



OSIsoft.
REGIONAL 2012
SEMINAR
E M E A
The **Power** of **Data**



Business Analytics with Microsoft SQL Server 2012 and the PI System

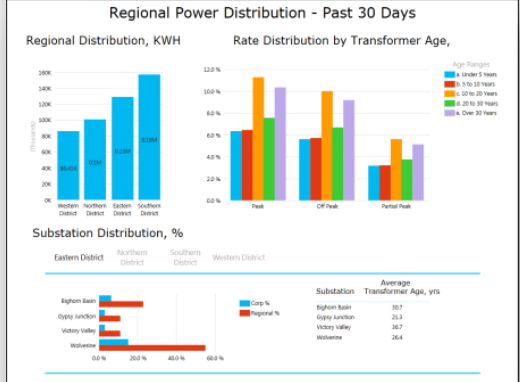
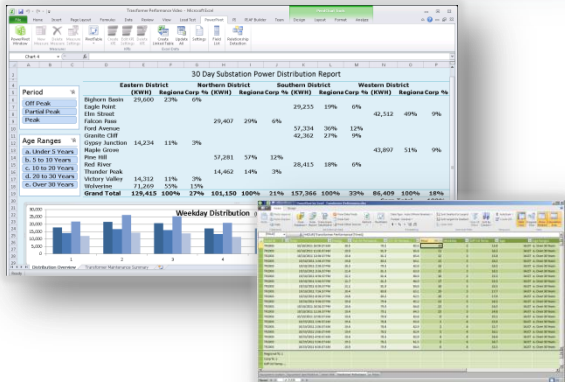
Presented by **Christian Leroux**

Senior Customer Support Engineer, EPM
OSIsoft España SL

Overview

- Business Analytics Toolkit
- Example: “*Substation Power Distribution Profile*”
 - ***Business Context*** - PI Asset Framework (PI AF)
 - ***Data Access*** - PI OLEDB Enterprise
 - ***Analytic Reporting*** - PowerPivot for Excel 2010
 - ***Ad Hoc Analytics and Reporting*** - Power View
- Power View Integration with PowerPoint
- Additional Resources

Business Analytics Toolkit

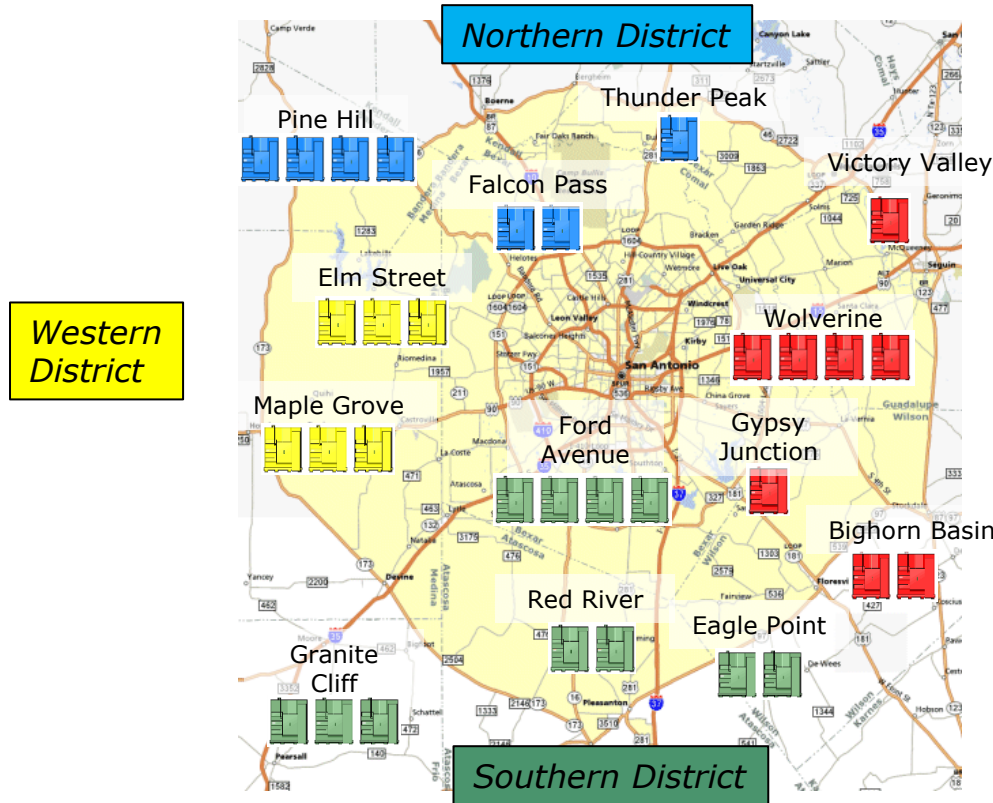


PowerPivot for Excel 2010



Power View

Example: Substation Power Distribution Profile



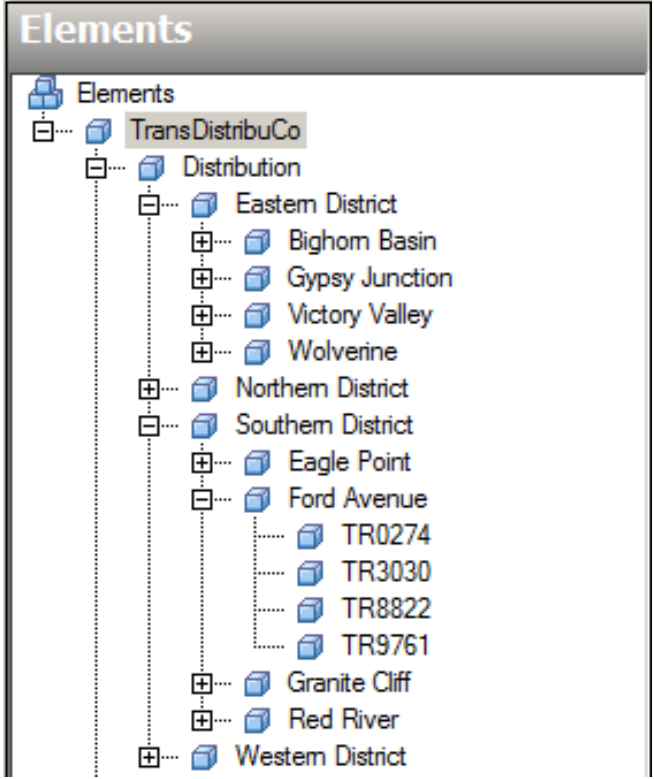
My Objectives

- Regional and Rate Period Power Distribution
- Aging Asset Risk Assessment
- *Want to do it myself !*

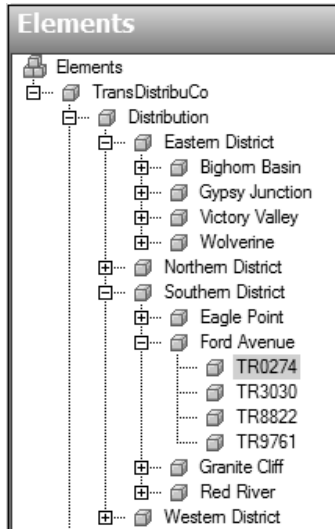
PI Server – PI Asset Framework (PI AF)

