

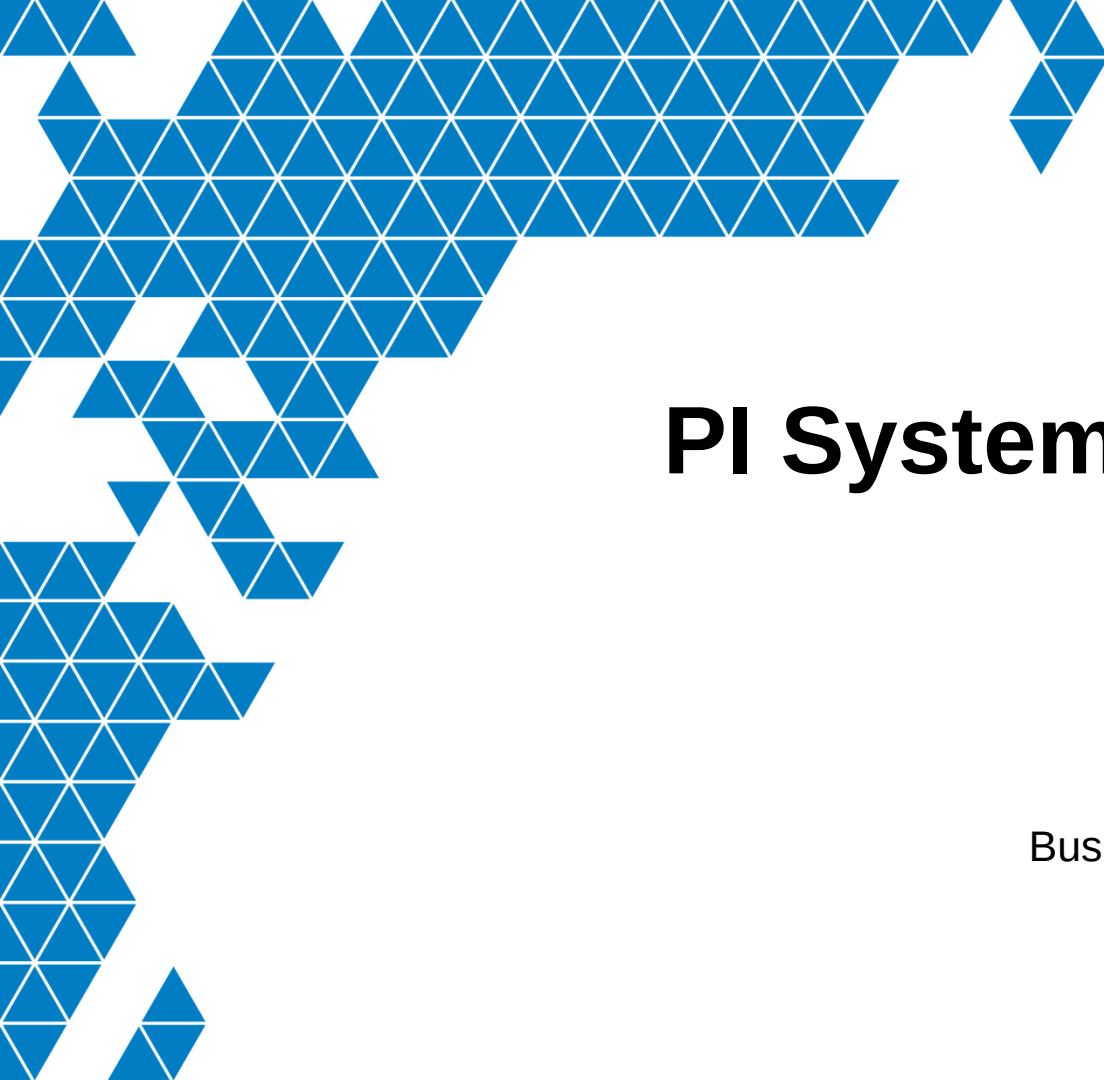


OSIsoft.

REGIONAL SEMINAR

E M E A

2012

A decorative graphic on the left side of the slide, consisting of a large, irregular shape made of many small blue triangles. The triangles are arranged in a way that creates a sense of depth and movement, with some triangles pointing towards the center and others pointing outwards. The overall effect is a complex, geometric pattern that fills the left side of the slide.

PI System in Smart Grids, T&D and Power

Presented by

Kevin P Walsh
Business Development – T&D Smart Grids



Agenda

- **Smart Grid – What does it really mean?**
- Smart Grid – Does it come with Directions?
- What are the Parts?
- What's important in a Smart Grid?
- End to End Visibility and Monitoring
 - PI System customer Use Cases
 - DTE
 - SEMPRA (SDG&E)
 - Xcel Smart Grid City
 - UCSD Micro Grid

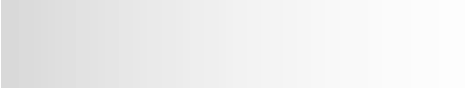


Smart Grids – What does it really mean??

- Does it mean AMI? Smart Meters?
- Does it mean HEMS?
- Does it mean DA/DMS?
- Does it mean PMUs?
- Does it mean DER?
- Does it mean Micro Grids?
- All of the above?
- Non of the above?
- Do we know our acronyms?



Smart Grids – What does it really mean??



“The Smart Grid isn’t a thing but rather a vision and to be complete, that vision must be expressed from various perspectives – its values, its characteristics, and the milestones for achieving it.”

Joe Miller – Smart Grid News.com



Smart Grids – What does it really mean??

- We know the following;
 - It must be more reliable
 - It must be more secure
 - It must be more economic
 - It must be more efficient
 - It must be more environmentally friendly
 - It must be safer



Smart Grids – What does it really mean??

- 5 Key Technologies that enable the Smart Grid:
 - Integrated Communications
 - Sensing and Measurements
 - Advanced Components
 - Advanced Controls
 - Improved Interfaces and Decision Support



Agenda

- Smart Grid – What does it really mean?
- **Smart Grid – Does it come with Directions?**
- What are the Parts?
- What's important in a Smart Grid?
- End to End Visibility and Monitoring
 - PI System customer Use Cases
 - DTE
 - SEMPRA (SDG&E)
 - Xcel Smart Grid City
 - UCSD Micro Grid

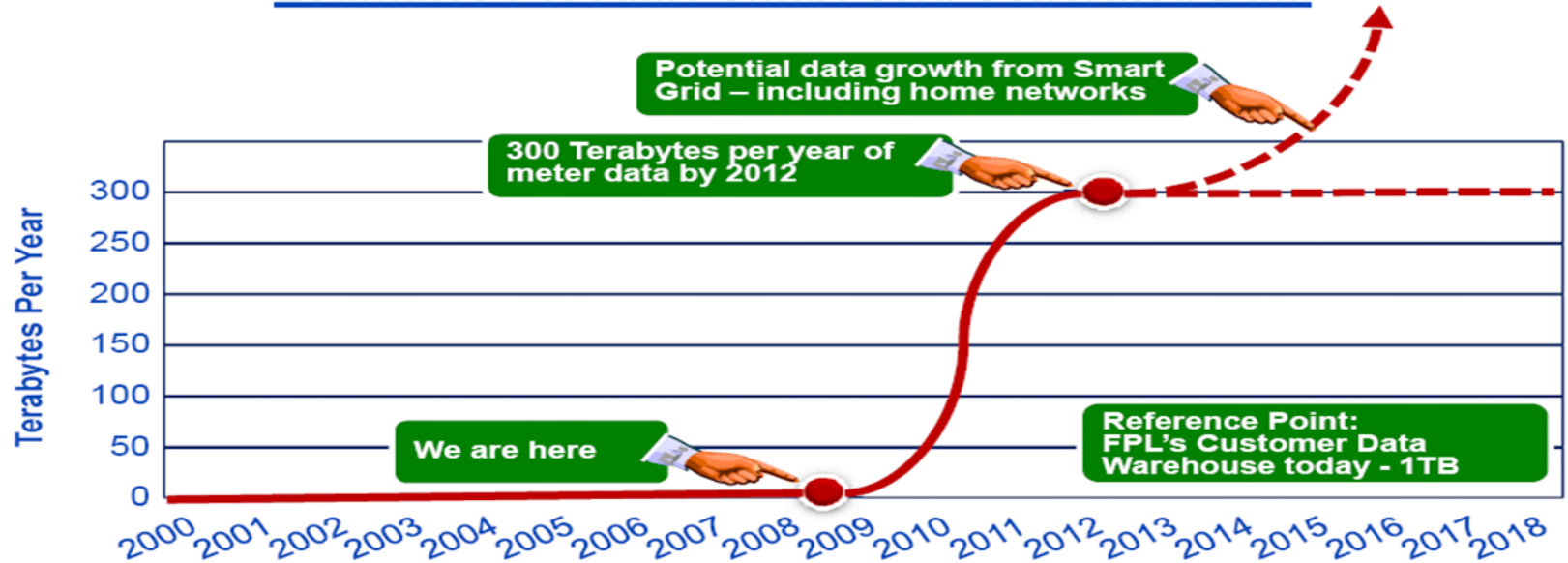
Smart Grid – Does it come with Directions?

- AMI and Smart Grid could be viewed like a box of Legos
- Legos are great, one can build most anything



Smart Grid – Does it come with Directions?

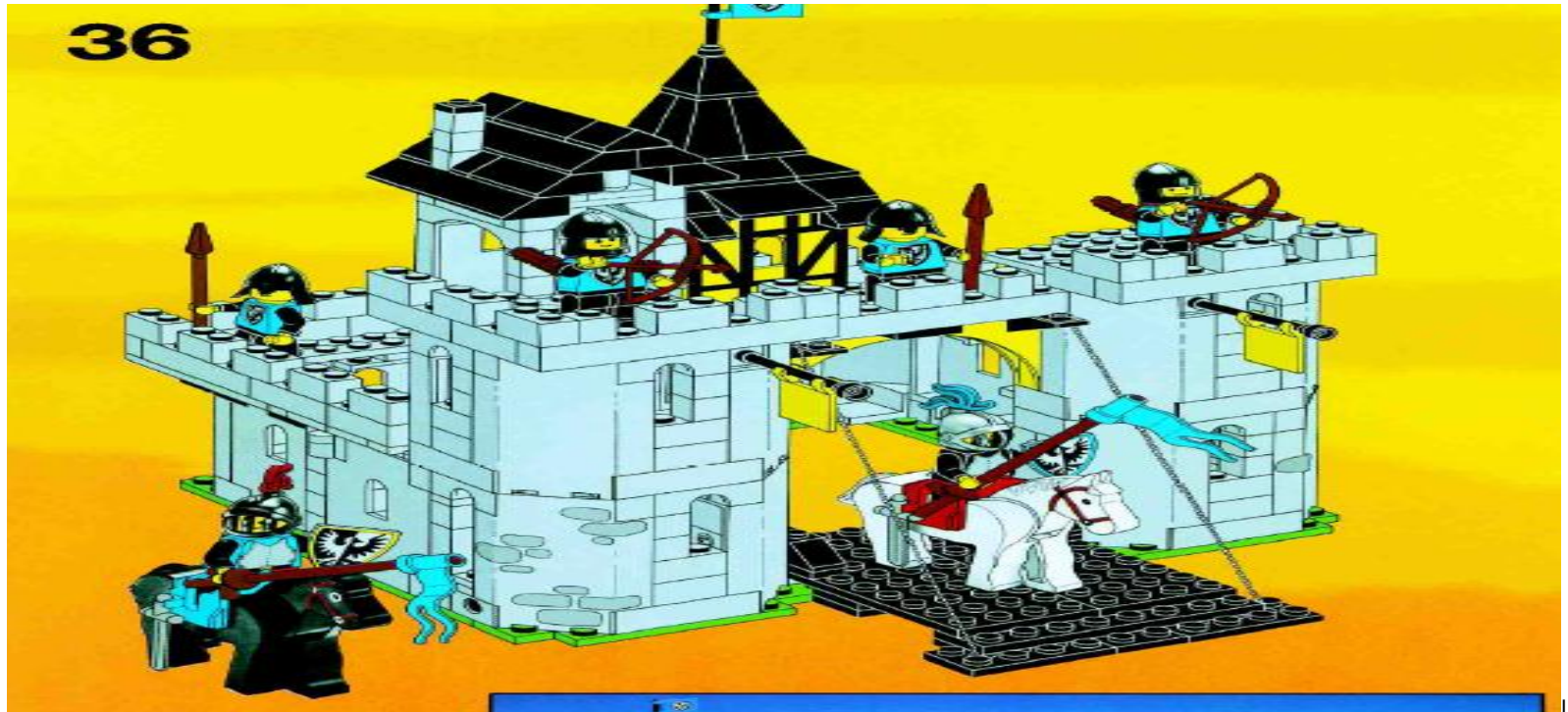
Estimates For AMI / Smart Grid Generated Data



AMI and Smart Grid will increase the amount of measurement and control points far beyond anything we have today – How we can leverage this data to compete?

Smart Grid – Does it come with Directions?

- And does not come with directions like Legos





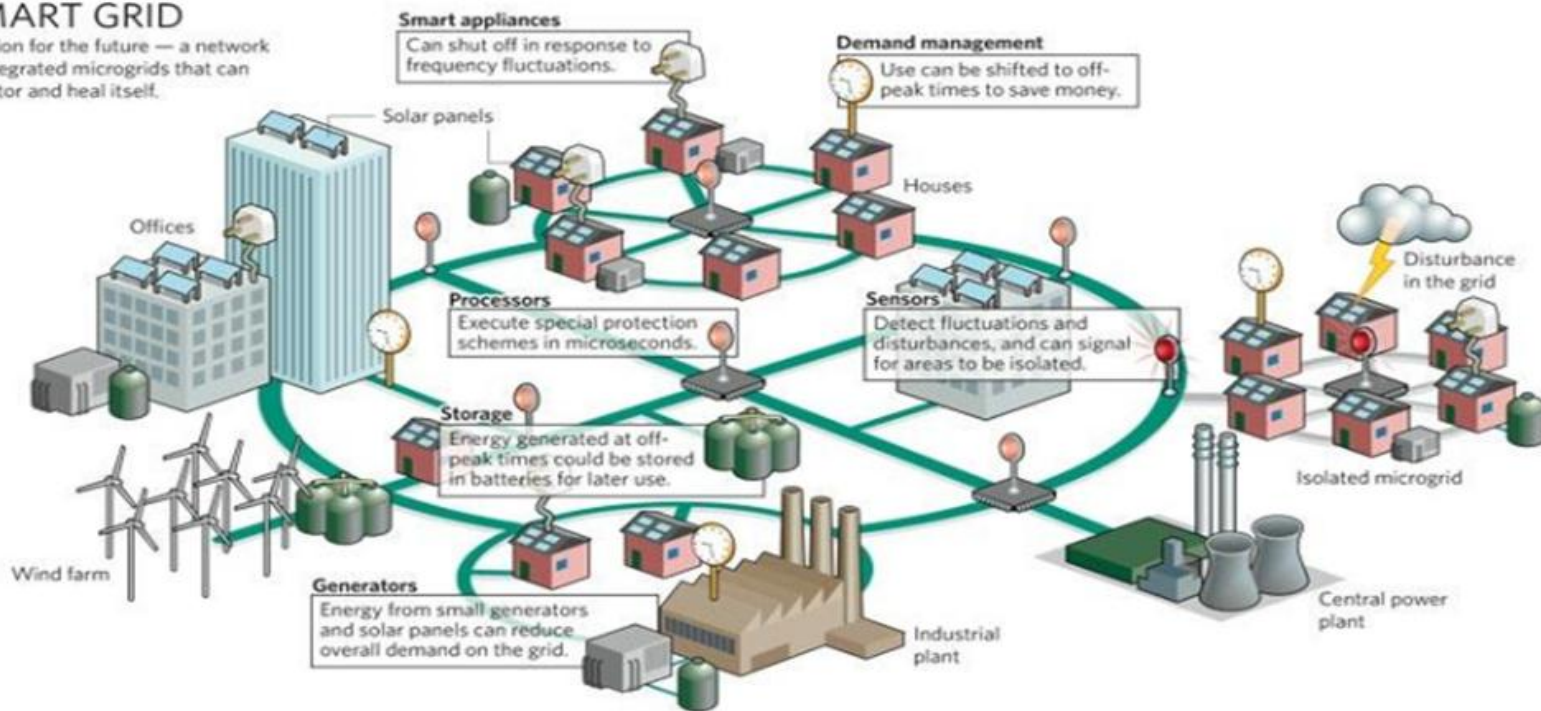
Agenda

- Smart Grid – What does it really mean?
- Smart Grid – Does it come with Directions?
- **What are the Parts?**
- What's important in a Smart Grid?
- End to End Visibility and Monitoring
 - PI System customer Use Cases
 - DTE
 - SEMPRA (SDG&E)
 - Xcel Smart Grid City
 - UCSD Micro Grid

What are the parts?

