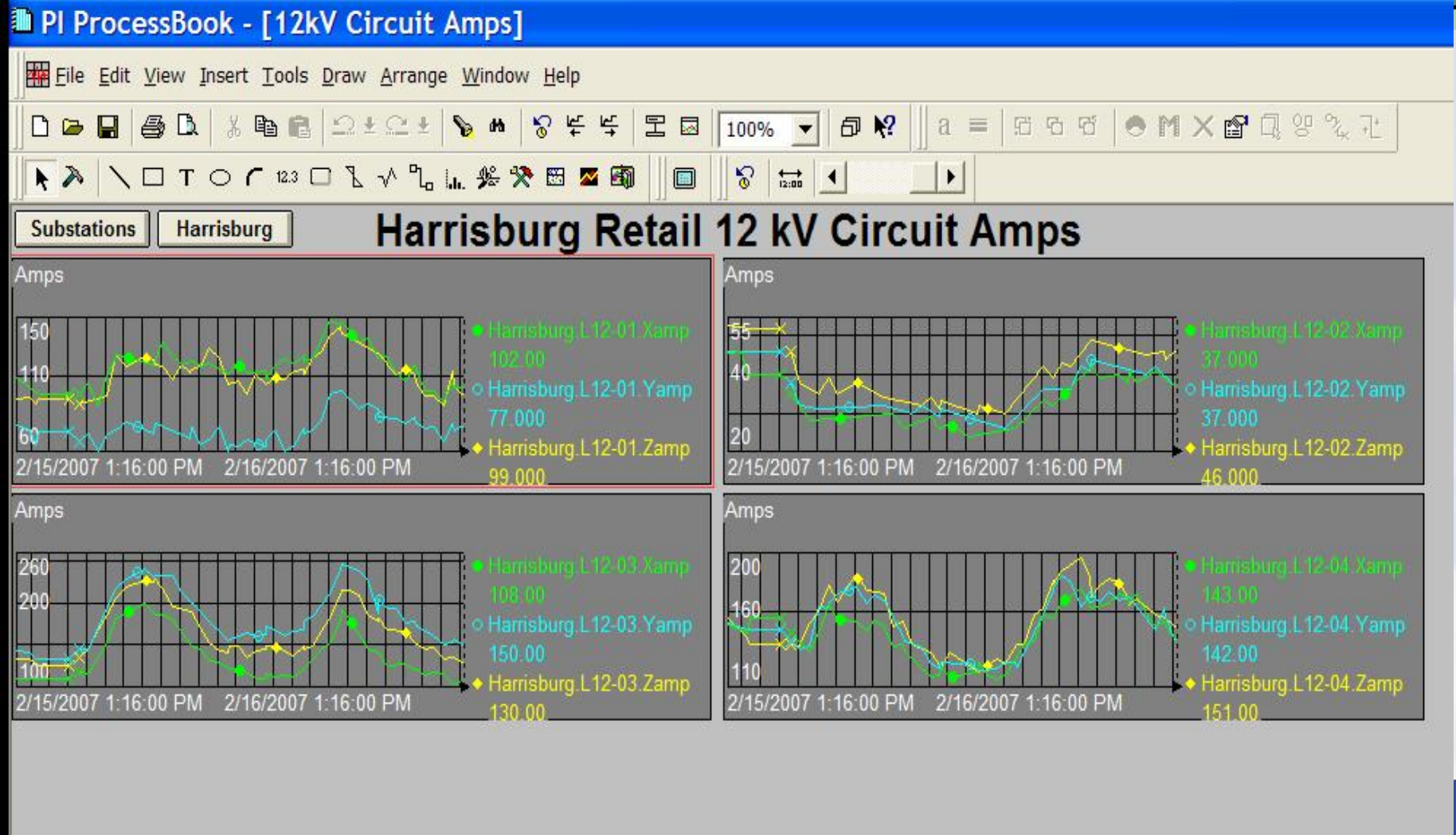
Overall Benefits

- Provides Distribution Data
- Improves Inspection Process
- Improves System Efficiency
- Improves Customer Service
- Enhances Asset Management