Asset Hierarchy

- District
- Substation
- Transformer



PI Server – PI Asset Framework (PI AF)



TR0274

General | Child Elements | Attributes | Ports | Version

Filter

Name	Value
Category: Current DGA Analysis	
Acetylene	4 ppm
Carbon Dioxide	3004 ppm
Carbon Monoxide	123 ppm
Ethane	190 ppm
Ethylene	38 ppm
Hydrogen	294 ppm
Methane	121 ppm
Nitrogen	22698 ppm
Oxygen	2340 ppm
Category: Load Tap Changer	
LTC Oil Temperature	65.0885009765625 °F
LTC Oil Temperature - 1H A...	62.7173211853571 °F
Category: Performance	
Energy	20.6299715201975 MWh
Load	20.1319046020508 MW
Category: Specifications	
Installation Date	6/10/1992 12:00:00 AM
Manufacturer	PowerMaster
Model	PM-56
Category: Tank	
Bottom Oil Temperature	48.3781089782715 °F
Top Oil Temperature	79.2328872680664 °F
Top Oil Temperature - 1H A...	83.2808045109946 °F

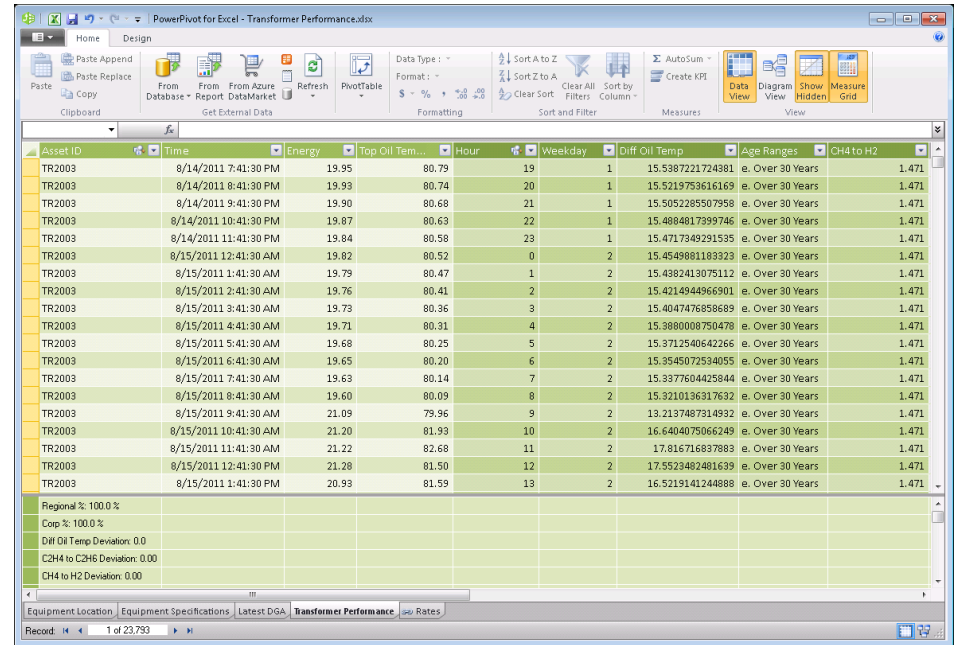
Transformer Attributes

- PI System Data
- Equipment Specifications
- DGA analysis

PI OLEDB Enterprise

Important Considerations

- Leverage structure used throughout your PI System infrastructure
- Insure accurate averages of real-time events
- Scale-up by adding PI AF Structure
- Access PI Event Frames in next release

