

Enterprise Approach to OSIsoft PI System

Presented by **Subbu Sankaran**

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Agenda

- San Diego Gas & Electric[®] (SDG&E[®]) Overview
- OSIsoft PI System at SDG&E
- Smart Grid Projects
- Current State
- SDG&E Enterprise Strategy
- Key Reasons For Adopting Enterprise Approach
- Summary of EA Benefits

San Diego Gas & Electric

- Subsidiary of Sempra Energy
- Regulated public utility
- Provide safe and reliable energy service to 3.4 million consumers
 - 1.4 million electric meters
 - 800,000 natural gas meters
- 4,100 square mile service territory in San Diego and southern Orange Counties (25 cities)

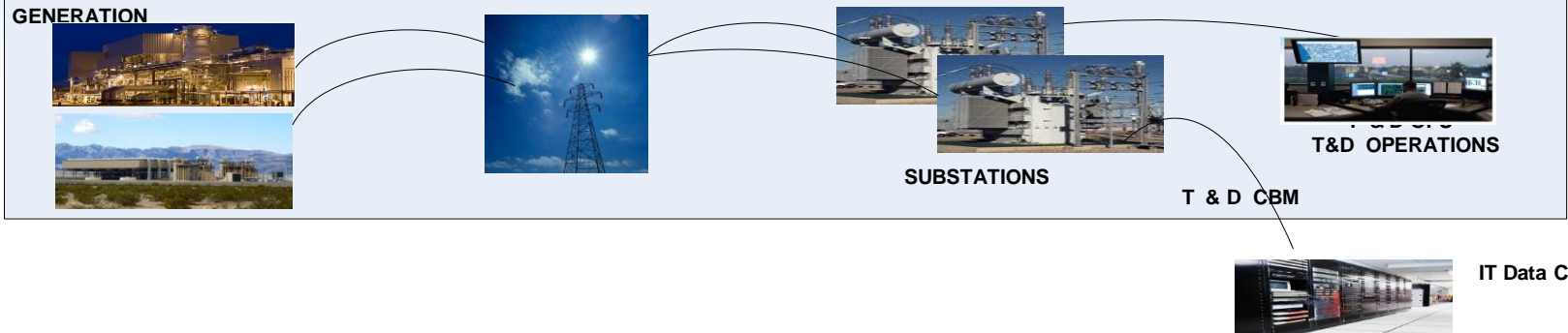


- 1,800 miles of electric transmission lines and 21,600 miles of electric distribution lines
- Two compressor stations, 160 miles of natural gas transmission pipelines, 8,100 miles of distribution pipelines and 6,200 miles of service lines
- 4,500 employees

GAS SYSTEM



ELECTRICAL SYSTEM

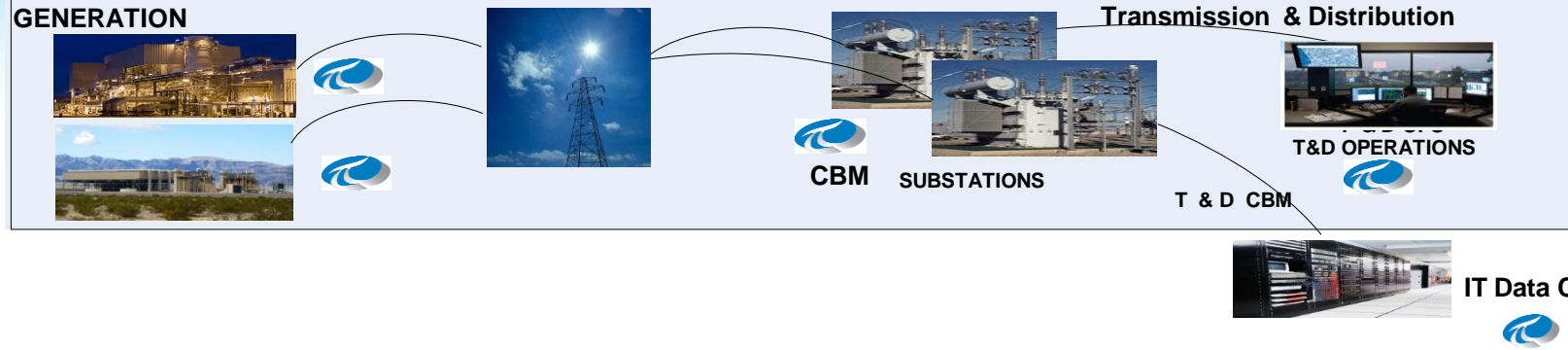


OSIsoft PI Systems at SDG&E

GAS SYSTEM



ELECTRICAL SYSTEM



OSIsoft PI Systems at SDG&E



2003 - T&D Operational Data (~ 260,000 tags)

Ability to integrate Transmission and Distribution data

2003 fire storm & activated in EOC, monitor EMS IT assets, T&D Planning, Engineering, Grid Operations, Distribution Operations, Substation

2005 - Generation (~ 30,000 tags)

Palomar, Miramar, Desert Star

Ability to monitor assets 24x7, operational efficiency, maintenance

2007 - CBM non-Operational Data (~ 150,000 Tags)

Monitor T&D substation assets, Reduce operational maintenance costs

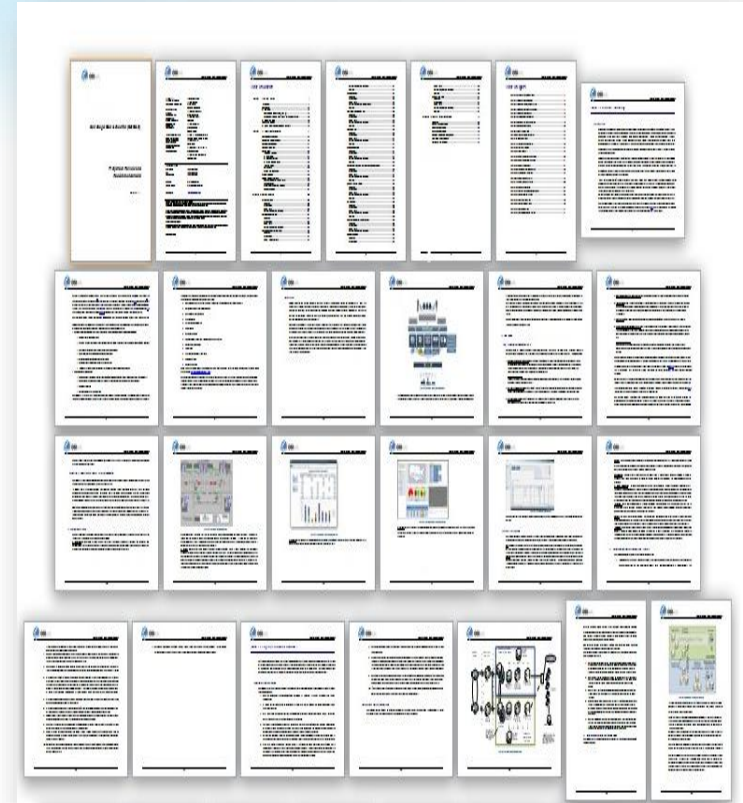
Event based notification, Dissolved gas analysis, LTC & Bushing monitoring

2011 - Enterprise Agreement (unlimited tags, EA Services)

Microgrid, Synchrophasors, PV integration, LPCN (On-Ramp) Interface, Cell Relay Monitoring, Gas Meter Events, Meter data (non-billing), EV's, Electric T&D, Asset Management, etc.

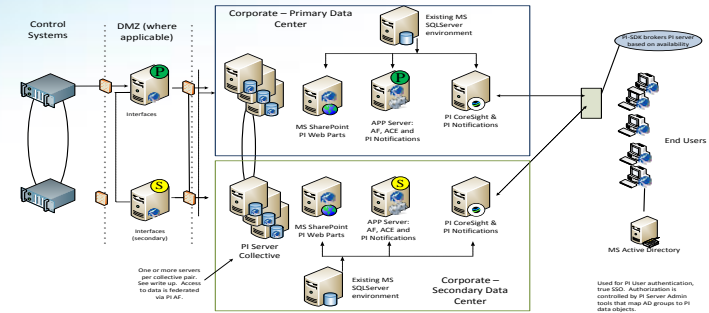
Smart Grid Projects Discovery Workshops

- Condition Based Maintenance (CBM)
- Borrego Springs Microgrid
- Synchrophasors
- Low Power Communication Network(OnRamp Wireless)
- Sustainable Communities and Substation PV
- Smart Meter Data Collection (Voltage Monitoring)
- Weather Data Analysis
- Gas Meter Events Processing
- Advanced Energy Storage (AES)
- Dynamic Voltage Support
- EV Detection
- Dynamic Line Rating
- Distribution Phase Imbalance