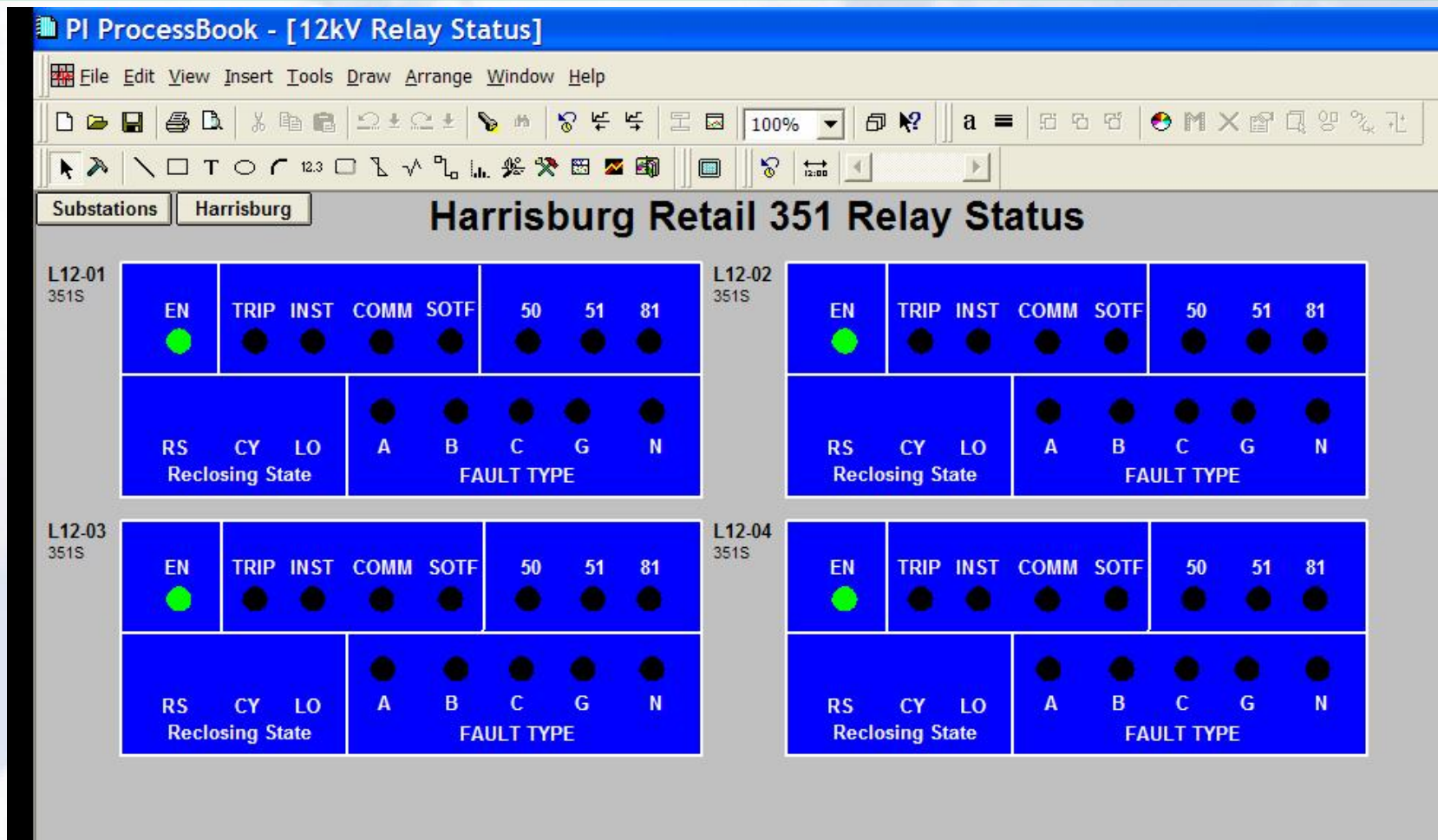
Distribution Substations

- Distribution Circuit Information
 - ▶ Analogs-Current, Voltage
 - ▶ Breaker Status
 - ▶ Currently deployed ~1400 of 2300
- Transformer bank information
 - ▶ >900 Bank Meters' data from interface with metering system
- ProcessBook displays created
- New users trained

Circuit Load



Circuit Relay Status



Substation Overview

PI ProcessBook - [ASHVLHW_12 KV OVERVIEW.PDI]