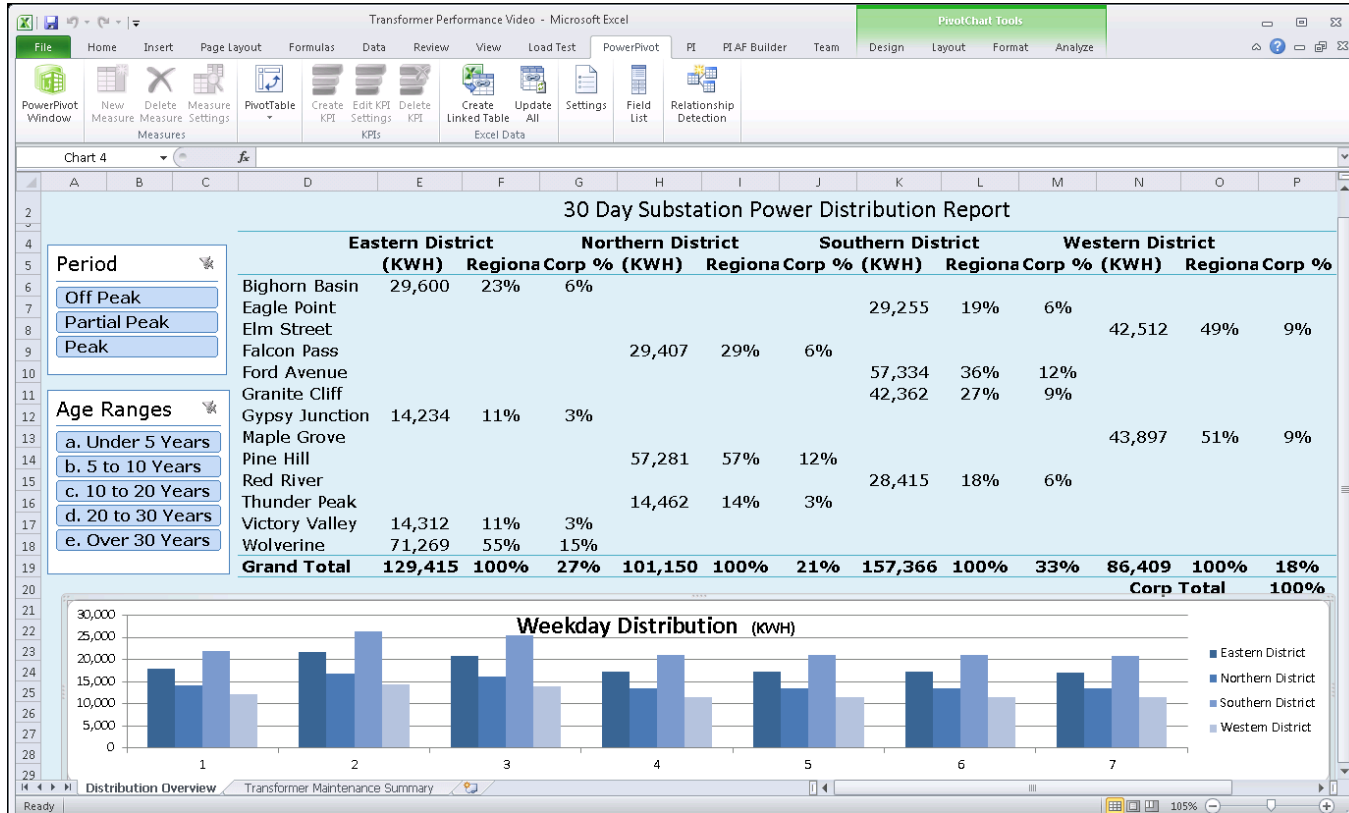


Asset ID	Time	Energy	Top Oil Tem...	Hour	Weekday	Diff Oil Temp	Age Ranges	CH4 to H2
TR2003	8/14/2011 7:41:30 PM	19.95	80.79	19	1	15.5387221724381	e. Over 30 Years	1.471
TR2003	8/14/2011 8:41:30 PM	19.93	80.74	20	1	15.5219753616169	e. Over 30 Years	1.471
TR2003	8/14/2011 9:41:30 PM	19.90	80.68	21	1	15.5052285507958	e. Over 30 Years	1.471
TR2003	8/14/2011 10:41:30 PM	19.87	80.63	22	1	15.4884817399746	e. Over 30 Years	1.471
TR2003	8/14/2011 11:41:30 PM	19.84	80.58	23	1	15.4717349291535	e. Over 30 Years	1.471
TR2003	8/15/2011 12:41:30 AM	19.82	80.52	0	2	15.4549881183323	e. Over 30 Years	1.471
TR2003	8/15/2011 1:41:30 AM	19.79	80.47	1	2	15.4382413076112	e. Over 30 Years	1.471
TR2003	8/15/2011 2:41:30 AM	19.76	80.41	2	2	15.4214944966901	e. Over 30 Years	1.471
TR2003	8/15/2011 3:41:30 AM	19.73	80.36	3	2	15.4047476858689	e. Over 30 Years	1.471
TR2003	8/15/2011 4:41:30 AM	19.71	80.31	4	2	15.3880008750478	e. Over 30 Years	1.471
TR2003	8/15/2011 5:41:30 AM	19.68	80.25	5	2	15.3712540642266	e. Over 30 Years	1.471
TR2003	8/15/2011 6:41:30 AM	19.65	80.20	6	2	15.3545072534055	e. Over 30 Years	1.471
TR2003	8/15/2011 7:41:30 AM	19.63	80.14	7	2	15.3377604425844	e. Over 30 Years	1.471
TR2003	8/15/2011 8:41:30 AM	19.60	80.09	8	2	15.3210136317632	e. Over 30 Years	1.471
TR2003	8/15/2011 9:41:30 AM	21.09	79.96	9	2	13.213748731493	e. Over 30 Years	1.471
TR2003	8/15/2011 10:41:30 AM	21.20	81.93	10	2	16.404075066249	e. Over 30 Years	1.471
TR2003	8/15/2011 11:41:30 AM	21.22	82.68	11	2	17.816716937883	e. Over 30 Years	1.471
TR2003	8/15/2011 12:41:30 PM	21.28	81.50	12	2	17.5523482481639	e. Over 30 Years	1.471
TR2003	8/15/2011 1:41:30 PM	20.93	81.59	13	2	16.5219141244888	e. Over 30 Years	1.471

Regional %: 100.0 %
Corp %: 100.0 %
Diff Oil Temp Deviation: 0.0
C2H4 to C2H6 Deviation: 0.00
CH4 to H2 Deviation: 0.00

Equipment Location | Equipment Specifications | Latest DGA | Transformer Performance | Rates
Record: 1 of 23,793

PowerPivot for Excel 2010



Power Distribution Report

File Home Insert Page Layout Formulas Data Review View Add-Ins PowerPivot PIAF Builder

Clipboard Font Alignment Number Styles Cells Editing

Calibri 11

General

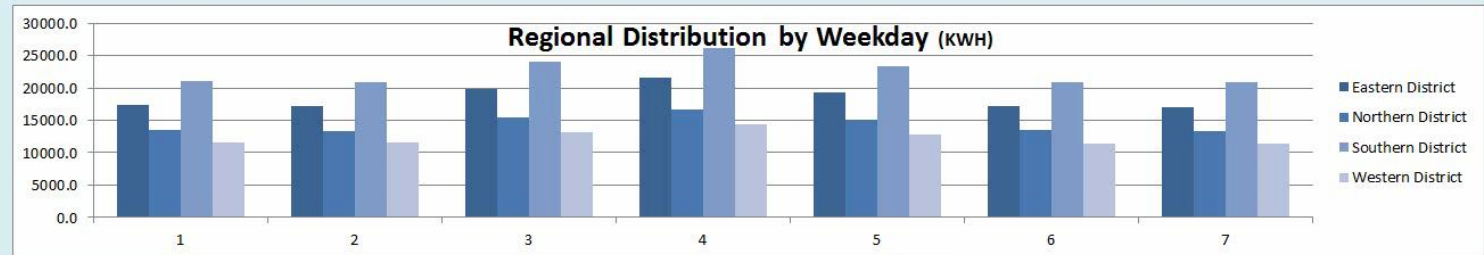
Conditional Formatting as Table Styles

AutoSum Fill Clear

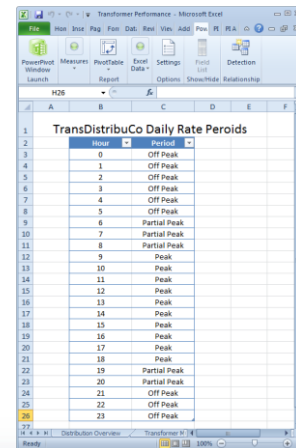
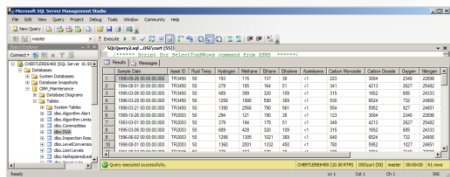
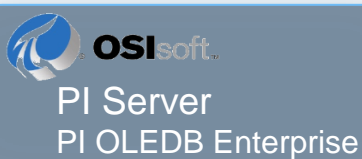
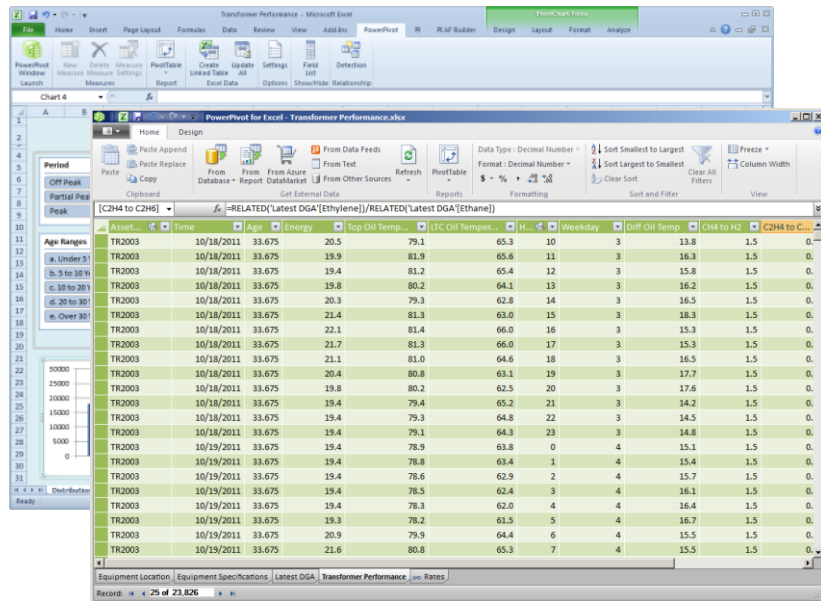
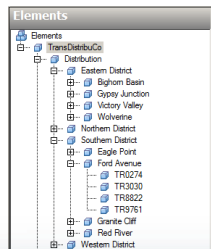
Sort & Filter Find & Select

