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USERS CONFERENCE 2016

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TRANSFORM YOUR WORLD

Asset Maintenance and Condition Assessment at PSEG

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Agenda

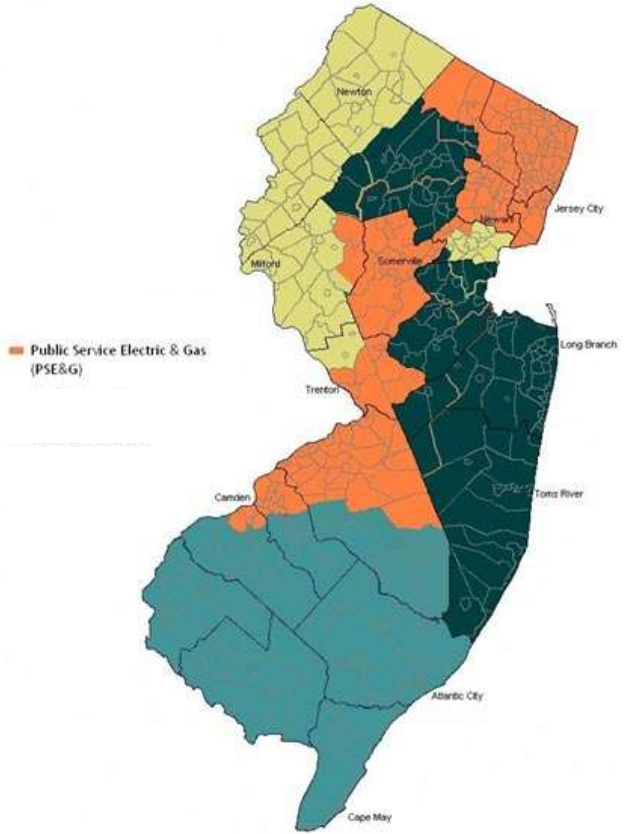
- About PSEG
- CMMS
  - Current Analytics
  - Benefits
- Energy Strong
- PSEG Project Management
- Accenture Technical Design and Delivery
- Future ES Analytics
- Conclusion

Asset Maintenance
And
Condition Assessment

About PSEG

- New Jersey Based
- Total Assets ~ $17 Billion
- Total Revenue ~ $8 Billion

- Service Territory 323 Municipalities
- 70% of New Jersey's population
- 2.2 million Electric customers
- 1.8 million Gas customers
- 2,600 Square Miles
- 22,223 Distribution Circuit Miles
- 1,735 Transmission Circuit Miles



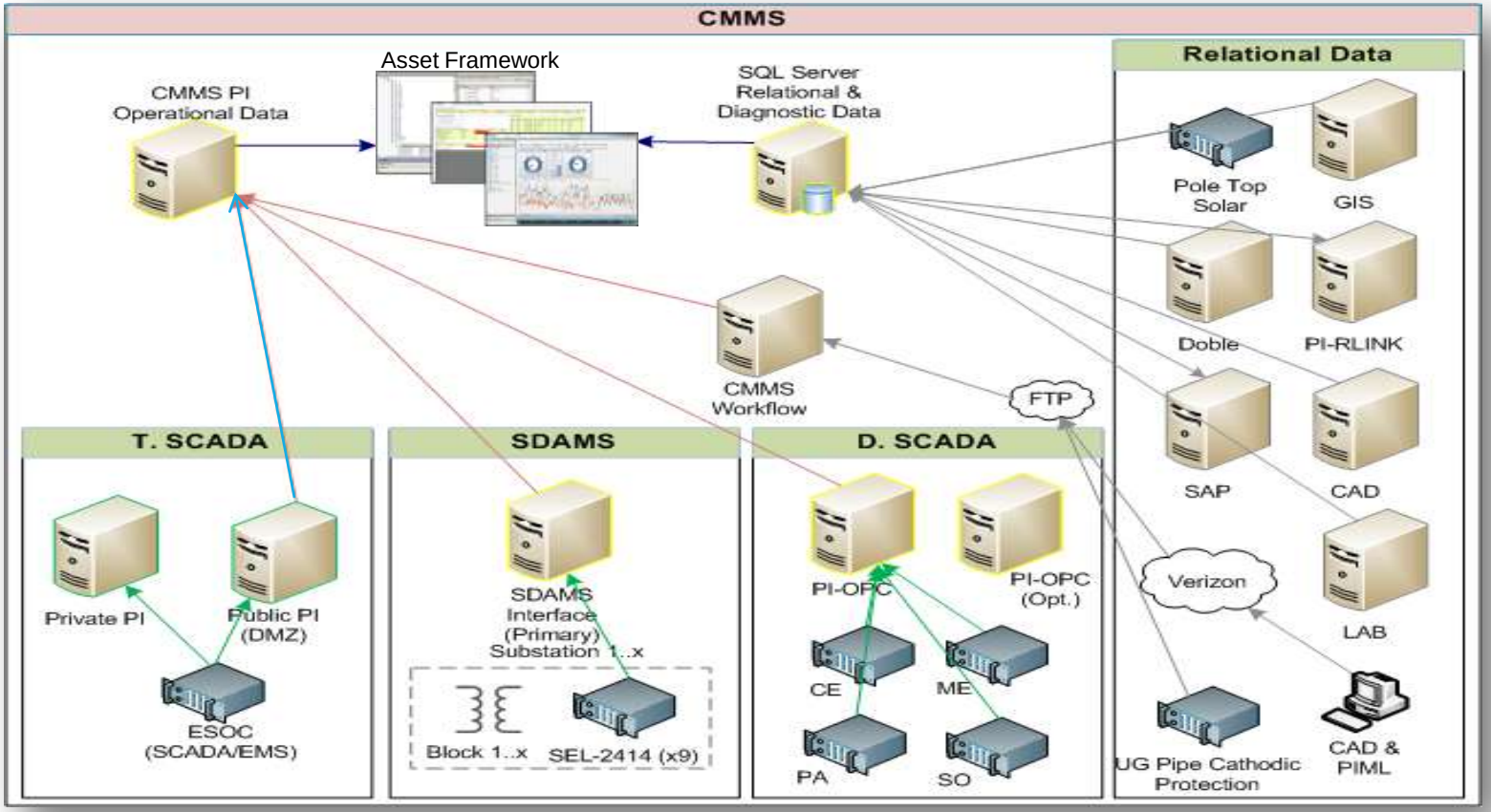
What is CMMS?

- CMMS is a decision support system that assists in making repair and replace maintenance decisions for:
  - Transformers
  - Load Tap Changers
  - Breakers & Circuit Switchers
  - Transmission OH and UG Assets
  - 26 KV UG Transformers & Protectors

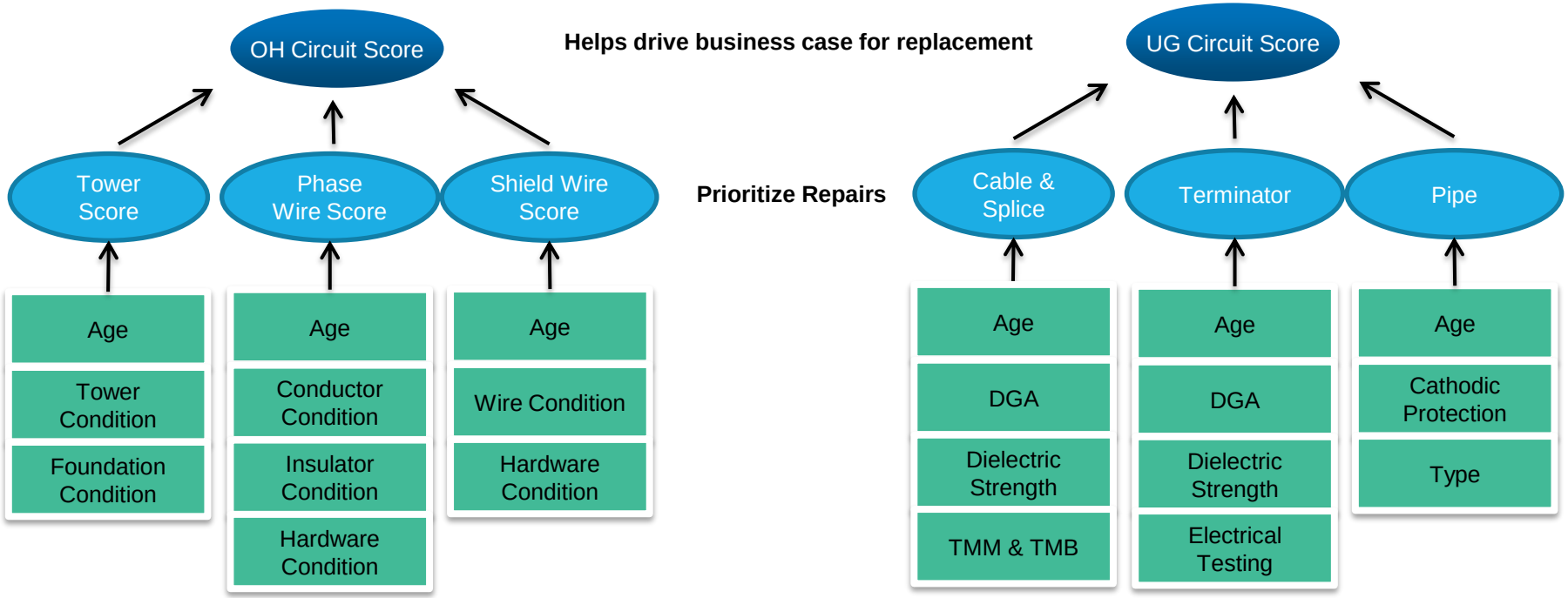
CMMS Vision

- To perform the right maintenance at the right time, based on the *consistent* analysis of data to ensure a safe, reliable & cost effective approach
- Centralize and correlate operational, diagnostic, real-time sensor data, order history and asset characteristics down to asset level
- Create action and replacement algorithms based on asset condition that turn data into actionable information.
- Use data to drive business plans for asset replacement

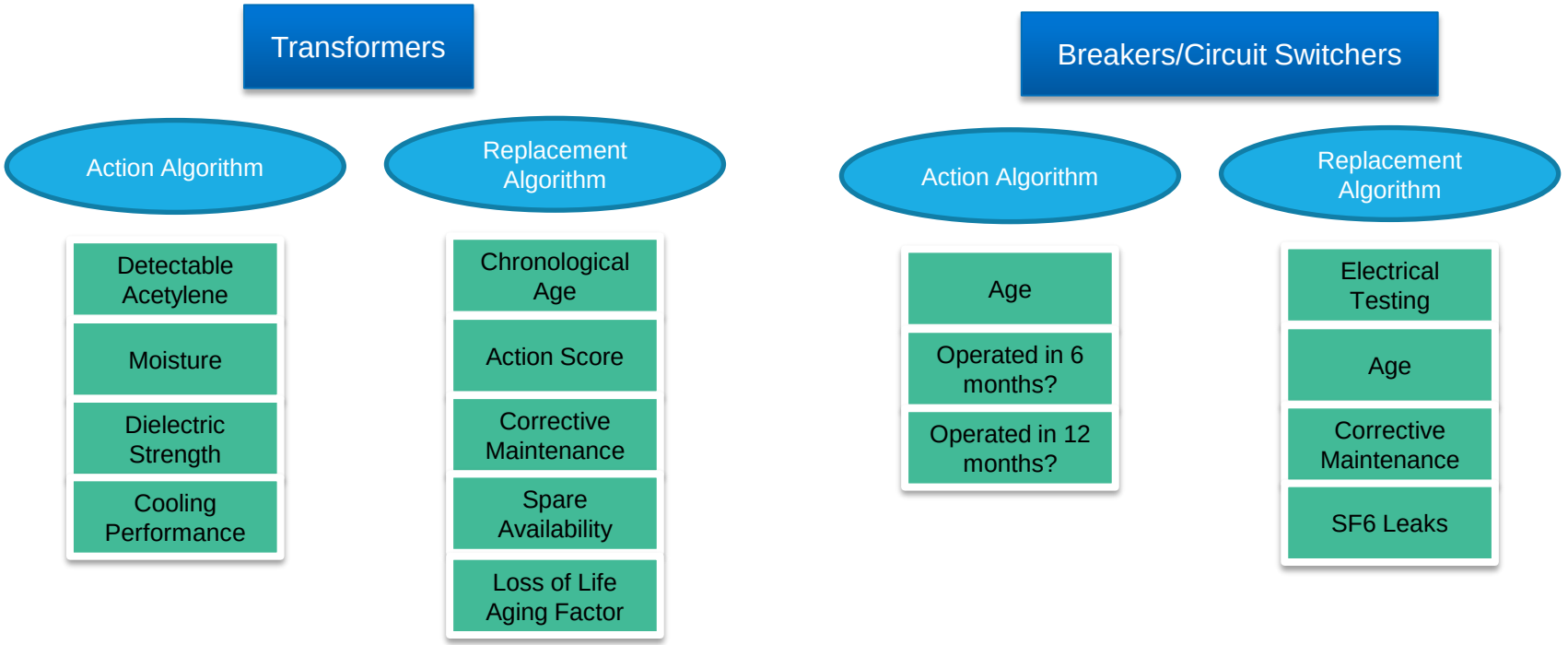
Data Collection



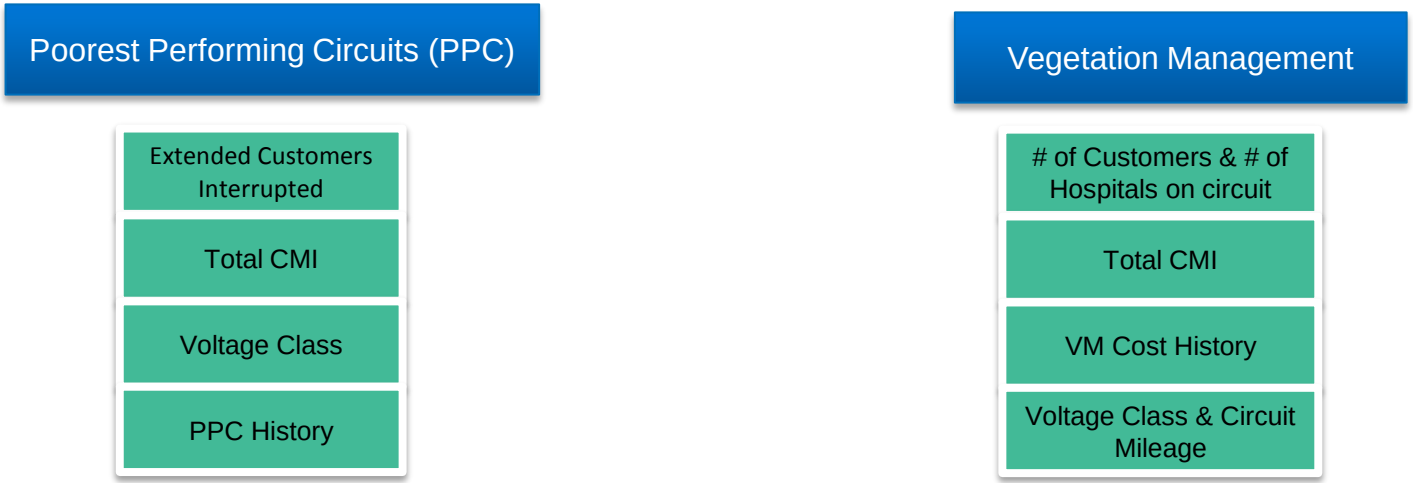
Condition Based Maintenance & Reliability - Transmission OH and UG



