



Operational Insight: Using Self-Service Technologies to Do More with the PI System

Presented by **Chris Van Dyke, Microsoft,**
Curt Hertler, OSIsoft

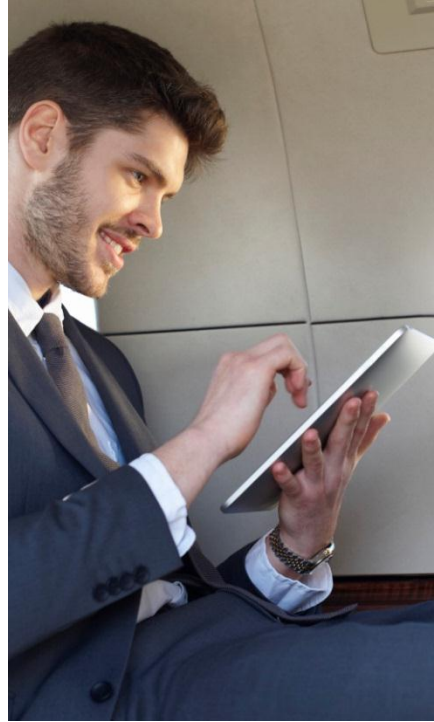
Diamond Sponsor

Microsoft[®]

Overview

- Microsoft's Strategy for Business Insight
 - “Microsoft SQL 2012 Self-Service Business Intelligence”
- OSIsoft's Infrastructure for Operational Insight
 - Business Analytics Toolkit
 - Example: “*Sustainability at Safeco Field*”
 - ***Coming soon!*** Excel 2013
 - Additional Resources

The Way People Experience Data



MANAGED SELF-SERVICE BI

END USER-CREATED, IT MANAGED

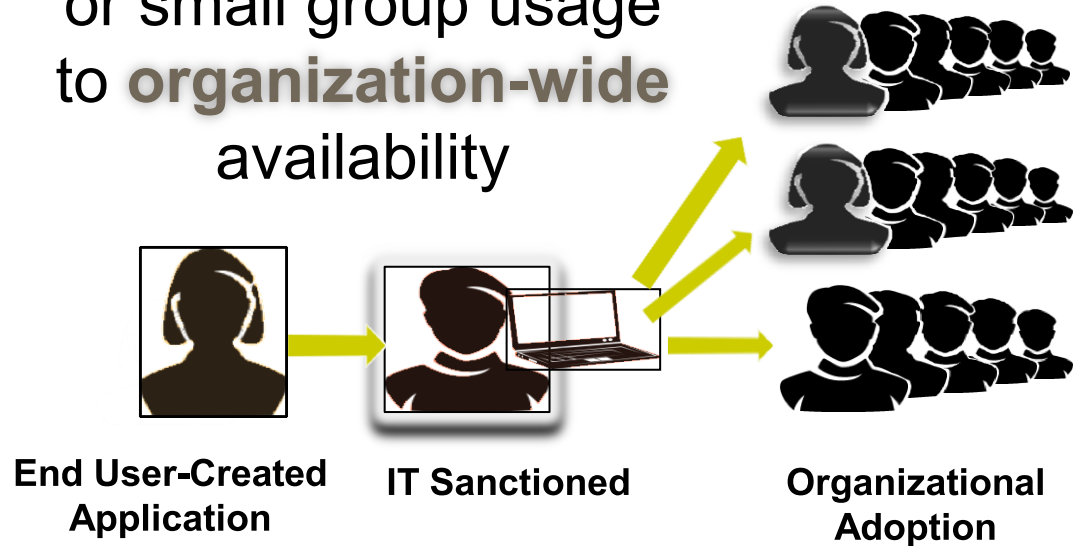
Transform end user-created applications in PowerPivot into corporate-grade solutions