PI System Review & Recommendations

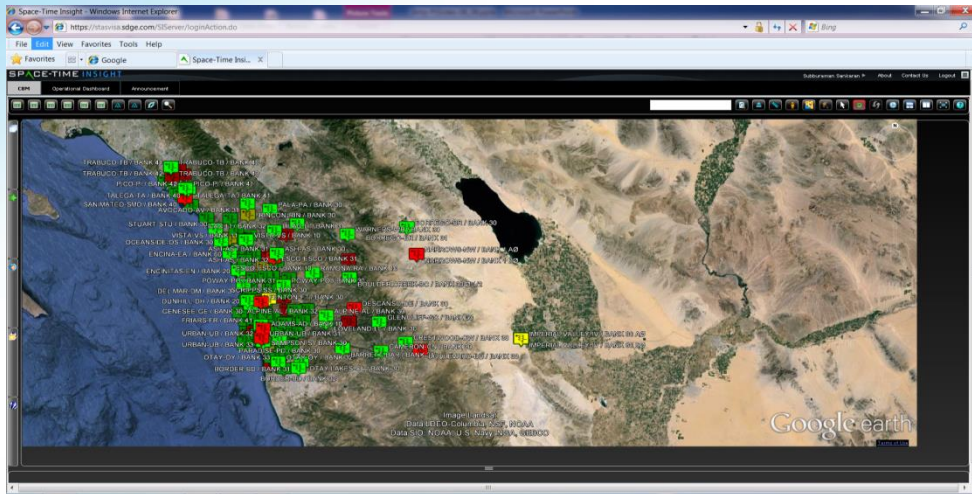
- Based on discovery workshops
- Summary of existing implementation & upcoming projects
- Provided basis for next generation, centralized architecture
- Provided insight into deployment options
- Provided guidance on internal CoE
- Recommendations on PI System use cases



Condition Based Maintenance

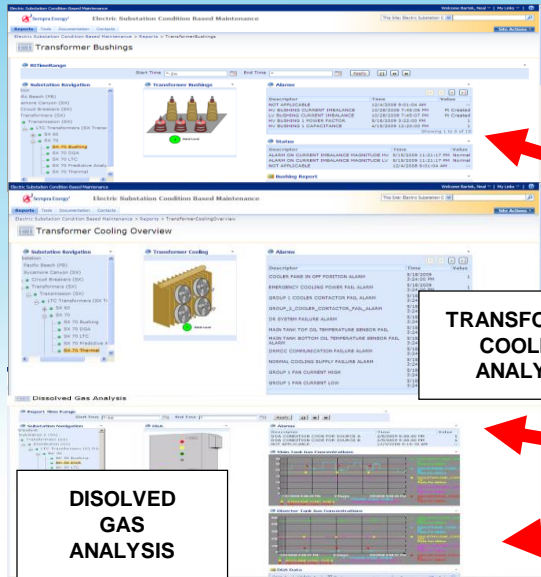
Extend the useful life and make greater utilization of transmission and distribution substation assets

Use technology to measure the performance and condition of equipment to make better maintenance decisions



% Load	40.25
Scada MVA	11.27
Scada MVAR	-1.34
Scada MW	11.2
LV Phase A Current	490
LV Phase B Current	509
LV Phase C Current	525
LV Winding Temp	0.0
LV Bushing Current Imbalance	
HV Winding Temp	0.0
HV Bushing Current Imbalance	0.63
Relative Saturation (Main Tank)	35
Relative Saturation (LTC)	37.01
Water Concentration (Main Tank)	22.4
Water Concentration (LTC)	24.57
Total Number of Tap Changes	22471

Condition Based Maintenance



Transformer Bushings

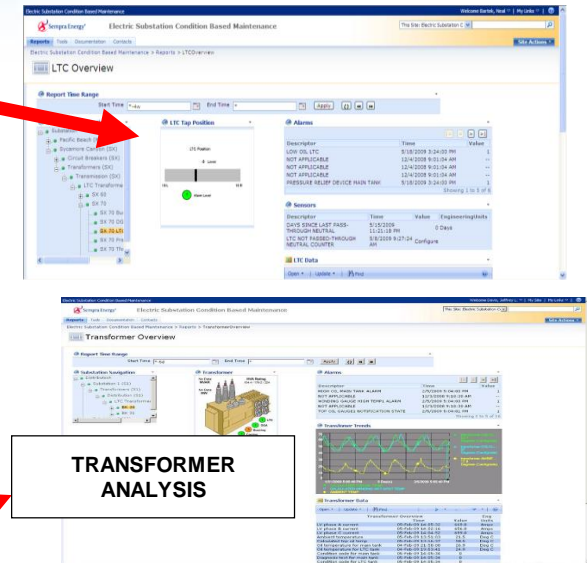
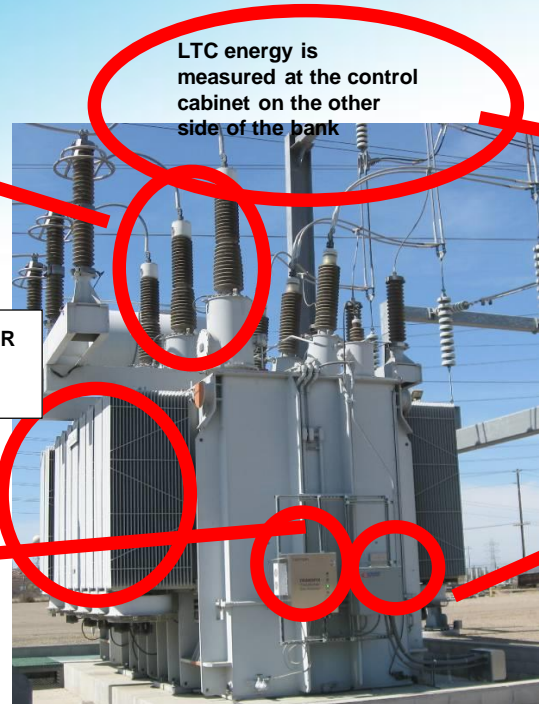
Asset Name	Value	Unit	Alarm
101-101-001	101-101-001	101-101-001	Normal
101-101-002	101-101-002	101-101-002	Normal
101-101-003	101-101-003	101-101-003	Normal
101-101-004	101-101-004	101-101-004	Normal
101-101-005	101-101-005	101-101-005	Normal

Transformer Cooling Overview

Asset Name	Value	Unit	Alarm
101-101-001	101-101-001	101-101-001	Normal
101-101-002	101-101-002	101-101-002	Normal
101-101-003	101-101-003	101-101-003	Normal
101-101-004	101-101-004	101-101-004	Normal
101-101-005	101-101-005	101-101-005	Normal

Disolved Gas Analyzes

Asset Name	Value	Unit	Alarm
101-101-001	101-101-001	101-101-001	Normal
101-101-002	101-101-002	101-101-002	Normal
101-101-003	101-101-003	101-101-003	Normal
101-101-004	101-101-004	101-101-004	Normal
101-101-005	101-101-005	101-101-005	Normal



LTC Overview

Report Time Range	Start Time	End Time
10/1/2019 12:00:00 AM	10/1/2019 12:00:00 AM	10/1/2019 12:00:00 AM

Transformer Overview

Asset Name	Value	Unit	Alarm
101-101-001	101-101-001	101-101-001	Normal
101-101-002	101-101-002	101-101-002	Normal
101-101-003	101-101-003	101-101-003	Normal
101-101-004	101-101-004	101-101-004	Normal
101-101-005	101-101-005	101-101-005	Normal

PI Notifications for CBM

MAR_BK41_DGA_A_AL3 - Message (HTML)

File Edit View Insert Format Tools Actions Help

From: [redacted]@semprautilities.com Sent: Thu 2/23/2012 12:58 PM
To: [redacted] CBM-XfmrLv3 NoAck NEW
Cc:
Subject: [redacted] DGA_A_AL3

Name: [redacted] Bank 41 DGA Main Tank Alarm Level 3
Server: AP-CBMINT-P01
Database: SDGE_CBM
Notification Start Time: 02/23/2012 12:57:25
Notification Trigger Time: 02/23/2012 12:57:25
Target: [redacted] 41