Condition Based Maintenance & Reliability - Substation Assets

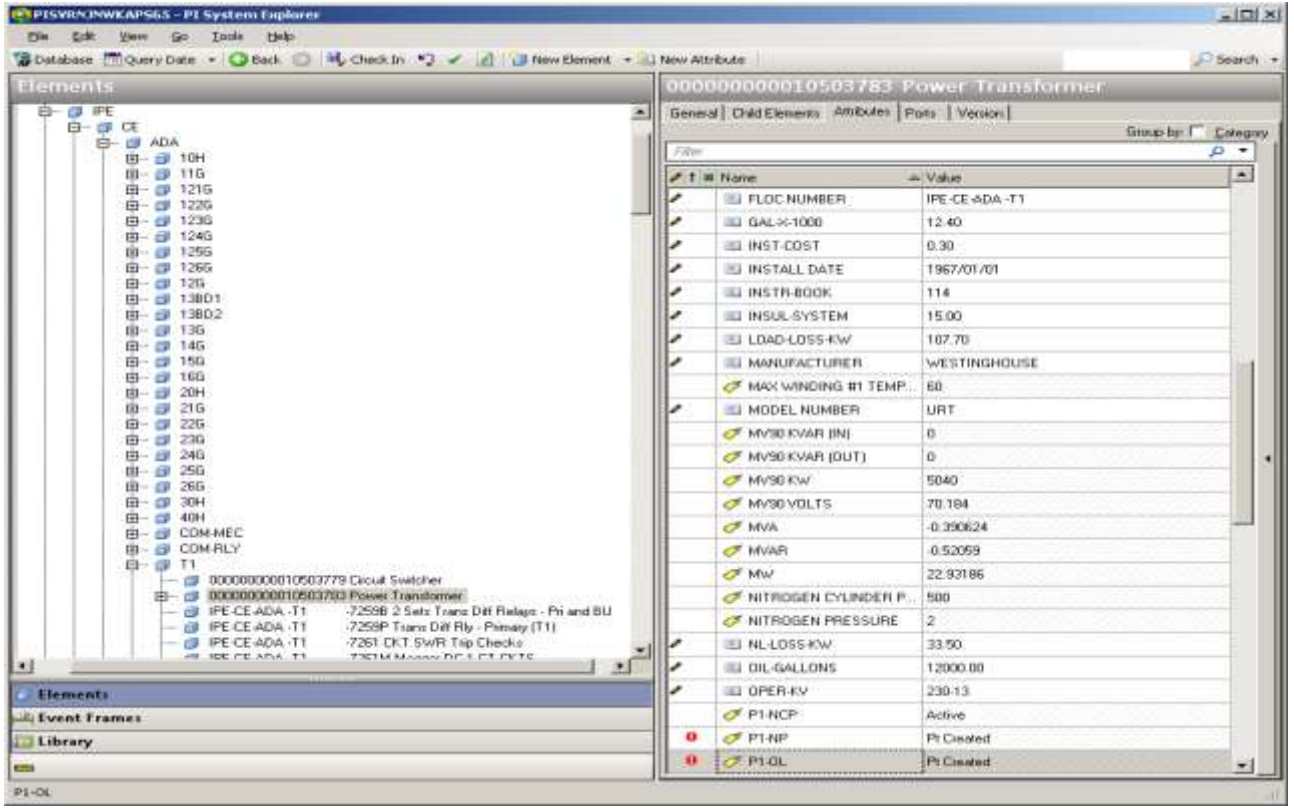


Condition Based Maintenance & Reliability - Distribution Overhead Circuits



- Program: Provide guidance on what to trim or remediate within the given budget to optimize SAIFI reductions

Correlate Data to Asset



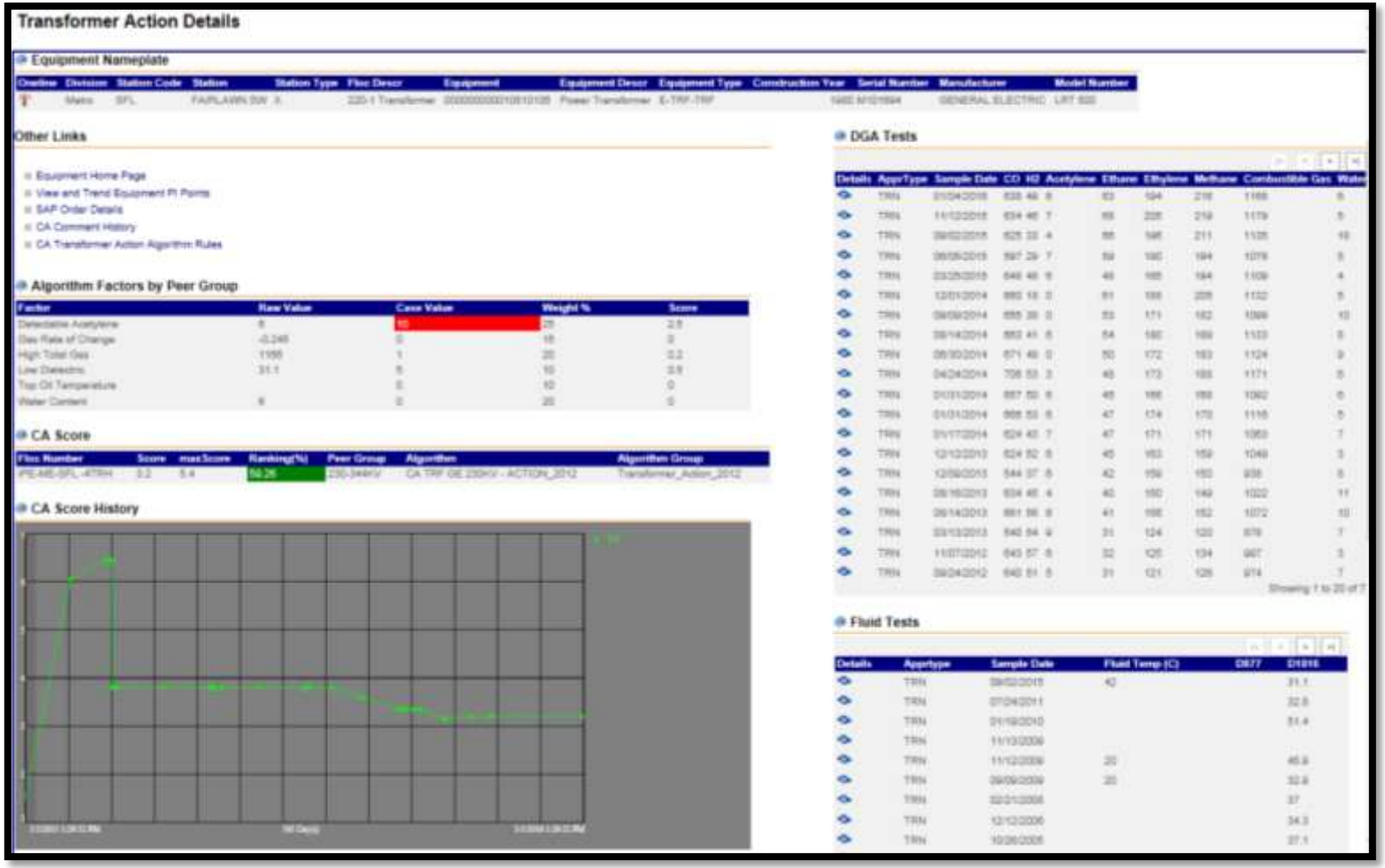
Transformer CA-Action Summary

Filter By Substation

Filter By Voltage

Action Results

Details	Station_Name	Division	Floc	Floc Descr	Equipment	Equip Descr	score_dw	Person	Status	Voltage	Manufacturer	Serial Number
	CORBETTS	CE	IPE-CE-CORB-MH4	Mobile M-14 (SPARE 60MVA)	000000000010780221	Transformer (M-14) - 60MVA	10	Lenny/Peter	Record Management Issue	230-26	ERACEC	C0667A
	ACADEMY STREET	PA	IPE-PA-ACA -T1	# 1 Transformer	000000000010514855	Power Transformer	5.16	George	Continue to monitor	26-4	PENNSYLVANIA	403962
	FURINO & SONS, INC	CE	IPE-CE-FURI	FURINO	000000000010608236	Power Transformer FAILED. AT HYUNDAI	7.76	George	Vendor Repair	230-13	HYUNDAI	2011209117P0
	HINCHMANS	ME	IPE-ME-HNC -T2	# 2 Transformer	000000000010507170	Power Transformer	6.3	George	Continue to monitor	230-13	FEDERAL PACIFIC	602541
	FAIRLAWN SW	ME	IPE-ME-SFL -4TRH	220-1 Transformer	000000000010510105	Power Transformer	5.63	Paul Morakinyo	Continue to Monitor	230-138	GENERAL ELECTRIC	M101694
	METUCHEN SWITCH	CE	IPE-CE-SMN -SPARE	Spare Equipment	000000000010019481	Voltage Regulator 26Kv Spare	5.74	John Wilson	Continue to Monitor	26	MOLONEY	P670834
	ORANGE VALLEY	ME	IPE-ME-ORA -T4	# 4 Transformer	000000000010508615	Power Transformer	5.74	Don Fallon	Being Monitored	26-4	PENNSYLVANIA	396432
	GETTY AVE	ME	IPE-ME-GET -T1	# 1 Transformer	000000000010505962	Power Transformer	5.74	George	OK	26-4	ALLIS CHALMERS	3079630
	MARION SWITCH	PA	IPE-PA-SMA -3TR	132-3	000000000010023083	Power Transformer 132-3C	5.65	John Wilson	Retire	138-26-11	WESTINGHOUSE	8535726
	KEASBEY	CE	IPE-CE-KEA -T3	# 3 Transformer	000000000010501605	Power Transformer	5.37	Paul Morakinyo	Monitor	26-4	MOLONEY	649853
	ORANGE VALLEY	ME	IPE-ME-ORA -T2	# 2 Transformer	000000000010508613	Power Transformer	5.37	George	Pending Action	26-4	PENNSYLVANIA	396431
	VAUXHALL ROAD	CE	IPE-CE-VXL -T3	# 3 Transformer	000000000010503610	Power Transformer T3	5.37	John Wilson	No Action	26-4	ALLIS CHALMERS	2837523
	BLOOMFIELD	ME	IPE-ME-BLO -T1	# 1 Transformer	000000000010505094	Power Transformer	5.29	George	Continue to Monitor	26-4	GENERAL ELECTRIC	M1514900
	FEDERAL SQUARE SUBSTATION	ME	IPE-ME-FED -T1A	Transformer T1A	000000000010748217	Power Transformer	5.19			26-4	GE PROLEC	G1498-08
	LAKESIDE	ME	IPE-ME-LAS -T3	# 3 Transformer	000000000010507634	Power Transformer	5.19	George	Request DGA Sample	26-4	ALLIS CHALMERS	2749808
	CALDWELL	ME	IPE-ME-CAD -T2	# 2 Transformer	000000000010506176	Power Transformer	5.19	Don Fallon	Being Monitored	26-4	ALLIS CHALMERS	3959103
	PASSAIC	ME	IPE-ME-PAS -T2	# 2 Transformer	000000000010508746	Power Transformer B	5	George Arthur	OK	26-4	ALLIS CHALMERS	2020237
	MORGAN STREET	PA	IPE-PA-MOG -T1	# 1 Transformer	000000000010516365	Power Transformer	5			26-4	GENERAL ELECTRIC	E6911940
	BRUNSWICK SWITCH	CE	IPE-CE-SBR -3TRH	220-3 Transformer	000000000010500123	Voltage Regulator 220-3 26Hv	5	George	OK	26	MOLONEY	P670533
	BRUNSWICK SWITCH	CE	IPE-CE-SBR -1TRH	220-2 Transformer	000000000010500124	Voltage Regulator 220-2 26Hv	5	Paul	Replacement	26	MOLONEY	P670532
	UNION	CE	IPE-CE-UN -T1	# 1 Transformer	000000000010503537	Power Transformer T1	5	Mark	Follow-up	26-4	ALLIS CHALMERS	3083107
	UNION	CE	IPE-CE-UN -T2	# 2 Transformer	000000000010503538	Power Transformer T2	5	Mark	OK	26-4	ALLIS CHALMERS	3083106
	BLOOMFIELD	ME	IPE-ME-BLO -T2	# 2 Transformer	000000000010505092	Power Transformer	5	George Arthur	No Action	26-4	GENERAL ELECTRIC	M1514900
	RIDGEWOOD	PA	IPE-PA-RGW -T2	# 2 Transformer	000000000010516614	Power Transformer	5			26-4	ALLIS CHALMERS	2414121
	PRINCETON	SO	IPE-SO-PRI -T1	# 1 Transformer	000000000010526062	Power Transformer	5			26-4	ALLIS CHALMERS	3152935
	ATHENIA SW	ME	IPE-ME-SAT -132-3	132-3 Transformer	000000000010509407	Power Transformer Phase 1	5	Paul Morakinyo	Continue to monitor	138-26-11	GENERAL ELECTRIC	M102359
	ALLWOOD	ME	IPE-ME-ALL -T2	# 2 Transformer	000000000010508678	Power Transformer	4.81			26-4	ALLIS CHALMERS	3152931
	CENTRAL AVE	ME	IPE-ME-CET -T2	# 2 Transformer	000000000010503088	Power Transformer	4.81			26-4	VIRGINIA TRANSFORMER	498000A004-0
	HASBROUCK HEIGHTS	PA	IPE-PA-HBG -UNIT1	8004	000000000010515898	Unit Transformer	4.81	Paul	OK	26-13	MCGRAW EDISON	C0441151
	BELLEVILLE	ME	IPE-ME-BEE -T1	# 1 Transformer	000000000010508926	Power Transformer	4.81	John Wilson	Awaiting Maint.	26-4	ALLIS CHALMERS	3151227
	GETTY AVE	ME	IPE-ME-GET -T2	# 2 Transformer	000000000010505963	Power Transformer	4.81			26-4	ALLIS CHALMERS	3079631
	CARTERET	CE	IPE-CE-CAT -T2	# 2 Transformer	000000000010503879	Power Transformer 2A	4.63	NA	DLPL Order	26-4	ALLIS CHALMERS	1759952
	GREENVILLE	PA	IPE-PA-GRN -T3	# 3 Transformer	000000000010520054	Power Transformer A	4.63			26-4	WESTINGHOUSE	1215501
	FINDERNE	CE	IPE-CE-FIN -T2	# 2 Transformer	000000000010504094	Power Transformer	4.63			26-4	ALLIS CHALMERS	1759551