SMART GRID

A vision for the future — a network of integrated microgrids that can monitor and heal itself.





Agenda

- Smart Grid – What does it really mean?
- Smart Grid – Does it come with Directions?
- What are the Parts?
- **What's important in a Smart Grid?**
- End to End Visibility and Monitoring
 - PI System customer Use Cases
 - DTE
 - SEMPRA (SDG&E)
 - Xcel Smart Grid City
 - UCSD Micro Grid

What's important in a Smart Grid?

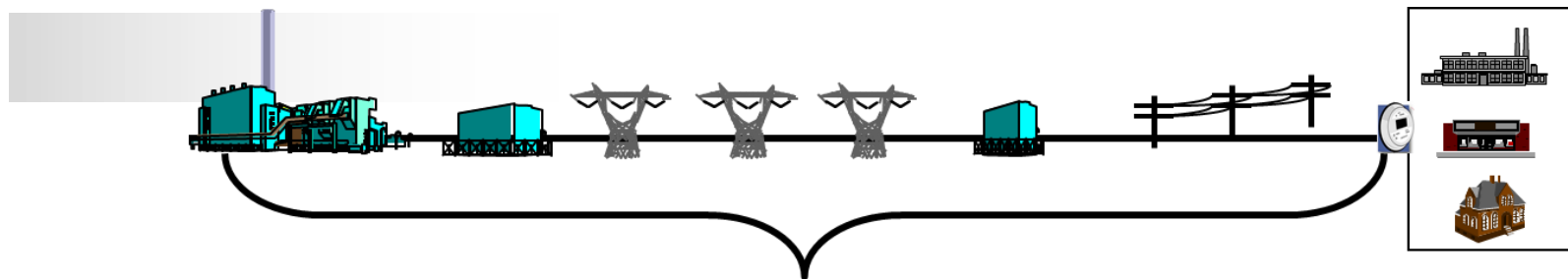




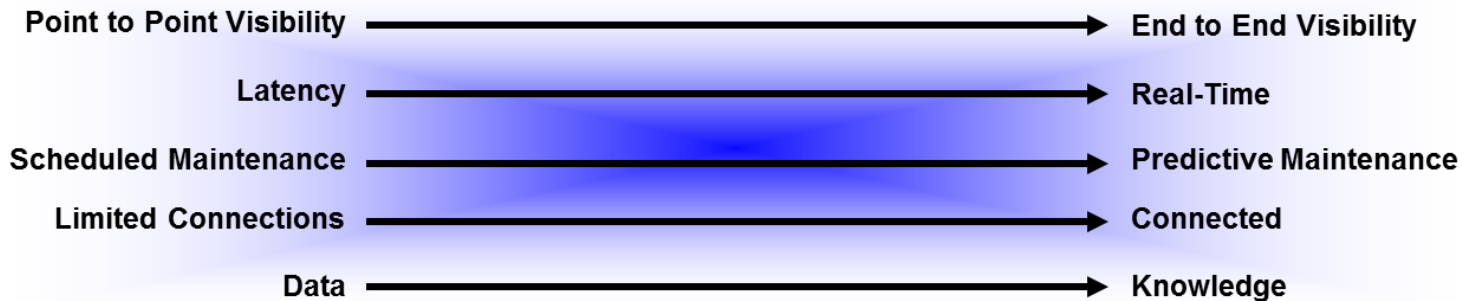
Agenda

- Smart Grid – What does it really mean?
- Smart Grid – Does it come with Directions?
- What are the Parts?
- What's important in a Smart Grid?
- **End to End Visibility and Monitoring**
 - PI System customer Use Cases
 - DTE
 - SEMPRA (SDG&E)
 - Xcel Smart Grid City
 - UCSD Micro Grid

End to End Visibility



Across the Enterprise
Transition



DTE Energy



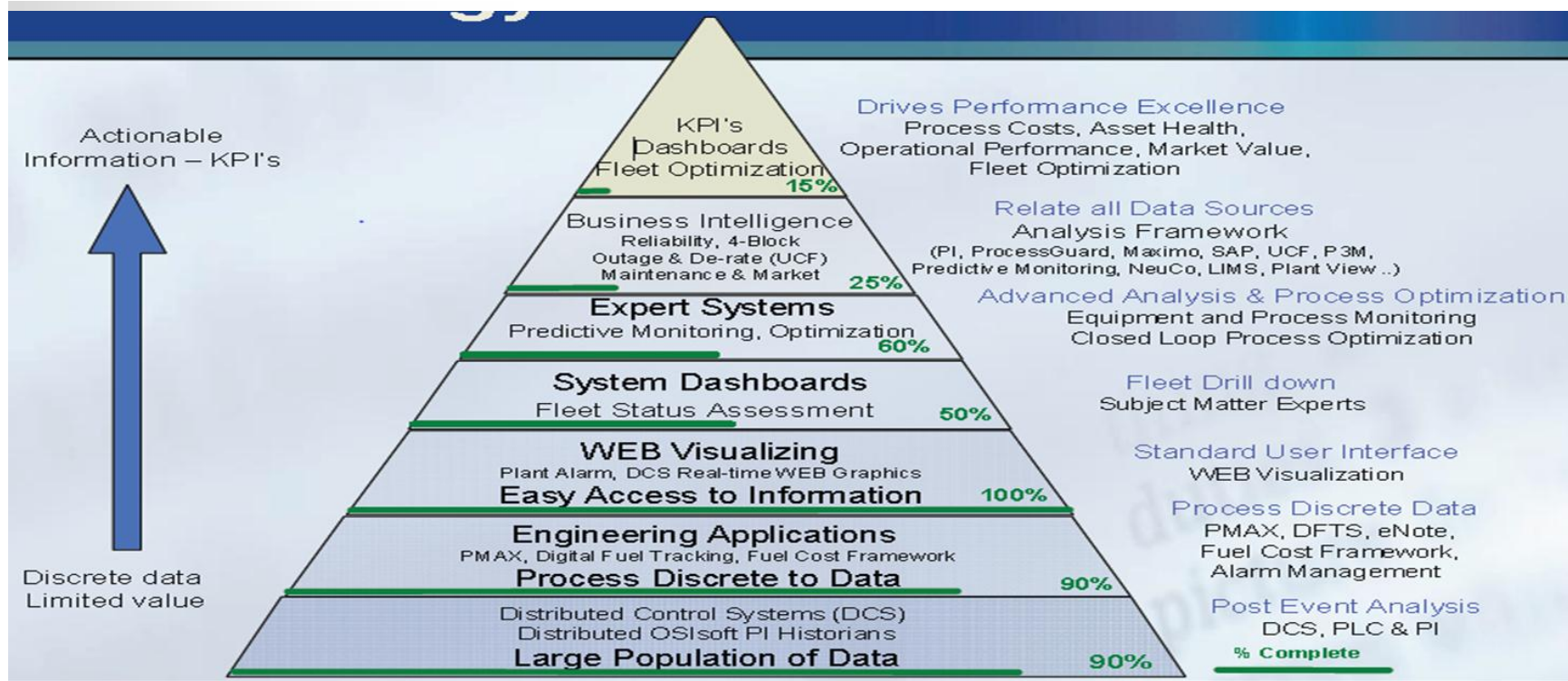
Detroit Edison

- Michigan's largest electric utility with 2.2 million customers
- Over 11,080 MW of power generation, primarily coal fired
- 54,000 GWh in electric sales
- \$4.7 billion in revenue

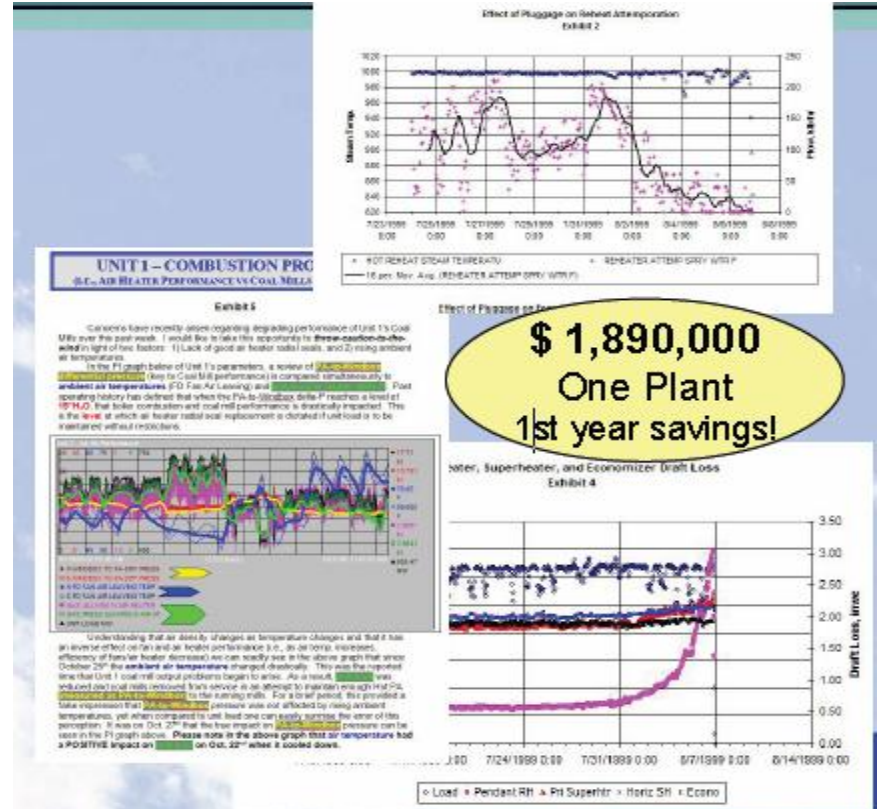
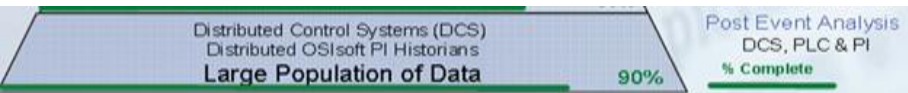


DTE Energy - Detroit Edison

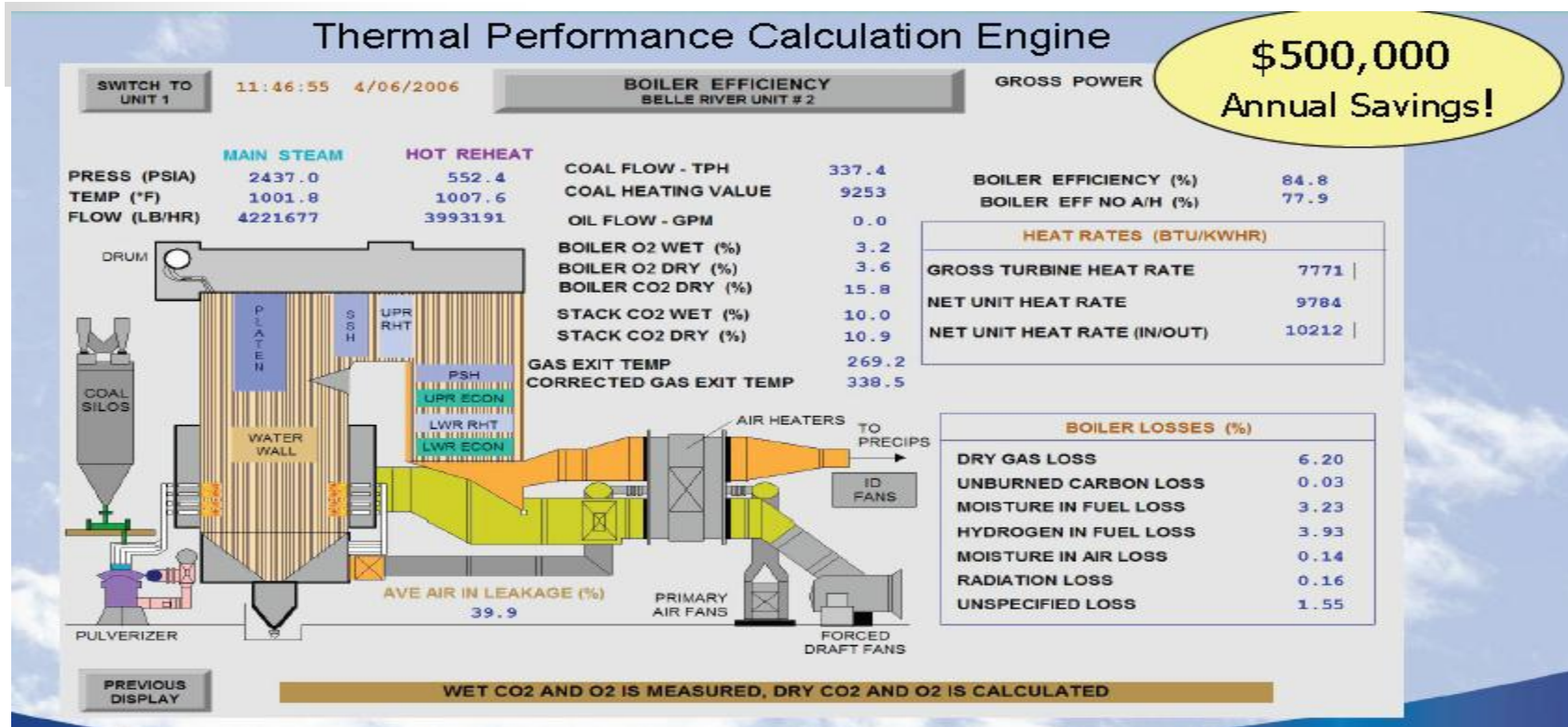
DTE Energy – Crawl, Walk, Run

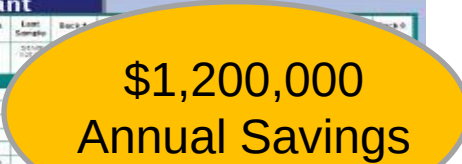


- Post trip Analysis
- Process Monitoring
- Optimization
- Early Warning
- Alarming