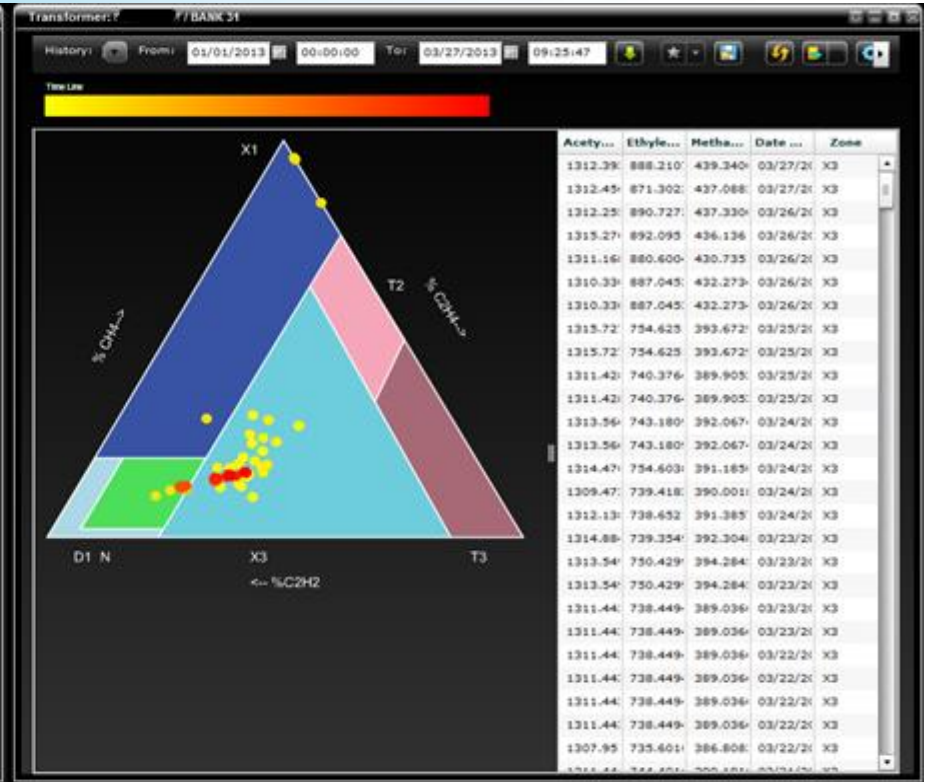
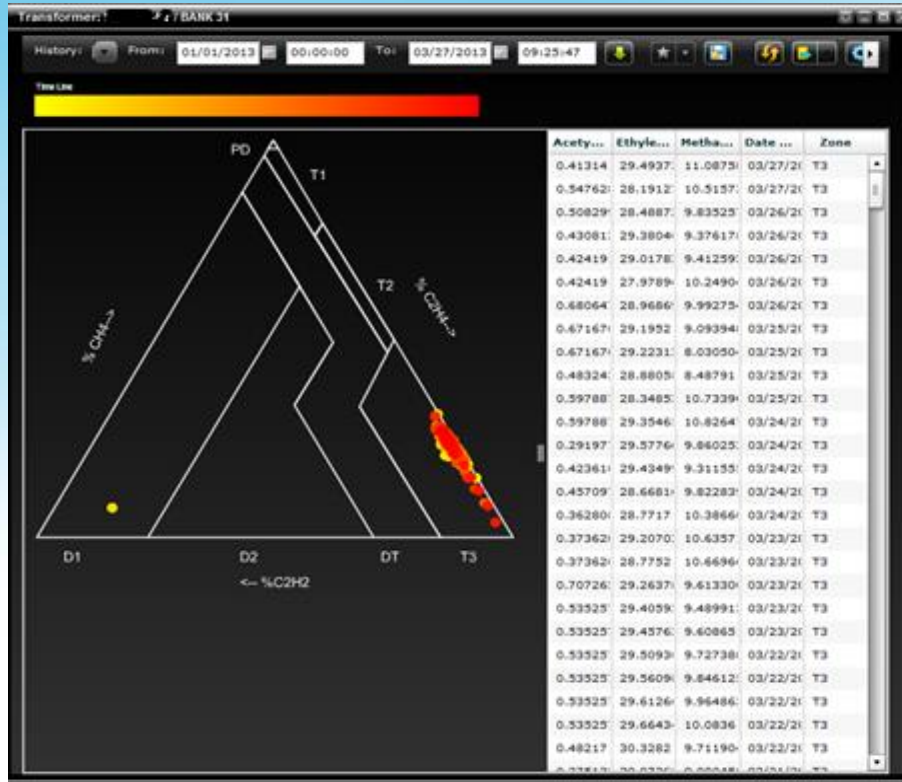
Trigger Input:

DGA.ALARM_MODE_FOR_A	Alarm
	02/22/2012 14:17:08

Attribute Value:

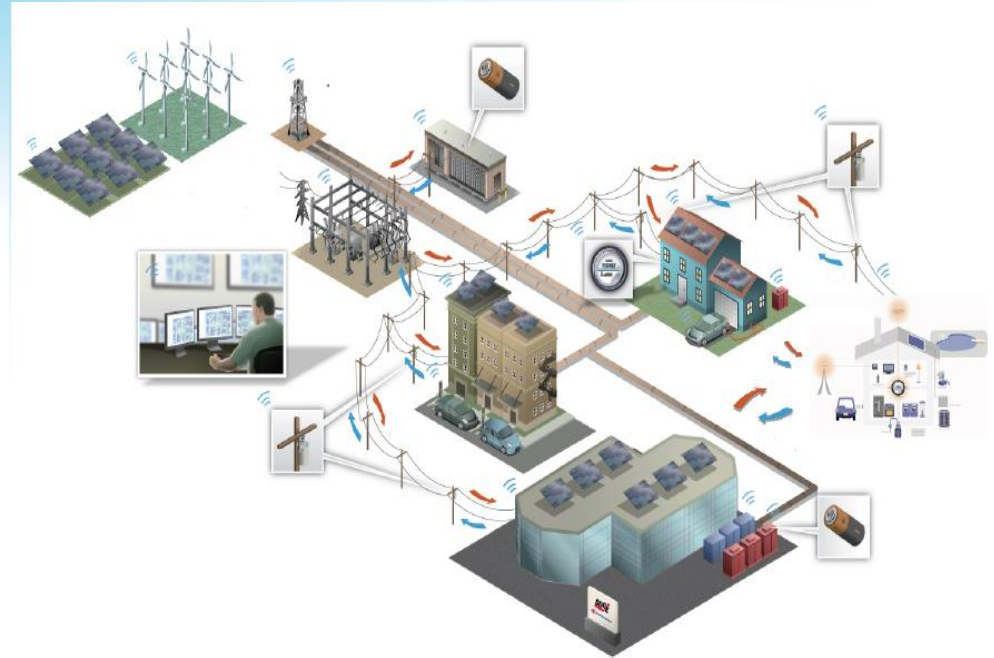
Gas Name	Level (ppm)	Limit Exceeded Alarm	ROC Alarm
Hydrogen - H2	0	Normal	Normal
Methane - CH4	6274.517	Alarm	Normal
Ethane - C2H6	13017.37	Alarm	Normal
Ethylene - C2H4	1234.017	Alarm	Normal
Acetylene - C2H2	538.7057	Alarm	Normal
TDCG	21033.83		
Water - H2O	2	Normal	Normal
Carbon Monoxide - CO	0	Normal	Normal
Carbon Dioxide - CO2	0	Normal	Normal
Oxygen - O2	395.9754	Normal	Normal
Nitrogen - N2	0	Normal	Normal
TDG	0		
Relative Saturation (%)	3.02948594093323		

Condition Based Maintenance



Borrego Springs Microgrid

- Integrate and leverage various generation and storage configurations.
- Reduce the peak load feeders and enhance system reliability.
- Enable customers to become more active participants in managing their energy usage.

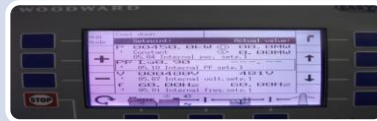


Borrego Springs Microgrid

- Each DER vendor provides its own control software
- No Automated controls or approval processes
- No Coordination with DMS
- No market participation
- No Optimization over multiple resource landscape