Import end user-created PowerPivot models into Analysis Services

Sanction applications for broad use

Publish for use as a corporate-grade solution

From **individual** or small group usage to **organization-wide** availability



Evolution of Self-Service BI

Increasing BI functionality over the last decade

Microsoft®
Excel.2007

Microsoft®
SharePoint® 2007
Microsoft®
SQL Server® 2008

Microsoft®
SQL Server™ 2005

- Reporting Services
- Report Builder 1

- Excel Services
- Reporting Services with SharePoint
- Report Builder 2

Microsoft®
Excel.2010
Microsoft®
SharePoint® 2010
Enterprise

Microsoft®
SQL Server® 2008 R2

- PowerPivot for Excel
- PowerPivot for SharePoint
- Master Data Management
- Report Builder 3

Microsoft®
Excel.2013
Microsoft®
SharePoint® 2013
Enterprise
Microsoft®
SQL Server® 2012
BI Edition

- Power View for SharePoint and Excel
- PowerPivot improvements in SharePoint and Excel
- BI Semantic Model

Seamless Transition Across BI Spectrum

Personal BI

Empowered

My Context

BI solution created by user.
Context is only for user & exists
as document.



PowerPivot For Excel

Team BI

Our Context

BI Solution created by power
user. Context is for a small team
& it's managed on a server.



PowerPivot For SharePoint

Organizational BI

Aligned

The Org's Context

BI Solution created by IT,
Established corporate context & is
reusable, scalable and backed up.

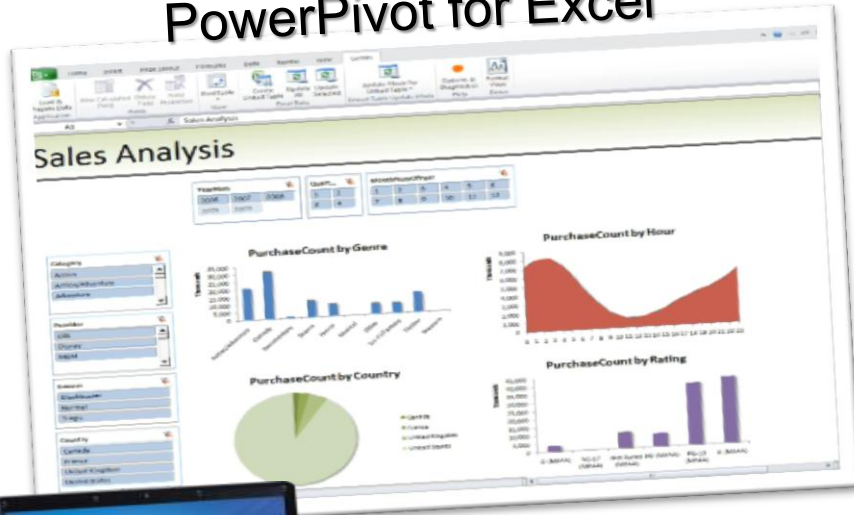


Analysis Services

PowerPivot

Powerful in-memory data mashup and data exploration tool providing analytical performance to process billions of rows.

PowerPivot for Excel



Microsoft®
Excel 2010

PowerPivot for SharePoint



Microsoft®
SharePoint® 2010

Microsoft®
SQL Server® 2012



Power View



Highly Visual Design Experience

- Interactive, web-based authoring and sharing of information
- Familiar Microsoft Office design patterns
- Powerful data layout with banding, callout, and small multiples visualizations

Rich metadata-driven interactivity

- Fully integrated with PowerPivot
- Drive greater insight through smart and powerful querying
- Zero configuration highlighting and filtering
- Animated trending and comparisons