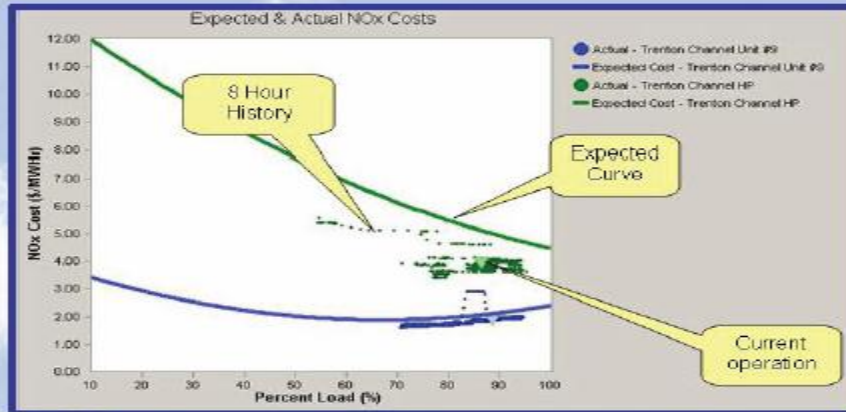
DTE Energy – Fleet Performance Analysis





DTE Energy - NOx Emission Strategy

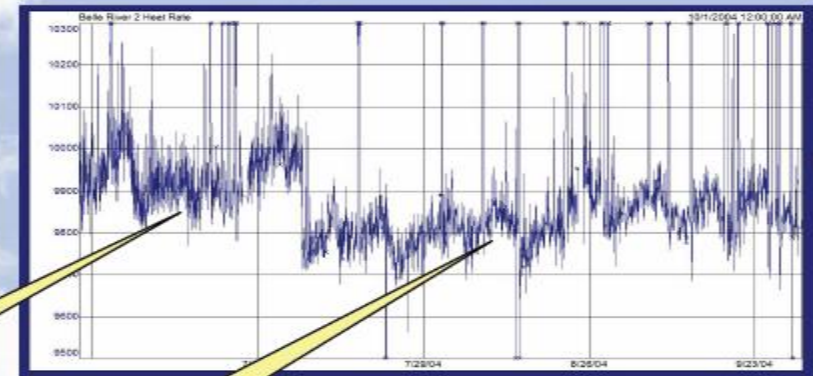
\$2,200,000
Annual Savings



NOx Reduction with Improved Heatrate

Before Implementation

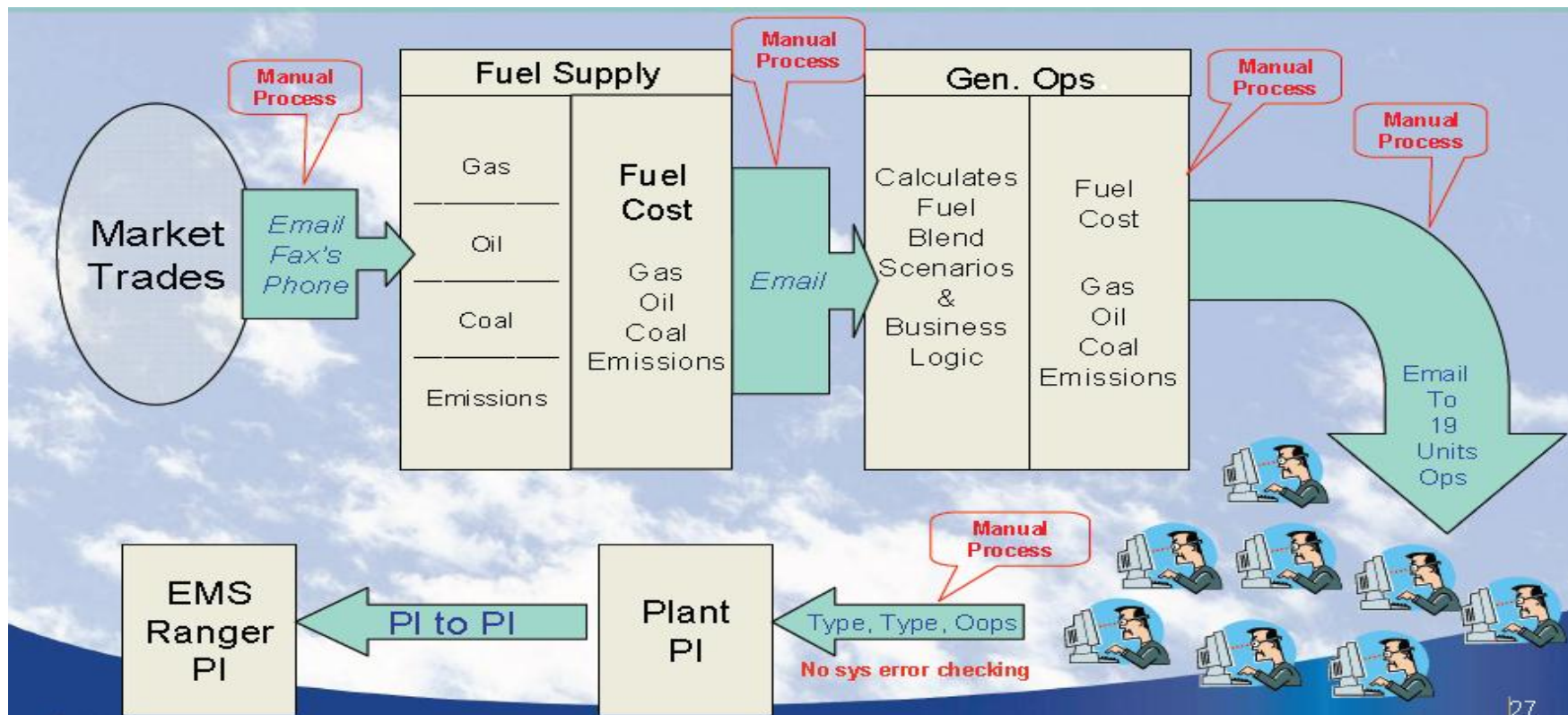
After Implementation



Primary focus is NOx reduction only

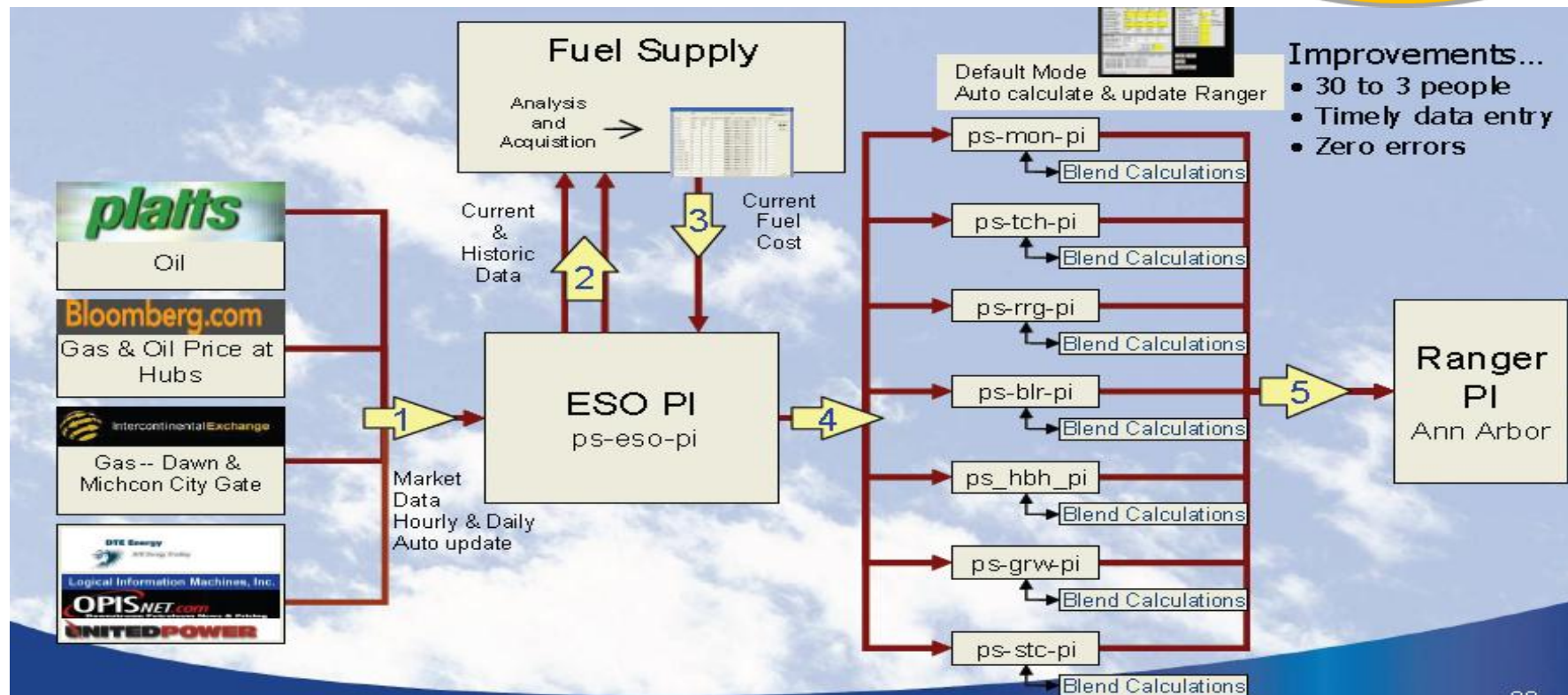
Focus on operating near NOx budget curve

DTE Energy – Before Fuel Cost Framework



DTE Energy – Fuel Cost Framework

\$530,000
Annual Savings



DTE Energy – Fleet Status

Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Load Forecast		
BR 1	0	0	0	CC 15	66	95	95	HA 12-1	0	42	42	HE	Today	Tomorrow
BR 2	609	635	635	CC 16	53	125	125	HA 12-2	0	42	42	0100	6041	8250
FE 2	0	0	0					HB 11	0	4	4	0200	6015	7862
MON 1	645	730	730	BR 12-1	77	77	77	MON 11	0	14	14	0300	5691	7505
MON 2	745	755	760	BR 12-2	75	75	75	NE 11-1	0	17	17	0400	5967	7457
MON 3	753	760	760	BR 13	76	76	76	NE 11-2	0	16	16	0500	6212	7564
MON 4	753	753	753	DLRY 11	0	67	67	NE 11-3	0	16	16	0600	6857	8010
RR 2	245	255	255	DLRY 12	0	69	69	NE 11-4	0	16	16	0700	7250	8581
RR 3	273	275	275	GW 11-1	77	77	77	NE 12	0	21	21	0800	7893	9183
SC 1	105	105	135	GW 11-2	54	54	54	NE 13-1	0	21	21	0900	8893	10069
SC 2	112	112	156	GW 12	19	19	19	NE 13-2	0	21	21	1000	9573	10593
SC 3	125	135	150	BR 11										
SC 4	135	140	140	CC 11										
SC 5	245	255	280	CF 11										
SC 7	329	329	329	DA 11										
TC 7	94	105	105	FE 11-1										
TC 8	73	80	80	FE 11-2										
TC 9	460	500	500	FE 11-3										
GW 1	369	450	785	FE 11-4										
HB 1	84	84	84	HA 11-1										
LUD 1	0	0	0	HA 11-2										
LUD 2	0	0	0	HA 11-3										
LUD 3	0	0	0	HA 11-4										
LUD 4	-319	0	319											
LUD 5	0	0	0											
LUD 6	-322	0	322											

Plant Generation	5281	Transactions	
Ludington Generation	0	Firm Purchase	
Peaker Generation	378	Non-Firm Purchase	
Misc. Generation	85	Firm Sale	
Total Generation	6745	Non-Firm Sale	
Total Load	7978	Service Area Load	
Steel Load	289	Retail Schedule	

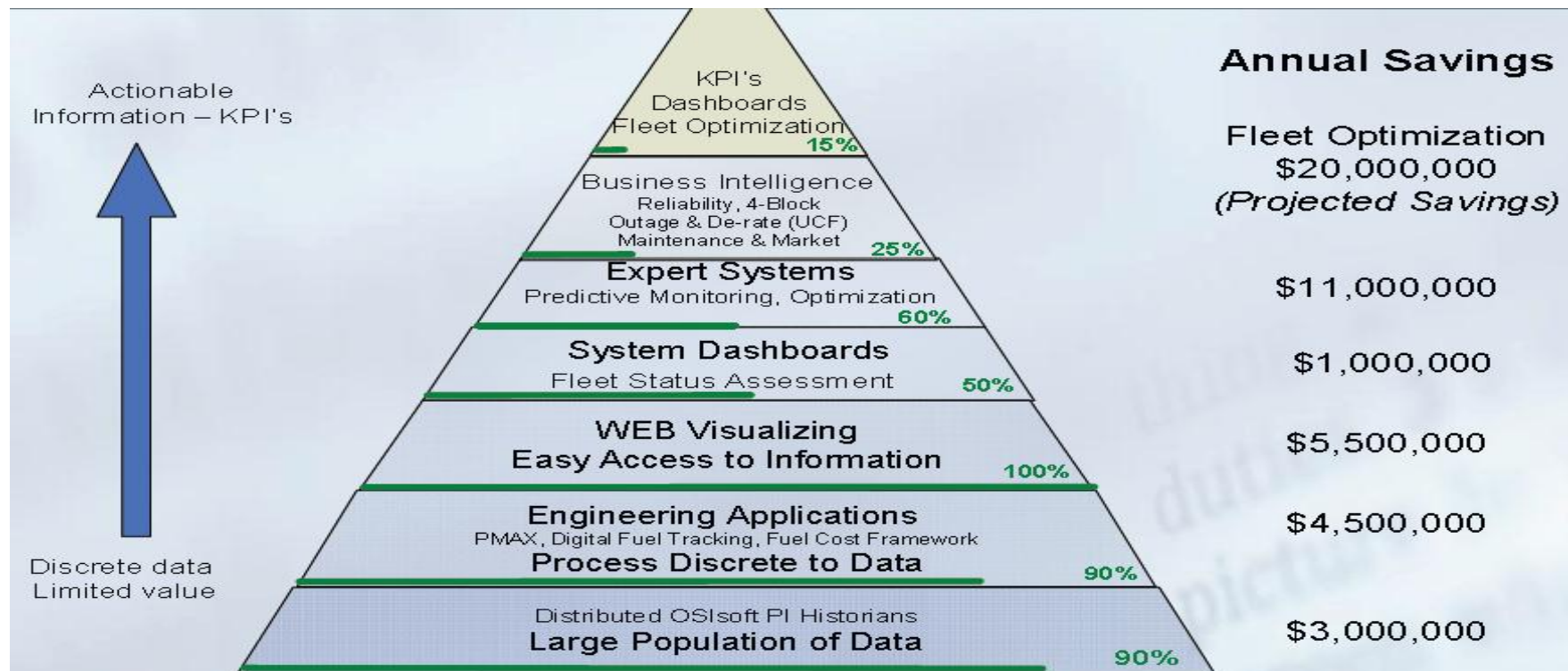
Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP
BR 1	0	0	0	CC 15	66	95	95	HA 12-1	0	42	42	HE	Today	Tomorrow	
BR 2	609	635	635	CC 16	53	125	125	HA 12-2	0	42	42	0100	6041	8250	
FE 2	0	0	0					HB 11	0	4	4	0200	6015	7862	
MON 1	645	730	730	BR 12-1	77	77	77	MON 11	0	14	14	0300	5691	7505	
MON 2	745	755	760	BR 12-2	75	75	75	NE 11-1	0	17	17	0400	5967	7457	
MON 3	753	760	760	BR 13	76	76	76	NE 11-2	0	16	16	0500	6212	7564	
MON 4	753	753	753	DLRY 11	0	67	67	NE 11-3	0	16	16	0600	6857	8010	
RR 2	245	255	255	DLRY 12	0	69	69	NE 11-4	0	16	16	0700	7250	8581	
RR 3	273	275	275	GW 11-1	77	77	77	NE 12	0	21	21	0800	7893	9183	
SC 1	105	105	135	GW 11-2	54	54	54	NE 13-1	0	21	21	0900	8893	10069	
SC 2	112	112	156	GW 12	19	19	19	NE 13-2	0	21	21	1000	9573	10593	
SC 3	125	135	150	BR 11											
SC 4	135	140	140	CC 11											
SC 5	245	255	280	CF 11											
SC 7	329	329	329	DA 11											
TC 7	94	105	105	FE 11-1											
TC 8	73	80	80	FE 11-2											
TC 9	460	500	500	FE 11-3											
GW 1	369	450	785	FE 11-4											
HB 1	84	84	84	HA 11-1											
LUD 1	0	0	0	HA 11-2											
LUD 2	0	0	0	HA 11-3											
LUD 3	0	0	0	HA 11-4											
LUD 4	-319	0	319												
LUD 5	0	0	0												
LUD 6	-322	0	322												

Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP
BR 1	0	0	0	CC 15	66	95	95	HA 12-1	0	42	42	HE	Today	Tomorrow	
BR 2	609	635	635	CC 16	53	125	125	HA 12-2	0	42	42	0100	6041	8250	
FE 2	0	0	0					HB 11	0	4	4	0200	6015	7862	
MON 1	645	730	730	BR 12-1	77	77	77	MON 11	0	14	14	0300	5691	7505	
MON 2	745	755	760	BR 12-2	75	75	75	NE 11-1	0	17	17	0400	5967	7457	
MON 3	753	760	760	BR 13	76	76	76	NE 11-2	0	16	16	0500	6212	7564	
MON 4	753	753	753	DLRY 11	0	67	67	NE 11-3	0	16	16	0600	6857	8010	
RR 2	245	255	255	DLRY 12	0	69	69	NE 11-4	0	16	16	0700	7250	8581	
RR 3	273	275	275	GW 11-1	77	77	77	NE 12	0	21	21	0800	7893	9183	
SC 1	105	105	135	GW 11-2	54	54	54	NE 13-1	0	21	21	0900	8893	10069	
SC 2	112	112	156	GW 12	19	19	19	NE 13-2	0	21	21	1000	9573	10593	
SC 3	125	135	150	BR 11											
SC 4	135	140	140	CC 11											
SC 5	245	255	280	CF 11											
SC 7	329	329	329	DA 11											
TC 7	94	105	105	FE 11-1											
TC 8	73	80	80	FE 11-2											
TC 9	460	500	500	FE 11-3											
GW 1	369	450	785	FE 11-4											
HB 1	84	84	84	HA 11-1											
LUD 1	0	0	0	HA 11-2											
LUD 2	0	0	0	HA 11-3											
LUD 3	0	0	0	HA 11-4											
LUD 4	-319	0	319												
LUD 5	0	0	0												
LUD 6	-322	0	322												

Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP
BR 1	0	0	0	CC 15	66	95	95	HA 12-1	0	42	42	HE	Today	Tomorrow	
BR 2	609	635	635	CC 16	53	125	125	HA 12-2	0	42	42	0100	6041	8250	
FE 2	0	0	0					HB 11	0	4	4	0200	6015	7862	
MON 1	645	730	730	BR 12-1	77	77	77	MON 11	0	14	14	0300	5691	7505	
MON 2	745	755	760	BR 12-2	75	75	75	NE 11-1	0	17	17	0400	5967	7457	
MON 3	753	760	760	BR 13	76	76	76	NE 11-2	0	16	16	0500	6212	7564	
MON 4	753	753	753	DLRY 11	0	67	67	NE 11-3	0	16	16	0600	6857	8010	
RR 2	245	255	255	DLRY 12	0	69	69	NE 11-4	0	16	16	0700	7250	8581	
RR 3	273	275	275	GW 11-1	77	77	77	NE 12	0	21	21	0800	7893	9183	
SC 1	105	105	135	GW 11-2	54	54	54	NE 13-1	0	21	21	0900	8893	10069	
SC 2	112	112	156	GW 12	19	19	19	NE 13-2	0	21	21	1000	9573	10593	
SC 3	125	135	150	BR 11											
SC 4	135	140	140	CC 11											
SC 5	245	255	280	CF 11											
SC 7	329	329	329	DA 11											
TC 7	94	105	105	FE 11-1											
TC 8	73	80	80	FE 11-2											
TC 9	460	500	500	FE 11-3											
GW 1	369	450	785	FE 11-4											
HB 1	84	84	84	HA 11-1											
LUD 1	0	0	0	HA 11-2											
LUD 2	0	0	0	HA 11-3											
LUD 3	0	0	0	HA 11-4											
LUD 4	-319	0	319												
LUD 5	0	0	0												
LUD 6	-322	0	322												

Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP
BR 1	0	0	0	CC 15	66	95	95	HA 12-1	0	42	42	HE	Today	Tomorrow	
BR 2	609	635	635	CC 16	53	125	125	HA 12-2	0	42	42	0100	6041	8250	
FE 2	0	0	0					HB 11	0	4	4	0200	6015	7862	
MON 1	645	730	730	BR 12-1	77	77	77	MON 11	0	14	14	0300	5691	7505	
MON 2	745	755	760	BR 12-2	75	75	75	NE 11-1	0	17	17	0400	5967	7457	
MON 3	753	760	760	BR 13	76	76	76	NE 11-2	0	16	16	0500	6212	7564	
MON 4	753	753	753	DLRY 11	0	67	67	NE 11-3	0	16	16	0600	6857	8010	
RR 2	245	255	255	DLRY 12	0	69	69	NE 11-4	0	16	16	0700	7250	8581	

Technology Frame Work – Complete Picture



Sempra Energy



'Regulated' Operations



San Diego Gas
& Electric®



Southern California
Gas Co.

'Unregulated' Operations



Sempra
Generation



Sempra Pipelines
& Storage



Sempra LNG

Sempra's Integrated Energy Business

New Supplies



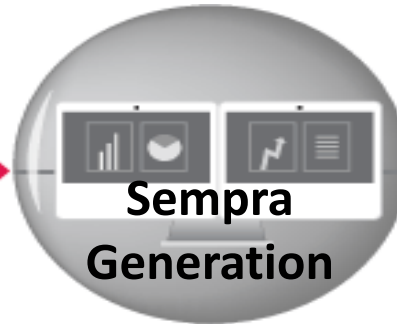
- ▶ Leading developer of LNG import facilities

Gas Transportation & Storage



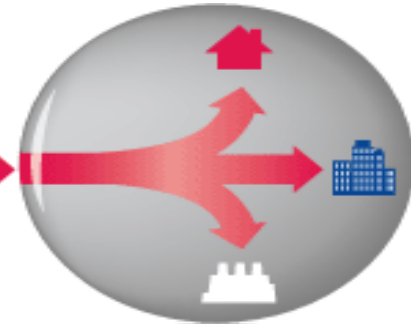
- ▶ Rockies Express is the largest pipeline built in 20 years
- ▶ 150 Bcf of natural gas storage

Electric Generation



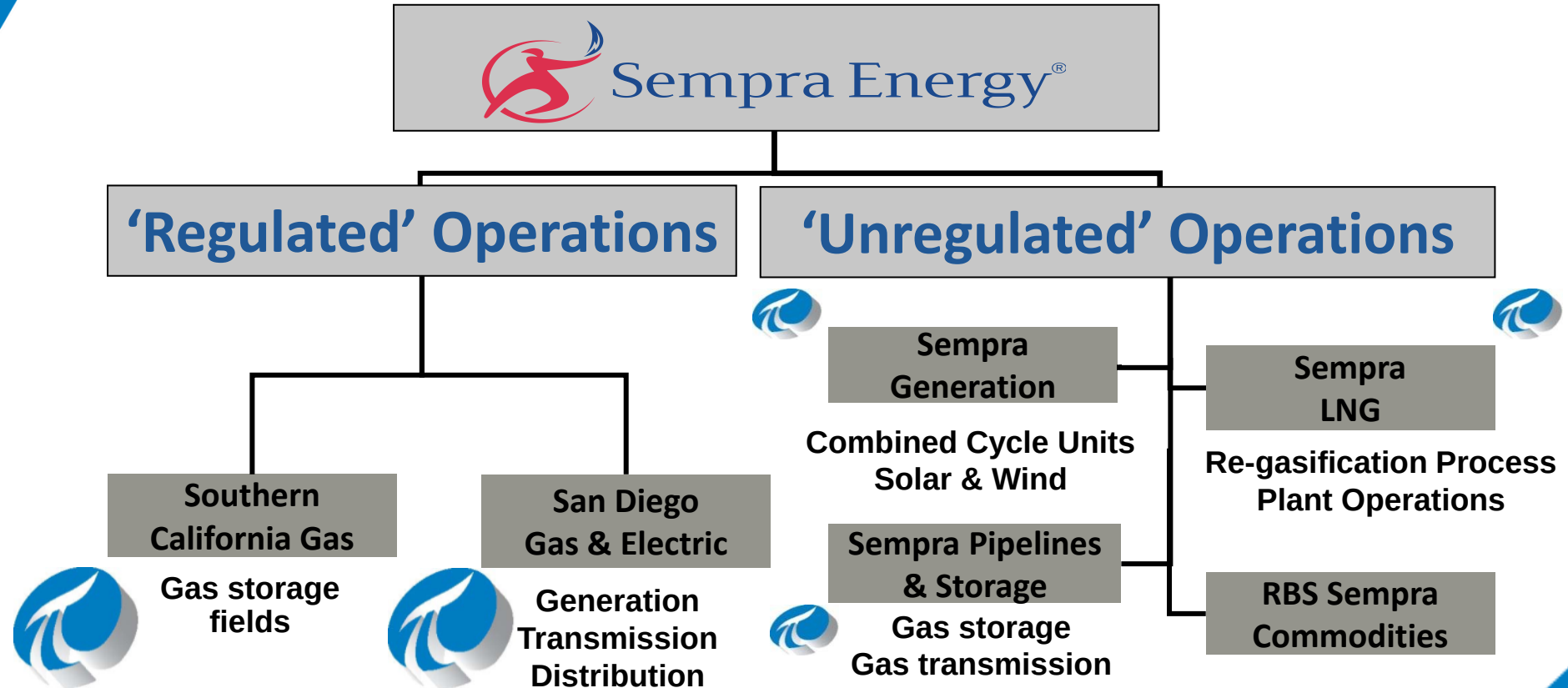
- ▶ Thermal power plants and renewable

Gas & Elec. Transmission & Distribution



- ▶ Largest gas utility in the U.S.
- ▶ Serve 29 million consumers

OSIsoft PI System Deployment in Sempra





Quotes:

“We turned all of our operators into **businessmen.**” Vice-President
Sempra Generation

“In every business I’ve been in where we put the PI System in...**we made money.**” Senior Vice President, SoCalGas

San Diego Gas & Electric (SDG&E)



NORTH COUNTY TIMES

Monday, August 2, 2010

SDG&E Honored as Most Intelligent Utility in USA

- For the second straight year, Sempra Energy's San Diego Gas & Electric (SDG&E) has taken top honors as the most intelligent utility in the United States, according to the annual ranking undertaken by Intelligent Utility magazine and IDC Energy Insights, released today.



The San Diego Union-Tribune.

November 18, 2010

SDG&E Awarded 2010 National Award For Outstanding Reliability

- San Diego Gas & Electric (SDG&E) was recognized by PA Consulting Group (PA) as the recipient of the ReliabilityOne™ 2010 National Award for Outstanding Reliability Performance. SDG&E was also the top winner of the ReliabilityOne™ award among Western U.S. electric utilities for the fifth year in a row.