File Edit View Insert Tools Draw Arrange Window Help

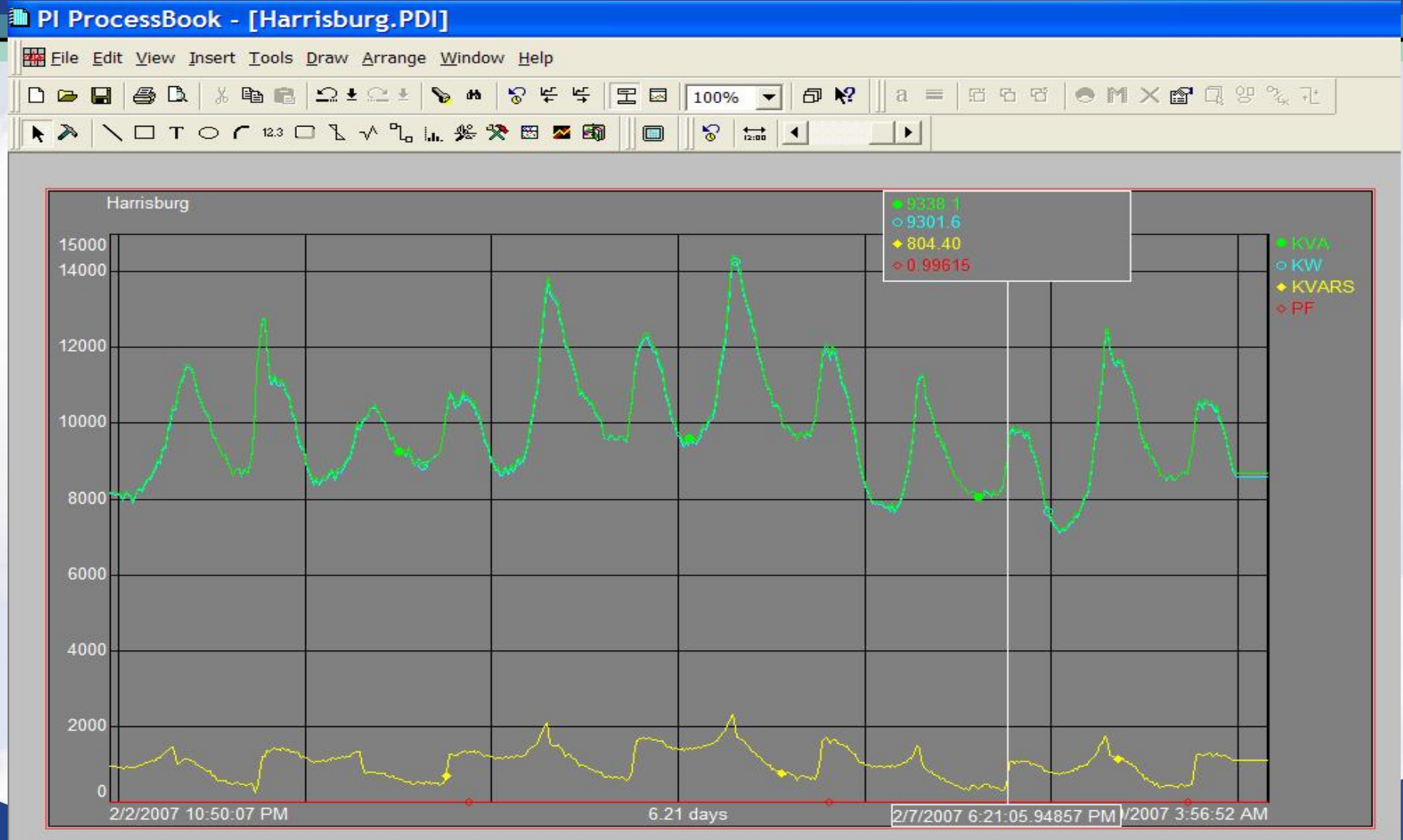


Back

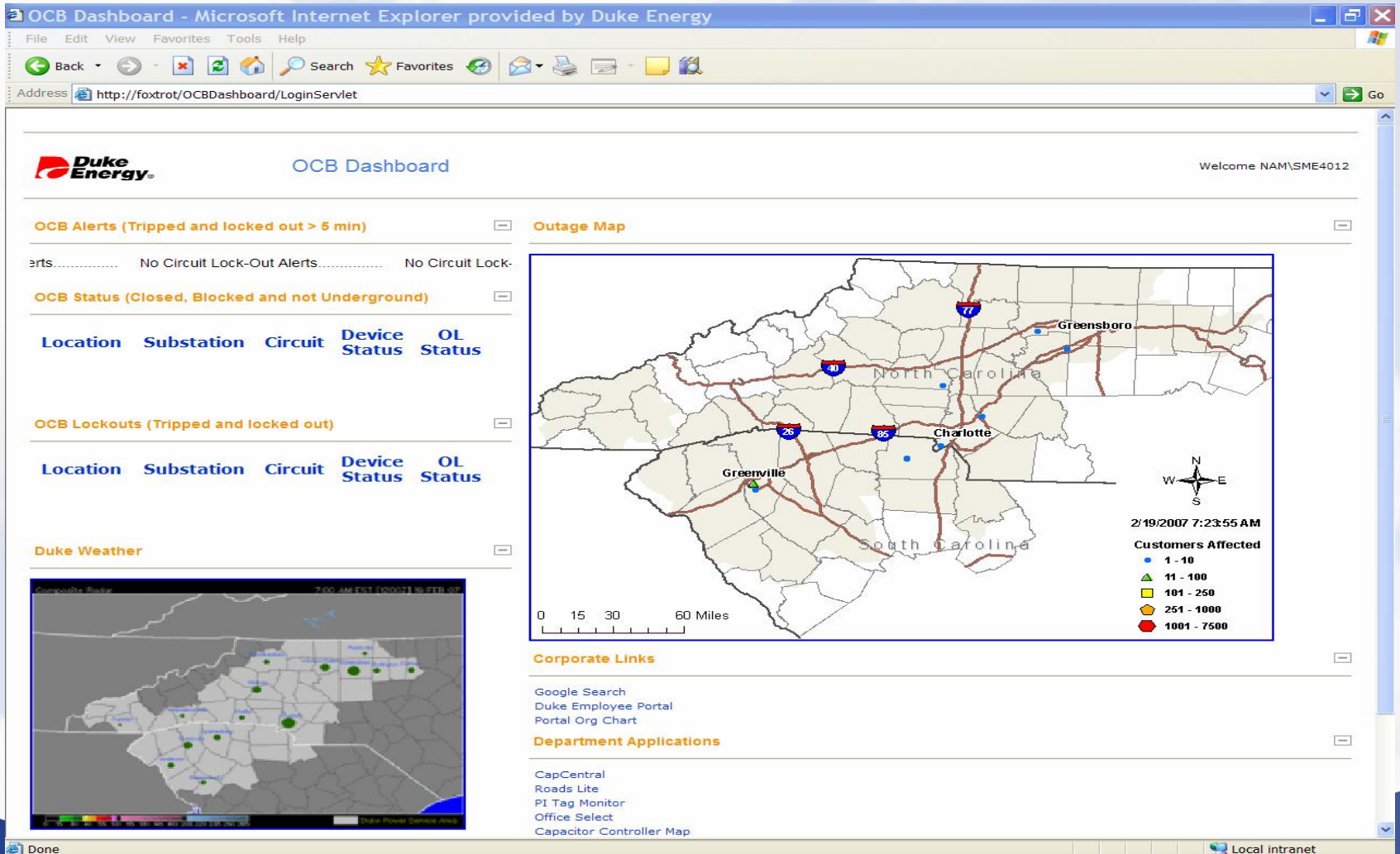
AshvlHw 12 kV Bus Overview

	L1201	L1202	L1203	L1204	L1205	L1206	L1207	L1208	L1209	L1210	L12AX
CB	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	TRIPPED
51-G	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED
79-CO	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	UNBLCKED	BLOCKED
Xamps	135	10	217	196	216	106	118	79	712	226	0
Yamps	112	36	249	201	234	99	109	61	728	227	0
Zamps	135	31	228	197	196	134	104	58	708	224	0
Gamps	30	23	21	5	45	26	13	20	0	3	0
Xkw	970	70	1580	1430	1600	800	880	580	4330	1640	0
Ykw	780	250	1820	1470	1730	750	820	440	4480	1670	0
Zkw	970	220	1660	1420	1460	1000	780	420	4370	1650	0
Xkvar	-130	10	170	-50	150	-30	0	-110	3160	440	0
Ykvar	-200	50	200	-30	280	10	-20	-90	3180	420	0
Zkvar	-170	50	150	-30	40	30	-40	-110	3050	390	0

Transformer Bank Meter



Breaker Status Dashboard



Internal Monitoring/Alarming

Alarm List - Microsoft Internet Explorer provided by Duke Energy