30 Day Substation Power Distribution Report

Period	Eastern District			Northern District			Southern District			Western District		
	(KWH)	Regional %	Corp %	(KWH)	Regional %	Corp %	(KWH)	Regional %	Corp %	(KWH)	Regional %	Corp %
Off Peak	Bighorn Basin	29,606	22.9%	6.2%								
Partial Peak	Eagle Point						29,275	18.6%	6.2%			
Peak	Elm Street									42,377	49.2%	8.9%
	Falcon Pass				29,263	28.9%	6.2%					
	Ford Avenue						57,612	36.5%	12.1%			
	Granite Cliff						42,389	26.9%	8.9%			
	Gypsy Junction	14,135	10.9%	3.0%								
	Maple Grove									43,763	50.8%	9.2%
	Pine Hill				57,428	56.8%	12.1%					
	Red River						28,365	18.0%	6.0%			
	Thunder Peak				14,405	14.2%	3.0%					
	Victory Valley	14,417	11.1%	3.0%								
	Wolverine	71,315	55.1%	15.0%								
	Grand Total	129,473	100.0%	27.3%	101,097	100.0%	21.3%	157,641	100.0%	33.2%	86,140	100.0%
										Corp Total	100.0%	

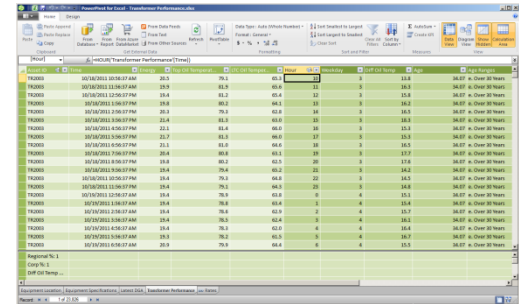


PowerPivot Enables Data Integration



PowerPivot Enables Extended Analysis

DAX – Data Analysis Expression Language



Transformer ID	Installation Date	Age	Age Range
TR0001	30/10/2011 00:00:00 AM	24.0	70.4
TR0002	30/10/2011 11:58:37 AM	19.9	81.9
TR0003	30/10/2011 12:00:00 AM	19.4	81.2
TR0004	30/10/2011 01:00:00 PM	19.4	80.2
TR0005	30/10/2011 01:00:00 PM	20.1	79.9
TR0006	30/10/2011 01:00:00 PM	21.4	81.3
TR0007	30/10/2011 01:00:00 PM	21.1	81.4
TR0008	30/10/2011 01:00:00 PM	21.7	81.3
TR0009	30/10/2011 01:00:00 PM	21.1	81.5
TR0010	30/10/2011 01:00:00 PM	21.4	81.3
TR0011	30/10/2011 01:00:00 PM	21.1	81.2
TR0012	30/10/2011 01:00:00 PM	21.4	81.2
TR0013	30/10/2011 01:00:00 PM	21.4	81.2
TR0014	30/10/2011 01:00:00 PM	21.4	81.2
TR0015	30/10/2011 01:00:00 PM	21.4	81.2
TR0016	30/10/2011 01:00:00 PM	21.4	81.2
TR0017	30/10/2011 01:00:00 PM	21.4	81.2
TR0018	30/10/2011 01:00:00 PM	21.4	81.2
TR0019	30/10/2011 01:00:00 PM	21.4	81.2
TR0020	30/10/2011 01:00:00 PM	21.4	81.2
TR0021	30/10/2011 01:00:00 PM	21.4	81.2
TR0022	30/10/2011 01:00:00 PM	21.4	81.2
TR0023	30/10/2011 01:00:00 PM	21.4	81.2
TR0024	30/10/2011 01:00:00 PM	21.4	81.2
TR0025	30/10/2011 01:00:00 PM	21.4	81.2
TR0026	30/10/2011 01:00:00 PM	21.4	81.2
TR0027	30/10/2011 01:00:00 PM	21.4	81.2
TR0028	30/10/2011 01:00:00 PM	21.4	81.2
TR0029	30/10/2011 01:00:00 PM	21.4	81.2
TR0030	30/10/2011 01:00:00 PM	21.4	81.2
TR0031	30/10/2011 01:00:00 PM	21.4	81.2
TR0032	30/10/2011 01:00:00 PM	21.4	81.2
TR0033	30/10/2011 01:00:00 PM	21.4	81.2
TR0034	30/10/2011 01:00:00 PM	21.4	81.2
TR0035	30/10/2011 01:00:00 PM	21.4	81.2
TR0036	30/10/2011 01:00:00 PM	21.4	81.2
TR0037	30/10/2011 01:00:00 PM	21.4	81.2
TR0038	30/10/2011 01:00:00 PM	21.4	81.2
TR0039	30/10/2011 01:00:00 PM	21.4	81.2
TR0040	30/10/2011 01:00:00 PM	21.4	81.2
TR0041	30/10/2011 01:00:00 PM	21.4	81.2
TR0042	30/10/2011 01:00:00 PM	21.4	81.2
TR0043	30/10/2011 01:00:00 PM	21.4	81.2
TR0044	30/10/2011 01:00:00 PM	21.4	81.2
TR0045	30/10/2011 01:00:00 PM	21.4	81.2
TR0046	30/10/2011 01:00:00 PM	21.4	81.2
TR0047	30/10/2011 01:00:00 PM	21.4	81.2
TR0048	30/10/2011 01:00:00 PM	21.4	81.2
TR0049	30/10/2011 01:00:00 PM	21.4	81.2
TR0050	30/10/2011 01:00:00 PM	21.4	81.2
TR0051	30/10/2011 01:00:00 PM	21.4	81.2
TR0052	30/10/2011 01:00:00 PM	21.4	81.2
TR0053	30/10/2011 01:00:00 PM	21.4	81.2
TR0054	30/10/2011 01:00:00 PM	21.4	81.2
TR0055	30/10/2011 01:00:00 PM	21.4	81.2
TR0056	30/10/2011 01:00:00 PM	21.4	81.2
TR0057	30/10/2011 01:00:00 PM	21.4	81.2
TR0058	30/10/2011 01:00:00 PM	21.4	81.2
TR0059	30/10/2011 01:00:00 PM	21.4	81.2
TR0060	30/10/2011 01:00:00 PM	21.4	81.2
TR0061	30/10/2011 01:00:00 PM	21.4	81.2
TR0062	30/10/2011 01:00:00 PM	21.4	81.2
TR0063	30/10/2011 01:00:00 PM	21.4	81.2
TR0064	30/10/2011 01:00:00 PM	21.4	81.2
TR0065	30/10/2011 01:00:00 PM	21.4	81.2
TR0066	30/10/2011 01:00:00 PM	21.4	81.2
TR0067	30/10/2011 01:00:00 PM	21.4	81.2
TR0068	30/10/2011 01:00:00 PM	21.4	81.2
TR0069	30/10/2011 01:00:00 PM	21.4	81.2
TR0070	30/10/2011 01:00:00 PM	21.4	81.2
TR0071	30/10/2011 01:00:00 PM	21.4	81.2
TR0072	30/10/2011 01:00:00 PM	21.4	81.2
TR0073	30/10/2011 01:00:00 PM	21.4	81.2
TR0074	30/10/2011 01:00:00 PM	21.4	81.2
TR0075	30/10/2011 01:00:00 PM	21.4	81.2
TR0076	30/10/2011 01:00:00 PM	21.4	81.2
TR0077	30/10/2011 01:00:00 PM	21.4	81.2
TR0078	30/10/2011 01:00:00 PM	21.4	81.2
TR0079	30/10/2011 01:00:00 PM	21.4	81.2
TR0080	30/10/2011 01:00:00 PM	21.4	81.2
TR0081	30/10/2011 01:00:00 PM	21.4	81.2
TR0082	30/10/2011 01:00:00 PM	21.4	81.2
TR0083	30/10/2011 01:00:00 PM	21.4	81.2
TR0084	30/10/2011 01:00:00 PM	21.4	81.2
TR0085	30/10/2011 01:00:00 PM	21.4	81.2
TR0086	30/10/2011 01:00:00 PM	21.4	81.2
TR0087	30/10/2011 01:00:00 PM	21.4	81.2
TR0088	30/10/2011 01:00:00 PM	21.4	81.2
TR0089	30/10/2011 01:00:00 PM	21.4	81.2
TR0090	30/10/2011 01:00:00 PM	21.4	81.2
TR0091	30/10/2011 01:00:00 PM	21.4	81.2
TR0092	30/10/2011 01:00:00 PM	21.4	81.2
TR0093	30/10/2011 01:00:00 PM	21.4	81.2
TR0094	30/10/2011 01:00:00 PM	21.4	81.2
TR0095	30/10/2011 01:00:00 PM	21.4	81.2
TR0096	30/10/2011 01:00:00 PM	21.4	81.2
TR0097	30/10/2011 01:00:00 PM	21.4	81.2
TR0098	30/10/2011 01:00:00 PM	21.4	81.2
TR0099	30/10/2011 01:00:00 PM	21.4	81.2
TR0100	30/10/2011 01:00:00 PM	21.4	81.2