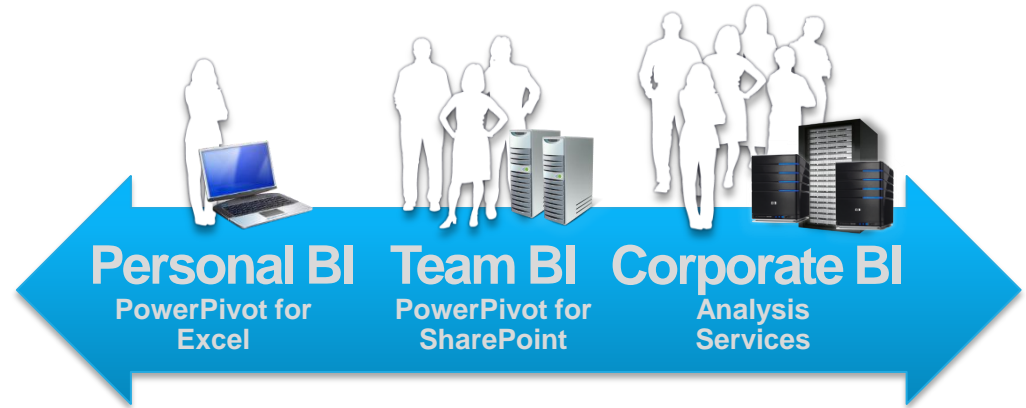
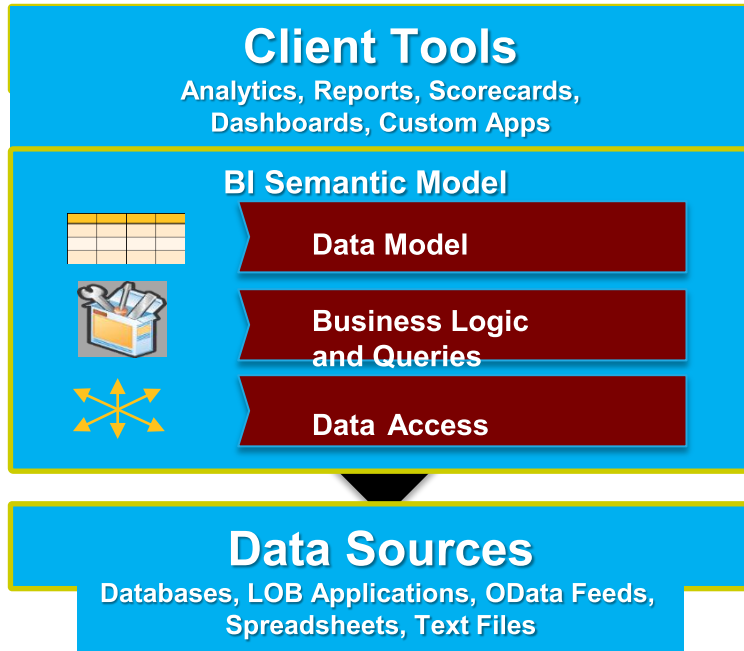


Presentation-ready at all times

- Presentation and story board turn pervasive information into persuasive information
- Deliver and collaborate through SharePoint
- Interactive PowerPoint runtime

BI Semantic Model

One Model for All End User Experiences



Office 2013 for BI



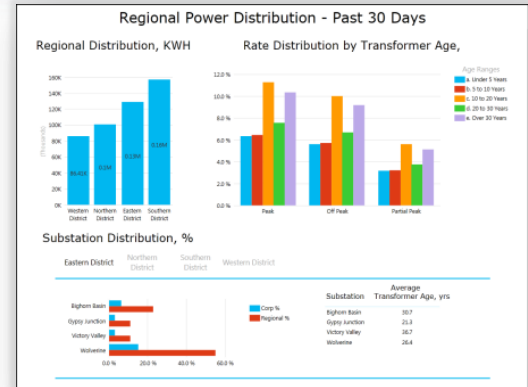
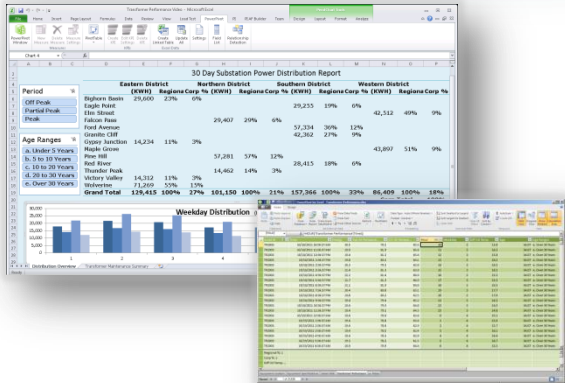
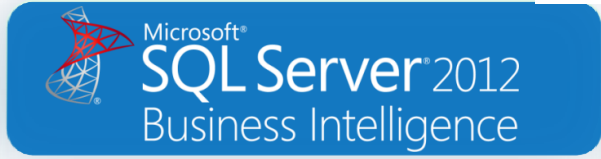
Power View in Excel 2013