File Edit View Favorites Tools Help

Back Forward Stop Reload Home Search Favorites Refresh Print Mail New Window

Address <http://denapiapp01/PITagMonitor/AlarmDetail.aspx> Go

[Login](#) [Edit User Info](#) [Contact Us](#) [Add New Alarm](#) Welcome Shawn Ervin

Alarm List

[Disable All Alarms](#) [Enable All Alarms](#)

Edit	Delete	Enable/Disable	ID	Server Name	Tag Name	Operator	Test Value	Enabled	DeadBand	Description	In Alarm
Edit	Delete	Enable/Disable	297	etpi01	PoplarTent.L12-03.Xamp	>	350	True	50	X current	1/1/1900 12:00:00 AM
Edit	Delete	Enable/Disable	468	etpi01	PoplarTent.L12-03.Yamp	>	350	True	25	Y current	1/1/1900 12:00:00 AM
Edit	Delete	Enable/Disable	839	etpi01	Camp_Croft_BK3_R6008219pf	<	0.92	True	0.01	Camp Croft Power Factor	1/1/1900 12:00:00 AM
Edit	Delete	Enable/Disable	889	etpi01	PoplarTent.L12-02.Xkvar	<	-240	True	0	VAR FLOW	1/1/1900 12:00:00 AM

PI tag, PoplarTent.L12-03.Yamp (Y current), on server etpi01 is in alarm (> 350) at 5/30/2007 8:57:52 AM, value = 354