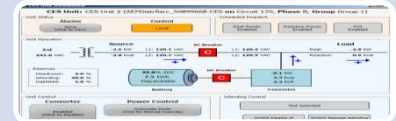
Woodward
controls for
generator 1



Woodward
controls for
generator 2



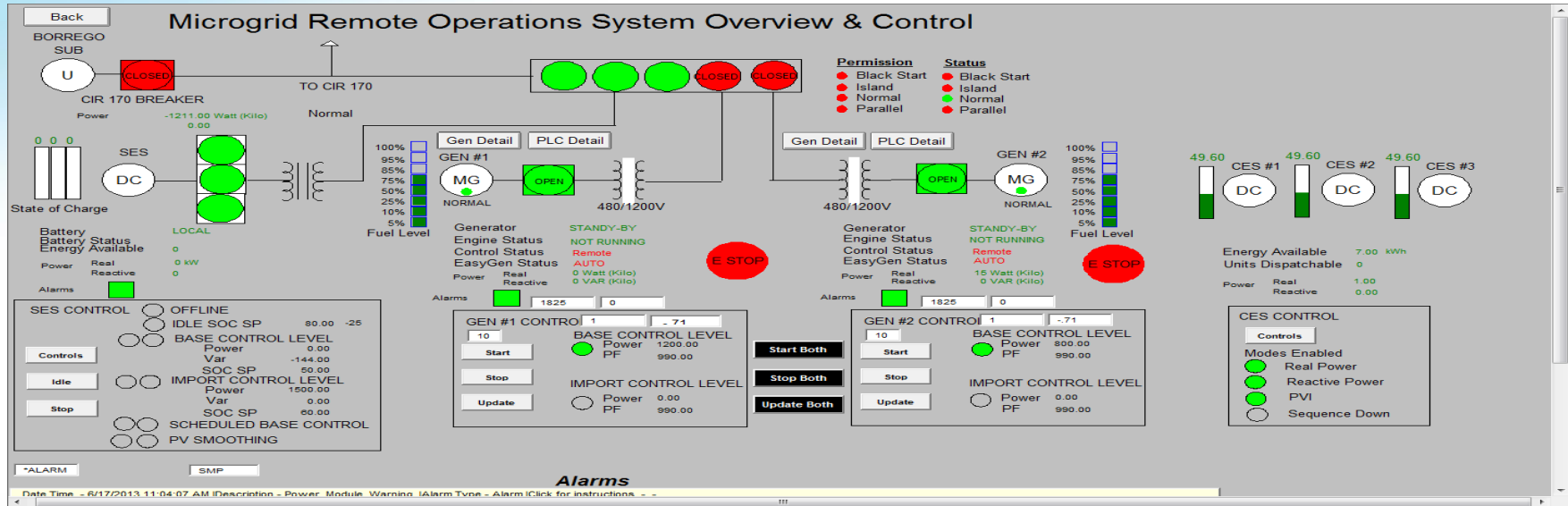
Soft SES unit



S&C CES
units

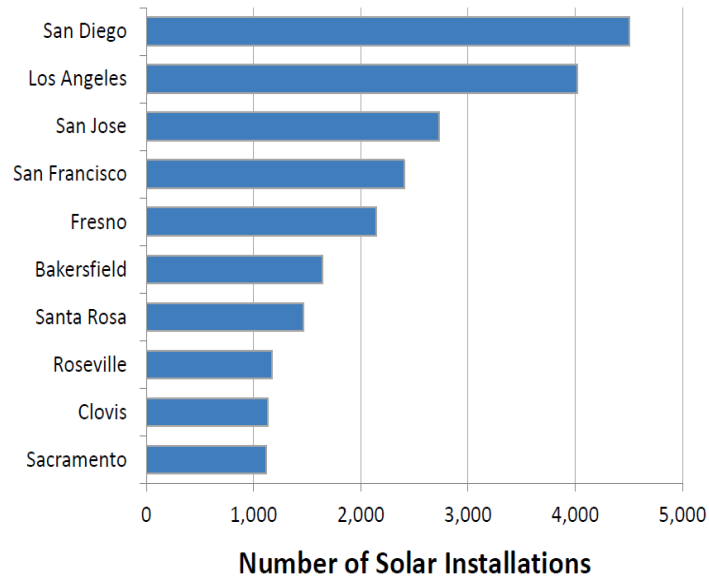
Borrego Springs Microgrid

- Centralized monitoring & control of multiple DER
- Integrates data from multiple sources (SCADA and various DER)
- Standardized controls across DER vendors
- PI Notifications used to monitor status of DER



Renewables Integration

SDG&E customers continue to install significant quantities and capacities of solar photovoltaic and other intermittent electric generation resources at residential and non-residential permises









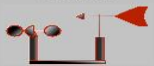

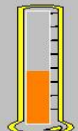

Source: California's Solar Cities 2012: Leaders in the Race Towards a Clean Energy Future; Environment California

Renewables Integration

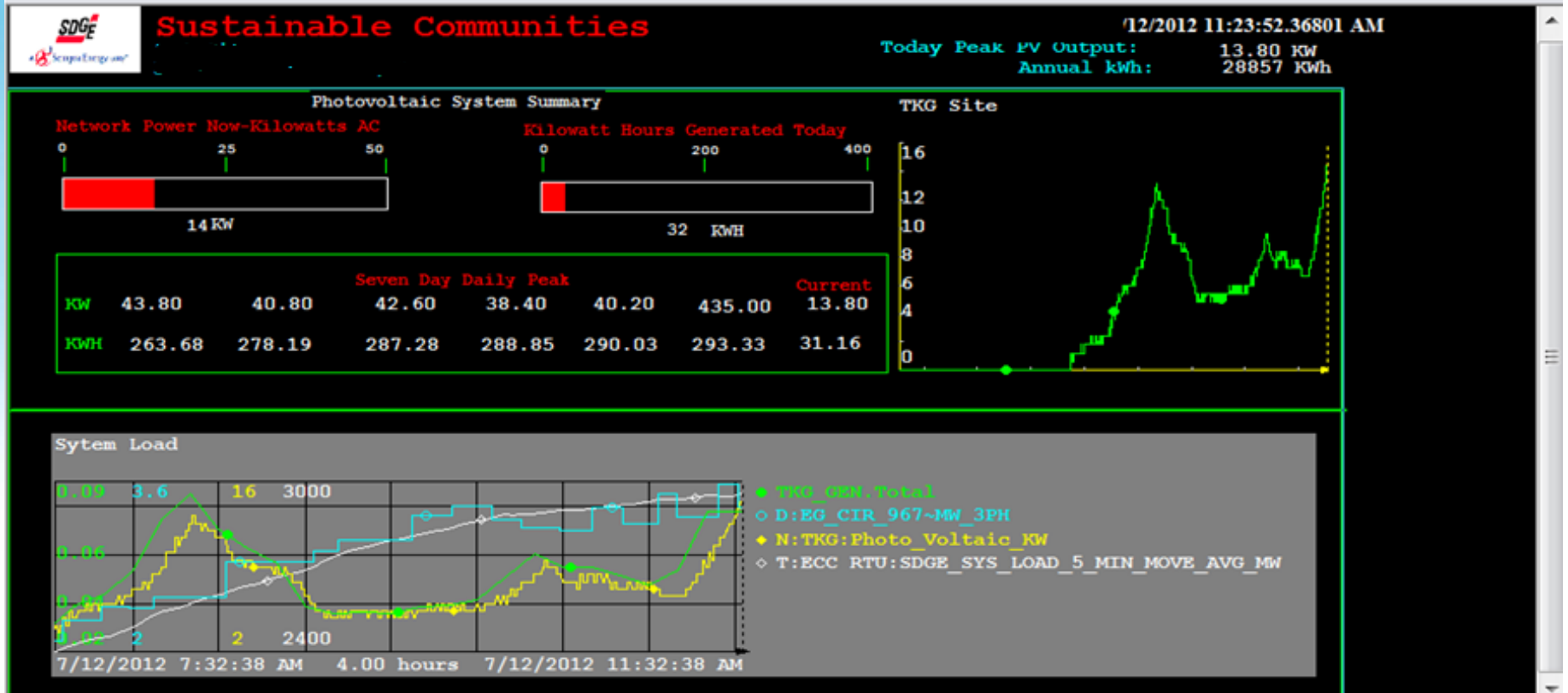
PI ProcessBook - [Command Center]