DeltaX Fluid Test Results

Equipment	Designation	ApprType	Sample Date	Fluid Condition	IFT	D1816	D877	PF25	PF100	Water	Comment	Reason
403962	No. 1	TRN	06/18/2014	2	23.4	28.6		0.158		38	LT 40	ROUTINE
403962	No. 1	TRN	04/26/2013	2	22.1	27.8		0.186		27	LT 30	ROUTINE
403962	No. 1	TRN	03/25/2013	2	22.5	30.3		0.115		17	LT 20	ROUTINE
403962	No. 1	TRN	03/22/2012	2	23.6	39.8		0.123		24	LT 38	ROUTINE
403962	No. 1	TRN	05/10/2011	2	21.4	26.6		0.141		37	LT 30	ROUTINE
403962	No. 1	TRN	03/09/2010	1	25.7	38.8		0.115		20	LT 39	ROUTINE
403962	No. 1	TRN	03/04/2009	2	23.3	45.4		0.14		14	LT 35	ROUTINE
403962	No. 1	TRN	02/27/2008	2	22.8	44.3		0.125		14	LT 25	ROUTINE
403962	No. 1	TRN	03/27/2007	2	21.6	41.5		0.107		21	LT 25	ROUTINE
403962	No. 1	TRN	04/11/2006	1	24.1	33.5		0.12		20	LT 30	ROUTINE
403962	No. 1	TRN	04/05/2005	2	22.5	30.1		0.122		17	LT 22	ROUTINE
403962	No. 1	TRN	04/16/2003	2	22.8	29.6		0.105		28	LT 40 ; PCB < 50 TK CBD	ROUTINE
403962	No. 1	TRN	04/11/2002	2	23.4	31.5		0.092		25	LT 35	ROUTINE
403962	No. 1	TRN	06/11/2001	2	25.3	32.7		0.11		39	LT=30	ROUTINE
403962	No. 1	TRN	05/17/2001	1	24.6	30.7		0.097		30		ROUTINE
403962	No. 1	TRN	05/13/2000	1	25.6	30.3		0.102		28	TEMP=30C	ROUTINE
403962	No. 1	TRN	04/06/1999	1	26.4	32.2		0.121		16		ROUTINE
403962	No. 1	TRN	09/02/1998	2	23.8	15.1		0.093		39		ROUTINE
403962	No. 1	TRN	08/27/1998	2	25.8	16.1		0.1		52	TEMP=50C	ROUTINE
403962	No. 1	TRN	03/04/1997	1	26.1	34.9		0.086		16		ROUTINE
403962	No. 1	TRN	06/12/1996	2	23.1	15.9		0.091		43		ROUTINE
403962	No. 1	TRN	07/03/1995	2	22	20		0.094				
403962	No. 1	TRN	06/30/1995	2	21	13		0.1				
403962	No. 1	TRN	05/23/1995	2	20	18		0.098				

Equipment Order History

Time Range

Start Time *-5y End Time * Apply

Nameplate

Oneline	Division	Station Code	Station	Station Type	Floc Descr	Equipment	Equipment Descr	Equipment Type	Construction Year	Serial Number	Manufacturer	Model Number
	Southern	SNF	NEW FREEDOM X		500-2 Transformer	000000000010523975	Power Transformer 500-2B	E-TRF-TRF	1970	D596878	GENERAL ELECTRIC	LRS 700

PM Teco Orders

Order	Order Description	Priority	Work Center	Status	Planned Cost	Actual Cost	Completion Date
000100834035	Southern TFMR 230kV-500kV 1yr	1	SO-ME	TECO	2894.7	241.28	5/20/2014 12:00:00 AM
000100736713	Southern TFMR 230kV-500kV 1yr	1	SO-ME	CLSD	1392.5	611.27	2/10/2013 12:00:00 AM
000100767593	DGA Sample	C	SO-ME	CLSD	0	107.55	11/23/2012 12:00:00 AM
000100748889	DGA Resample	C	SO-ME	CLSD	0	165.1	7/30/2012 12:00:00 AM
000100679524	Southern TFMR 230kV-500kV 1yr	1	SO-ME	CLSD	4292.5	336.91	4/28/2012 12:00:00 AM
000100614164	So. Transf.-230kv -500KV 2yr	1	SO-ME	CLSD	1320.8	84.22	4/28/2012 12:00:00 AM
000100614428	Southern TFMR 230kV-500kV 1yr	1	SO-ME	CLSD	4032.1	1130.8	5/8/2011 12:00:00 AM

PM Teco Order Operations

Operation	Description	Planned Hours	Actual Hours	Sub-Operation
0010	TRF (ALL) Desicant System - Transm 1yr		1	0.5 0000
0020	TRF (ALL) Cooling System - Transm 1 yr		16	0.5 0000
0030	TRF (ALL) Gas in Oil Test - Transm 1yr		1	0.5 0000
0060	MTS-Transf. (ALL) 1 Yr. Oil Test		0	0 0000

PM Open Orders

Order	Order Description	Priority	Work Center	Status	Planned Cost	Actual Cost	Due Date
000100902409	Transformers 69KV-500KV Transm 4yr	1	SO-ME	OPEN	0	0	7/1/2016 12:00:00 AM
000100851772	Southern TFMR 1230V-500kV 1yr	1	SO-ME	OPEN	3123.9	0	5/20/2015 12:00:00 AM

PM Open Order Operations

Operation	Description	Planned Hours	Actual Hours	Sub-Operation
0010	69KV-500KV Phys Oil Test - Transm 4yr		6	0 0000
0020	MTS-Physical Oil Test - Transm 4yr		0	0 0000

Maintenance Cycles

Last_Comp_Date	Next_Sched_Date	Maint_Cycle
2009-03-18	2019-03-18	10
2013-12-12	2017-12-12	4
2012-04-28	2014-04-28	2
2010-03-09	2014-03-09	4
2010-03-09	2012-03-09	2

PM Actual Cost

Total PM Cost
2677.1

PM Actual Hours

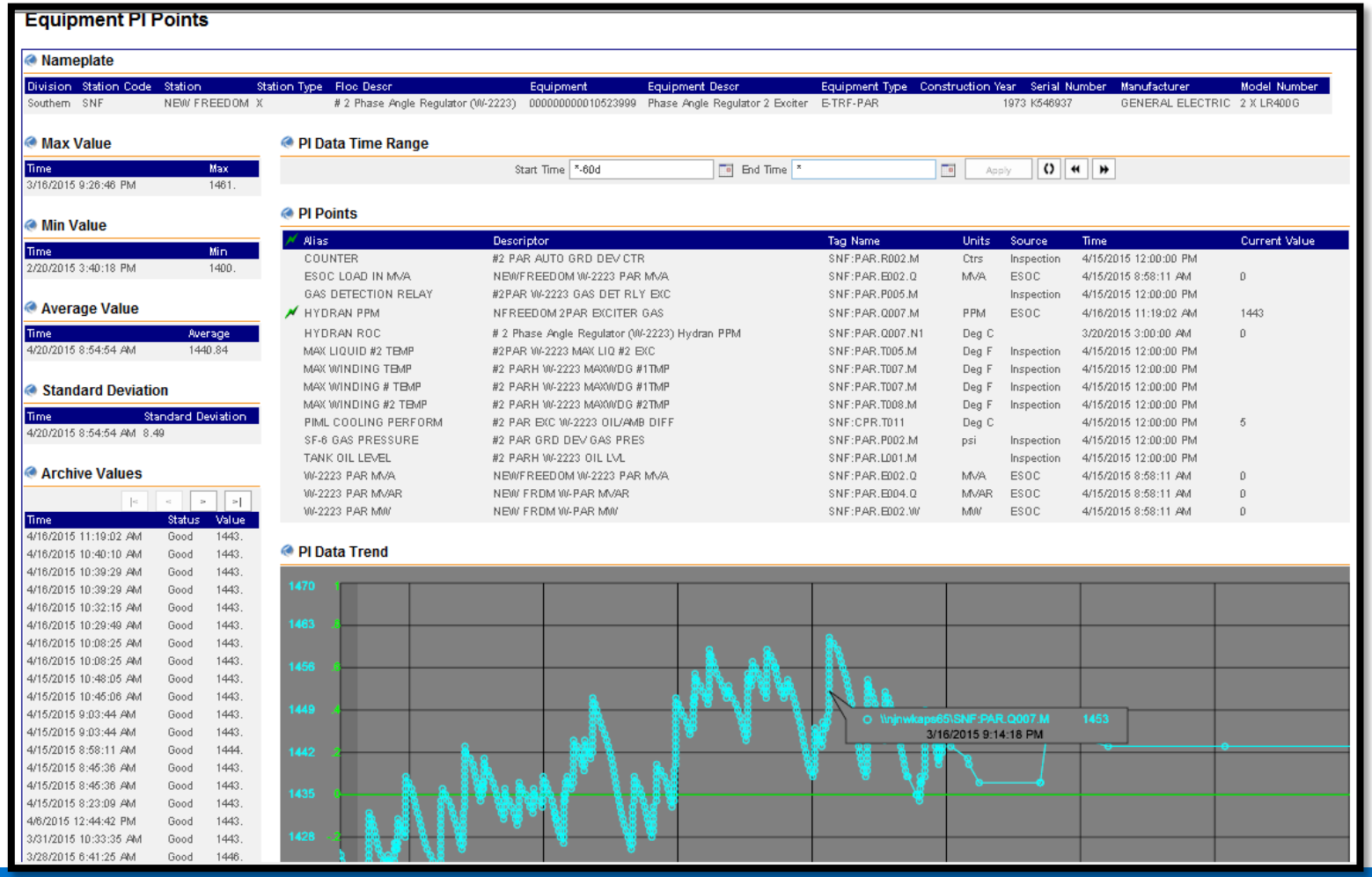
Total PM Hours
12.3

CM Actual Cost

Total CM Cost
8253.7

CM/PM Ratio

Total PM Cost	Total CM Cost	CM-PM Ratio
2677.1	8253.7	3.08



Benefits

- Have been very successful in the past 13 years identifying problems and remediating issues before a failure
- Extremely valuable system when you have
  - $5 B of installed assets with a replacement value > 13B
  - Average age of the assets exceeds 40 years
  - All equipment is expected to be **used and useful** all the time
- Justify millions of dollars in saving over past 13 years in equipment failure avoidance
- No secret sauce for success – program success is contributed to Asset Engineer's commitment to program and data owners ensuring data integrity.

2015 Examples

Substation/Designation	Findings	Action	Estimated Savings
Culver Ave 4002 Unit Sub	Elevated DGA readings	Drain OLTC and perform internal inspection. Found selector switch contacts coked because of OLTC lock into position. Operate OLTC manually, clean contacts and replace old sullied oil with new to enhance the life of the OLTC and unit sub.	$500k save by avoiding unit transformer failure
Polk St. #3 Transformer	IR scan indicates hot-spot	Drain and inspect OLTC, found oil highly carbonized and sludge. Rust in OLTC compartment from water seepage from cap on top of OLTC. Repair leaks, paint rusted section; wipe and wash clean OLTC of sludge. Refill OLTC with new oil. These actions have enhanced the life of the transformer.	$500k save by avoiding transformer failure
Centex Towers Unit Sub 300	IR scan indicates hot-spot in the OLTC compartment	Drain and inspect OLTC, found heavy oil sludge and low oil level. Wash OLTC clean of sludge and replace oil with new to the correct level. This action has enhanced the life of the transformer.	$750k save by avoiding transformer failure

Energy Strong

Superstorm Sandy

Customers	2,000,000
Tree Locations	48,000
Poles	2,400
Circuits	2,9
Services	8,3
Substations	30

Energy Strong Filing

- A Proposal To Invest in New Jersey's Future
  - **$620 million** to raise, relocate or protect 29 switching and substations that were damaged by water in recent storms.
  - **$100 million** to create redundancy in the system, reducing outages when damage occurs.
  - **$100 million** to deploy smart grid (advanced) technologies to improve storm/emergency response and improve customer communications.

Energy Strong – Advanced Technology & CMMS

- Automate 80% of Distribution Circuits
- Support ES data &
  expansion of non-operational data path
  - Transformer Monitoring
  - Pumping Plants
  - Gas Insulated Switchgear
- Need to make CMMS more reliable, scalable & sustainable
- Critical in terms of asset failure avoidance

	Class H 230-13kv	Class A&B 26-4kv	Total
Planned Total stations:	53	41	94
Planned Total feeders:	632	266	1046

PSEG

Project Management

CMMS Project Details

- Project Duration
  - 14-months (May 2014 to Feb 2016)

    Go-Live in mid-Nov 2015
- Vendors Involved:
  - Accenture® - PI System Integration
  - TCS® - SQL Integration
  - OSIsoft® (Licenses)
  - Microsoft® (Licenses)

CMMS Before and After

Original CMMS State

- Windows Server 2003 out of support
- Physical servers deployed
- No server redundancy for PI System or SQL
- No secondary site in the event the main datacenter went offline
- PI Com Connector provided slow data retrieval from Operations PI Server (outdated software)
- Use of PI System users and groups made security management difficult
- Need to integrate further data sources into the PI System

CMMS Project Outcomes

- Updated to Windows Servers 2012
- All servers were implemented as Virtual Servers
- Implemented a Test environment that mimics the Production environment
- Create a monitoring system to check server status
- Implemented High Availability
- Implemented a Disaster Recovery environment
- Easier security management by using Active Directory

Project Scope (In-Scope)

- PI System Architecture Upgrade
  - 150K tags to 400K tags
- Overall PI System Software Upgrade
- SQL Server Upgrade
- Connectivity into our Transmissions / Distribution systems

Project Scope (In-Scope)

- Connectivity into our external data feeds (i.e. SAP, DeltaX, Doble, CAD, OMS, GIS)
- CMMS Reporting
  - PI WebParts
- Implementation of a Disaster Recovery Environment
- Implementation of High Availability

Project Scope (Out-Of-Scope)

- Upgrade / replacement of PI Manual Logger (included in another PSEG project)
- Upgrade of Transmission / Distribution systems that connect with CMMS
- Upgrade of PSEG Mobile laptops
- Implementation of the CMMS platform in PSEG Long Island
- Any external interface upgrades

CMMS Project Risk Management

CMMS, being a high visibility project due to its dependencies on Energy Strong funding required a proactive risk monitoring and mitigation