Click here to view/edit alarm parameters >>

<http://denapiapp01/PITagMonitor>

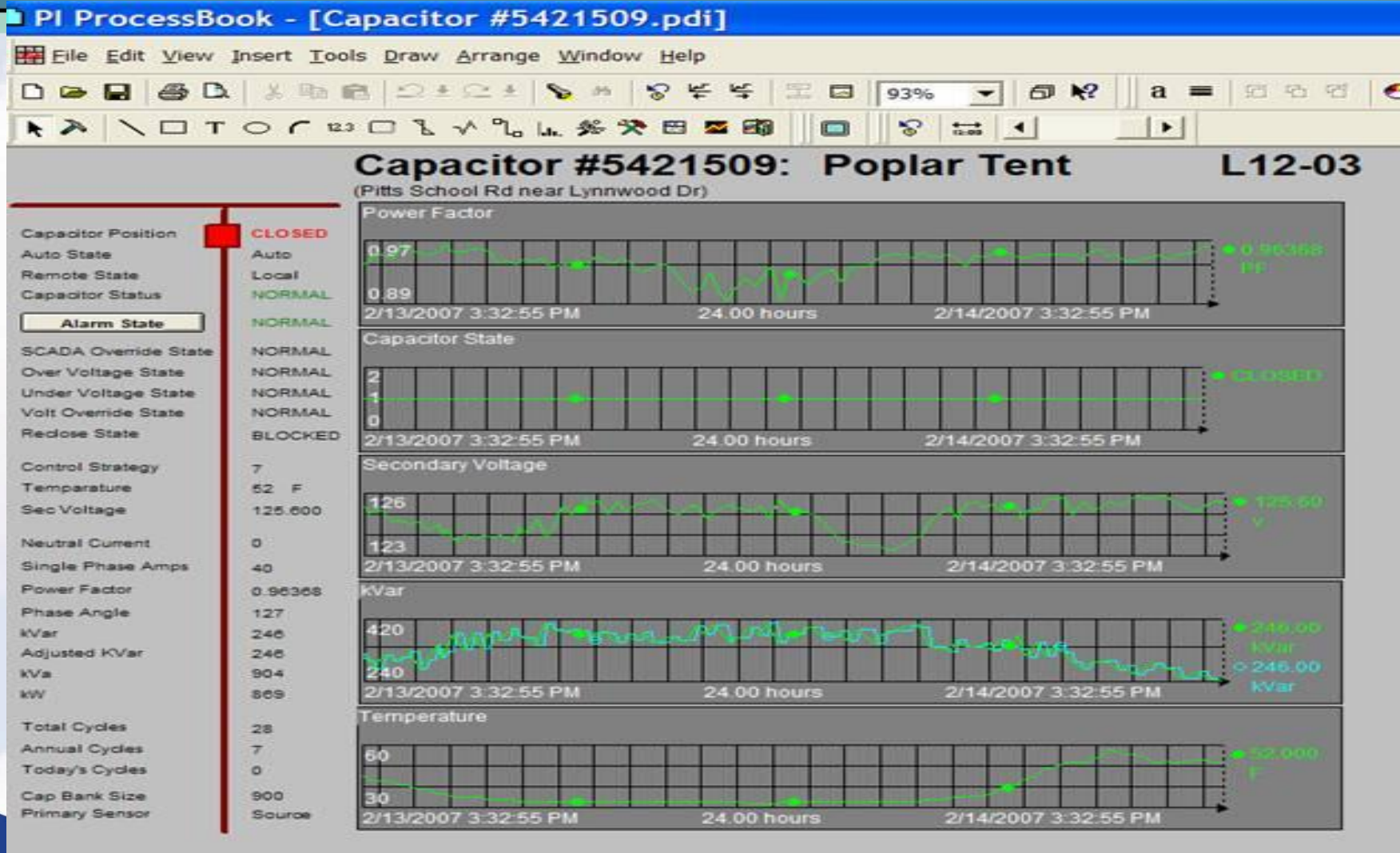
Substation Benefits

- Full Voltage, Load and VAR Profiles
 - ▶ Improves planning with full view of load, improves project justifications-previously only used a snapshot of peak values
 - ▶ Identifies equipment issues prior to customer complaints
 - Voltage, Other issues related to unbalanced loading
 - ▶ Improves effectiveness of existing capacitors-both station and line
- Breaker Status knowledge
 - ▶ Visual Presentation to Distribution Dispatchers
 - ▶ Improves outage trouble shooting, outage history easier to analyze
 - ▶ Outage prevention-Identify breakers inadvertently left in blocked position
- Future changes to inspection practices

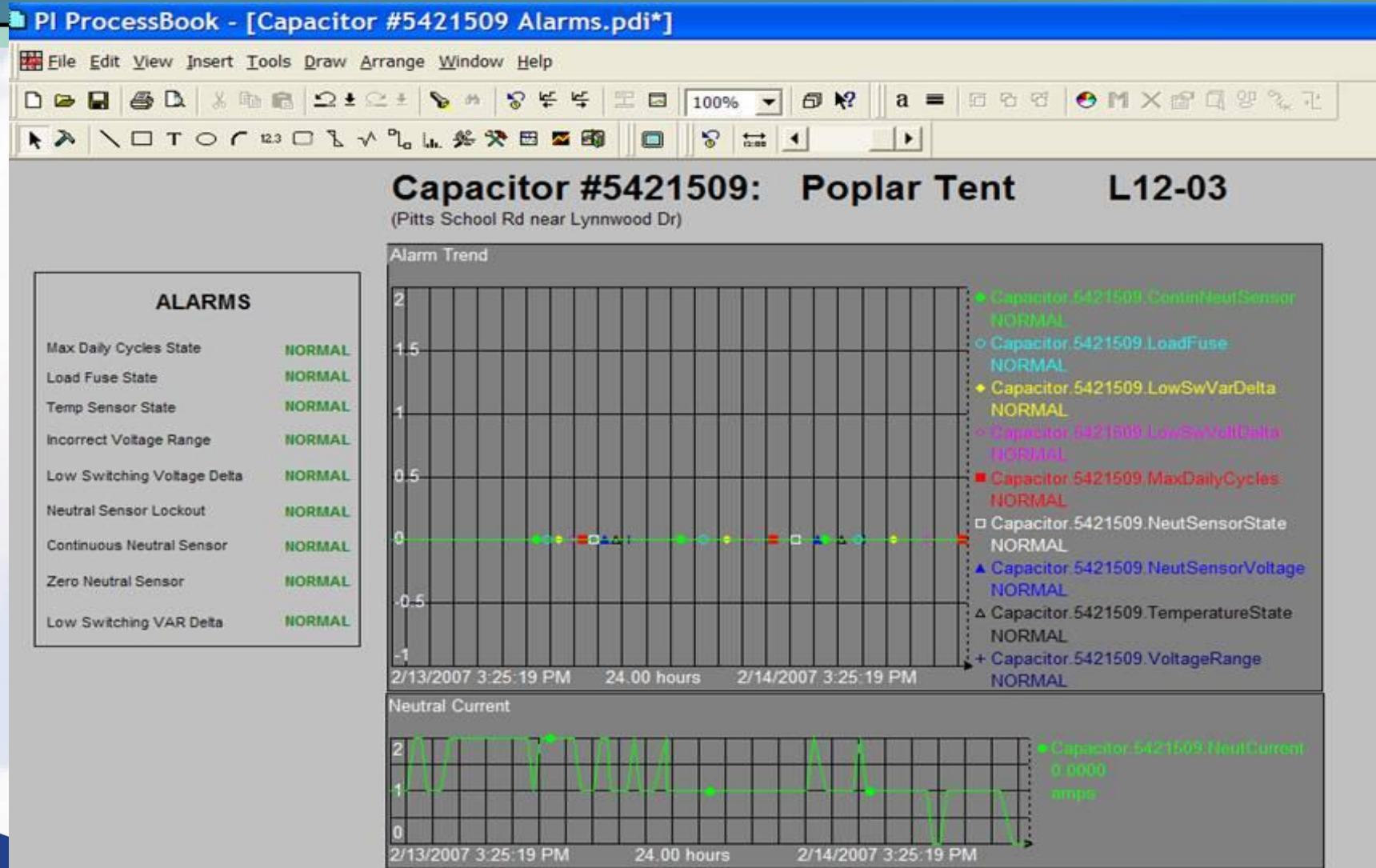
Line Capacitors

- Added digital modem to existing capacitor controllers
- Mapped available analogs and status points to PI
- Currently about 850 deployed with 1400 remaining