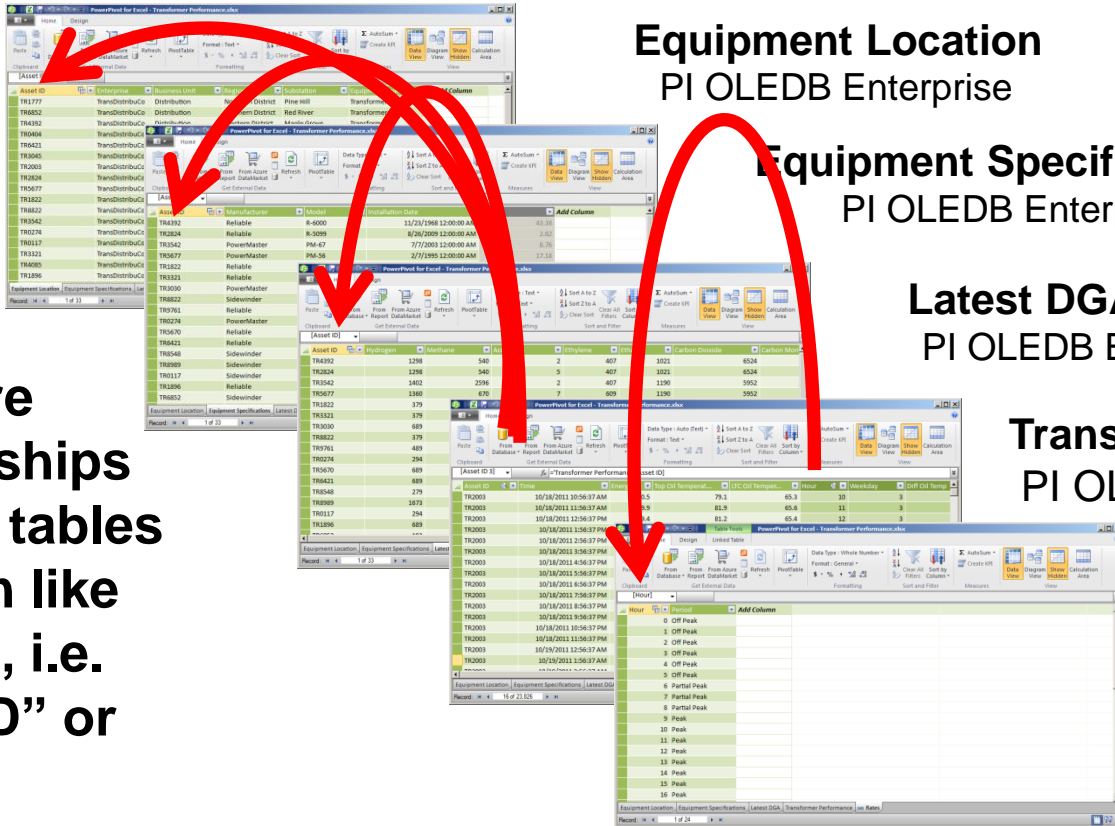
Transformer Age Column

=YEARFRAC('Equipment Specifications'[Installation Date],NOW())

Transformer Age Ranges Column

=IF('Transformer Performance'[Age]>30,"e. Over 30 Years", IF('Transformer Performance'[Age]>20,"d. 20 to 30 Years", IF('Transformer Performance'[Age]>10,"c. 10 to 20 Years", IF('Transformer Performance'[Age]>5,"b. 5 to 10 Years", "a. Under 5 Years"))))

PowerPivot Creates the “Cube”



Equipment Location
PI OLEDB Enterprise

Equipment Specifications
PI OLEDB Enterprise

Latest DGA
PI OLEDB Enterprise

Transformer Performance
PI OLEDB Enterprise

Rates
Excel Linked Table

Configure Relationships between tables based on like columns, i.e. “Asset ID” or “Hour”

SharePoint 2010 Enterprise – PowerPivot Gallery

Transformer Performance
Last Modified By: Curt Hertler, Date: 1/11/2012
Created By: Curt Hertler

Distribution Overview

Benchmarking Fuel and Maintenance

Equipment Benchmarking Fuel Cost

Equipment	Region	Cost	Efficiency
1	Eastern	120	85%
2	Northern	150	90%
3	Southern	180	88%
4	Western	200	92%

30 Day Substation Power Distribution Report

Substation	Region	Power (KWH)	Efficiency
1	Eastern	25,000	82%
2	Northern	30,000	85%
3	Southern	35,000	88%
4	Western	40,000	90%

Regional Distribution by Weekday (KWH)