Risk Identification	Probability	Impact	Outcome
RLINK release delayed	3	5	Obtained recent RLINK. Kept in close communication with Product Manager
Compatibility issues with PSEG Mobile laptops	2	4	Was able to set up a separate environment to be able to test
New PI SDK not compatible with new solution	3	3	All users will able to connect to the new environment
Errors in original platform are carried over to new CMMS	5	4	All errors that were carried over were remediated
Data migration and/or validation issues encountered	2	4	Refreshed data frequently to ensure accurate data validation
Firewall changes not implemented in time	2	3	All firewalls required were open to allow connectivity
SQL AlwaysOn implementation delayed or incomplete	3	3	Brought in Microsoft SQL experts to assist in installation

CMMS Project Lessons Learned

Lesson Learned	Lesson Learned Description	Recommendations
CMMS Overall Team (Multi-vendor, distributed)	Team co-location worked well for design sessions	A separate area should be reserved in order for team members to work without distractions (i.e. team conference calls)
	As team members came into project at different stages a lack of understanding on technical decisions made led to confusion due to multi-vendor, distributed team resources in this 14-month long project	Hold design sessions before each phase of implementation to ensure clarity among all team members, vendors, and PSEG personnel
	At points throughout the project, it was unclear the Roles and Responsibilities of each vendor.	Set clear expectations for each vendor initially

CMMS Project Lessons Learned - Continued

Lesson Learned	Lesson Learned Description	Recommendations
Deployment	We did not have a test environment for PI Coresight. We did a quick test to ensure we could connect to the new environment. However, during implementation PI Coresight had a lot of issues connecting to the new environment.	Create test environment for all production software
	There were instances where services and interfaces were shut off. Looking at the logs, it was unclear as to who / what might have caused this.	During deployment, make sure that tighter IT security control on servers are enforced to allow for traceability of changes

Technical Design & Implementation Accenture

PSEG CMMS Project Vision

Establish a state-of-the-art and modernized PI System architecture to support the business and functional requirements of CMMS data acquisition and historization, condition assessment and condition based maintenance, system security, and display and visualization

Provide System Scalability

- Add data integration for enhance calculations
- Ability to sustainably add new asset classes

Improve System Reliability

- Add control center-level reliability (DR)
- Add failover for data sources

Enhance Security & Centralization

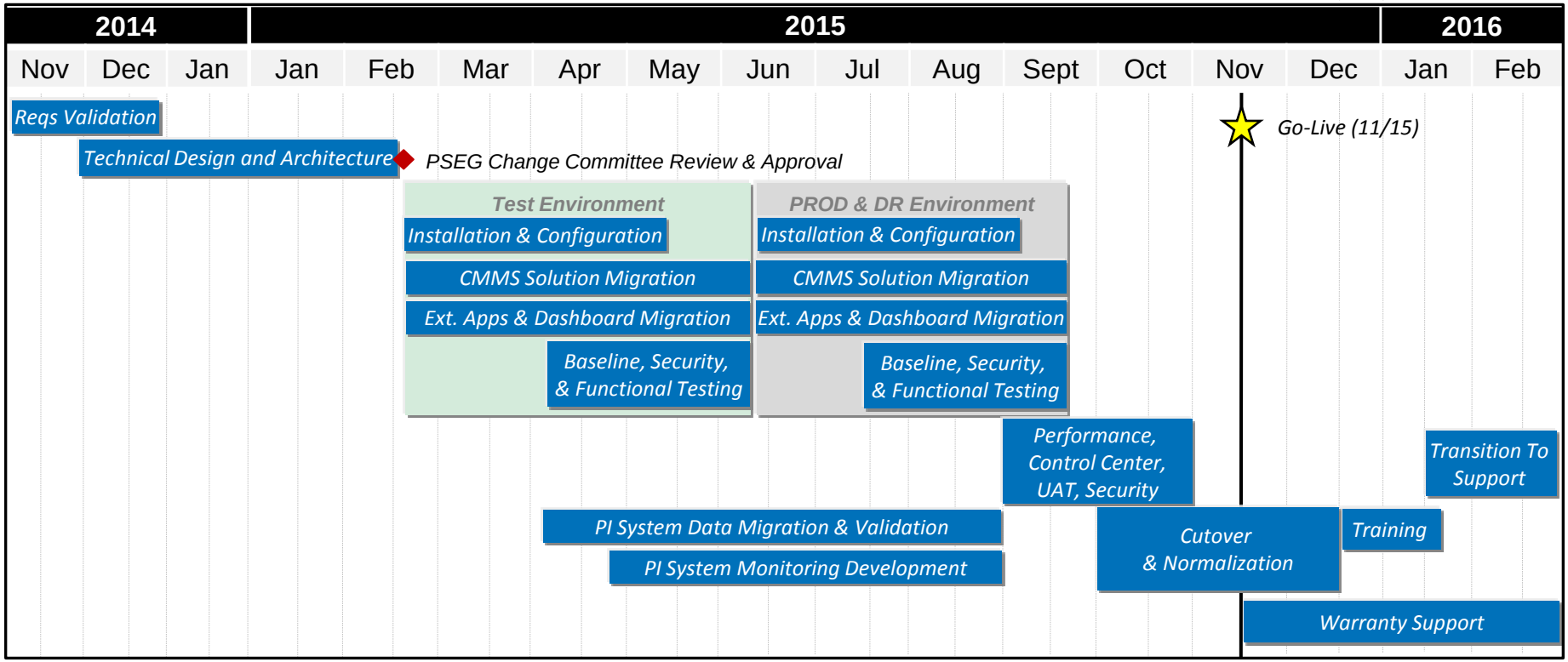
- Centralization of distributed servers
- Enhance user and application security

Improve System Supportability

- Improved visibility into system performance and health
- Predictability of system behavior

Asset Maintenance and Condition Assessment Platform (CMMS)

CMMS PSEG Project Timeline



CMMS Project Deliverables

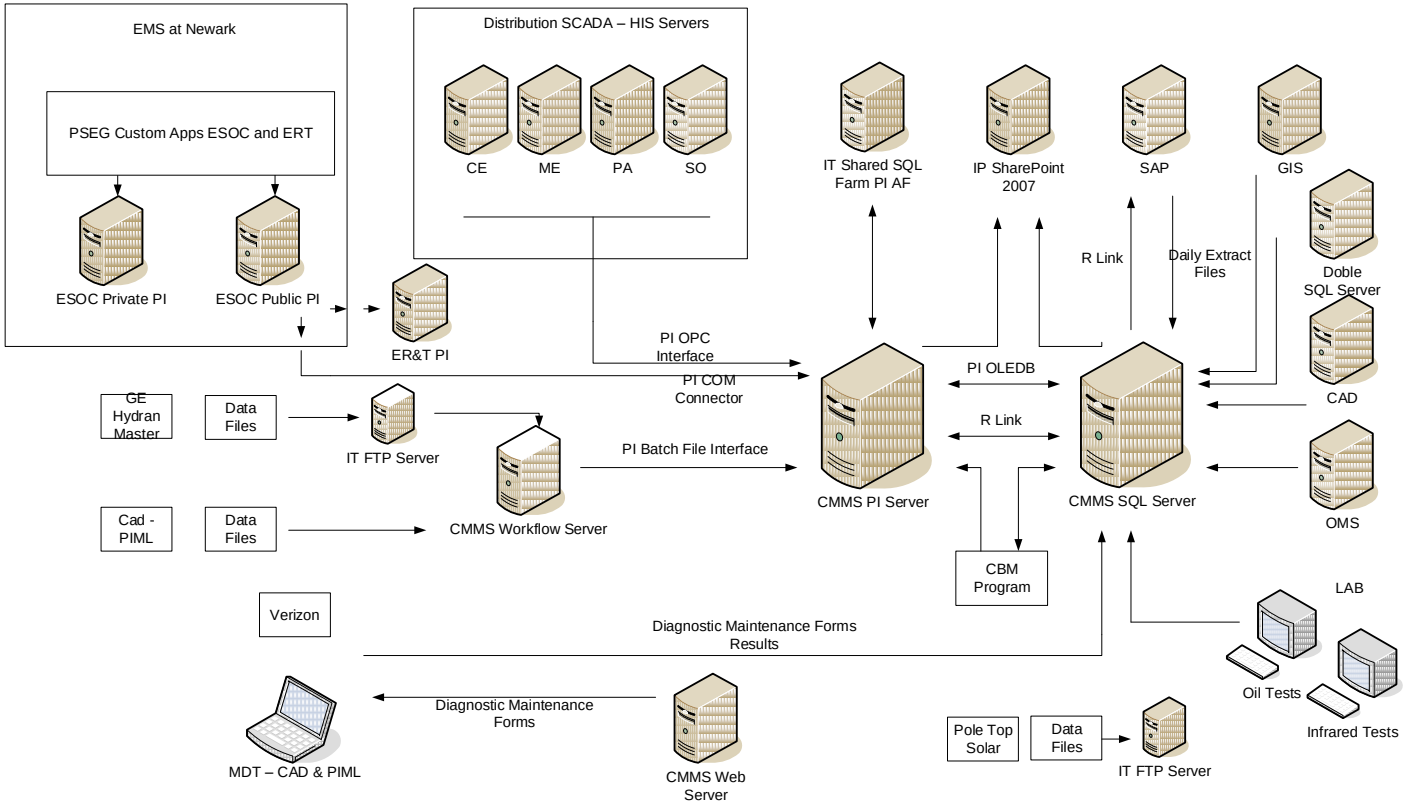
PSEG
We make things work for you.

Planning and Detailed Design	Integration & Deployment	Testing	System Cutover	Warranty Support
✓ Project Plan Development	✓ DR and Production PI System Deployment	✓ Baseline, Platform HA, and Security Testing	✓ Operational Runbook Development	✓ 30-Day Warranty Support
✓ Hardware & Software Procurement	✓ SCADA EMS (ESOC) Interface Config.	✓ Functional Testing	✓ Production and DR Go-Live	✓ 90-Day Warranty Support
✓ Build Out Plan	✓ SCADA DMS Interface Config.	✓ Performance Testing	✓ System Deactivation and Retirement	
✓ Security and AD Design	✓ SDAMS Config.	✓ Parallel Testing	✓ LOB and Admin Training Sessions	
✓ Functional Design and Technical Specs	✓ Health Monitoring	✓ Control Center Failover Testing	✓ Transition to Support	
✓ Migration and Testing Design	✓ Backup and Maintenance	✓ User Acceptance Testing		
	✓ PI System Migration			

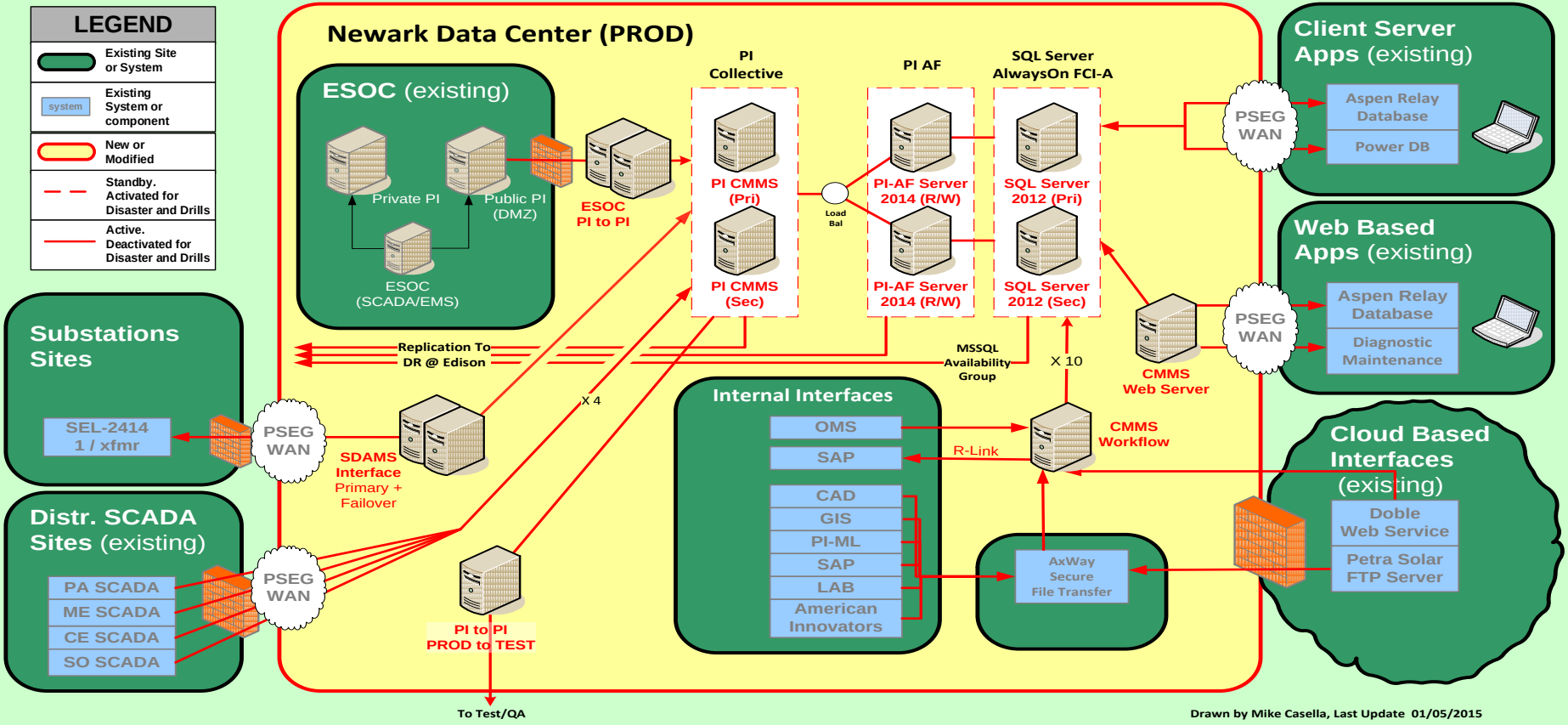
Architecture Design Considerations

- ✓ Provide ***control center-level failover*** so that in the case the Newark control center (Primary) is offline, the PI System at Edison/DR (Backup) can be activated
- ✓ Provide CMMS ***Test environment*** for safe testing of applications before release to Production
- ✓ Elimination of architecture ***points of failure*** by implementation of ***High Availability*** for Data Archives in all environments
- ✓ Provide ***interface failover*** to minimize data loss situations
- ✓ PI System (merge) data migration and validation for 10+ years of data from multiple Data Archives allowing ***consolidation and centralization*** of data
- ✓ Decommission outdated software such as PI COM Connector