File Edit View Insert Tools Draw Arrange Window Help

10/6/2011 10:29/2011 C:\Users\AMANley\Desktop\EIC Processbook.PIW\Command Center

<p>SMON1</p> <ul style="list-style-type: none"> Total Current (A) 21.35 Ch.1 4.29 Ch.2 4.36 Ch.3 4.07 Ch.4 4.41 Ch.5 4.22 <p>Average Instantaneous Current (A) 4.27</p> <p>Tree #1</p> 	<p>SMON2</p> <ul style="list-style-type: none"> Total Current (A) 25.62 Ch.3 4.16 Ch.4 4.45 Ch.5 4.3 Ch.6 4.26 Ch.7 4.18 Ch.8 4.27 <p>Average Instantaneous Current (A) 4.27</p> <p>Tree #2</p> 	<p>SMON3</p> <ul style="list-style-type: none"> Total Current (A) 21.05 Ch.1 4.15 Ch.2 4.19 Ch.3 4.24 Ch.4 4.27 Ch.5 4.2 <p>Average Instantaneous Current (A) 4.21</p> <p>Tree #3</p> 	<p>SMON4</p> <ul style="list-style-type: none"> Total Current (A) 26.12 Ch.3 4.51 Ch.4 4.43 Ch.5 4.35 Ch.6 4.24 Ch.7 4.29 Ch.8 4.3 <p>Average Instantaneous Current (A) 4.35</p> <p>Tree #4</p> 	<p>SMON5</p> <ul style="list-style-type: none"> Total Current (A) 21.05 Ch.1 4.15 Ch.2 4.19 Ch.3 4.24 Ch.4 4.27 Ch.5 4.2 <p>Average Instantaneous Current (A) 4.21</p> <p>Tree #5</p> 	<p>SMON6</p> <ul style="list-style-type: none"> Total Current (A) 26.12 Ch.3 4.51 Ch.4 4.43 Ch.5 4.35 Ch.6 4.24 Ch.7 4.29 Ch.8 4.3 <p>Average Instantaneous Current (A) 4.35</p> <p>Tree #6</p> 	<p>Inverter Status</p> <ul style="list-style-type: none"> Invert RTU Comm AC Over Freq AC Under Freq AC Under Volt Invert Ambient Temp Inverter Comm Status CPU Load DC Over Volt DC Under Volt Drive A HI Drive A LO Drive B HI Drive B LO Drive C HI Drive C LO Fan 1 Fan 2 Power Supply Ground Fault Heatsink Temp Low Power Fault Module Fault -15v Fault +5v Fault PLL Fault Pre-Charge Fault Voltage Fault 	<p>Weather Status</p> <ul style="list-style-type: none"> RTU Comm <p>SMON Status</p> <ul style="list-style-type: none"> RTU Comm SMON1 RTU Comm SMON2 RTU Comm SMON3 RTU Comm SMON4 	<p>EIC SOLAR GROVE</p> <p>Live Display</p> <p>Weather</p>  <p>Wind Speed (MPH) 0.038</p> <p>Wind Direction (Degrees) 4.396</p> <p>Ambient Temperature (C) 29.812</p>	<p>Inverter</p>  <ul style="list-style-type: none"> DC Input Current (A) 99.4129 Line Frequency (Hz) 60.2271 AC Current A (A) 40.4349 Voltage A (V) 286.415 DC Input Voltage (V) 365.565 Line Kw (Kw) 33.4538 AC Current B (A) 40.4349 Voltage B (V) 284.616 AC Current C (A) 40.1157 Voltage C (V) 278.067 	<p>Panels</p>  <p>Panel Temperature (C) 48.24</p>  <p>Solar Irradiation (W/m²) 629.269</p>
--	--	---	--	---	--	--	--	--	---	---

Renewables Integration



Synchrophasors

- The Synchrophasors provide near real-time synchronized state of the power system and disturbance data that can be analyzed to improve generator, transmission, and load modeling and to understand abnormal power system behavior in the power grid.
- Synchrophasors system will provide the system operators and engineers the power system situational awareness and visualization tools. Wide Area Situational Awareness (WASA) and visualization will enable the operator to:
 - Monitor System Stress (Phase Angle Separation)
 - Monitor Critical Voltage support
 - Monitor Frequency and rate of change of frequency
 - Monitor Critical tie-line loadings and generation
 - Oscillation detection
- CoE provided advice on use cases for Transmission, Distribution and Generation
- Used for condition assessment and generator modeling
- Potential for sharing data with WECC, CAISO, Universities and researchers for reliability and deeper analysis

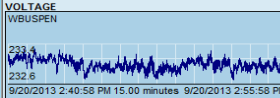
Synchrophasors

PI ProcessBook - [PMU Entire Service Region.pd]*

File Edit View Insert Tools Draw Arrange Window Help Show Details and Annotations

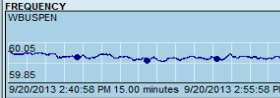
C:\Users\SSankara\Desktop\Transmission -Synchrophason\Process Innovation Scre... 7/12/2012

VOLTAGE
WBUSPEN



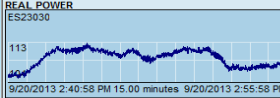
9/20/2013 2:40:58 PM 15.00 minutes 9/20/2013 2:55:58 PM

FREQUENCY
WBUSPEN



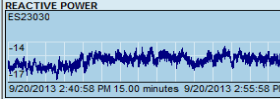
9/20/2013 2:40:58 PM 15.00 minutes 9/20/2013 2:55:58 PM

REAL POWER
ES23030



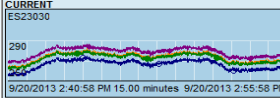
9/20/2013 2:40:58 PM 15.00 minutes 9/20/2013 2:55:58 PM

REACTIVE POWER
ES23030



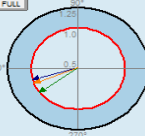
9/20/2013 2:40:58 PM 15.00 minutes 9/20/2013 2:55:58 PM

CURRENT
ES23030

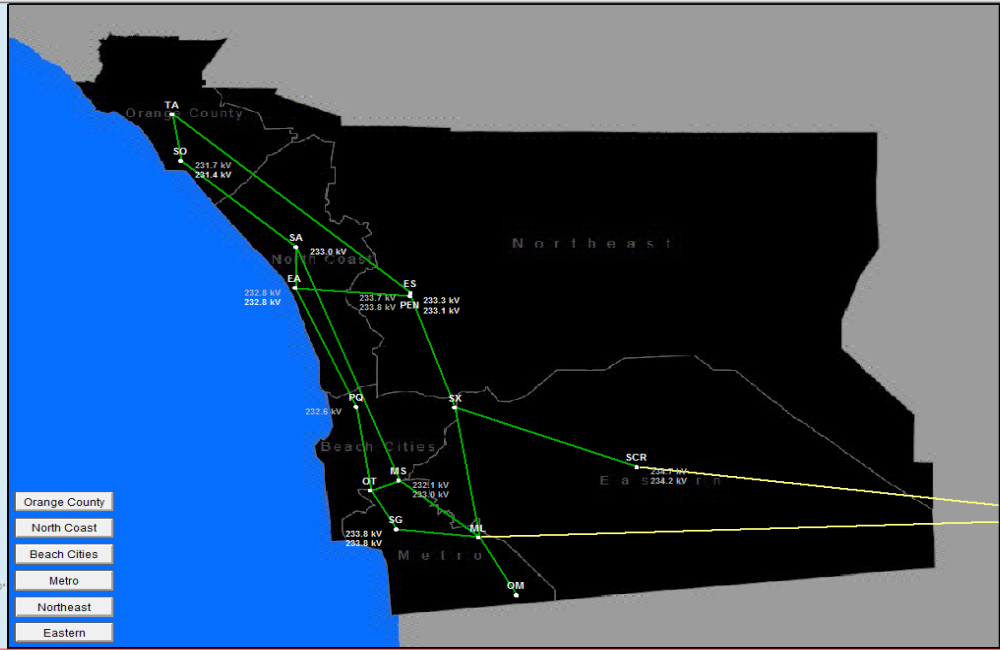


9/20/2013 2:40:58 PM 15.00 minutes 9/20/2013 2:55:58 PM

PHASOR CHART

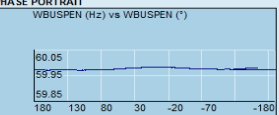


WBUSPEN 233 kV
SOSEBUS 232 kV -6°
NEBUSV230 233 kV 14°

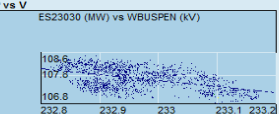


- Orange County
- North Coast
- Beach Cities
- Metro
- Northeast
- Eastern

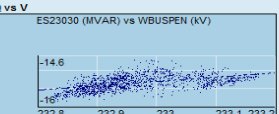
PHASE PORTRAIT
WBUSPEN (Hz) vs WBUSPEN (°)



P vs V
ES23030 (MW) vs WBUSPEN (kV)



Q vs V
ES23030 (MVAR) vs WBUSPEN (kV)



DISPLAY

TL Actual Simple

69 KV 138 KV 230 KV 500 KV

BUS Voltage

PMU

TIME RANGE

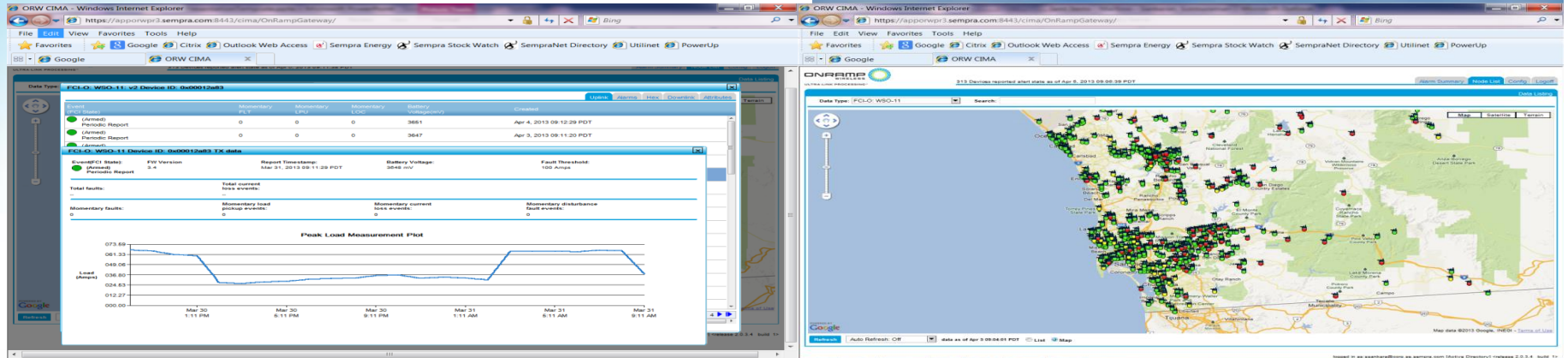
VOLT
FREQ
MODE
MW
MVAR
MVA

Ready Server Time

Low Power Communication Network

Acquiring additional data from smart grid wireless devices

- Fault Circuit Indicators
- Aircraft warning light status
- Smart Transformers



The screenshot displays a web-based monitoring interface for smart grid devices. The left pane shows a 'Peak Load Measurement Plot' graph and a table of device status. The right pane shows a map of a coastal region with numerous green and red markers representing device locations.