Ready

Emergency Operations Load Curtailment – Rolling Blackout

- Enter total MW's required to be dropped
- Show circuit breakers status and MW load
- Automatically calculate how many breakers need to be opened and total customers are out
- Automatically publish to SDG&E public website and report to Utility Commission and Regulator

Microsoft Excel

Dist LC 2010_Master_Final.xls [Compatibility Mode]

Ready

Daily Totals:

ISO Requested MW: 6.00

SDG&E MW Total: 6.00

PGP MW Total: 6.00

MW Dropped: 6.00

Cust Affected: 0

Recalc: ☐ Auto Init: ☐ Include non-SCADA: ☐ Protect: ☐ Test Mode: ☐ Send: ☐ Don't Send to Web: ☐

ISO Requested MW: 25.90

SDG&E Contribution: 25.90

PGP: 0

Run Start Time: 0

Run End Time: 0

Fin MW Dropped: 21.00

Customers Affected: 21,040

Run #1: 25.90

Run #2: 25.90

Run #3: 25.90

MW Dropped: 21.00

MW Dropped: 21.00

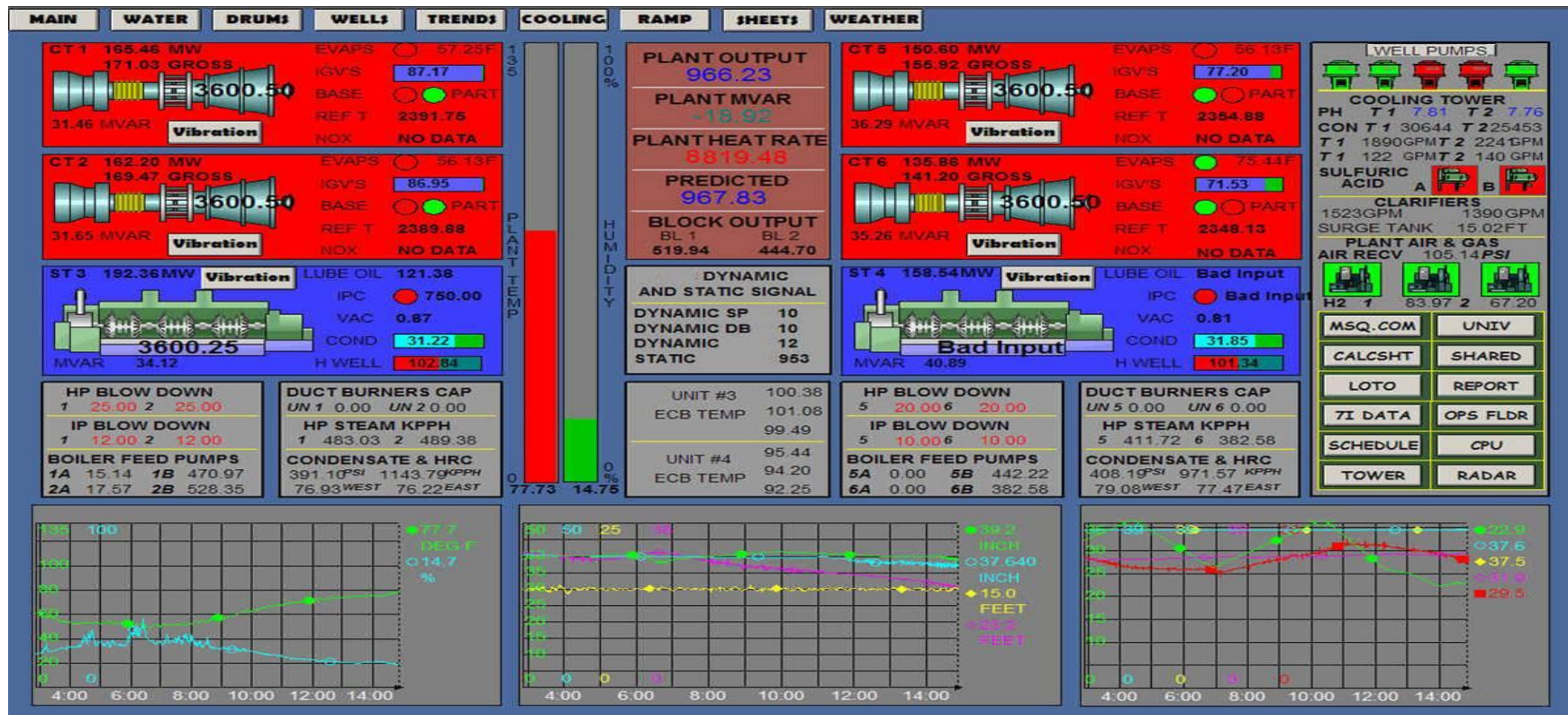
MW Dropped: 21.00

Order	Block	Circuit	Station	Total Customers	PI Breaker Status Tag	MW Tag	Final Time MW	IKKI Status Time	Breaker Status	MW Dropped	MW Dropped	MW Dropped
1	1A	434	SS	2478	D-SS CIR 434-BRKR 3PH	D-SS CIR 434-MW 3PH	4.60		CLOSE			
2	1A	229	MR	1888	D-MR CIR 229-BRKR 3PH	D-MR CIR 229-MW 3PH	2.87		CLOSE	2.87		
3	1A	350	LI	1517	D-LI CIR 350-BRKR 3PH	D-LI CIR 350-MW 3PH	3.50		CLOSE	3.50		
4	2A	463	SYO	1768	D-SYO CIR 463-BRKR 3PH	D-SYO CIR 463-MW 3PH	5.76		CLOSE	5.76		
5	2A	456	AS	2407	D-AS CIR 456-BRKR 3PH	D-AS CIR 456-MW 3PH	3.05		CLOSE	3.05		
6	2A	516	ESCO	934	D-ESCO CIR 516-BRKR 3PH	D-ESCO CIR 516-MW 3PH	4.13		CLOSE	4.13		
7	3A	831	NCV	4465	D-NCV CIR 831-BRKR 3PH	D-NCV CIR 831-MW 3PH	5.46		CLOSE	5.46		
8	3A	311	LNL	3823	D-LNL CIR 311-BRKR 3PH	D-LNL CIR 311-MW 3PH	2.63		CLOSE	2.63		
9	3A	63	DM	2524	D-DM CIR 63-BRKR 3PH	D-DM CIR 63-MW 3PH	3.73		CLOSE	3.73		
10	4A	83	MY	2354	D-MY CIR 83-BRKR 3PH	D-MY CIR 83-MW 3PH	1.79		CLOSE		1.79	
11	4A	72	EC	2587	D-EC CIR 72-BRKR 3PH	D-EC CIR 72-MW 3PH	1.59		CLOSE		1.59	
12	4B	382	EL	1851	D-EL CIR 382-BRKR 3PH	D-EL CIR 382-MW 3PH	7.68		CLOSE	7.68		
13	5A	988	MAR	1243	D-MAR CIR 988-BRKR 3PH	D-MAR CIR 988-MW 3PH	1.92		CLOSE	1.92		
14	5A	944	CC	1735	D-CC CIR 944-BRKR 3PH	D-CC CIR 944-MW 3PH	1.57		CLOSE	1.57		
15	5B	177	HO	1228	D-HO CIR 177-BRKR 3PH	D-HO CIR 177-MW 3PH	7.00		CLOSE	7.00		
16	6A	500	CC	2761	D-CC CIR 500-BRKR 3PH	D-CC CIR 500-MW 3PH	3.47		CLOSE			
17	6A	740	PL	2452	D-PL CIR 740-BRKR 3PH	D-PL CIR 740-MW 3PH	5.20		CLOSE		5.20	
18	6B	258	MG	2	D-MG CIR 258-BRKR 3PH	D-MG CIR 258-MW 3PH	1.02		CLOSE			1.02
19	7A	659	SH	419	D-SH CIR 659-BRKR 3PH	D-SH CIR 659-MW 3PH	4.60		CLOSE	4.60		
20	7A	1153	EG	2	D-EG CIR 1153-BRKR 3PH	D-EG CIR 1153-MW 3PH	0.00		CLOSE			0.00
21	7A	1166	LL	314	D-LL CIR 1166-BRKR 3PH	D-LL CIR 1166-MW 3PH	0.26		CLOSE			0.26
22	8A	268	AL	1884	D-AL CIR 268-BRKR 3PH	D-AL CIR 268-MW 3PH	4.42		CLOSE	4.42		
23	8A	291	BE	2951	D-BE CIR 291-BRKR 3PH	D-BE CIR 291-MW 3PH	3.82		CLOSE			
24	8B	210	VR	192	D-VR CIR 210-BRKR 3PH	D-VR CIR 210-MW 3PH	0.88		CLOSE	0.88		
25	9A	443	SYO	5	D-SYO CIR 443-BRKR 3PH	D-SYO CIR 443-MW 3PH	0.95		CLOSE	0.95		
26	9A	183	OT	1598	D-OT CIR 183-BRKR 3PH	D-OT CIR 183-MW 3PH	3.02		CLOSE	3.02		
27	9A	512	DM	2578	D-DM CIR 512-BRKR 3PH	D-DM CIR 512-MW 3PH	3.42		CLOSE	3.42		
28	10A	290	BE	3127	D-BE CIR 290-BRKR 3PH	D-BE CIR 290-MW 3PH	2.33		CLOSE	2.33		
29	10A	768	BT	1993	D-BT CIR 768-BRKR 3PH	D-BT CIR 768-MW 3PH	2.58		CLOSE	2.58		
30	10B	775	MSH	775	D-MSH CIR 775-BRKR 3PH	D-MSH CIR 775-MW 3PH	5.72		CLOSE			
31	11A	797	LNL	2767	D-LNL CIR 797-BRKR 3PH	D-LNL CIR 797-MW 3PH	2.18		CLOSE			
32	11A	588	PAR	181	D-PAR CIR 588-BRKR 3PH	D-PAR CIR 588-MW 3PH	3.44		CLOSE	3.44		
33	11B	774	MSH	478	D-MSH CIR 774-BRKR 3PH	D-MSH CIR 774-MW 3PH	6.84		CLOSE	6.84		
34	12A	452	AS	3192	D-AS CIR 452-BRKR 3PH	D-AS CIR 452-MW 3PH	2.15		CLOSE			
35	12A	517	ESCO	459	D-ESCO CIR 517-BRKR 3PH	D-ESCO CIR 517-MW 3PH	2.15		CLOSE			
36	12B	487	MH	1657	D-MH CIR 487-BRKR 3PH	D-MH CIR 487-MW 3PH	2.24		CLOSE	2.24		
37	13A	745	GE	17	D-GE CIR 745-BRKR 3PH	D-GE CIR 745-MW 3PH	4.80		CLOSE	4.80		
38	13A	986	MAR	2843	D-MAR CIR 986-BRKR 3PH	D-MAR CIR 986-MW 3PH	2.20		CLOSE	2.20		
39	13A	975	CRE	1341	D-CRE CIR 975-BRKR 3PH	D-CRE CIR 975-MW 3PH	1.43		CLOSE	1.43		
40	14A	550	PV	2627	D-PV CIR 550-BRKR 3PH	D-PV CIR 550-MW 3PH	2.94		CLOSE	2.94		
41	14A	468	UB	112	D-UB CIR 468-BRKR 3PH	D-UB CIR 468-MW 3PH	2.21		CLOSE	2.21		
42	14A	1117	BQ	3855	D-BQ CIR 1117-BRKR 3PH	D-BQ CIR 1117-MW 3PH	4.30		CLOSE	4.30		
43	15A	296	SM	3175	D-SM CIR 296-BRKR 3PH	D-SM CIR 296-MW 3PH	2.77		CLOSE	2.77		
44	15A	438	SS	4958	D-SS CIR 438-BRKR 3PH	D-SS CIR 438-MW 3PH	4.54		CLOSE	4.54		
45	15A	65	DM	1479	D-DM CIR 65-BRKR 3PH	D-DM CIR 65-MW 3PH	3.77		CLOSE	3.77		
46	16A	112	B	2	D-B CIR 112-BRKR 3PH	D-B CIR 112-MW 3PH			CLOSE			
47	16A	947	GA	0	D-GA CIR 947-BRKR 3PH	D-GA CIR 947-MW 3PH			CLOSE			
48	16A	510	DM	1806	D-DM CIR 510-BRKR 3PH	D-DM CIR 510-MW 3PH			CLOSE			

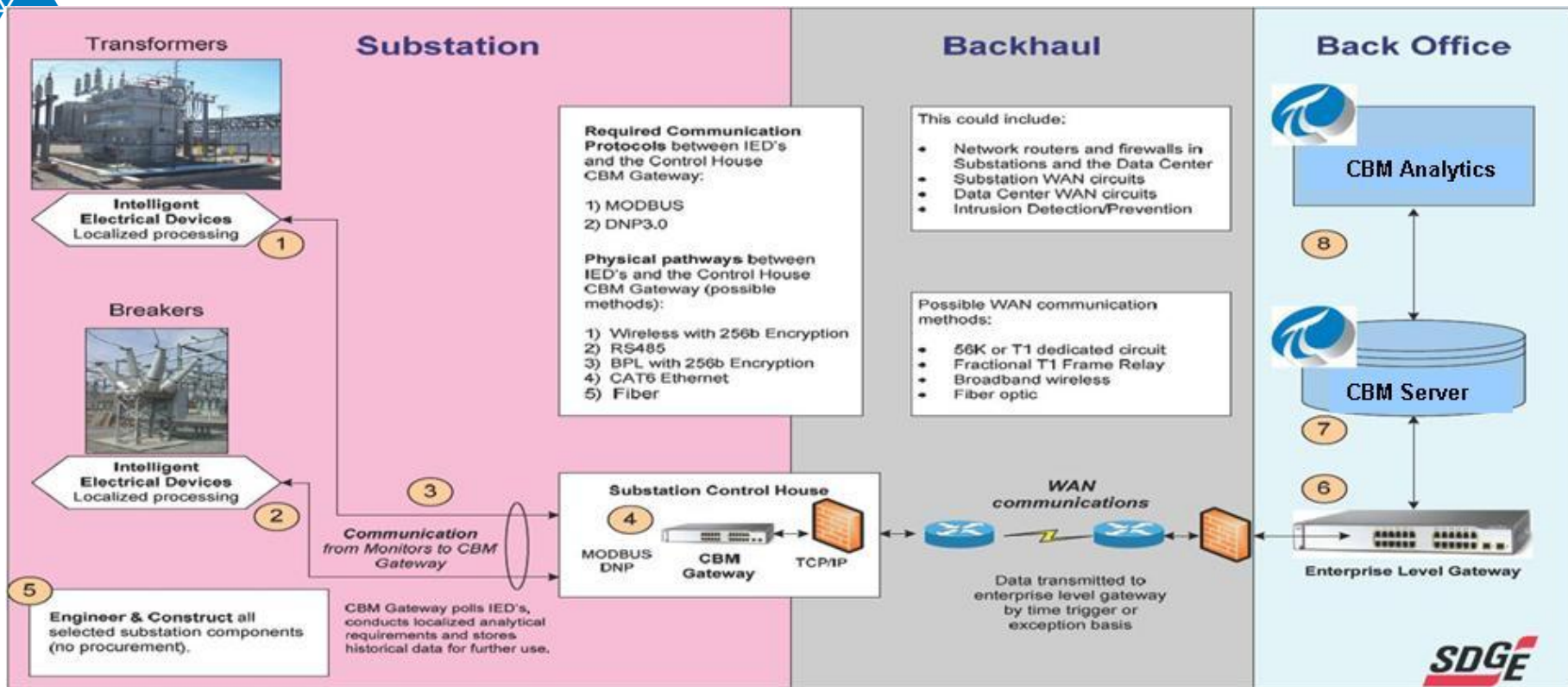
Ready Calculate

55%

CCGT Plant Operation



Substation Condition Based Maintenance



Condition Based Monitoring – PI Notifications Email Alert

From: [REDACTED]@semprautilities.com
To: CBM-XfmrLv4 Ack
Cc:
Subject: [REDACTED]_BK71_THER_AlarmLevel4