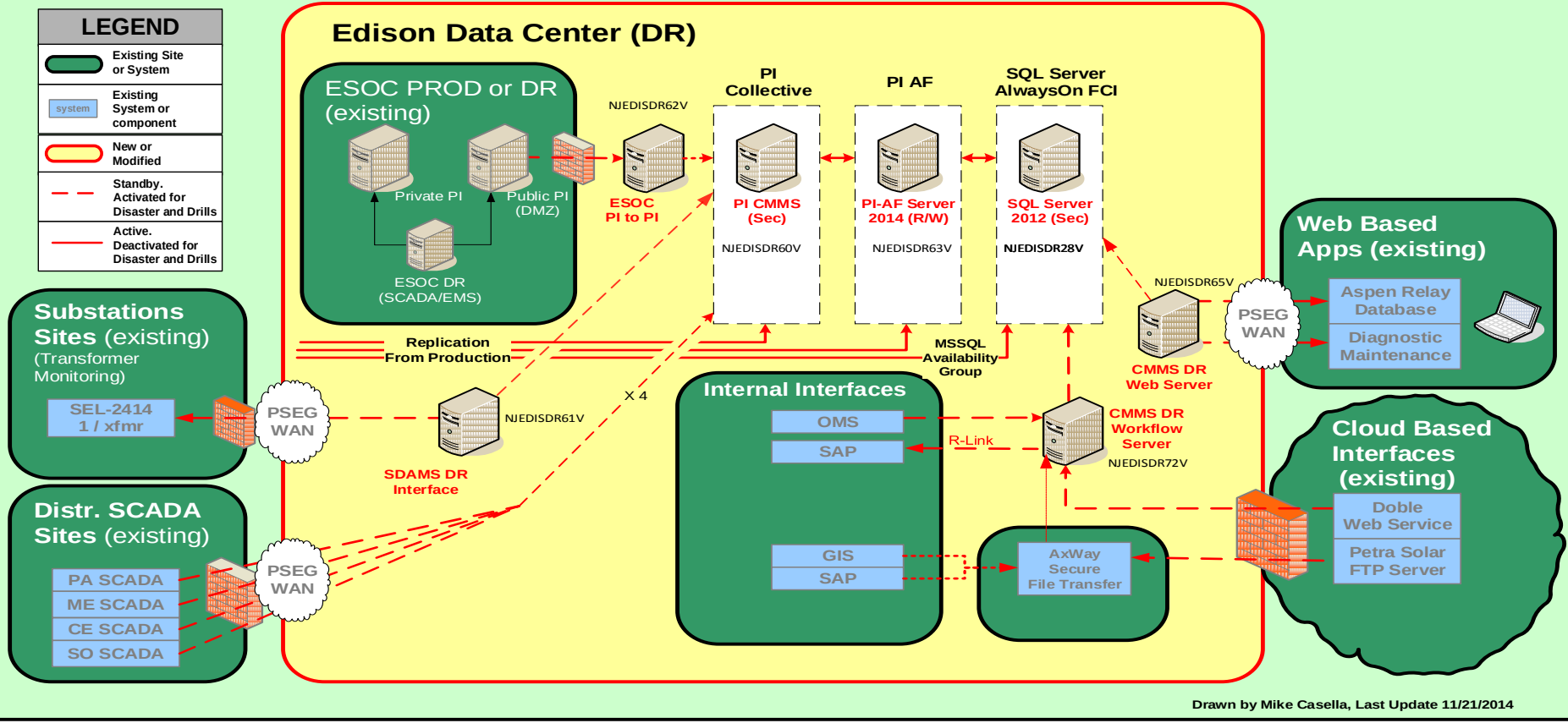
CMMS PI System Platform - Legacy



ENERGY STRONG – CMMS PI HISTORIAN – PRODUCTION



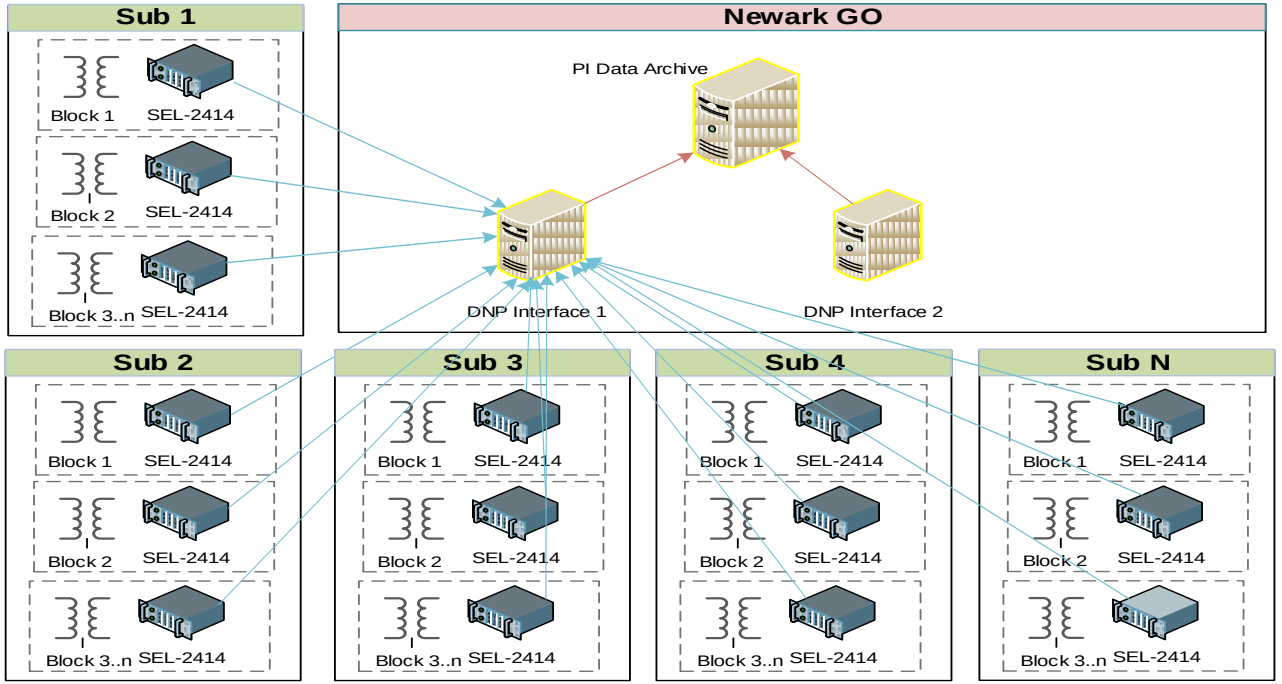
ENERGY STRONG – CMMS PI HISTORIAN – DR



Drawn by Mike Casella, Last Update 11/21/2014

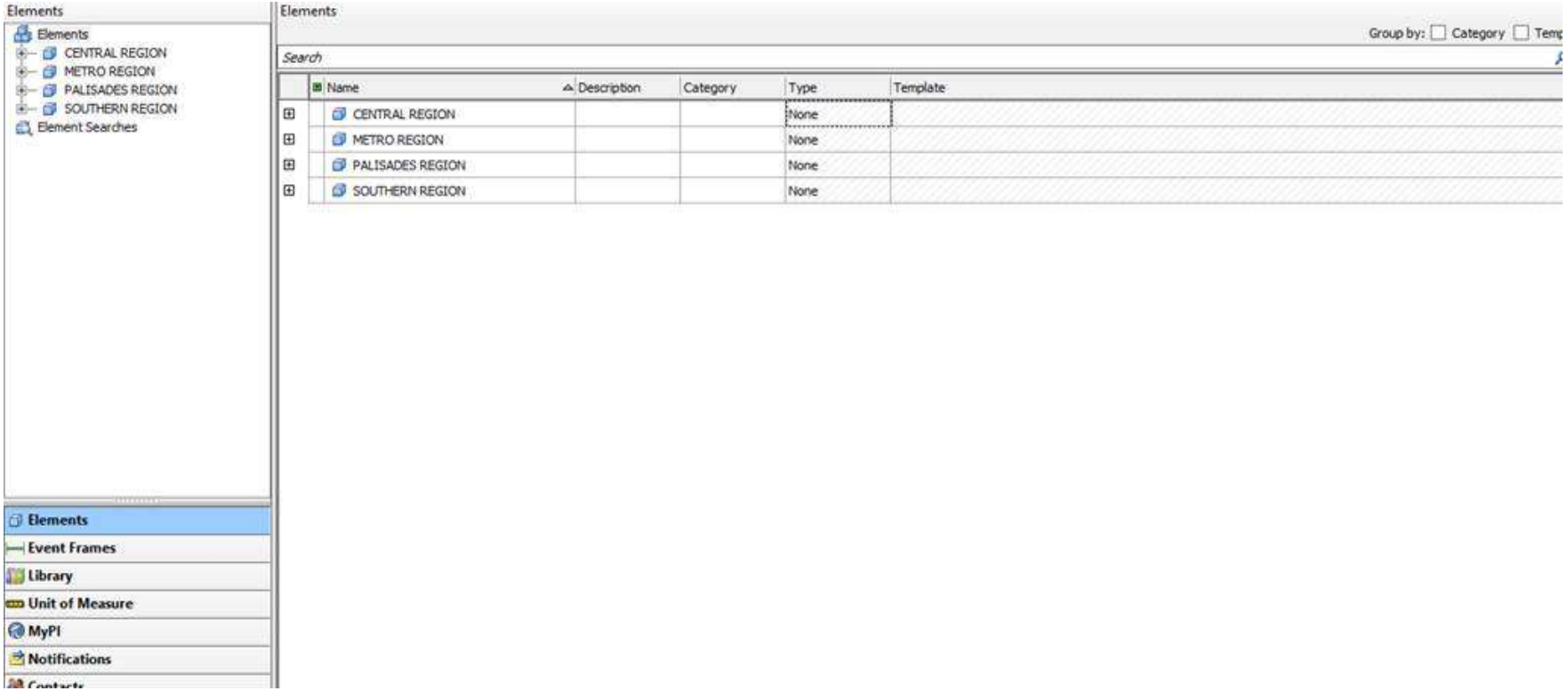
Non-Operational Data Collection

111 Substations
276 Transformers



Substation Monitoring (SDAMS)

Target Audience: Asset Strategy Team (LOB)



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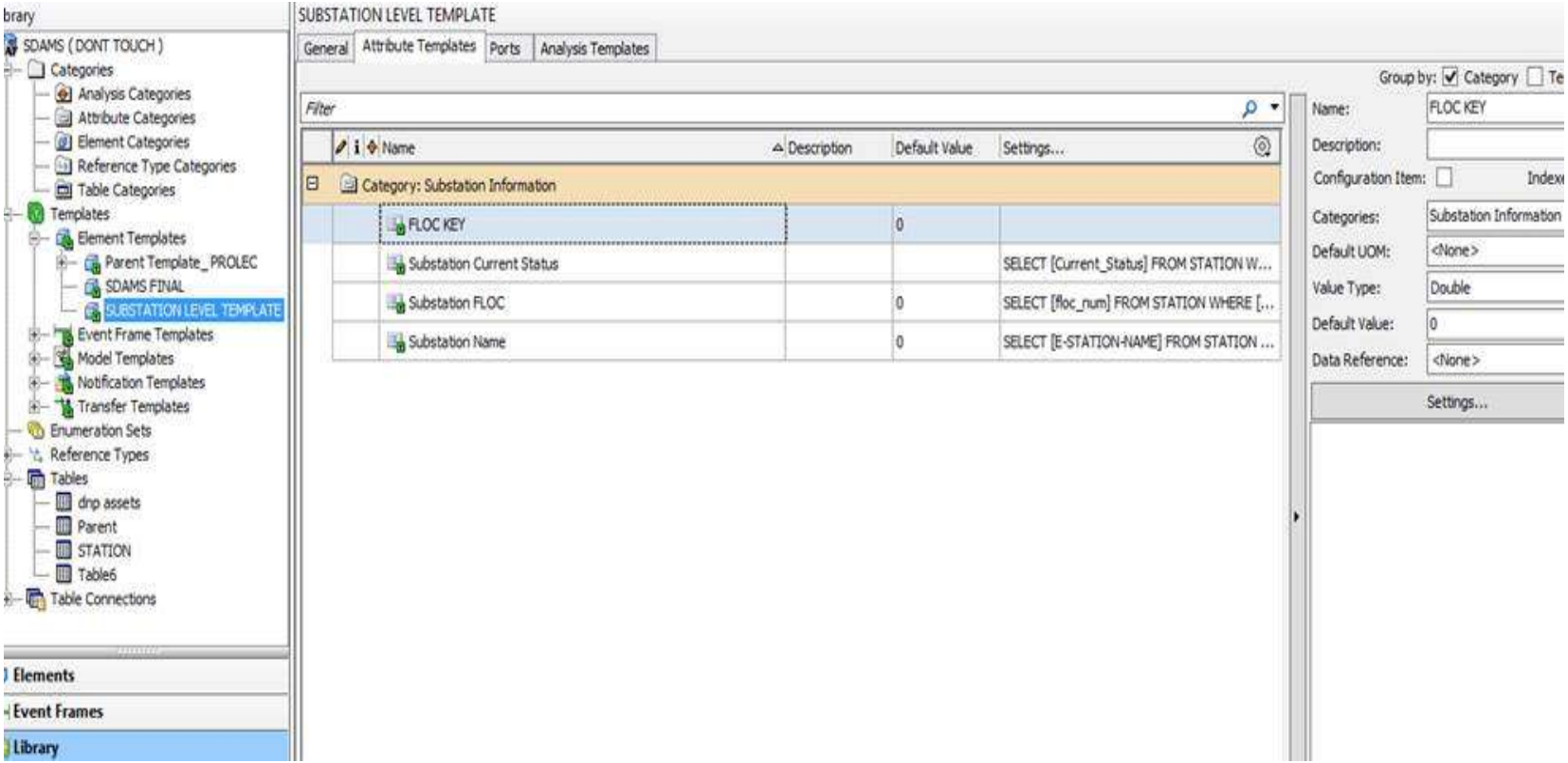