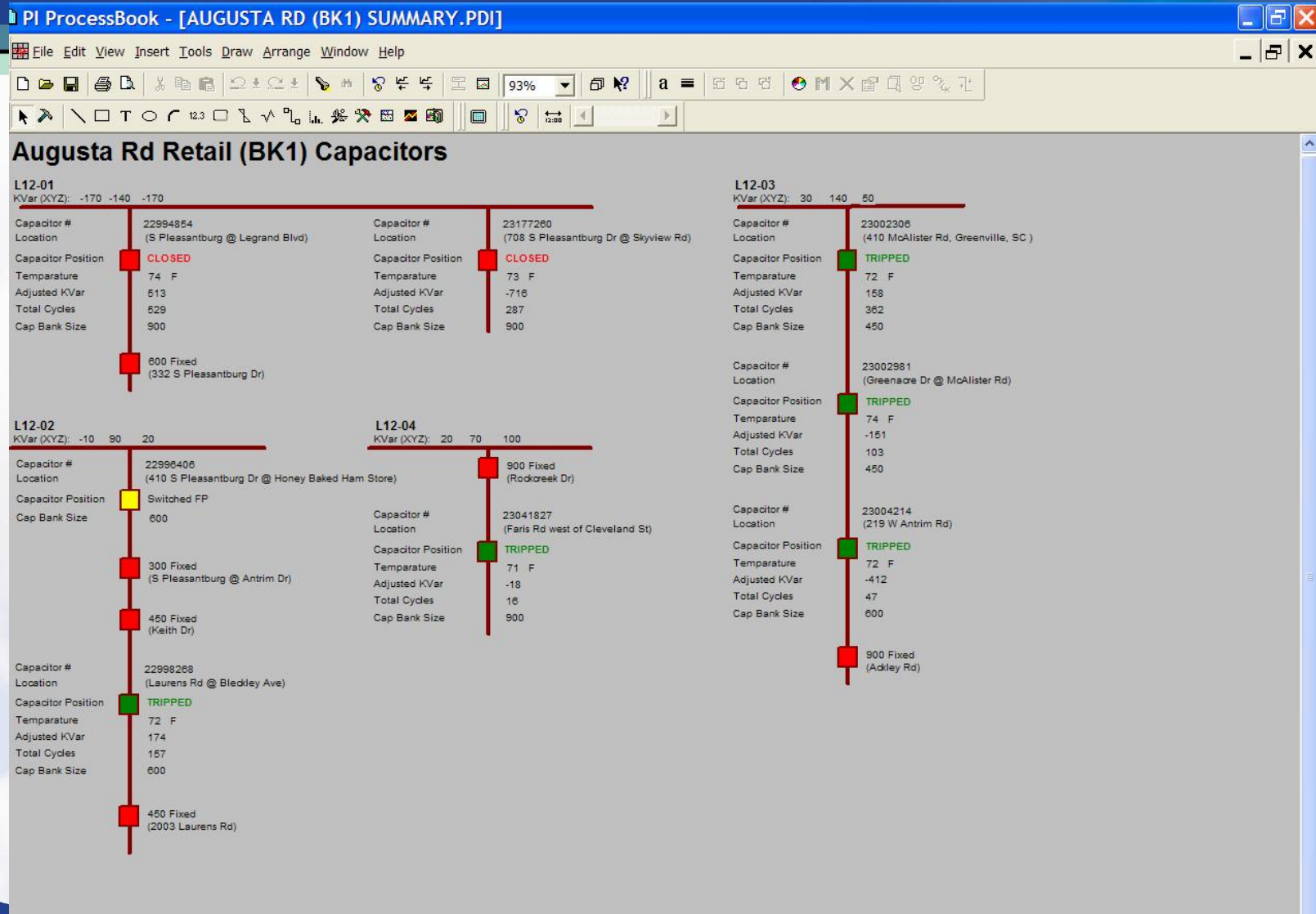
Line Capacitor Displays



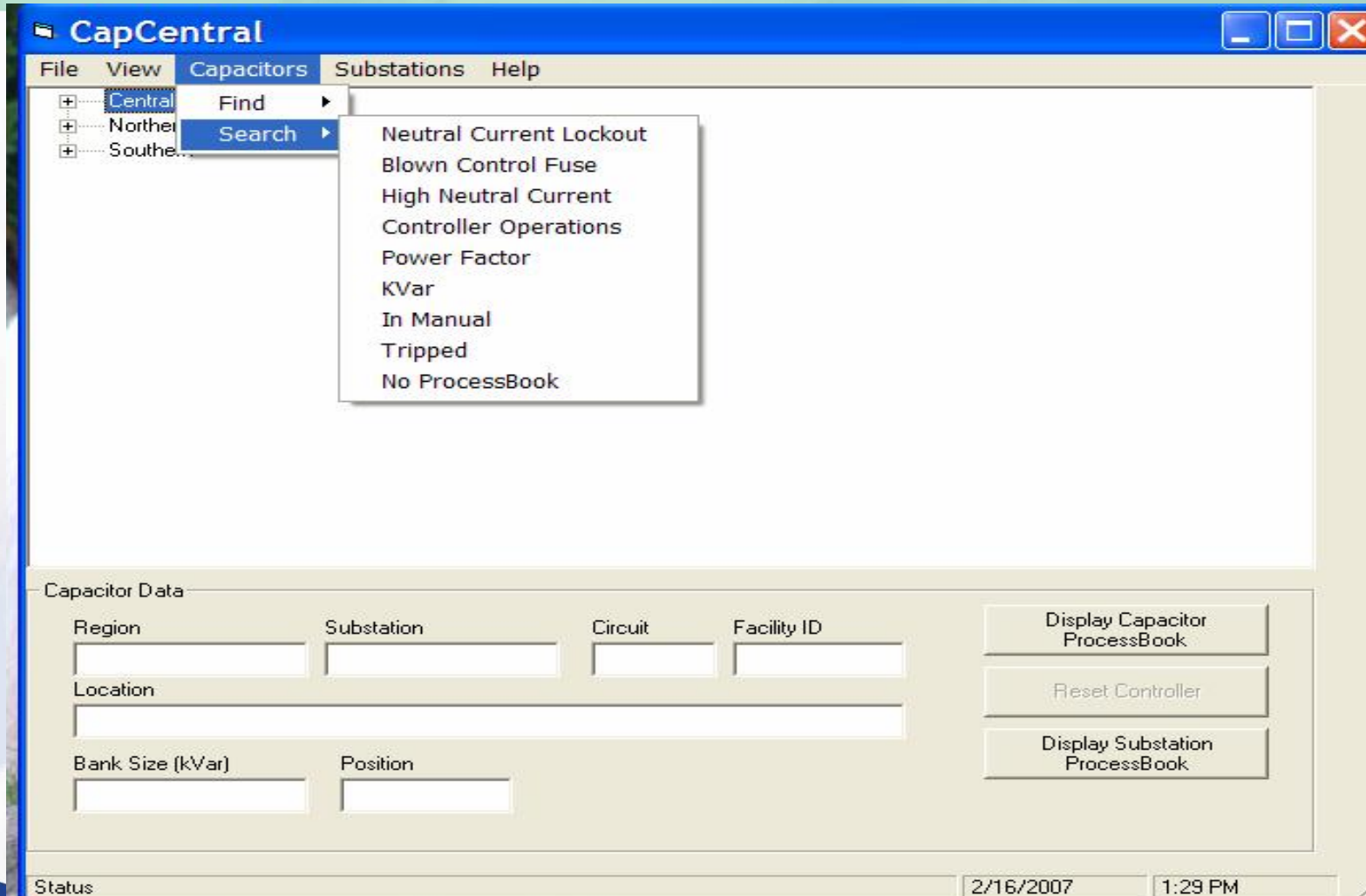
Line Capacitor Displays



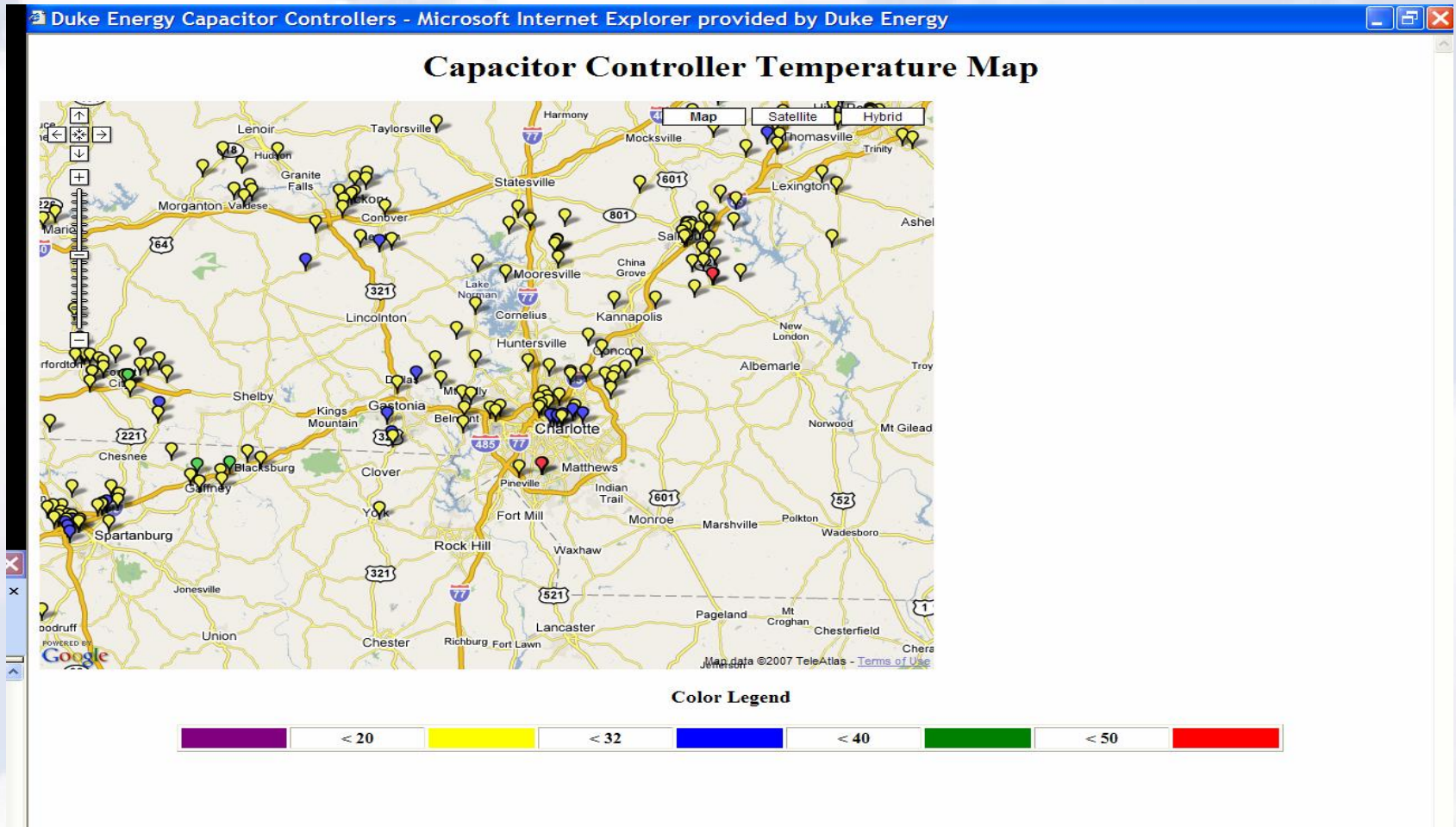
Line Capacitor Displays



Line Capacitors Application



Field Temp. from Line Capacitors



Line Capacitor Benefits

- Eliminates Manual Inspections
 - ▶ System identifies where work is needed
- Improves VAR profiles
 - ▶ Improves overall effectiveness of the capacitor asset
 - ▶ Gains efficiency for system capacity
 - ▶ Enables capital dollar deferment and improves prioritization of available capital.
 - ▶ Allows for installation of less expensive line caps (instead of station caps)
 - ▶ Improves voltage profiles-leads to better customer service

Future Plans

- Substations

- ▶ All circuits will be added to the PI System over next 2-3 years as part of SCADA project
- ▶ New substation metering interface will streamline future transformer bank data retrieval