- As Power View in SharePoint 2013
- Interactive data exploration, visualization, and presentation
- Interactive tables, matrices, maps, and a variety of charts

PowerPivot in Excel 2013

- The PowerPivot Add-In ships as an Excel feature
- Fully integrated engine, Data Model and Field List of Excel

Business Analytics Toolkit



**PowerPivot
for Excel 2010**



Power View

Sustainability at Safeco Field

- Real-time Operational Awareness
 - Security Office
- Unplanned Event Notification
 - Water Leak
- Operational Systems Costs
 - Stadium Roof Open/Close
- Key Equipment Reliability
 - Stadium Roof Equipment
- Solar Panel Integration
 - Green Operations and Cost Reduction



Real-time Visualization for Awareness

Now, how can we learn from our experience?

What affects game day power and water consumption?



AF Structure Required

Important Considerations

- Leverage structure used throughout the PI Infrastructure
- Correct aggregation of real-time events
- Scalable, driven from PI AF Structure

The screenshot displays the PI System Explorer interface. The left pane shows a tree view of the AF structure for 'Seattle Mariners', with 'Electricity' containing several 'F1HW_H8026' elements. The right pane shows the details for 'F1HW_H8026-1', including a table of aggregated values.

Name	Value
Category: Aggregated Values	
10 Minute Total Real Power	1.18886064269541 kWh
10 Minute Total Real Power ...	51.7154379572505 kWh
Average Real Power	7.25391006469727 kW
Consumption	218259 kWh
ConsumptionxConv	9494266.5 kWh
Hourly Total Real Power	7.24968556471787 kWh
Hourly Total Real Power Conv	315.36132206522751
Category: Conversion Constants	
Conv	43.5
Category: Converted Power Values	

Other Required Information

Excel table
linked to
PowerPivot

Safeco Field Utility Consumption - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins PowerPivot P1 DataLink P1 AF Builder

PowerPivot Window New Measure Delete Measure Measure Settings PivotTable Create KPI Edit KPI Settings Delete KPI Create Linked Table Update All Settings Field List Relationship Detection

R28

	A	B	C	D	E	F	G	H	I	J	K
1											
2			Date	Location	Opponent	Game Time	Start Time	Outcome	Innings	Duration	Attendance
15			4/13/2012	Home	Athletics	Night	4/13/12 7:00 PM	Loss	9	182	46,026
16			4/14/2012	Home	Athletics	Night	4/14/12 6:00 PM	Win	9	149	21,071
17			4/15/2012	Home	Athletics	Day	4/15/12 1:00 PM	Win	9	156	19,650
18			4/16/2012	Off	na	Off		Off	0	0	0
19			4/17/2012	Home	Indians	Night	4/17/12 7:00 PM	Loss	9	213	12,461
20			4/18/2012	Home	Indians	Night	4/18/12 7:00 PM	Win	9	167	11,343
21			4/19/2012	Home	Indians	Night	4/19/12 7:00 PM	Loss	9	149	12,942
22			4/20/2012	Home	White Sox	Night	4/20/12 7:00 PM	Loss	9	165	19,947
23			4/21/2012	Home	White Sox	Day	4/21/12 1:00 PM	Loss	9	137	22,472
24			4/22/2012	Home	White Sox	Day	4/22/12 1:00 PM	Loss	9	176	19,975
25			4/23/2012	Off	na	Off		Off	0	0	0
26			4/24/2012	Away	Tigers	Night		Win	9	-1	-1
27			4/25/2012	Away	Tigers	Night		Win	9	-1	-1
28			4/26/2012	Away	Tigers	Day		Win	9	-1	-1
29			4/27/2012	Away	Blue Jays	Night		Win	10	-1	-1