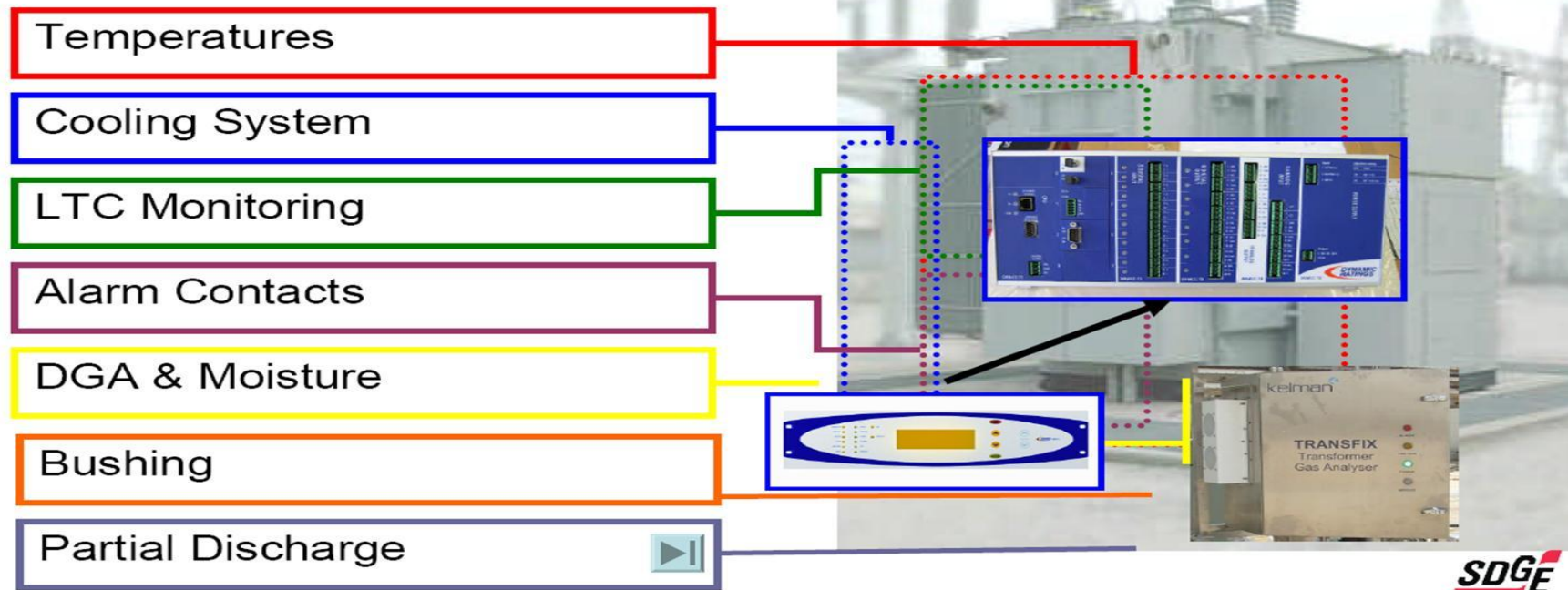
Sent: Wed 1/21/2009 11:57 AM

Name: [REDACTED]_BK71_THER_AlarmLevel4
Description: [REDACTED] Bank 71 Thermal Alarm Level 4
Server: [REDACTED]T-P01
Database: CBM2
Start Time: 1/21/2009 11:56:24 AM Pacific Standard Time (GMT-08:00:00)
Trigger Time: 1/21/2009 11:56:24 AM Pacific Standard Time (GMT-08:00:00)
Target: [REDACTED]T-P01\CBM2\SISCO Managed Models\SDGE_CBM\ClassView\thermal[REDACTED] 1 Thermal
Value: Alarm 4
Priority: Normal

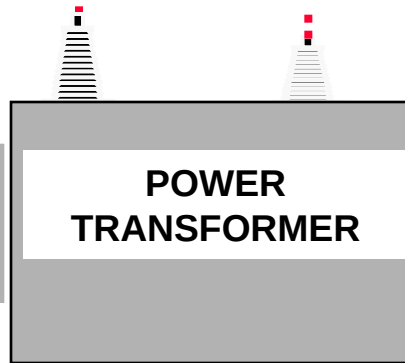
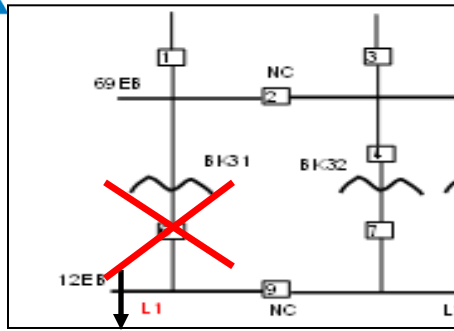
Link:
[\[REDACTED\] - BK71 - Thermal](#)

Actions:
[Acknowledge](#)
[Acknowledge with comment](#)

Condition Based Monitoring – Transformers



Operations Decision Support – Transformer at Emergency Rating?

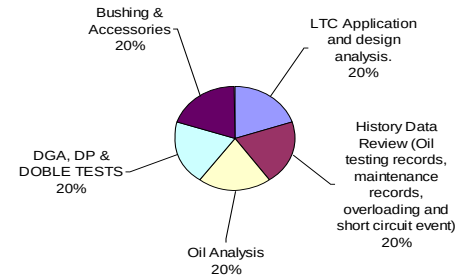


TRANSFORMER Health Indices
 Insulation Power Factor
 LTC Application & Design
 Oil Conditions
 Bushing & Accessories
 Operating History & Conditions

Paper Insulation Health

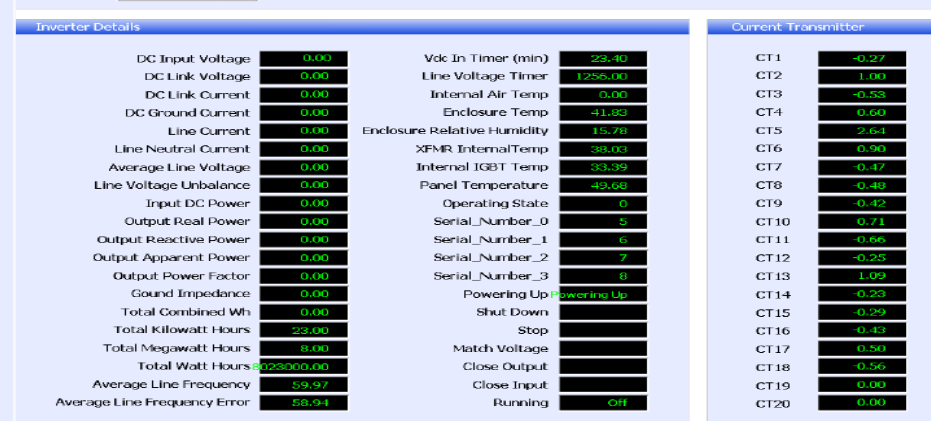
Location of Paper Sample	Degree of Polymerization (DP)
NLTC – Phase A	586
NLTC – Phase B	737
69kV Bushing C	688

New Insulation Paper: $1000 < DP_v < 1300$
Middle Aged Insulation Paper: $DP_v = 500$
Old Age Insulation Paper: $DP_v < 251$
Severely Degraded Insulation Paper: $DP_v < 151$



Solar Field Monitoring

- Performance Monitoring
 - DC and AC Output
 - Inverter Operating Conditions
- Weather Conditions



Total Power produced:

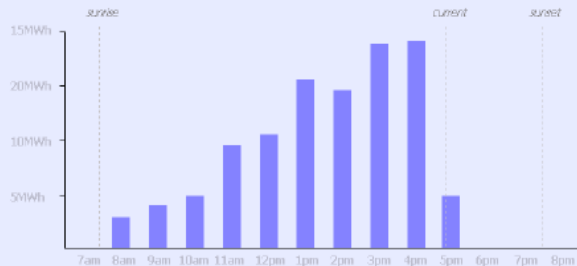
3.78MW

Field Power Rating:

85.4

Hours of Operation:

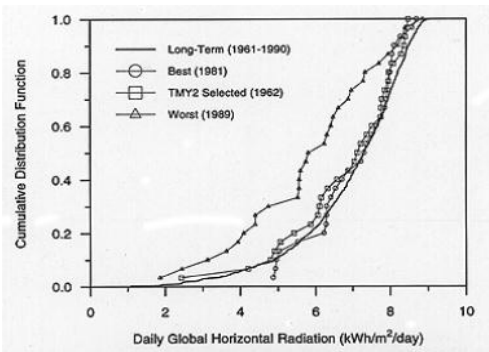
4.75 Hours



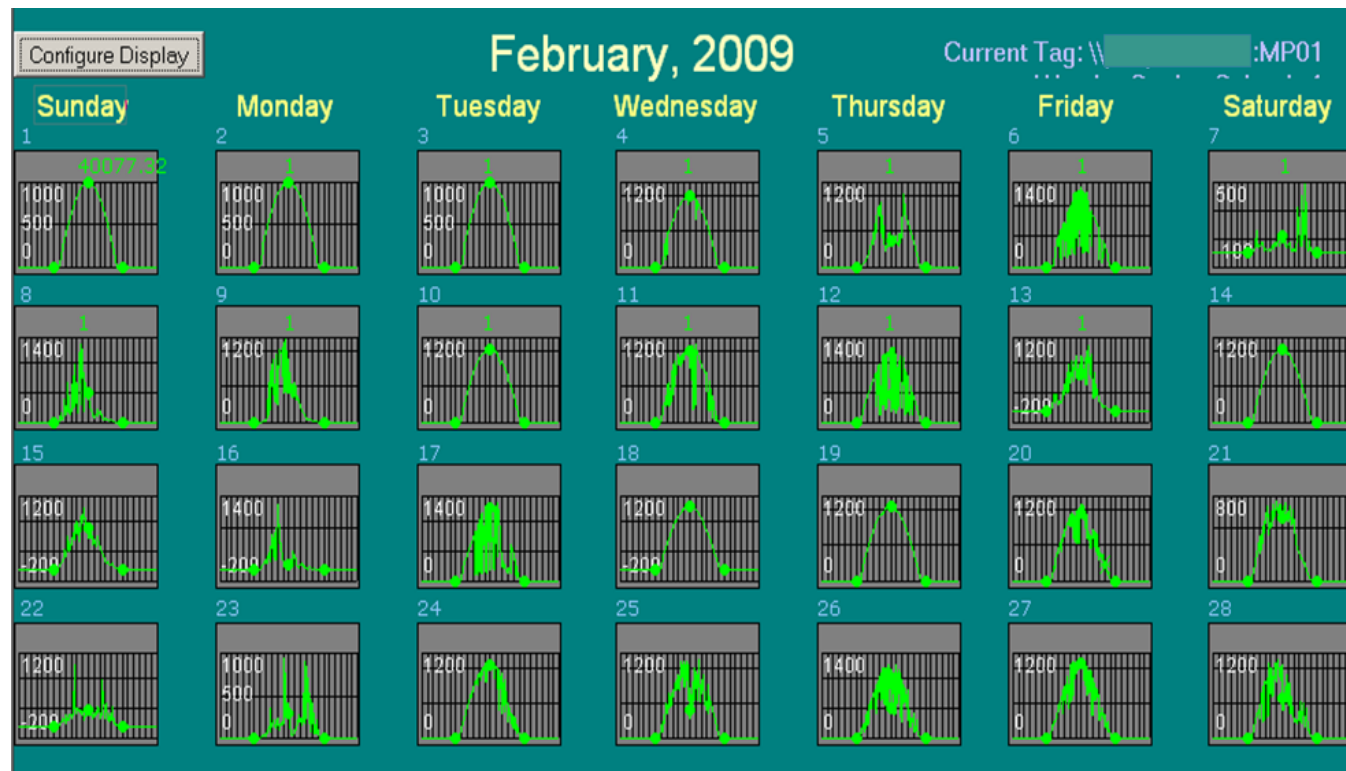
Solar Generation Applications - Irradiance Analysis (Historical, Predicted, and Actual)

National Renewable
Energy Lab (NREL)

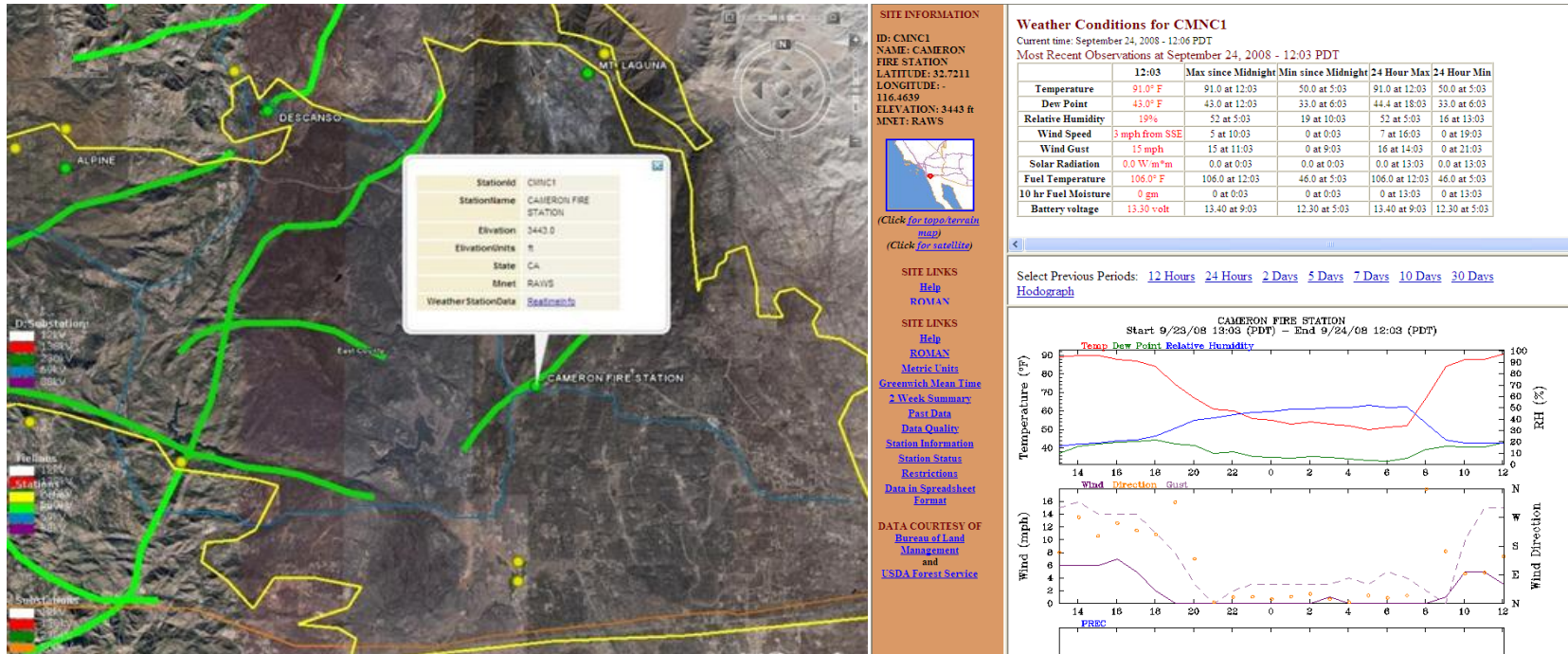
- Typical Meteorological Year (TMY)
- TMY2 and TMY3 Data Sets



Statistical
Modeling



Weather Intelligence



- More than 90 pole mounted weather stations to support fire operations and Smart Grid vision
- Currently the 4th largest privately owned weather station network in US; the densest weather station network in the world
- Locations selected by SDG&E's Meteorologist, based on topography, field observations, and fire hazard