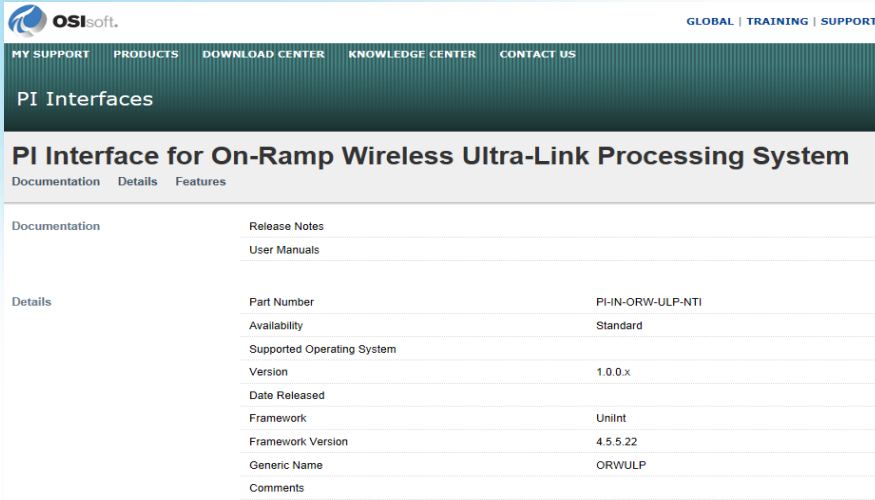
Device ID	Report Time	Report Status	Report Type	Report Date
FCI-01-WIC-11-v2 Device ID: 0x000120b3	Mar 31, 2013 09:12:29 PDT	OK	Periodic Report	Apr 4, 2013 09:12:29 PDT
FCI-01-WIC-11 Device ID: 0x000120b3	Mar 31, 2013 09:11:20 PDT	OK	Periodic Report	Apr 3, 2013 09:11:20 PDT

Peak Load Measurement Plot

The graph shows Load (amps) on the y-axis (012.27 to 073.69) and Time on the x-axis (Mar 30 1:11 PM to Mar 31 9:11 AM). The load fluctuates between approximately 024.63 and 061.33 amps.

LPCN(OnRamp) Interface

- OSIsoft developed interface and released as supported product to support this Initiatives
- Data can be combined with other operational data from EMS



OSIsoft. GLOBAL | TRAINING | SUPPORT

MY SUPPORT PRODUCTS DOWNLOAD CENTER KNOWLEDGE CENTER CONTACT US

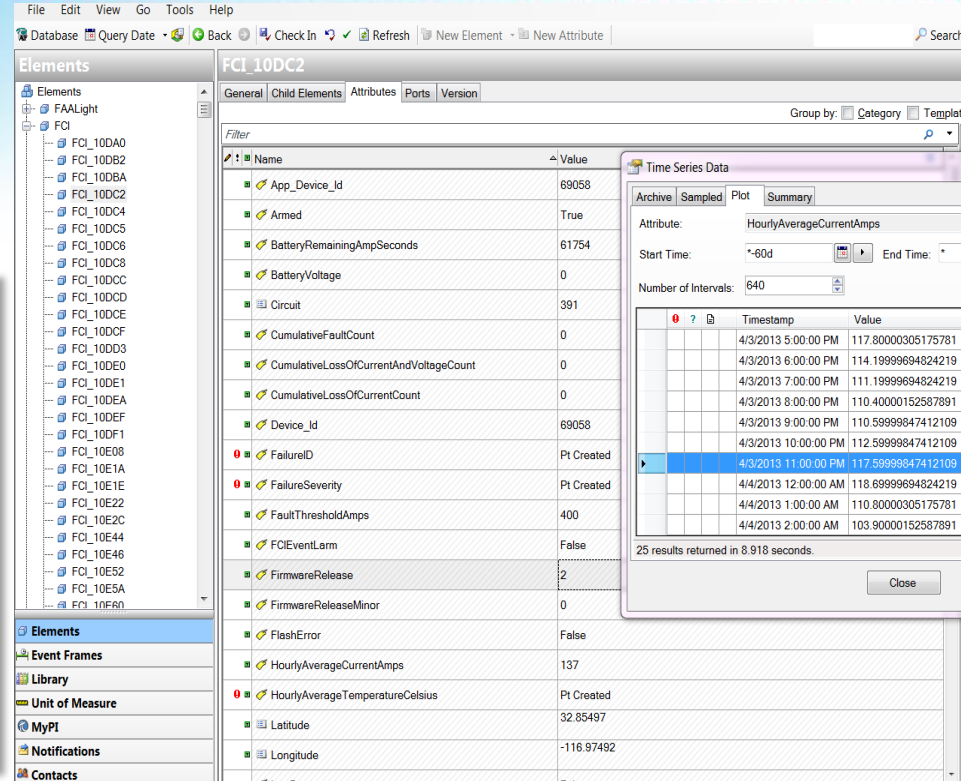
PI Interfaces

PI Interface for On-Ramp Wireless Ultra-Link Processing System

Documentation Details Features

Documentation	Release Notes
	User Manuals

Details	Part Number	PI-IN-ORW-UWP-NTI
	Availability	Standard
	Supported Operating System	
	Version	1.0.0.x
	Date Released	
	Framework	Unilnt
	Framework Version	4.5.22
	Generic Name	ORWULP
	Comments	



File Edit View Go Tools Help

Database Query Date Back Check In Refresh New Element New Attribute

FCI_10DC2

General Child Elements Attributes Ports Version

Group by: Category Template

Filter

Name	Value
App_Device_Id	69058
Armed	True
BatteryRemainingAmpSeconds	61754
BatteryVoltage	0
Circuit	391
CumulativeFaultCount	0
CumulativeLossOfCurrentAndVoltageCount	0
CumulativeLossOfCurrentCount	0
Device_Id	69058
FailureID	Pt Created
FailureSeverity	Pt Created
FaultThresholdAmps	400
FCIEventLarm	False
FirmwareRelease	2
FirmwareReleaseMinor	0
FlashError	False
HourlyAverageCurrentAmps	137
HourlyAverageTemperatureCelsius	Pt Created
Latitude	32.85497
Longitude	-116.97492

Time Series Data

Archive Sampled Plot Summary

Attribute: HourlyAverageCurrentAmps

Start Time: -60d End Time:

Number of Intervals: 640

Timestamp	Value
4/3/2013 5:00:00 PM	117.80000305175781
4/3/2013 6:00:00 PM	114.19999694824219
4/3/2013 7:00:00 PM	111.19999694824219
4/3/2013 8:00:00 PM	110.40000152587891
4/3/2013 9:00:00 PM	110.59999847412109
4/3/2013 10:00:00 PM	112.59999847412109
4/3/2013 11:00:00 PM	117.59999847412109
4/4/2013 12:00:00 AM	118.69999694824219
4/4/2013 1:00:00 AM	110.80000305175781
4/4/2013 2:00:00 AM	103.90000152587891

25 results returned in 8.918 seconds.