30 Day Substation Power Distribution Report

Substation	Eastern District (KWH)			Northern District (KWH)			Southern District (KWH)			Western District (KWH)		
	Power	Regional %	Corp %	Power	Regional %	Corp %	Power	Regional %	Corp %	Power	Regional %	Corp %
Bighorn Basin	29,600	22.9%	6.24%									
Eagle Point							29,255	18.6%	6.17%			
Elm Street										42,512	49.2%	8.96%
Falcon Pass				29,407	29.1%	6.20%						
Ford Avenue							57,334	36.4%	12.09%			
Granite Cliff							42,362	26.9%	8.93%			
Gypsy Junction										43,897	50.8%	9.25%
Maple Grove	14,234	11.0%	3.00%									
Pine Hill							57,281	56.6%	12.08%			
Red River										28,415	18.1%	5.99%
Thunder Peak												
Victory Valley	14,312	11.1%	3.02%	14,462	14.3%	3.05%						
Wolverine	71,269	55.1%	15.02%									
Grand Total	129,415	100.0%	27.28%	101,150	100.0%	21.32%	157,366	100.0%	33.18%	86,409	100.0%	18.22%
										Corp Total	100.0%	

Regional Distribution by Weekday (KWH)

SharePoint 2010 Enterprise – Power View

The screenshot shows a SharePoint 2010 Power View report titled "Distribution Profile" with the following content:

- Page Header:** "Distribution Profile", "Last Modified By: Curt Hertler, Date: 1/13/2012", "Created By: Curt Hertler".
- Left Navigation:** Home, Libraries, Site Pages, Shared Documents, PowerPivot Examples, Backups, Dave's Reports, Lists, Calendar, Tasks, Discussions, Team Discussion, Recycle Bin, All Site Content.
- Main Content:**
 - Regional Power Distribution - Past 30 Days:** A bar chart showing KWH distribution across Western, Northern, Eastern, and Southern Districts. Values are 86.41K, 0.1M, 0.13M, and 0.16M respectively.
 - Rate Distribution by Transformer Age:** A grouped bar chart showing rates for Peak, Off Peak, and Partial Peak across five age ranges (a-e).
 - Substation Distribution, %:** A horizontal bar chart comparing Corp % and Regional % for Bighorn Basin, Gypsy Junction, Victory Valley, and Wolverine substations.

Regional Power Distribution - Past 30 Days

Regional Distribution, KWH

District	KWH (Thousands)
Western District	86.41K
Northern District	0.1M
Eastern District	0.13M
Southern District	0.16M

Rate Distribution by Transformer Age,

Age Ranges:

- a. Under 5 Years
- b. 5 to 10 Years
- c. 10 to 20 Years
- d. 20 to 30 Years
- e. Over 30 Years

Category	a	b	c	d	e
Peak	~6.5%	~6.5%	~11.5%	~7.5%	~10.5%
Off Peak	~5.5%	~5.5%	~10.0%	~6.5%	~9.0%
Partial Peak	~3.0%	~3.0%	~5.5%	~3.5%	~5.0%

Substation Distribution, %

Substation	Corp %	Regional %	Average Transformer Age, yrs
Bighorn Basin	~10%	~25%	30.7
Gypsy Junction	~5%	~15%	21.3
Victory Valley	~5%	~15%	36.7
Wolverine	~15%	~55%	26.4

Substation	Average Transformer Age, yrs
Bighorn Basin	30.7
Gypsy Junction	21.3
Victory Valley	36.7
Wolverine	26.4

PowerPivot Gallery - Windows Internet Explorer
 http://74.217.101.216/PowerPivot%20Gallery/Forms/Carousel.aspx

Site Actions | Browse | Documents | Library | Curt Hertler

Main Site > PowerPivot Gallery
 Share a document with the team by adding it to this document library.

Main Site | PI Fundamentals | Product Demos | Storyboard Demos

Search this site...

Recycle Bin | All Site Content

Transformer Performance

Last Modified By: Curt Hertler, Date: 4/6/2012
 Created By: Curt Hertler

Server Performance Dashboard | Distribution Overview | Transformer Maintenance Summary

OSsoft Corporate Server Performance

Average CPU Use %

Average Memory Use %

Free Disk Space TB

30 Day Substation Power Distribution Report

Regional %	Corp %	Northern District (KWH)		Southern District (KWH)		Western District (KWH)					
		Regional %	Corp %	Regional %	Corp %	Regional %	Corp %				
22.9%	8.34%			29,255	18.6%	6.17%	42,512	49.2%	8.96%		
		29,487	25.1%	6.20%	57,834	36.4%	13.09%				
				42,362	26.9%	8.93%	43,897	50.8%	9.25%		
11.0%	3.00%			57,281	56.6%	12.08%					
		34,462	14.3%	3.05%	26,413	18.1%	5.99%				
17.11%	3.02%										
19.55.1%	25.02%										
19.100.0%	27.28%	181,150	100.0%	21.32%	557,366	100.0%	33.58%	86,409	100.0%	18.22%	
										Corp Total	100.00%

Regional Distribution by Weekday (KWH)

Legend: Eastern District, Northern District, Southern District, Western District

Transformer Maintenance Summary

Differential Oil Temperature

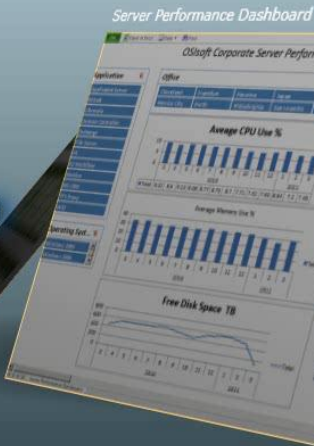
Thermal Fault

Conditions by Manufacturer

Transformer Performance

Last Modified By: Curt Hertler, Date: 4/6/2012
 Created By: Curt Hertler

Distribution Overview



30 Day Substation Power Distribution Report

Regional %	Corp %	Northern District (KWH)		Southern District (KWH)		Western District (KWH)						
		Regional %	Corp %	Regional %	Corp %	Regional %	Corp %					
22.3%	8.34%			29,255	18.6%	6.17%	42,512	49.2%	8.96%			
		29,487	25.1%	6.20%	57,834	36.4%	12.09%					
				42,362	26.9%	8.93%	43,897	50.8%	9.25%			
11.0%	3.00%			57,281	56.6%	12.08%						
		34,462	14.3%	3.05%	26,413	18.1%	5.99%					
17	11.1%	3.02%										
18	15.1%	15.02%										
19	100.0%	27.28%	181,150	100.0%	21.32%	157,366	100.0%	33.18%	86,409	100.0%	18.22%	
											Corp Total	100.00%

Regional Distribution by Weekday (KWH)

Transformer Maintenance Summary

Transformer Maintenance Summary

Differential Oil Temperature

Thermal Fault

Conditions by Manufacturer

Manufacturer	Age	Oil Temp	Insulation	Oil %	Oil % OK	Oil % Fail
100001	6.8	24.1	10000	57	57	0
100002	4.3	25.1	10000	50	50	0
100003	5.3	25.9	10000	52	52	0
100004	45.4	23.7	10000	54	54	0
100005	12.4	25.5	10000	53	53	0
100006	5.4	25.1	10000	53	53	0