Power Use Profile Water Use Profile Schedule and Statistics

Ready 100%

PowerPivot Data Tables

PowerPivot for Excel - Safeco Field Utility Consumption.xlsx

Home Design Advanced

Clipboard: Paste, Get External Data, PivotTable

Formatting: Data Type, Format, \$ % , +.00 -0.00

Sort and Filter: Clear All Filters, Sort by Column

Measures: Create KPI

View: Diagram View, Show Hidden, Calculation Area

Date	Month	Hour of...	Elapsed Gam...	Hourly Utility Use	Utility	Attendance Gr...	
8/19/12	Aug		16	3	894.6	Electricity	20,000 to 25,000
8/19/12	Aug		17	4	593.8	Electricity	20,000 to 25,000
8/19/12	Aug		18	5	319.0	Electricity	20,000 to 25,000
8/19/12	Aug		19	6	263.6	Electricity	20,000 to 25,000
8/19/12	Aug		20	7	251.6	Electricity	20,000 to 25,000
8/19/12	Aug		21	8	291.5	Electricity	20,000 to 25,000
8/19/12	Aug		22	9	304.7	Electricity	20,000 to 25,000
8/19/12	Aug		23	10	301.2	Electricity	20,000 to 25,000
8/20/12	Aug		0	-19	303.9	Electricity	10,000 to 15,000
8/20/12	Aug		1	-18	278.4	Electricity	10,000 to 15,000
8/20/12	Aug		2	-17	270.8	Electricity	10,000 to 15,000
8/20/12	Aug		3	-16	270.8	Electricity	10,000 to 15,000
8/20/12	Aug		4	-15	280.4	Electricity	10,000 to 15,000
8/20/12	Aug		5	-14	275.2	Electricity	10,000 to 15,000
8/20/12	Aug		6	-13	268.6	Electricity	10,000 to 15,000

Record: 1 of 725,970

PI System Data – utility meters

PowerPivot fo... Table Tools

Home Design Advanced Linked Table

Clipboard: Paste, Get External Data, PivotTable

Formatting: Data Type, Format, \$ % , +.00 -0.00

Sort and Filter: Clear All Filters, Sort by Column

Measures: Create KPI

View: Diagram View, Show Hidden, Calculation Area

Date	Location	Opponent	Game TI...	Attend...	Duration	Outcome	Start Time
6/6/12	Away	Angels	Night	-1	-1	Win	
6/7/12	Off	na	Off	0	0	Off	
6/8/12	Home	Dodgers	Night	22028	168	Win	6/8/2012 7:00...
6/9/12	Home	Dodgers	Day	30287	189	Loss	6/9/2012 4:00...
6/10/12	Home	Dodgers	Day	34807	183	Loss	6/10/2012 1:0...
6/11/12	Off	na	Off	0	0	Off	
6/12/12	Home	Padres	Night	13084	182	Loss	6/12/2012 7:0...
6/13/12	Home	Padres	Night	13931	166	Loss	6/13/2012 7:0...
6/14/12	Home	Padres	Night	17306	192	Loss	6/14/2012 7:0...
6/15/12	Home	Giants	Night	29818	165	Loss	6/15/2012 7:0...
6/16/12	Home	Giants	Night	30589	169	Win	6/16/2012 7:0...
6/17/12	Home	Giants	Day	40603	185	Win	6/17/2012 1:0...
6/18/12	Away	Diamondbacks	Night	-1	-1	Loss	
6/19/12	Away	Diamondbacks	Night	-1	-1	Win	
6/20/12	Away	Diamondbacks	Day	-1	-1	Loss	
6/21/12	Off	na	Off	0	0	Off	
6/22/12	Away	Padres	Night	-1	-1	Loss	