- ▶ Other apparatus with intelligent devices will be added

- Line Capacitors

- ▶ New installations include PI
- ▶ Retrofits will also continue

- Additional interfaces

- ▶ Outage management system

Future Plans

- Other devices for consideration
 - ▶ Electronic Reclosers
 - ▶ Line Sensors
 - ▶ Voltage Regulators
 - ▶ Transformer Monitors
 - ▶ Line Switches





Is Your Interface Dictating Your System Architecture? *What's in your design?*

Daniel Riddell
Interface Developer
OSIsoft, Inc.



Agenda

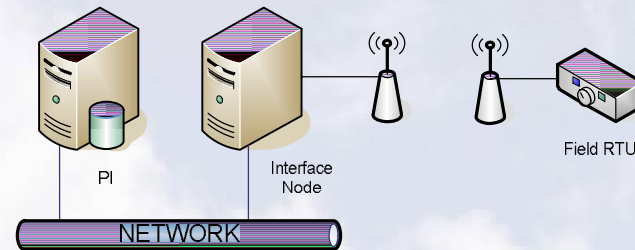
- Architectural Challenge
- Shortcomings
- Let's Talk
- The New PI Solution
- Realization of Benefits
- What's Next

Geographically Isolated RTUs



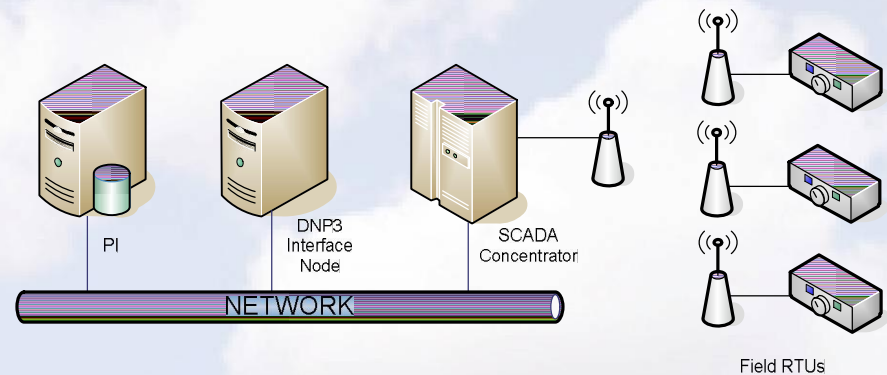
Architectural Challenge

- Wireless Connectivity



- Scalability

- ▶ Common Protocol – DNP3
- ▶ SCADA DCS



Architectural Shortcomings

The Interface is Dictating the Architecture!

- ▶ Current DNP3 Interface Limits
- ▶ Require 100+ instances (Windows Services)
- ▶ ~8 Hour start time
- ▶ Increased expenditures

Result is a Maintenance Nightmare!

How can OSIssoft help?

Help us help you.



Help us help you.

Don't settle for WYSIWYG!

The Solution

- Needed DNP3 Interface Enhancements
 - ▶ Asynchronous IO
 - ▶ Reduce required instances
 - ▶ Consolidate DNP3 requests
 - ▶ Effective Interface and RTU Health Points
 - ▶ Disconnected startup
- PI Solutions
 - ▶ Upgrade to the latest version
 - ▶ Pointsource reorganization

The Benefits

- Reduction in required instances
 - ▶ 100+ to 10 instances
- Reduction in start time
 - ▶ ~8 hours to ~1 minute
- Detect cellular connectivity issues
- PI Administrator relief
- Cost savings!

What's Next

- DNP3 Interface Release
- Continuing Duke Energy and OSIsoft collaboration.

So, what's in your design?



VOYAGE2007



***Thank
You***

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VALUE NOW, VALUE OVER TIME