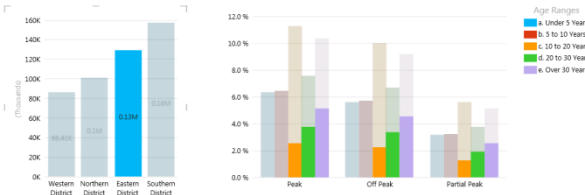
Microsoft SQL 2012 Power View

Interactive Analysis

Regional Power Distribution - Past 30 Days

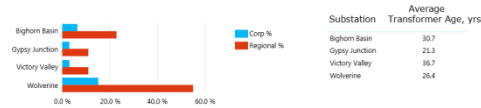
Regional Distribution, KWH

Rate Distribution by Transformer Age,



Substation Distribution, %

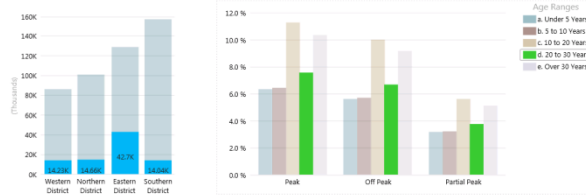
Eastern District



Regional Power Distribution - Past 30 Days

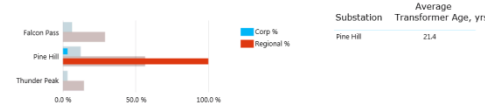
Regional Distribution, KWH

Rate Distribution by Transformer Age,



Substation Distribution, %

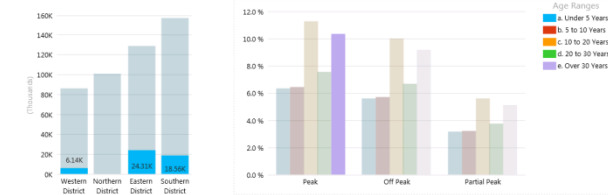
Northern District



Regional Power Distribution - Past 30 Days

Regional Distribution, KWH

Rate Distribution by Transformer Age,



Substation Distribution, %

Southern District



Distribution by District

Distribution by Transformer Age

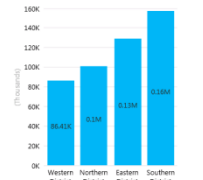
Distribution by Age and Rate

Microsoft SQL 2012 Power View

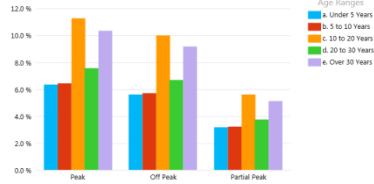
Multiple Views \ Pages

Regional Power Distribution - Past 30 Days

Regional Distribution, KWH

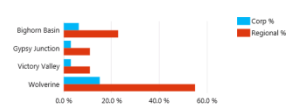


Rate Distribution by Transformer Age,



Substation Distribution, %

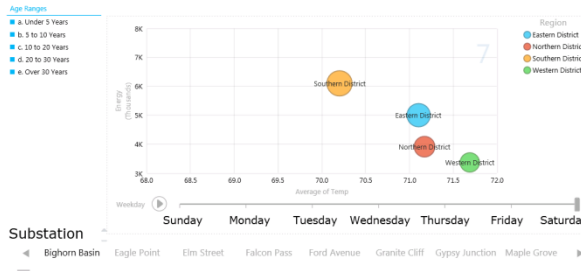
Eastern District Northern District Southern District Western District



Substation	Average Transformer Age, yrs
Bighorn Basin	32.7
Gypsy Junction	21.3
Victory Valley	36.7
Wolverine	26.4

Power Distribution Profile - Past 30 Days

Regional Distribution by Weekday vs. Substation Temperature



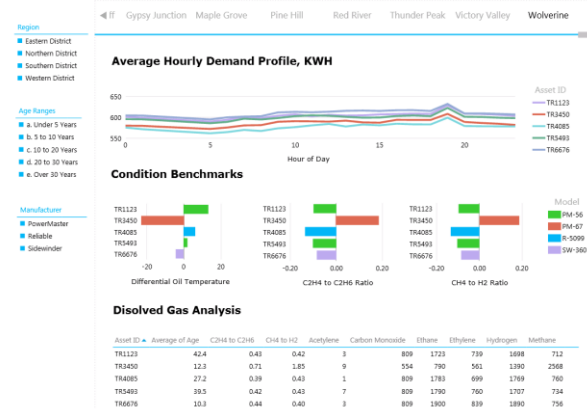
Average Daily Power, KWH



Average Daily Substation Temperature, F



Substation Transformer Condition and Benchmarking



Aging Asset Risk Assessment

Weekday Distribution Profile

Equipment Condition Benchmarking

Power View Reports in PowerPoint

Power View
Microsoft SQL Server Reporting Services
Version 11.0.2100.60
© 2012 Microsoft Corporation. All rights reserved.

Diagnosics
[Sync diagnostic information with the server.](#)
Not synced during this session.

Export to PowerPoint

Distribution - Past 30 Days
Distribution by Transformer Age, %

Age Ranges
 • Under 5 Years
 • 5 to 10 Years
 • 10 to 20 Years
 • 20 to 30 Years
 • Over 30 Years

Substation Distribution, %

Substation	Under 5 Years	5 to 10 Years	10 to 20 Years	20 to 30 Years	Over 30 Years
Eastern District	~10%	~20%	~30%	~25%	~15%
Northern District	~15%	~25%	~35%	~20%	~5%
Southern District	~10%	~20%	~30%	~25%	~15%
Western District	~10%	~20%	~30%	~25%	~15%

Average Transformer Age, yrs

Substation	Average Transformer Age, yrs
Eastern Basin	20.7
Grady Junction	22.4
Valley Valley	28.7
Warnerne	28.4

Power View Slides - Microsoft PowerPoint

File Home Insert Design Transitions Animations Slide Show Review View Add-Ins

Clipboard Slides Paragraph

1 Regional Power Distribution - Past 30 Days
Regional Distribution, kWh State Distribution by Transformer Age, %
Substation Distribution, %

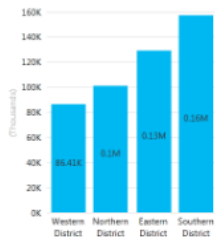
2 Power Distribution Profile - Past 30 Days
Regional Distribution by Weekday vs. Substation Temperature
Substation

3 Substation Transformer Condition and Benchmarking
Average Hourly Demand Profile, kWh
Condition Benchmarks
Detailed Site Analysis