Weather Station Network Project

- Real-time weather data every 10 minutes (wind direction, wind speed, wind gust, temperature, and relative humidity, etc.) to provide SDG&E with a better tool to maintain and operate the system safely
- Viewing winds in areas that have never been monitored to help to “harden” overhead electric system with larger conductors and steel poles to better withstand high winds
- Sharing data with the public, local universities and posting on the National Weather Service (NWS) Site and MesoWest
- San Diego First Responders (Fire Agencies) have been provided a mobile SDG&E weather station application and website to access to all SDG&E weather station data and maps

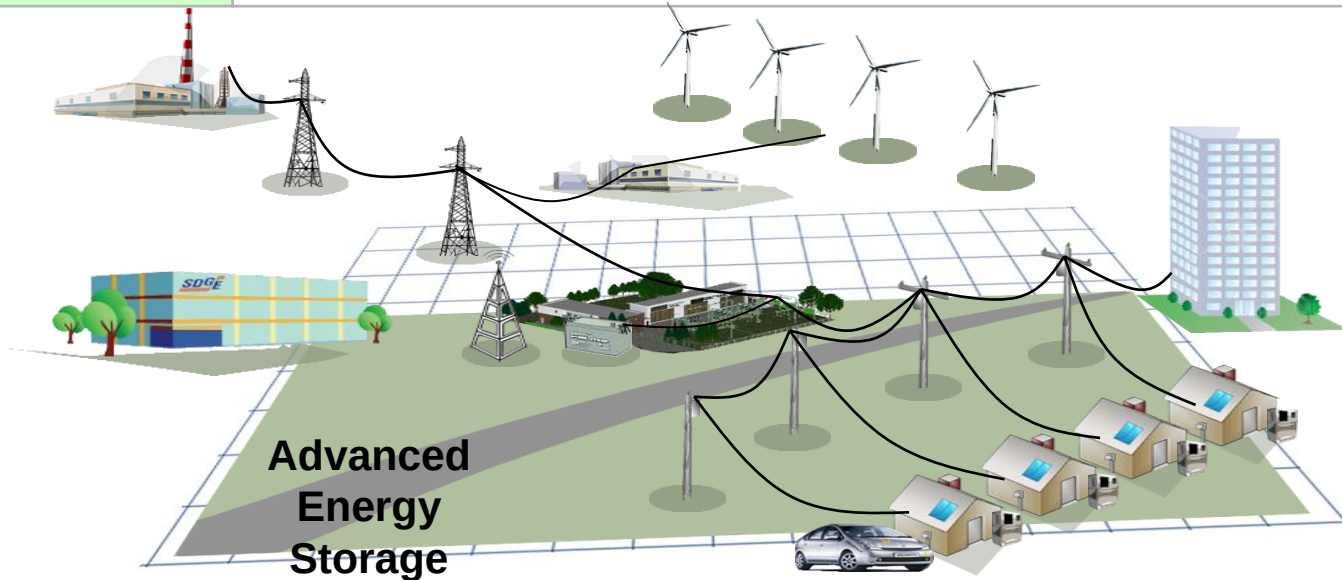
SDG&E RDSI Project

Budget:

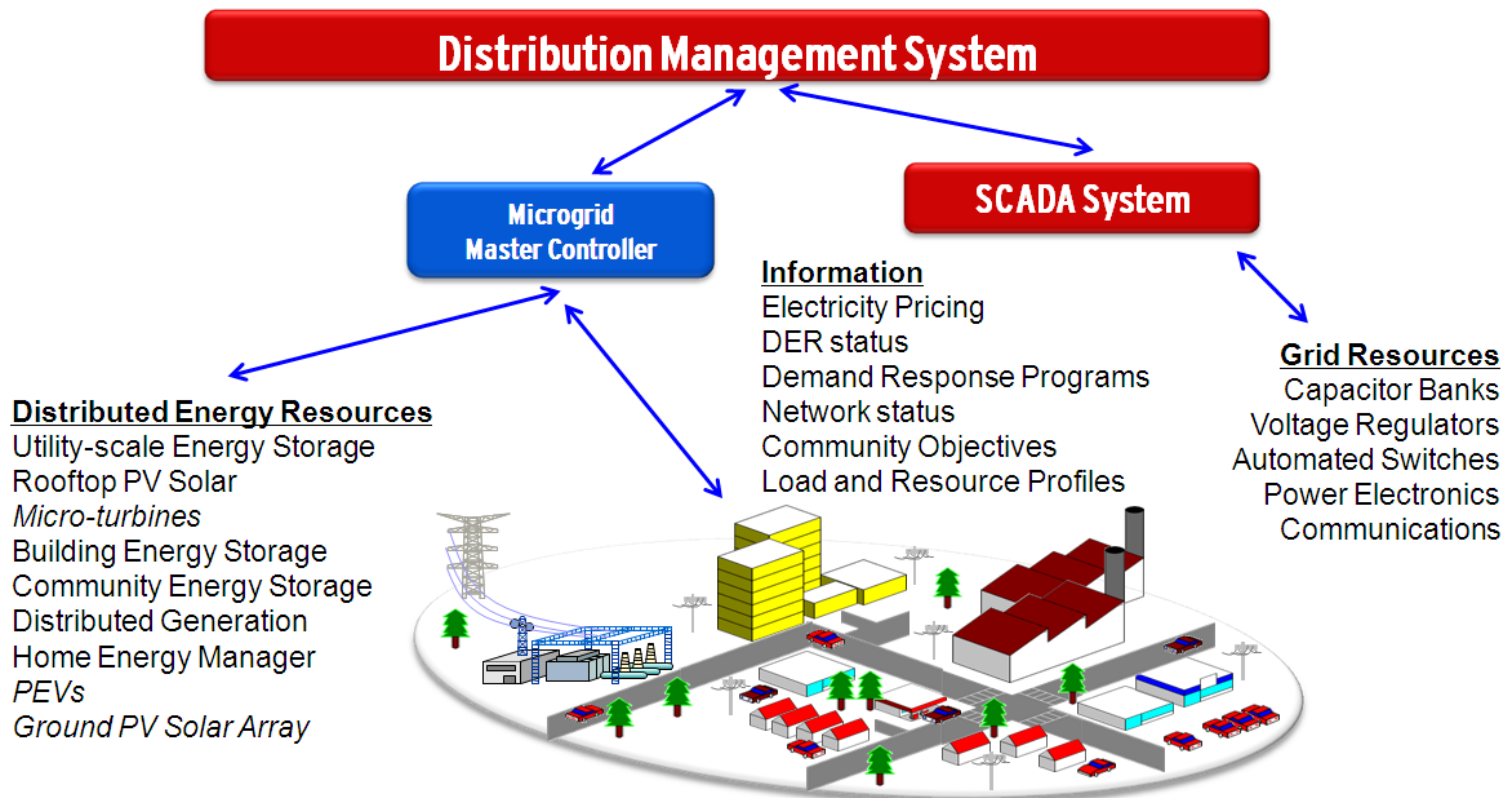
\$15.2M (\$4.1M SDG&E, \$7.5M DOE, \$2.8M CEC, and \$0.8M partners)

Benefits:

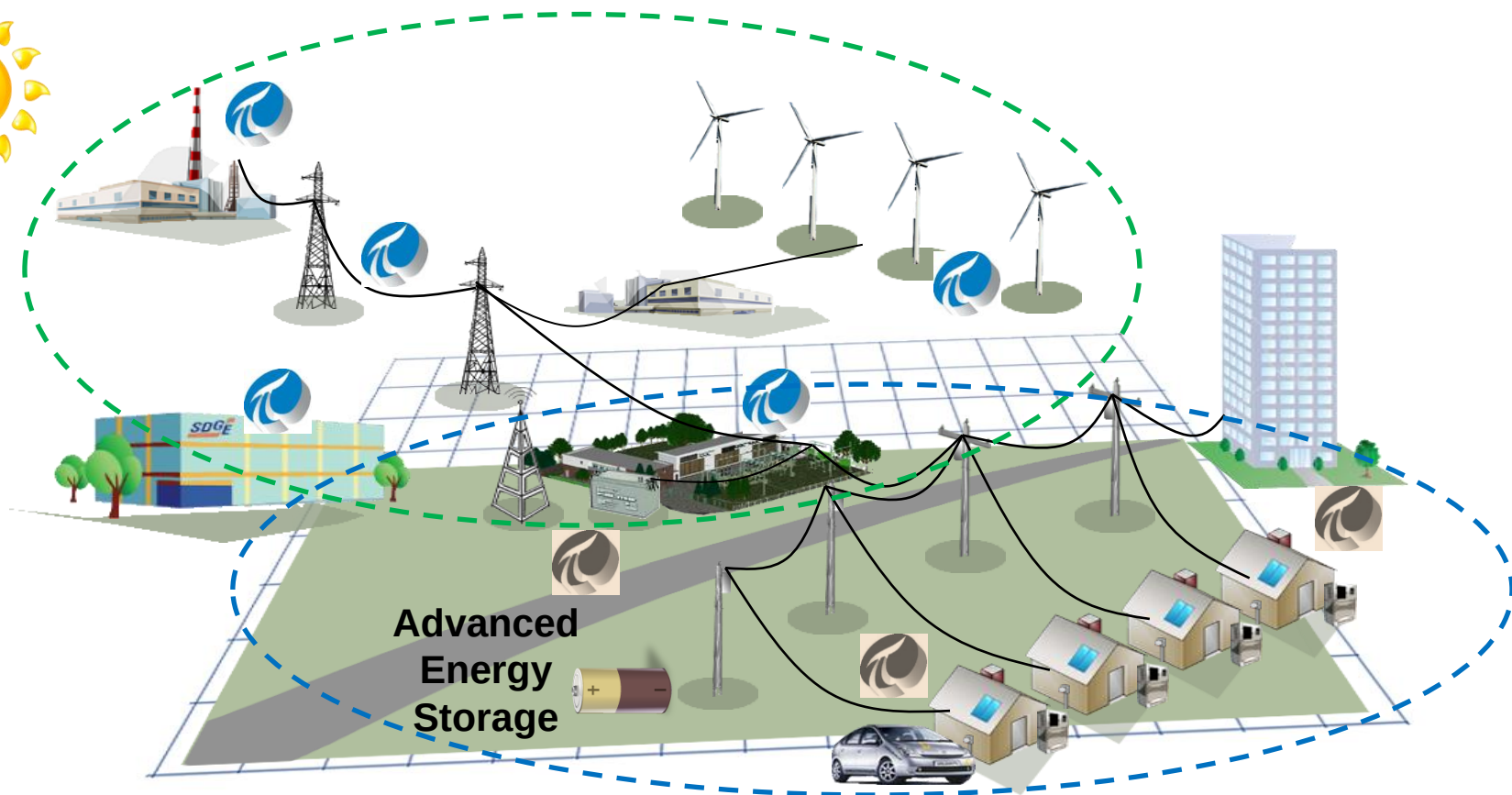
- Integrate and leverage various generation and storage configurations
- Reduce peak demand and enhance overall system reliability



Microgrid Applications



SDG&E's End-to-End Energy Value Chain





Quotes: Patrick Lee, Vice-President Energy Supply, SDG&E

“Data is in silos today...Smart Grid will drive end-to-end data integration!”

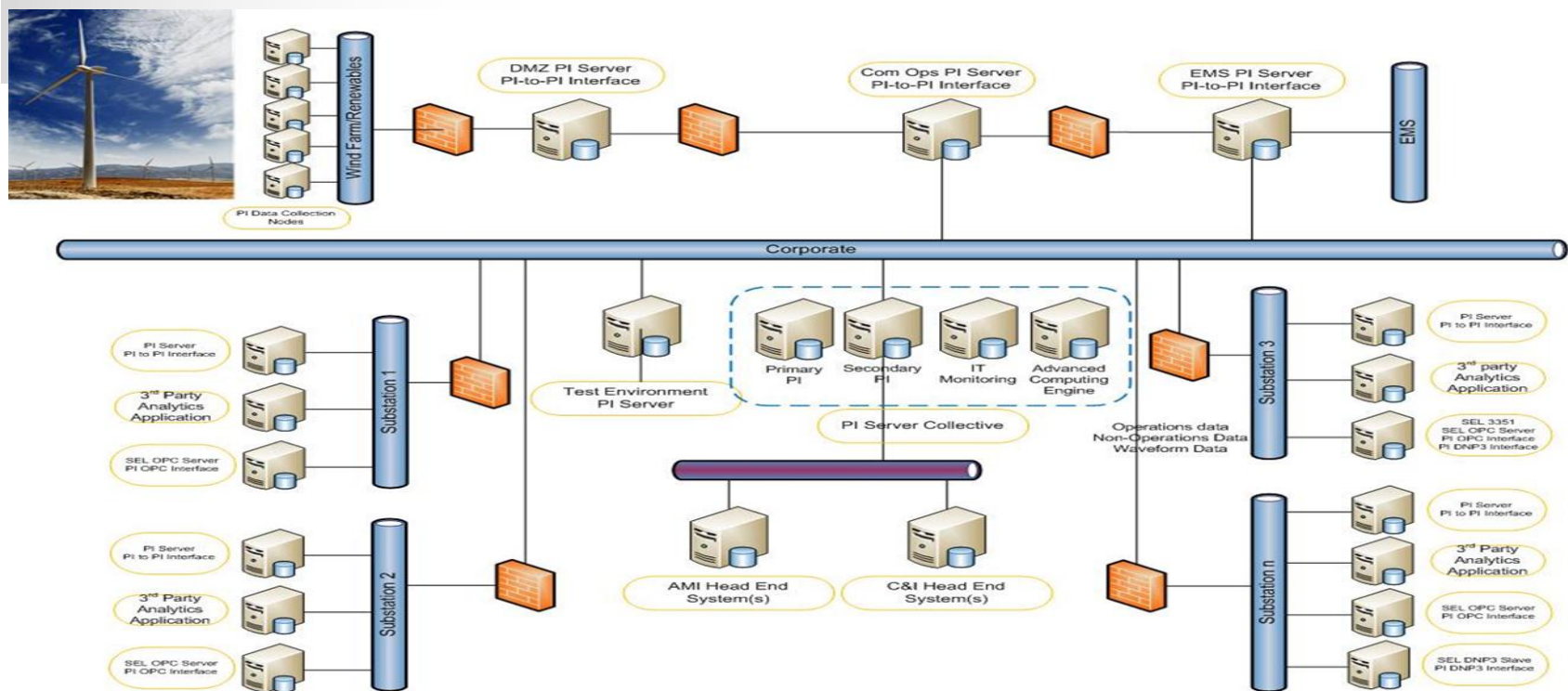
“As you have seen in some of our applications using the OSIsoft PI System, I believe we have only scratched the surface in turning available data into valuable and relevant information. We will continue to expand our data collection, analysis, and modeling capabilities at Sempra Energy. ***We believe a successful company must have the ability to make good judgment decisively.*** This core capability is best augmented by a powerful data and information system. We believe the OSIsoft PI System is a key component of this data system.”