Close

Elements

Event Frames

Library

Unit of Measure

MyPI

Notifications

Contacts

LPCN -Smart Transformer

ORW CIMA - Windows Internet Explorer

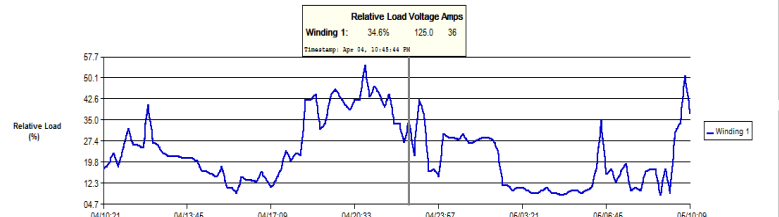
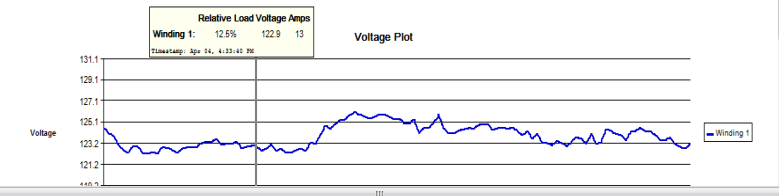
https://apporwpr3.sempra.com:8443/cima/OnRampGateway/

TIQ-P: Transformer IQ: Device ID: 0x00002277 Transformer ID: 1

Status	Relative Load	Voltage	Amps	Min Voltage	Max Voltage	Power Factor	Top Oil	Hot Spot	Created
●	1: 37.4%	123.0	39	122.4	123.2	0.986 (Lag)	25.3°C	27.4°C	Apr 5, 2013 10:09:51 PDT
	2: 31.7%	118.6	33	118.5	119.4	0.998 (Lag)	25.3°C	26.7°C	
●	1: 50.9%	122.6	53	122.4	123.4	0.990 (Lag)	25.3°C	29.1°C	Apr 6, 2013 09:58:05 PDT
	2: 38.4%	118.7	40	118.0	119.3	0.999 (Lag)	25.3°C	27.9°C	
●	1: 33.6%	129.8	34	129.7	129.3	0.984 (Lag)	24.8°C	26.8°C	

Device ID: 0x00002277 Transformer ID: 1 TX Data Plot

Starting Timestamp: Apr 4, 2013 10:21:42 PDT Measurement Count: 120

PI Processlink [Summary]

Real-time System Values:

Voltages:
 Voltage_A: 120.40 < 0.00
 Voltage_B: 120.50 < 179.98
 Voltage_AB: 241.20 < 0.00

Currents:
 I_A: 0.20 < 18.00
 I_B: 0.00 < -119.24

Apparent Power:
 VA_A: 25.00 VA_AB: 17.02
 VA_B: 4.00

Reactive Power:
 VAR_A: -9.00 VAR_AB: -11.94
 VAR_B: -3.00

True Power:
 WATTS_A: 25.00 WATTS_AB: 25.97
 WATTS_B: 1.00

Power Factors:
 PF_A: 95.00
 PF_B: 48.00

Frequency:
 FREQ: 59.99

System Max Values:

Currents:
 IA_MAX: 10.90 2/1/2011 8:03:54 48401 PM
 IB_MAX: 11.10 2/1/2011 8:03:54 48401 PM
 IL_MAX: 11.50 2/1/2011 8:03:54 48401 PM

Voltages:
 Voltage_A_MAX: 123.20 2/1/2011 8:03:54 48401 PM
 Voltage_B_MAX: 123.30 2/1/2011 8:03:54 48401 PM
 Voltage_AB_MAX: 2437.00 1/31/2011 12:00:00 AM

Reactive Power:
 VAR_A_MAX: -7.95 2/1/2011 12:00:00 AM
 VAR_B_MAX: -87.00 1/31/2011 12:00:00 AM
 VAR_AB_MAX: -96.97 1/31/2011 12:00:00 AM

True Power:
 WATTS_A_MAX: 943.00 1/31/2011 12:00:00 AM
 WATTS_B_MAX: 967.00 1/31/2011 12:00:00 AM
 WATTS_AB_MAX: 1479.39 1/31/2011 12:00:00 AM

Apparent Power:
 VA_A_MAX: 947.00 1/31/2011 12:00:00 AM
 VA_B_MAX: -1.98 2/1/2011 12:00:00 AM
 VA_AB_MAX: 975.00 1/31/2011 12:00:00 AM


System Averages:

Reactive Power:
 VAR_A_AVG: 41.00
 VAR_B_AVG: 2.00

Apparent Power:
 VA_AB_AVG: 11.19

True Power:
 WATTS_A_AVG: 25.00
 WATTS_B_AVG: 2.00

Temperature (C):
 Meter Box Temp (C): 27.31



Gas Meter Event Processing

- Consume gas meter events for analysis
- Provide exceptions back to meter data management system
- Provided advice on implementation approach and sizing
- 900k meters, 6 events each, twice a day
- 5.4MM tags



Figure 1 - Conceptual Overview

PI Server 2012		Data Archive Sizing	
<i>Please review and modify the values in yellow cells, sizing recommendations are shown in orange cells</i>			
PI Collectible Size	2 members	PI Interface Nodes	3 nodes
Total Point Count	5,500,000 points	Active Client Applications	1 application
Average Point Sampling	43,500.00000 sec (0 Hz)	Average Query Interval	60 seconds
Data Retention Requirement	48 months	Average Query Range	8.0 hours
Measurement Data Type	int32 (32-bit precision)	Average Points per Query	1,000 points
Average Data Compression	90 % (10:1)	Estimated Query Rate	1 events/sec
Estimated Snapshot Rate	126 events/sec		
Estimated Event Size	7 bytes	PROCESSOR	
Estimated Archiving Rate	13 events/sec	Minimum CPU Count	4 cores*
		Recommended CPU Count	8 cores*
		<i>(*) Physical cores (not counting Hyper-Threading) or 100% allocated virtual cores</i>	
STORAGE		MEMORY	
Minimum Archive Size	10,750 MB	Minimum RAM	32,250 MB
Recommended Archive Size	25 GB	Recommended RAM	75 GB
Total Online Disk Space	200 GB	Estimated Cache Capacity	163,880 hours
Estimated Archive Count	1 files/year	Estimated Cache Efficiency	100 %
Estimated Archive Volume (per PI Collectible member)	0 MB/hour 0 GB/month	Non-Cached Archive Reads	- events/sec
DISK I/O		NETWORK	
Minimum Disk Throughput	18 MB/sec	Minimum Bandwidth*	10 Mbps
Minimum Disk Latency	10 IOPS*	Recommended Bandwidth*	100 Mbps
Recommended Disk Throughput	20 MB/sec		
Recommended Disk Latency	100 IOPS*		

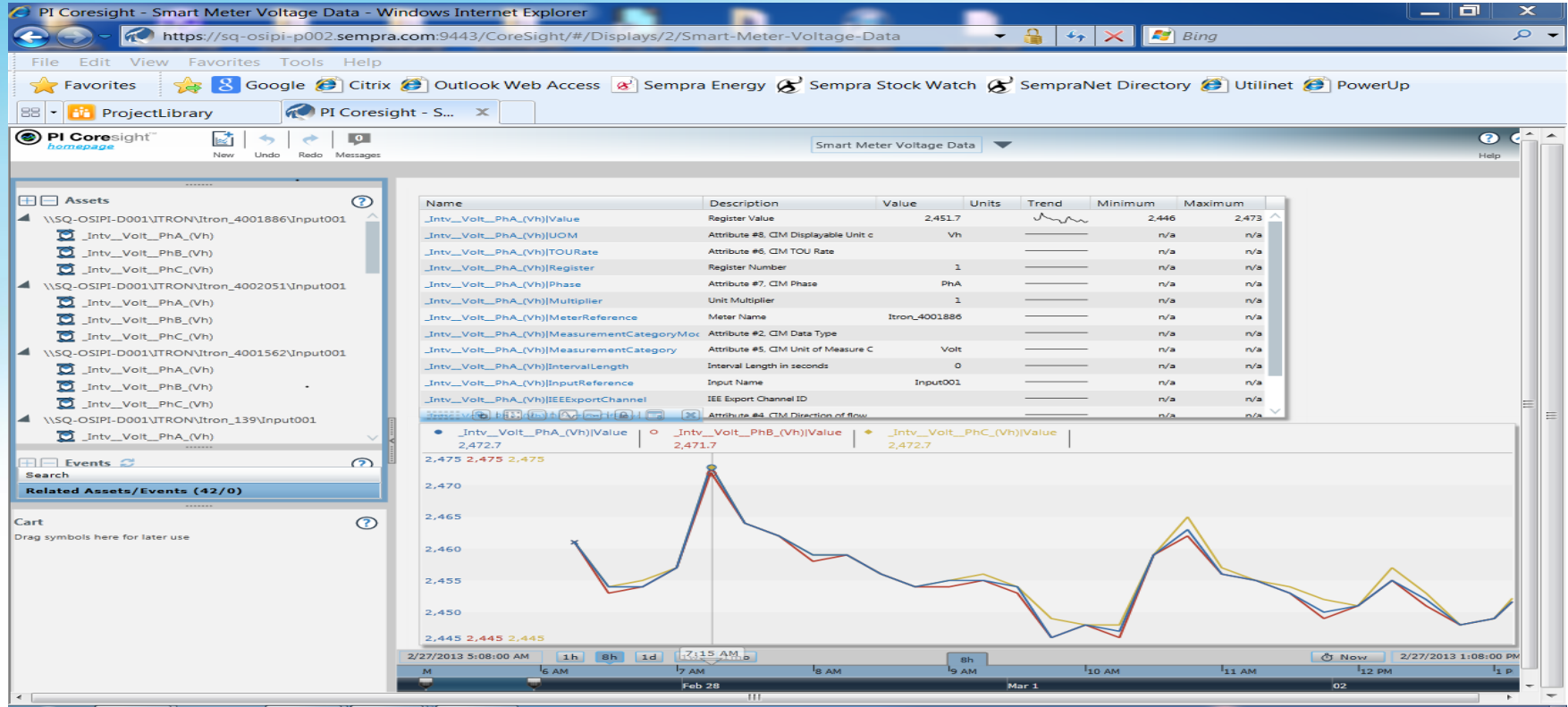
(* See "KB Article #xxxxx" for details on how to evaluate IOPS