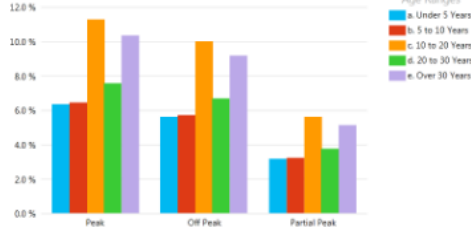
Power View Reports in PowerPoint

Regional Power Distribution - Past 30 Days

Regional Distribution, KWH

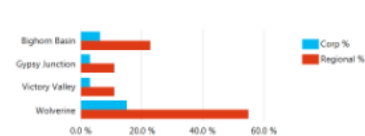


Rate Distribution by Transformer Age, %



Substation Distribution, %

Eastern District Northern District Southern District Western District

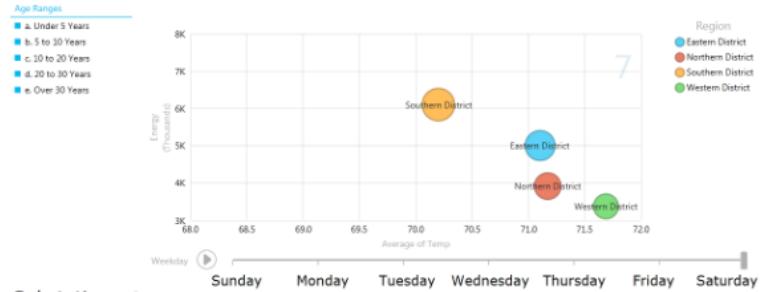


Substation	Average Transformer Age, yrs
Bighorn Basin	30.7
Gypsy Junction	23.3
Victory Valley	36.7
Wolverine	26.4

click to interact

Power Distribution Profile - Past 30 Days

Regional Distribution by Weekday vs. Substation Temperature



Substation

Bighorn Basin Eagle Point Elm Street Falcon Pass Ford Avenue Granite Cliff Gypsy Junction Maple Grove

Average Daily Power, KWH



Average Daily Substation Temperature, F



click to interact

Additional Information

Good presentation to download from the UC!

- “Insightful Reporting with the PI System”,
Todd Brown and Chris Nelson

OSIsoft Resources

- “Business Analytics with your PI System Data using Microsoft PowerPivot”
- PI T&D Users Group Site extranet.osisoft.com
- OSIsoft vCampus vcampus.osisoft.com

Microsoft Resources

- www.microsoft.com/en-us/bi/powerpivot.aspx

Helpful Books

- “PowerPivot for the Data Analyst”, Bill Jelen
- “Practical PowerPivot & DAX Formulas for Excel 2010”, Art Tennick

The screenshot shows a presentation slide with the following content:

OSIsoft

Business Analytics with your PI System Data
Using Microsoft PowerPivot

2011 OSIsoft T & D Users Group Meeting
September 23, 2011, Philadelphia

Curt Hertler
Marketing Manager, OSIsoft, LLC
curt@osisoft.com

Business Analytics with your PI System Data Using Microsoft PowerPivot
2011 OSIsoft T&D Users Group Meeting Training
September 23, 2011, Philadelphia

I. Overview

The release of PI CLEDB Enterprise and Microsoft PowerPivot for Excel 2010 provide an exciting combination of new technologies supporting advanced data analysis and enterprise awareness. These tools bring the power of multidimensional data analysis to the forefront of every PI user's innovation within Microsoft Excel 2010. This document describes the steps needed to create an example PowerPivot report for analyzing substation power distribution, as well as substation asset condition scoring and benchmarking.

The document is organized in five sections. It begins by describing the PI Asset Framework (AF) structure used to provide the contextual organization required to make the PI System data meaningful for multidimensional analysis. Next, the role of PI CLEDB Enterprise is discussed as the means of extracting PI System data in a tabular form, as datasets that can be imported directly into PowerPivot tables. The third section will discuss the use of PowerPivot to configure relationships between tables, to add calculated columns and calculated measures to the multidimensional data cube used for analysis. In section four, we will build two example reports that demonstrate the features of PowerPivot tables and charts. Lastly, we will describe how PowerPivot reports developed in Excel 2010 can be posted in Microsoft SharePoint 2010 Enterprise to extend the analytical experience to others in the organization through the browser.

The 30 Day Substation Power Distribution Profile Report shown below will demonstrate how PowerPivot can be used to aggregate total power delivered by region and substation. We will be adding measures to calculate the relative percentages of each total shown in the report pivot table. PowerPivot slicers (on the left-hand side of the screenshot below) will be added to allow users to filter totals based on the time of day each rate is enforced and also by transformer age. A PowerPivot chart will be added to show total power delivery by region for each weekday.

Region	Substation	Power Delivered (kWh)	Power Delivered (MWh)	Power Delivered (GWh)
Region 1	Substation 1	1000000	1000	1
Region 1	Substation 2	2000000	2000	2
Region 2	Substation 3	3000000	3000	3
Region 2	Substation 4	4000000	4000	4
Region 3	Substation 5	5000000	5000	5
Region 3	Substation 6	6000000	6000	6
Region 4	Substation 7	7000000	7000	7
Region 4	Substation 8	8000000	8000	8
Region 5	Substation 9	9000000	9000	9
Region 5	Substation 10	10000000	10000	10

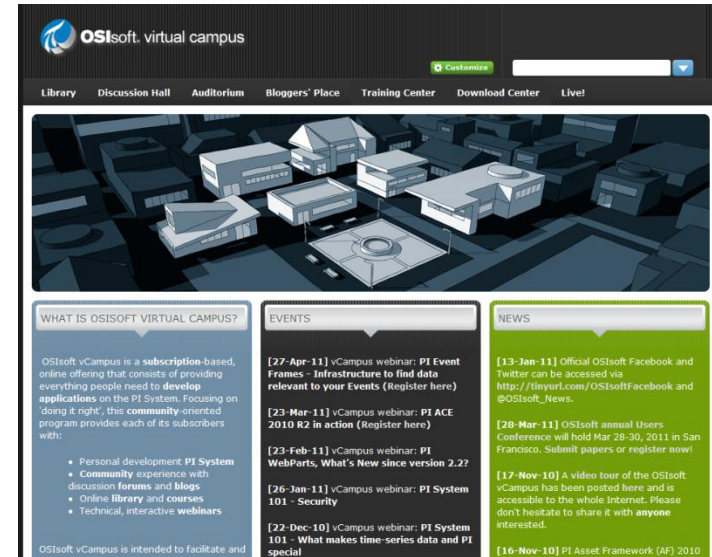
Regional Distribution by Weekday

The chart shows power distribution by region (Region 1 to Region 5) for each weekday (Monday to Friday). The Y-axis represents Power Delivered (kWh) and the X-axis represents Weekday. The bars show that power delivery is highest in Region 5 and lowest in Region 1.

3

OSIsoft Virtual Campus (vCampus)

- **Online, community-oriented** program
 - Software + Resources + Collaboration
 - Focus on development and integration
 - Partners, customers and OSIsoft
 - Exclusive contents (CTPs, Betas, technical papers)
- Personal **development PI System**
 - Development licenses for PI Data Access products (for developers and integrators)



<http://vCampus.osisoft.com>
vCampus@osisoft.com



vCampus Live! 2012

WHERE PI GEEKS MEET



Week of November 26th

Grand Hyatt Union Square, San Francisco

Christian Leroux

cleroux@osisoft.com

Senior Customer Support Engineer, EPM
OSIsoft España SL



THANK YOU

Brought to you by  **OSIsoft.**