Opportunities For Future Applications in PI System

- More renewable energy development
- Electric vehicles planning
- Roof top solar and electric vehicles integration
- Roof top solar PV monitoring
- Smart meters
- Renewable and distributed systems integration (RDSI)
- Microgrid
- Energy market assessment & transaction
- Create synergy across the integrated business

Smart Grid City – Xcel Boulder CO



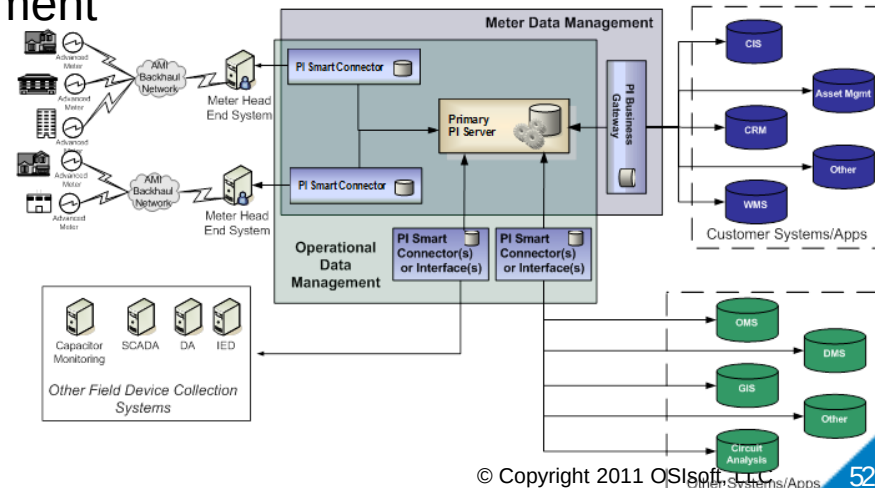


Meter to Cash and Smart Grid with Meter Data

- Primary Reason for AMI
 - Billing
 - Customer Service
 - Metering Efficiencies
- Secondary Reasons for AMI
 - Operations
 - Voltage/PQ
 - TLM
 - Outages

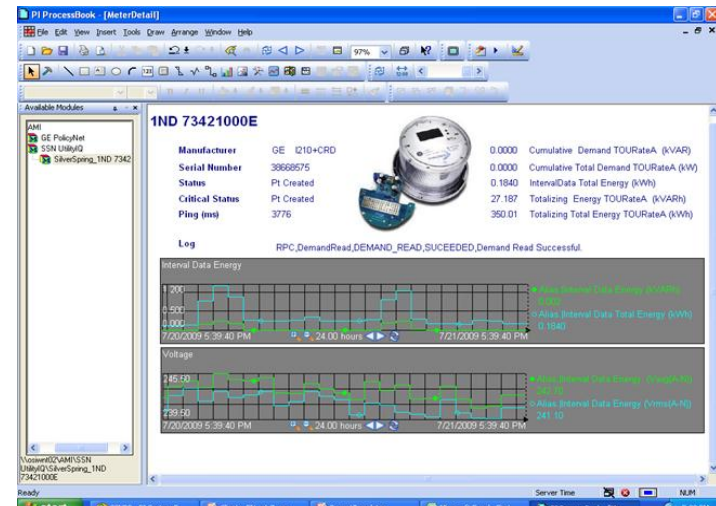
Operational Data Management – What is it?

- Operational Data Management System
 - Blend of **Meter** and **Operational** data in one system
 - Provides end to end seamless view of the Grid
 - Data Base of record for time series data
 - Meter and Substation data Management
 - Visualization with Situational awareness



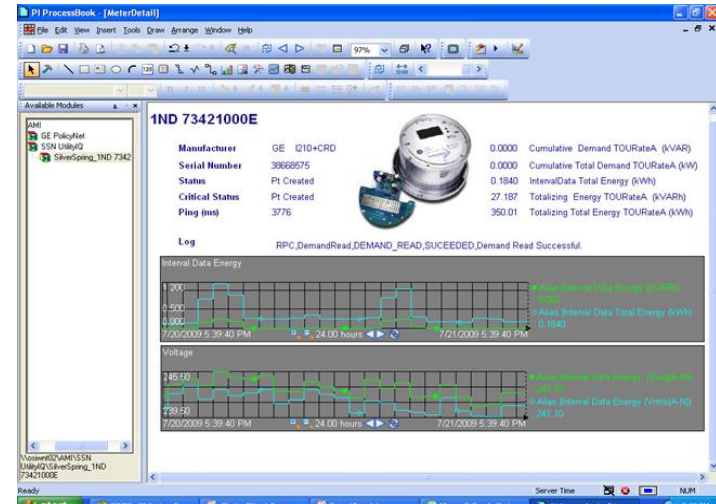
Smart Meter Data Value – Outage Management

- Outages
 - Remote meter reading
 - Assist in Identifying Nested Outages
 - Data Base of record for time series data
 - Reduces “Ok on arrival” calls
 - Fewer Truck rolls



Smart Meter Data Value – Low Voltage Monitoring

- Voltage
 - Enhance Power Quality
 - Improved Customer Service
 - Better Grid Efficiency

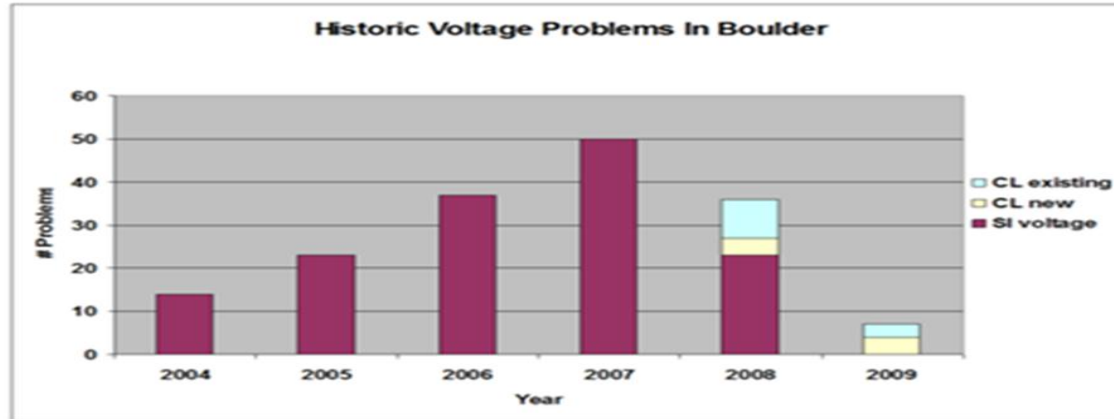


Smart Meter Data Value – Low Voltage Monitoring



Voltage Problem Resolution

Data: YTD, June 2009



CL existing: Existing issue monitoring

CL new: Detected issue

SI voltage: Service investigation needed



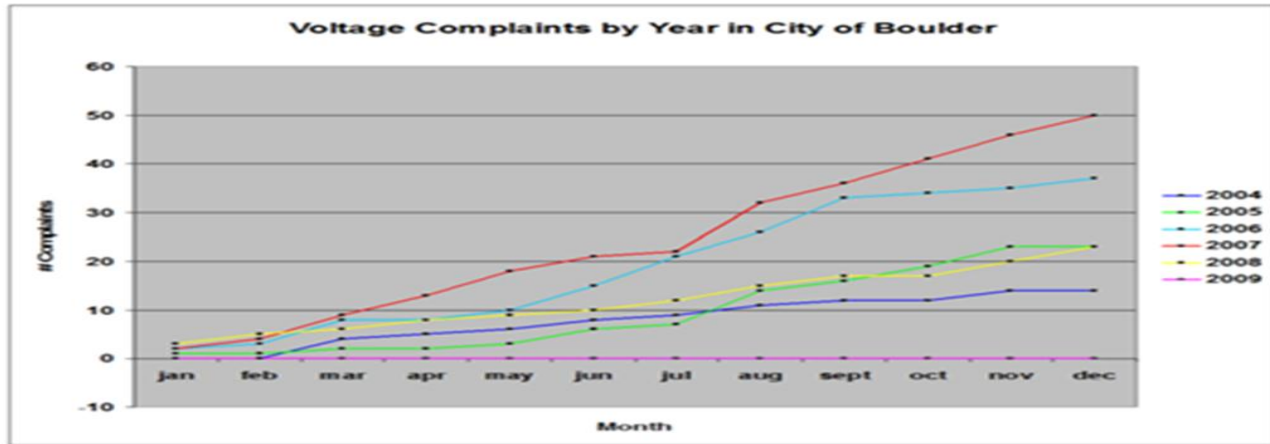
RESPONSIBLE BY NATURE™

Smart Meter Data Value – Low Voltage Monitoring



Reduced Customer Complaints

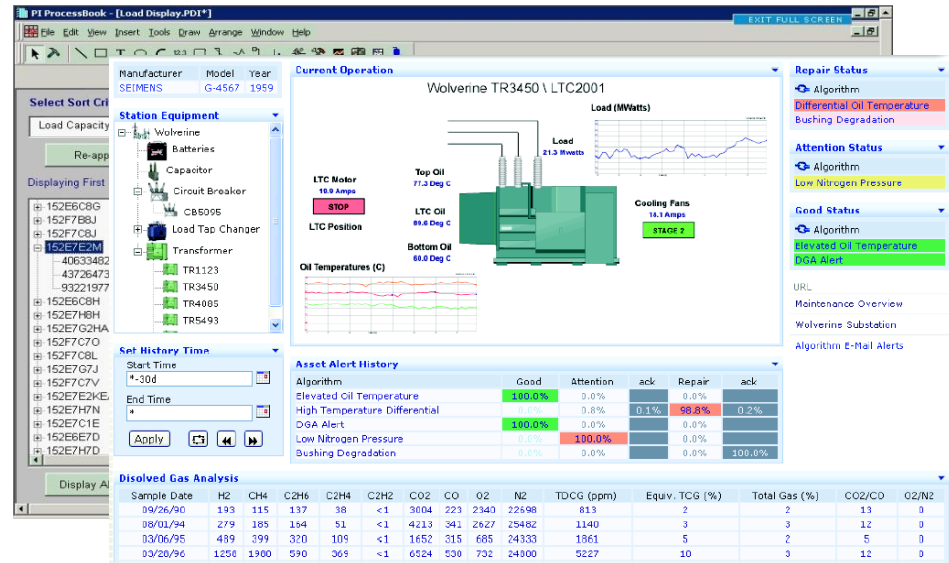
Data: YTD, June 2009



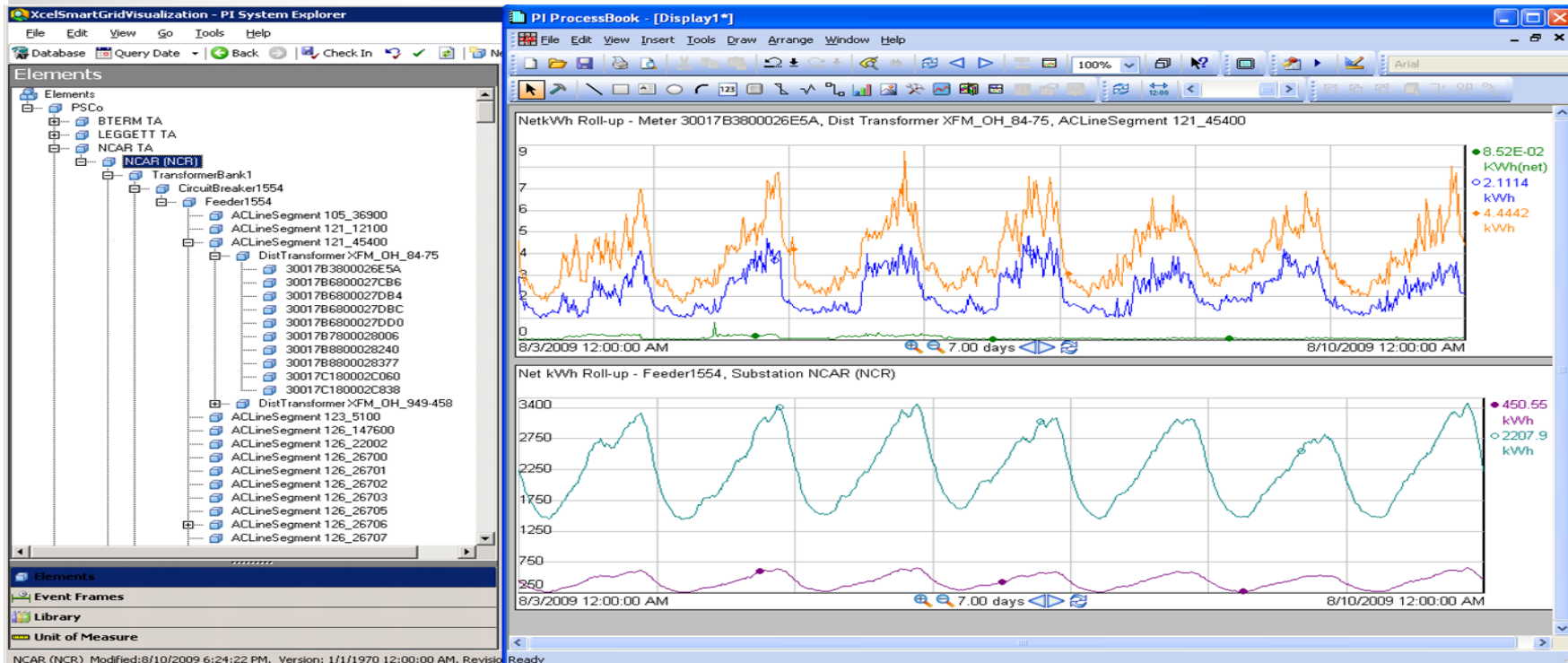
RESPONSIBLE BY NATURE™

Smart Meter Data Value – Transformer Loading from AMI Data

- Outage Avoidance
 - Early Detection of Problems
 - Shorter and few outages if they occur
 - Improve maintenance



Smart Meter Data Value – Transformer Loading from AMI Data



Smart Meter Data Value – Transformer Loading from AMI Data



Transformer Overload Detection

Data: YTD, June 2009

YEAR	UNPREDICTED FAILURES	CURRENTLOOK DETECTIONS	BOULDER TOTAL
2005	7	NA	7
2006	13	NA	13
2007	6	NA	6
2008	6	3	9
2009	0	4	4



RESPONSIBLE BY NATURE™



PI System Value Proposition

- Improve real-time & historical data analysis & modeling
- Increase timely decision making capability
- Enable energy market assessment & transaction
- Improve abilities for new business development
- Extract value from capital investments
- Support innovation
- Optimize operations and maintenance costs
- Improve system performance and reliability
- Increase productivity
- Improve customer satisfaction
- Improves safety and environmental compliance
- Enable end-to-end integration



Conclusion

- PI System delivers value out of the box and over time
- Customers can improve their businesses in silos
- PI System can deliver value in ‘regulated’ or ‘unregulated’ operations
- Acceleration of PI System expansion can occur with cooperation between operating units, IT and leadership
- Enterprise agreements can help customers accelerate end-to-end integration
 - Enterprise Project Manager and Account Manager
 - Access to Center of Excellence (Max VALUE from PI System)
 - PI System monitoring
 - Lose the “tag” constraint mentality and think “eat more PI”



Thank you