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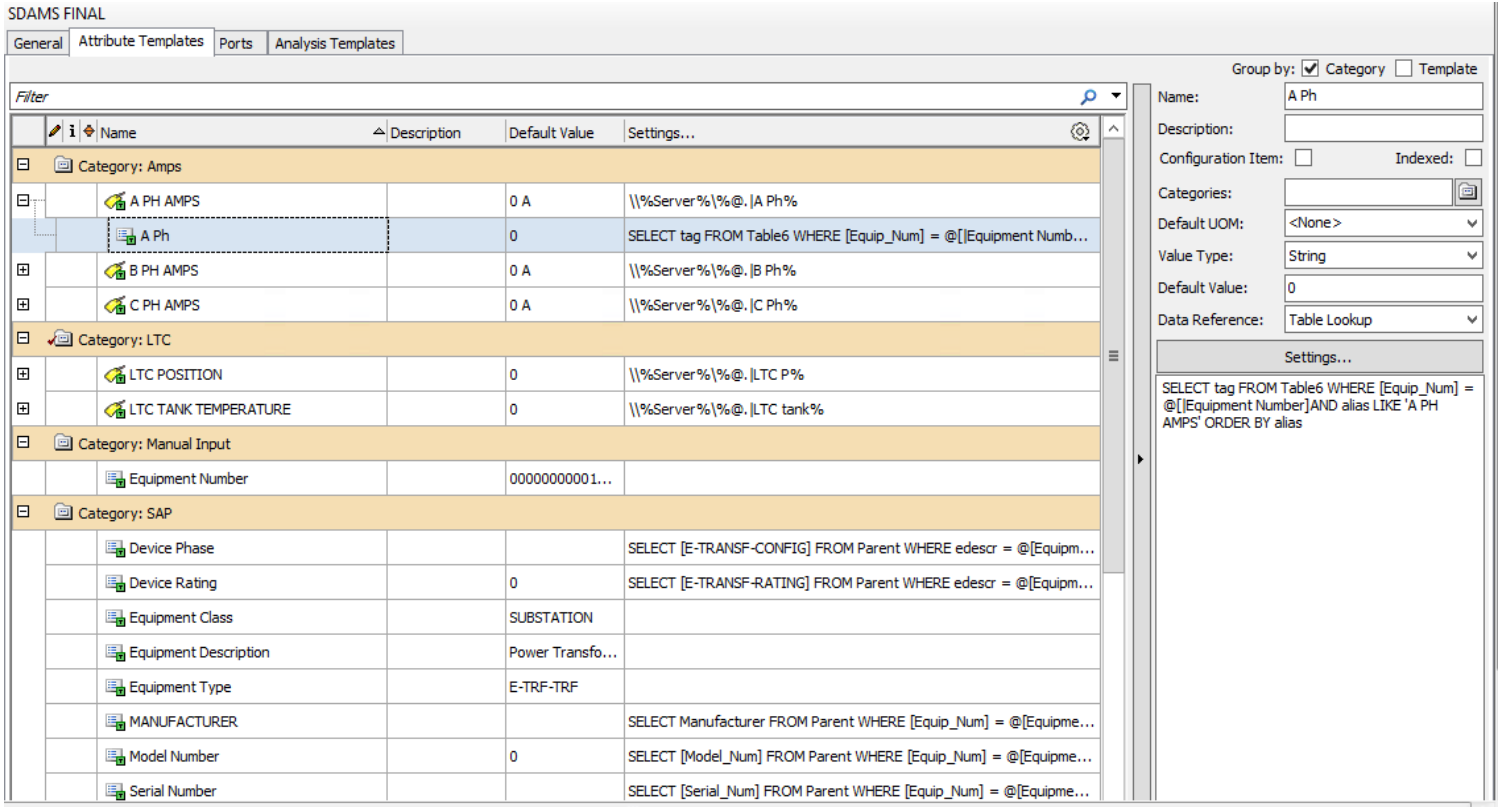

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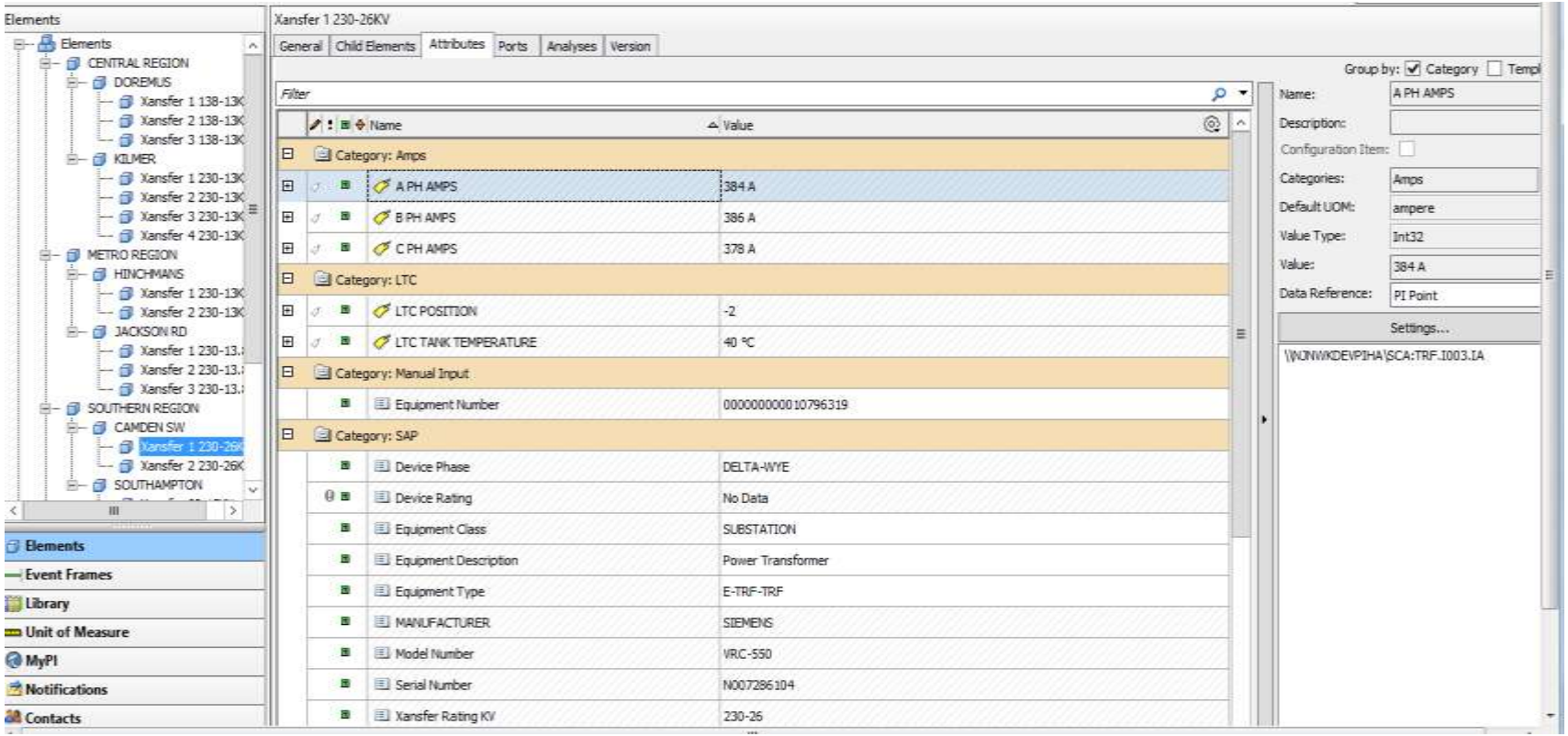
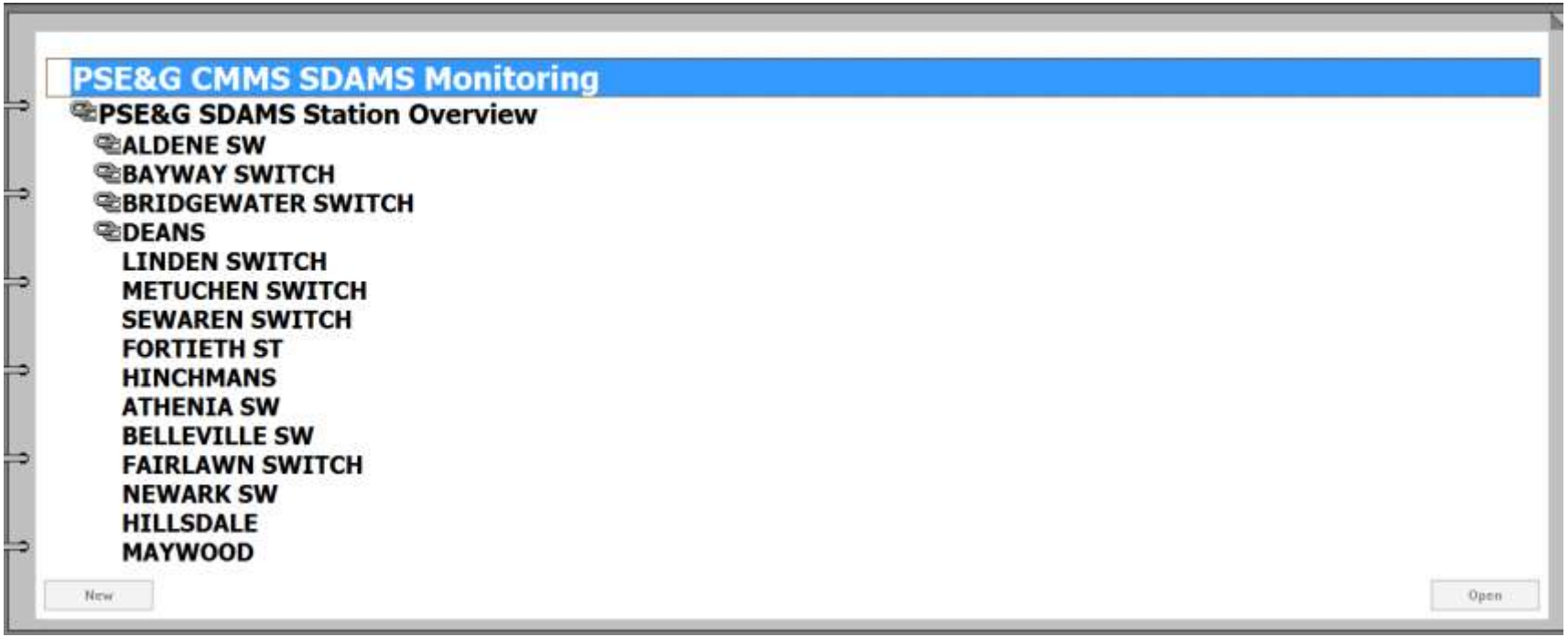
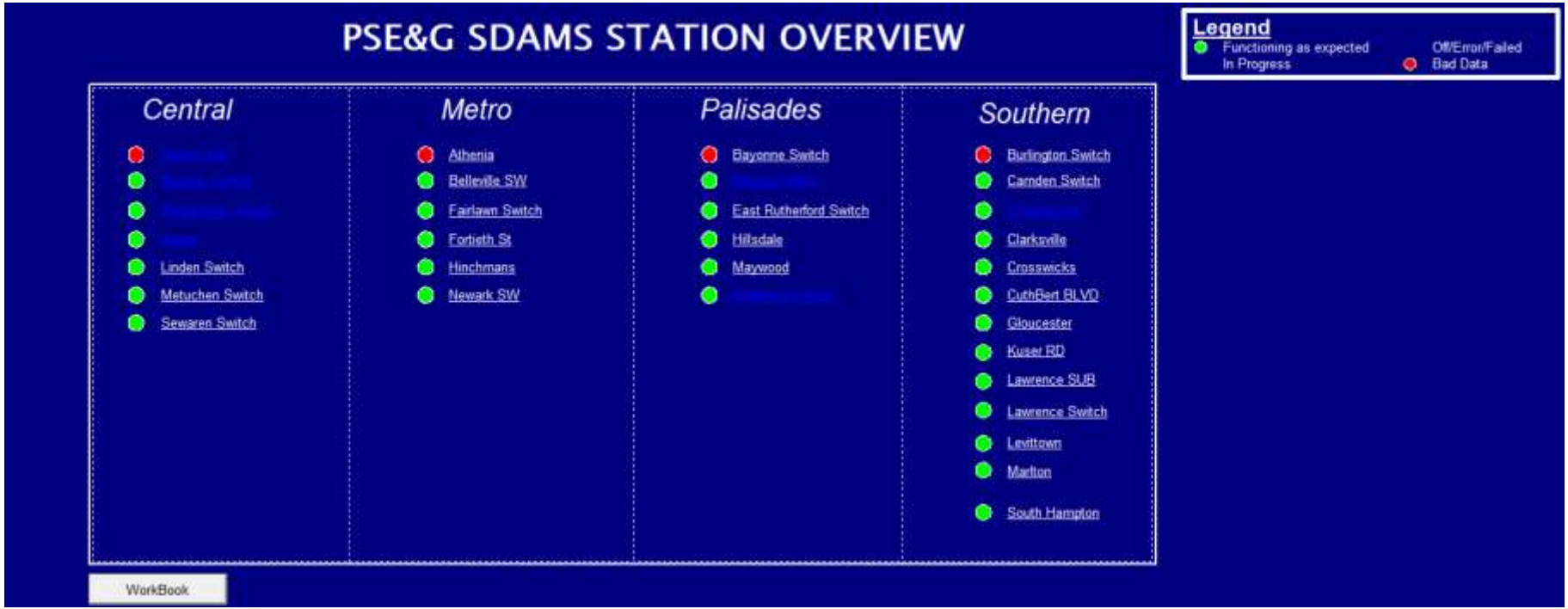


Substation Monitoring Dashboards (SDAMS)



Substation Monitoring Dashboards (SDAMS)

Target Audience: Asset Strategy Team (LOB)



Substation Monitoring Dashboards (SDAMS)