Non-Billing Smart Meter Data Analytics

- New subscriber interface to head-end system
- Collect instantaneous voltage levels
- Analyze voltage against upstream data
- Targeting PV and older circuits customers first
- CoE Provided project advice, architecture, sizing, etc.
- Developing production interface to head-end system
- Supports auto-creation of PI AF elements

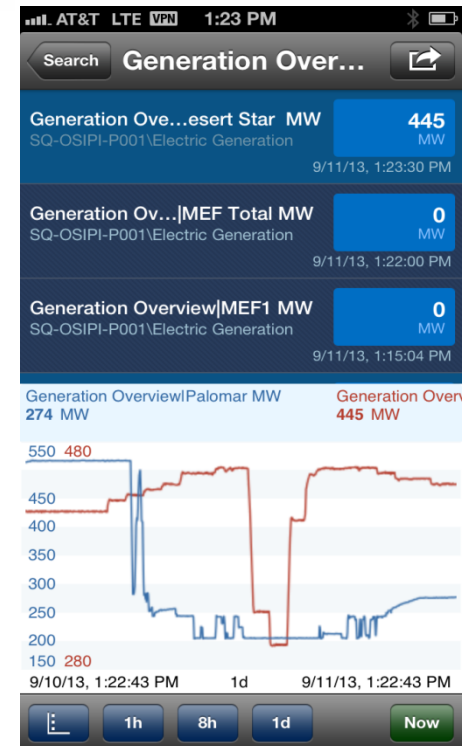
configuration Date	2/2/2011	2/2/2011	2/24/2011 1	2/2/2011	6/19/2012	9/6/2012
Voltage Monitor						
Enable Voltage Monitor	True	True	False	True	True	True
Phase Selection	Phase A	Phase A	Phase A	Phase A	Phases A, B, C	Auto Detect
Interval Length	60 minutes	60 minutes	5 minutes	15 minutes	15 minutes	15 minutes
VoltHour Low Threshold (per interval)	93	93	80	93	93	93
VoltHour High Threshold (per interval)	107	107	120	107	107	107
RMS Volt Low Threshold	192	192	192	192	80%	80%
RMS Volt High Threshold	288	288	288	288	120%	120%
Instantaneous Voltage High/Low Alarm Latency	N/A	N/A	N/A	N/A	N/A	0 seconds

Non-Billing Smart Meter Voltage Data Analytics



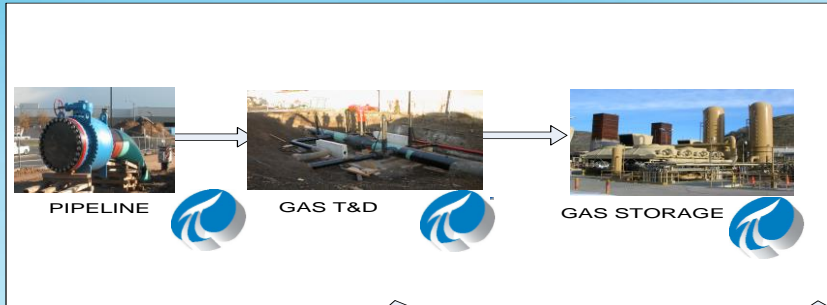
Mobility

- Provide KPI and executive summary displays (generation, system load, outages, load flows, etc.)

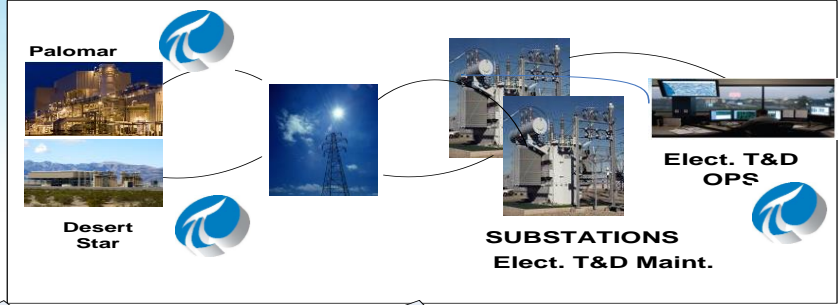


Current State

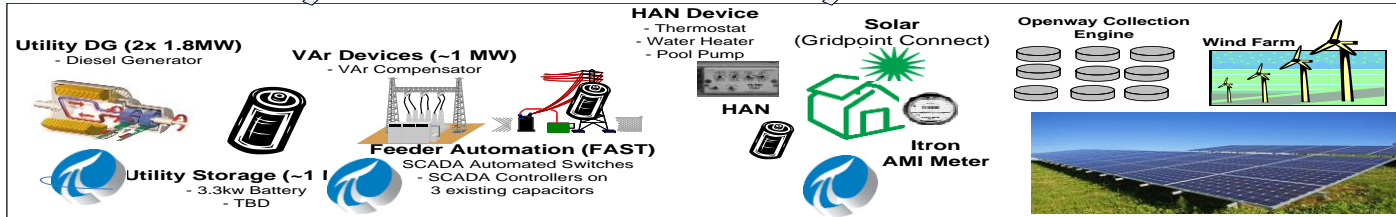
GAS SYSTEM



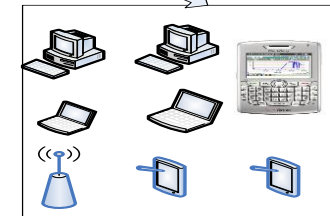
ELECTRICAL SYSTEM



Smart Grid



Client Applications



Key Reasons For Adopting Enterprise Approach

- **Vendor Management**

- SDG&E has multiple instances of PI System installed across the business areas.
- Procurement effort was an order of magnitude greater in the site-by-site approach.
- Excessive time required to negotiate each new project

- **Internal Support**

- Lack of ownership for applications & configuration management

- **Architecture**

- Inconsistent infrastructure standards-Security,Redundancy,SoftwareTools and Upgrade
- Application Integration was fragmented

- **Missed Opportunities**

- Data was under utilized (silos)
- Missed business application (SmartGrid)
- Under utilized operational (PI System) and business data for real time decision making

- **Vendor Management**

- Managing the total cost of ownership while meeting growing business needs.
- Leveraging OSIsoft's EA model
 - Support Enterprise wide licensing
 - PI System rollout/monitoring
 - Center of excellence
- Improved relationship with OSIsoft to best leverage their platform to support all business needs.
 - OSIsoft's understanding of SDG&E Business
 - Facilitate broader communication
 - Understanding SDG&E technical issues

- **Smart Grid and Future Use Cases**

- Position ourselves to maximize the use of an enterprise solution while minimizing the software licensing and infrastructure costs
- Be innovative in the use of the Tsunami of data (Big Data) that the smart grid initiatives will bring to the enterprise

SDG&E Enterprise Strategy

- **Smart Grid and Future Use Cases (cont.)**
 - Condition assessment
 - Closing the loop in analytics and operations
- **Managing the total cost of ownership (TCO) of the existing infrastructure, while meeting growing business needs by:**
 - Consolidated systems where practical
 - Centralize PI System application support and management of infrastructure (and make use of the OSisoft provided Network Operations Center or NOC)
 - Self-service user access to the data for business intelligence and mobility
 - Consistent processes and procedures for rollout and migrations
 - Improved configuration management and maintenance
 - Reuse of existing catalog functions, analytics, displays and rules
 - Internal User group to share best practices in cross-functional group discussions for added value
 - Limit Data Replication

Success Criteria

- Manage total cost of ownership while meeting growing business needs
- Empower PI System users at SDG&E
- Support Smart Grid Initiatives and Future Use Cases

Summary of EA Benefits

- Strategic Expertise and Advice
- PI System Installs
- Interface Development
- PI System Monitoring
- PI System Promotion and Training Events
- Removed Project Constraints for Adoption
- Expanded Organizational Capabilities with one Toolset



THANK

YOU

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