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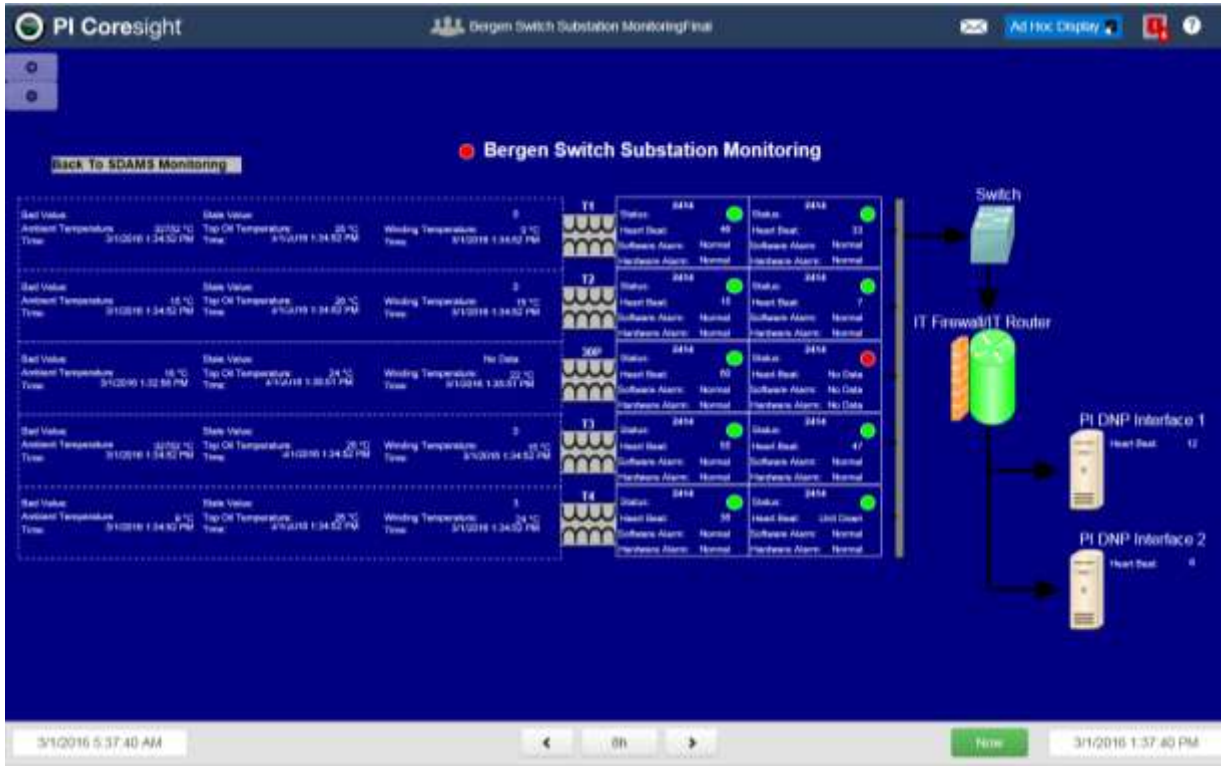
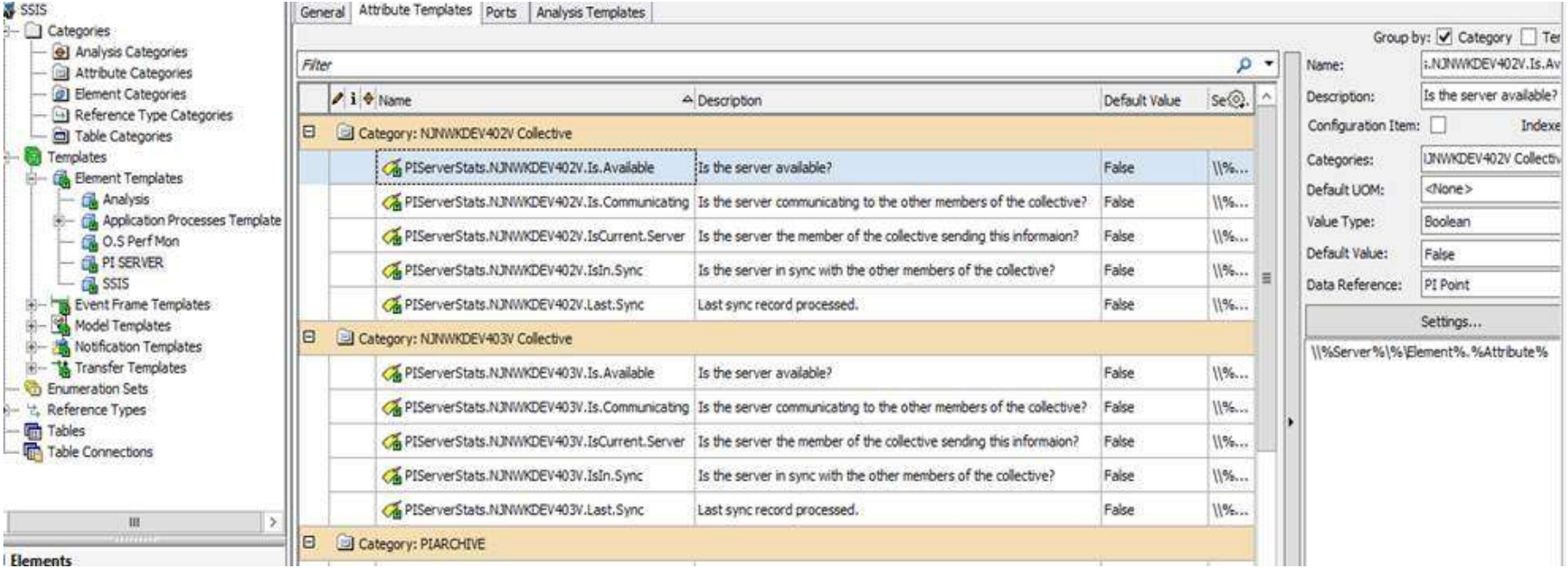


CMMS Platform Monitoring (Wellness Check)

Target Audience: PSEG PI System Support Team



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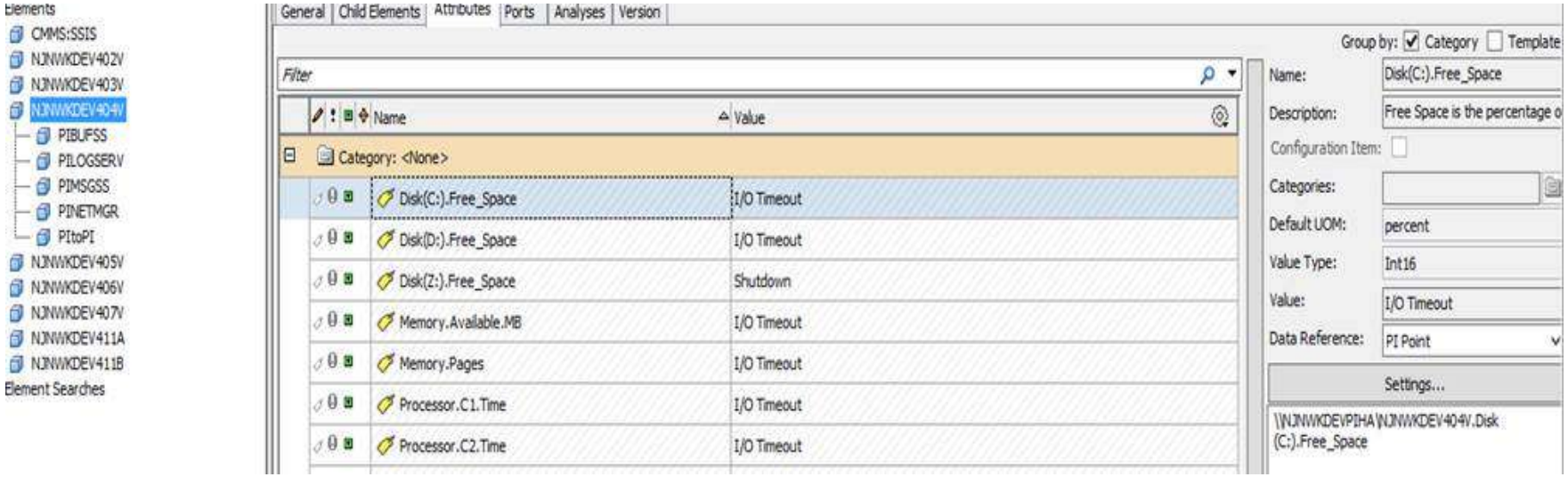

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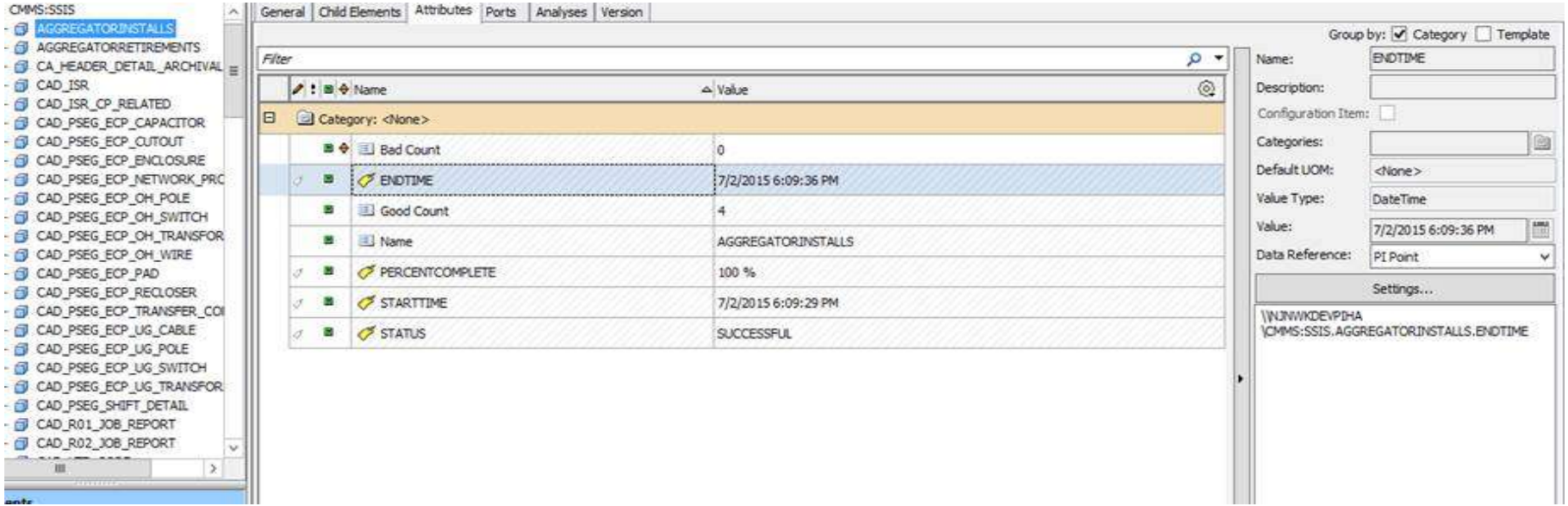

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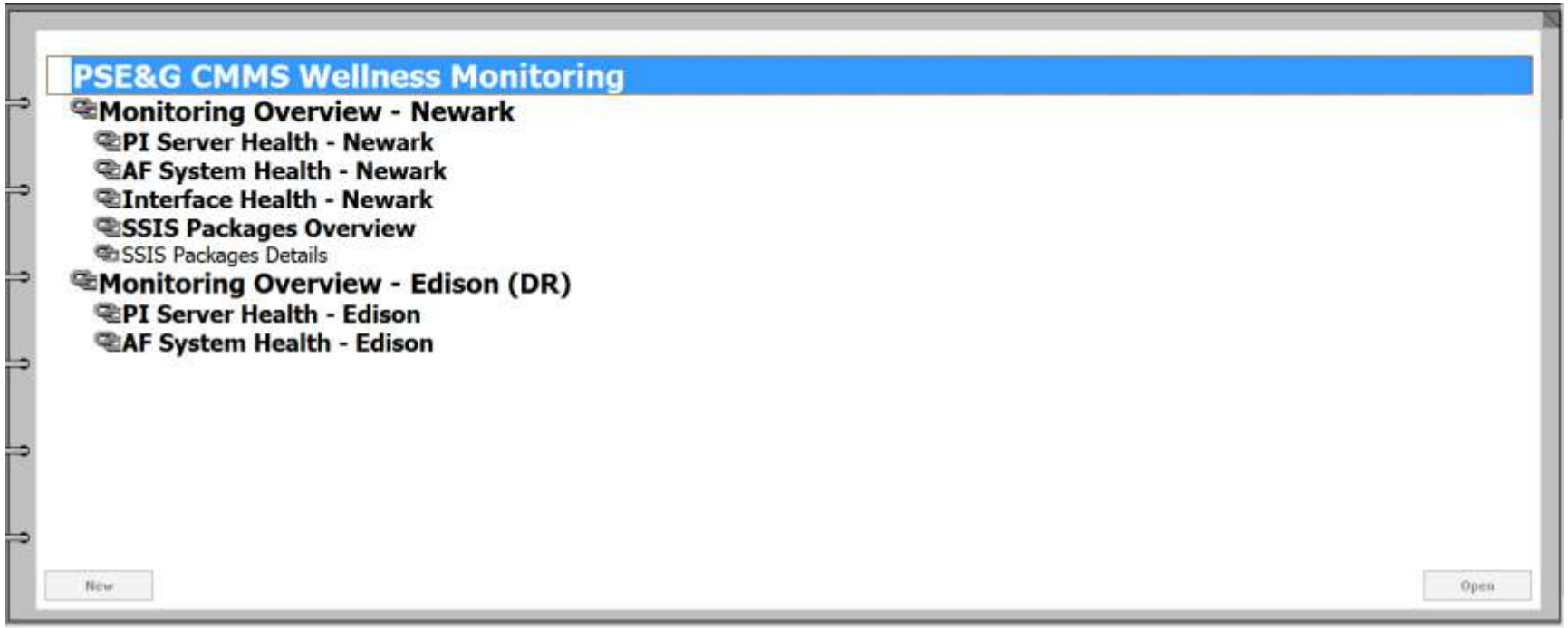

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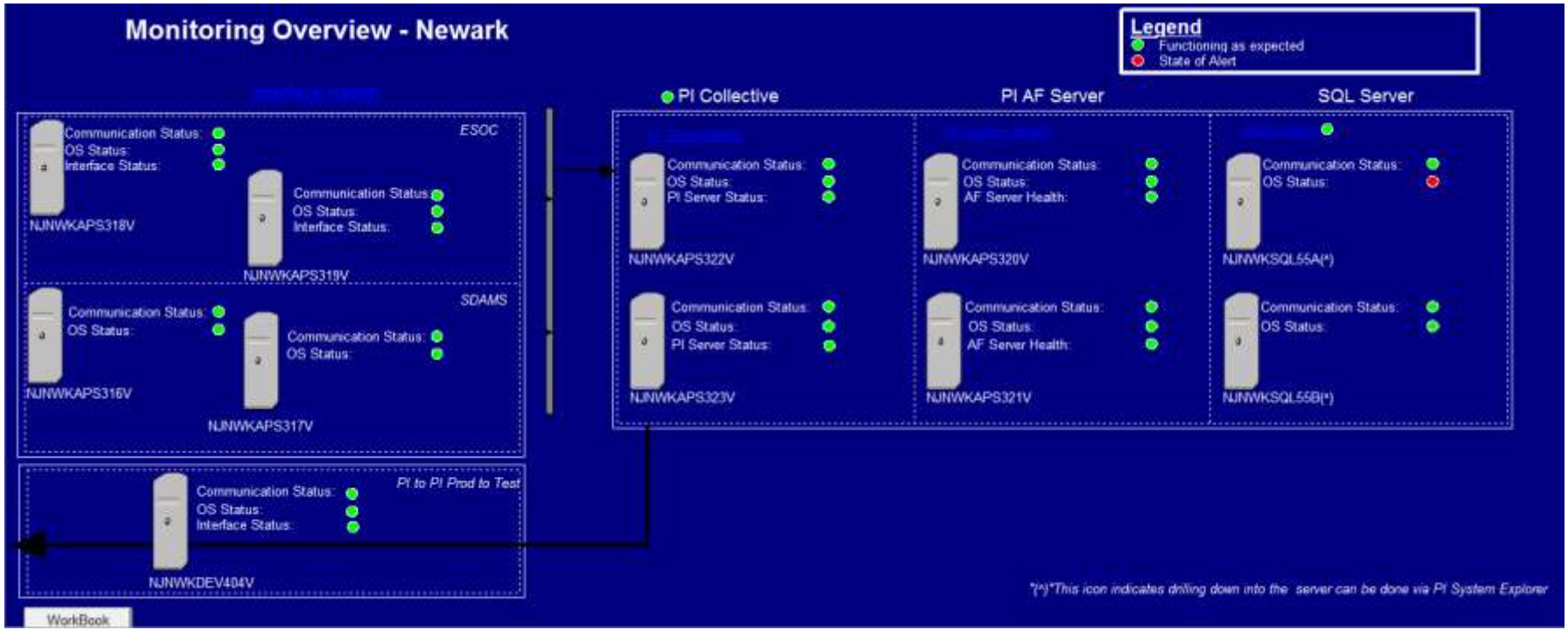

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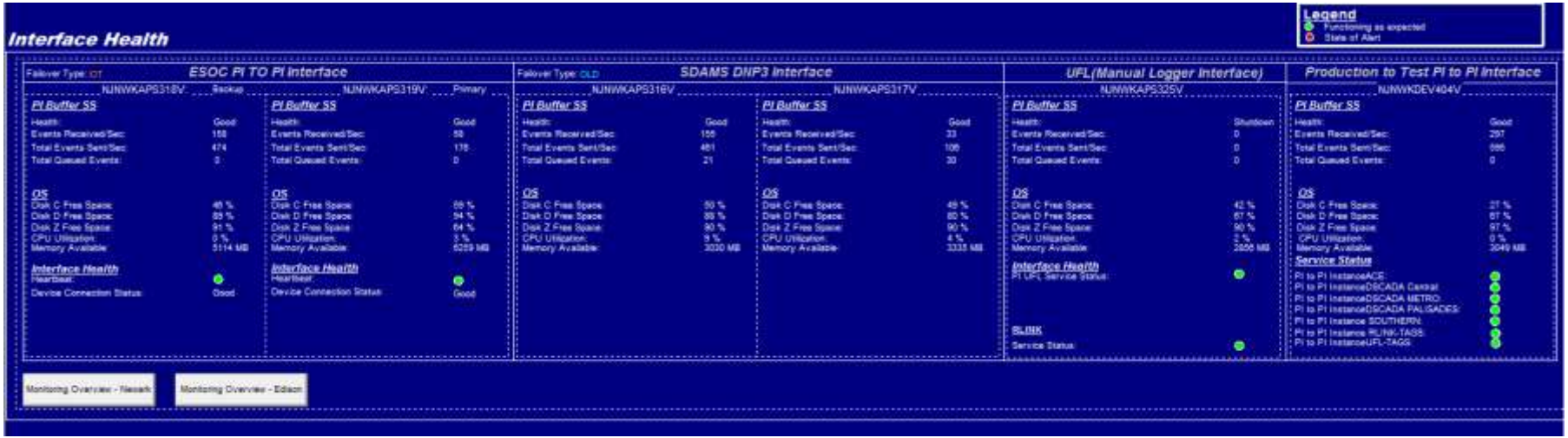

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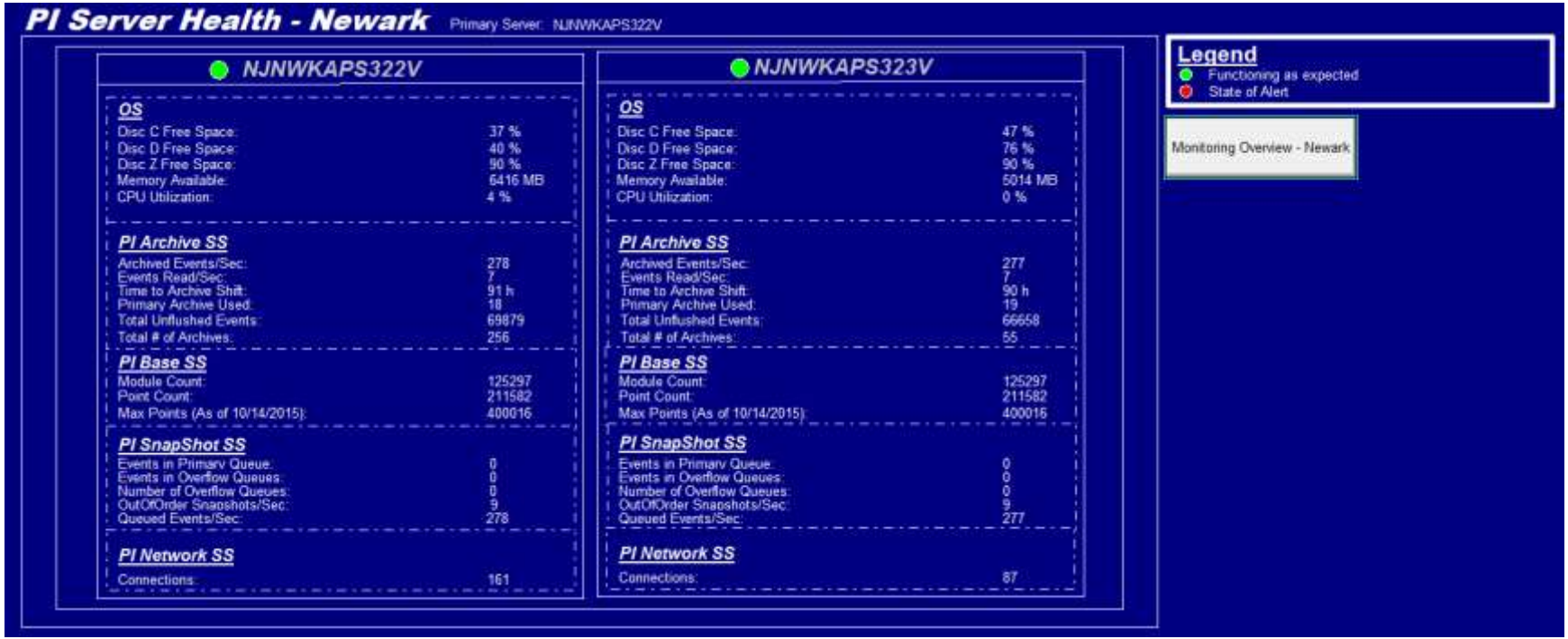

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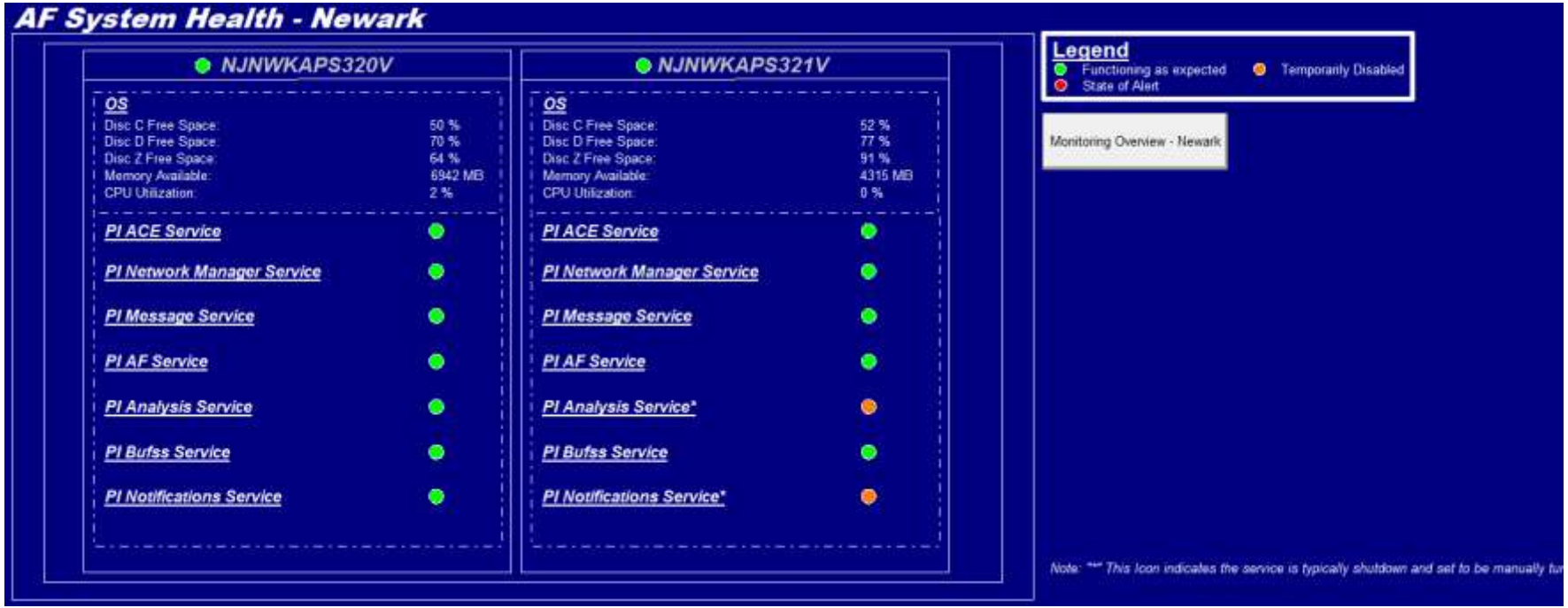

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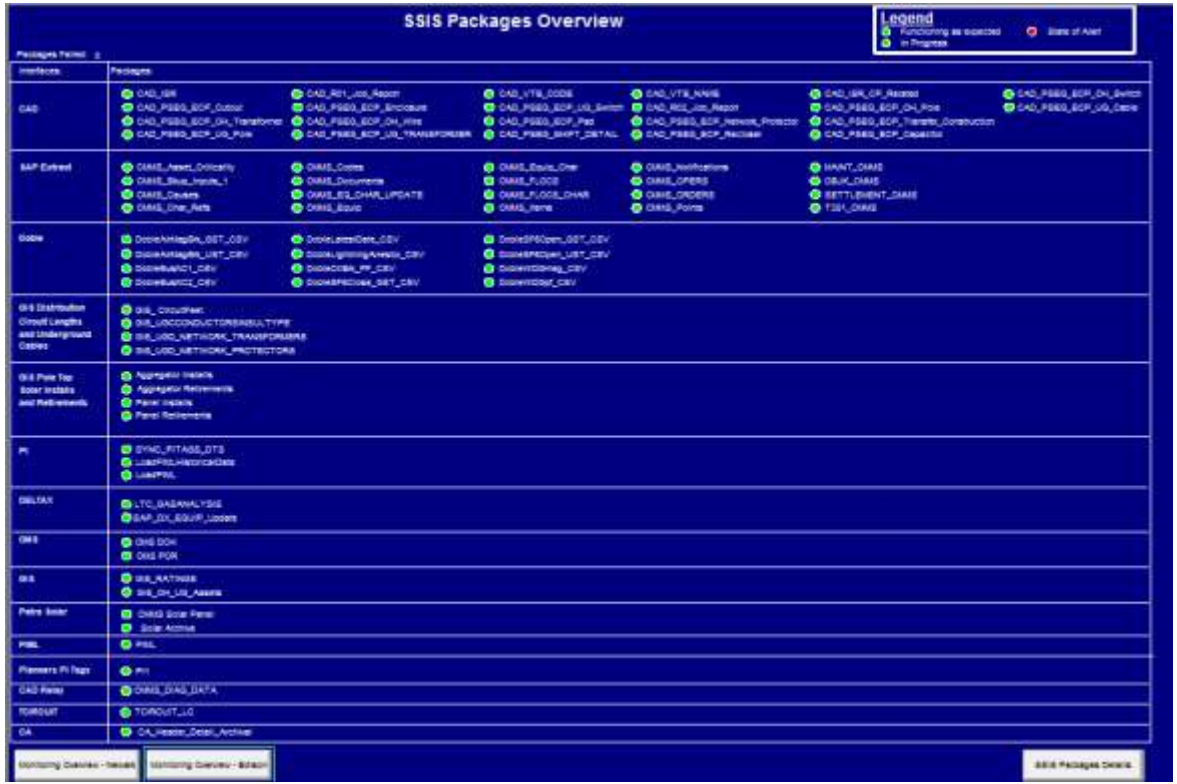

Integration of Portfolio of Applications

Application	Vendor	Product
PI System Suite (Test, Prod, & DR environments)	OSIsoft	Data Archive
Condition Assessment	Microsoft	SQL
AF Builder	OSIsoft	AF SDK
Engineering Dashboards	Microsoft SAP OSIsoft	Sharepoint SAP Business Objects PI Webparts
Operations and Support dashboards	OSIsoft	PI ProcessBook PI Coresight
Substation Condition Monitoring & CMMS Health Monitoring	OSIsoft	Asset Framework Notifications Asset Analytics
Condition Based Maintenance	OSIsoft SAP	RLINK SAP PM
Manual Inspection	OSIsoft CGI CAD	PI Interface for Universal File and Stream PI Manual Logger (PI ML) Custom CAD web services
Asset Scoring & Algorithms	OSIsoft	PI Advanced Computing Engine (ACE)
External Data Sources	Microsoft	SQL SSIS for Pole Top Solar, GIS, OMS, CAD Relay, Doble, Delta-X, Megger, Aspen
EMS Data	OSIsoft	PI to PI Interface
DMS Data	OSIsoft	PI Interface for OPC
Non-Operational Data	OSIsoft	PI Interface for DNP3

The Future of CMMS

Future Analytics – Energy Strong

- Determine Load factor for the 4/13/26/69 kV system (better asset utilization):
- Proactive voltage determination:
  - Feeders violating the ANSI voltage limits
  - Our voltage criteria is to operate between 0.95-1.05 p.u. with a goal of operating at 1.05 p.u.:
- Solar Analysis:
  - Voltage impact
  - Transformer LTC impact
  - Capacitor impact
  - Weather impact

- Condition based maintenance reports:
  - LTC movement
  - Power factor vs. available capacitors

- System power analysis factor:
  - Unity power factor
  - Leading power factor
  - Poor power factor
  - Very poor power factor
  - Model validation

Condition Maintenance and Management System (CMMS) Modernization Project

COMPANY and GOAL

1) PSEG is a New Jersey based Electric and Gas utility based serving over 2.2 million electric customers and 1.8 million gas customers.
2) We keep the lights on for NJ

PSEG

CHALLENGE

- Aging infrastructure that was obsolete with limited supported by the vendor
- Add data sources (non-operational and manual inspection) and other external data sources
- Production challenges supporting aging platform
- Need to scale assets for a sustainable growth

SOLUTION

- Upgraded to latest PI System, including High Availability across control centers
- Delivered asset templates and accelerators to support condition monitoring of substation assets
- Enhanced platform security using AD eliminating explicit logins
- Additional data sources for condition assessment such as substation and manual inspection

RESULTS

- Enabled high availability of data seamlessly to the user at various architecture levels
- Improved CMMS performance and reliability to provide accurate asset health indicators to the planners and operations
- Enabled platform sustainable growth for asset classes using latest PI System technology

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Accenture Smart Grid Services

Questions

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

State your **name & company**

Please remember to…

Complete the Online Survey for this session

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감사합니다

谢谢

Danke

Gracias

Merci

Thank You

ありがとう

Спасибо

Obrigado

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USERS CONFERENCE 2016

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