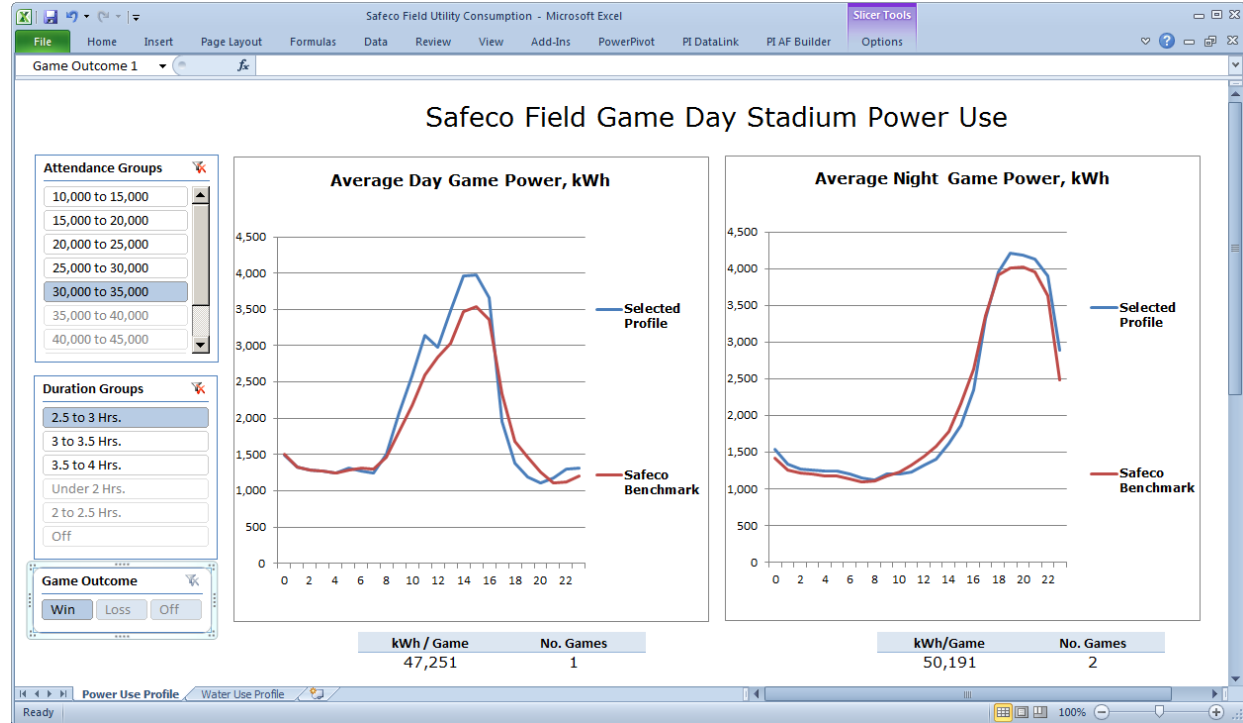
Record: 35 of 145

Internet data – game information

Utility Use Profile – PowerPivot for Excel 2010

Benchmarking

- Day and night game profiles
- Benchmark average of all day or night games
- Compare effects of attendance and game duration

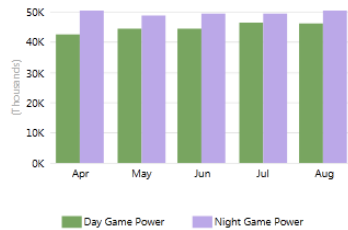


Season Utility Profiles – Power View

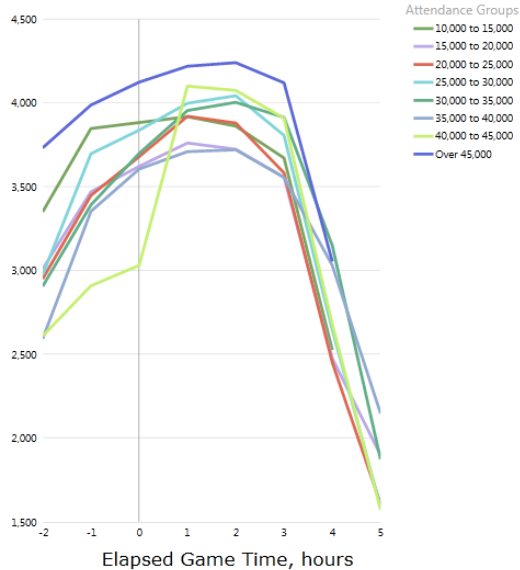
Use by month, time of game and elapsed game time.

Safeco Field Power Use Profile - 2012 Season

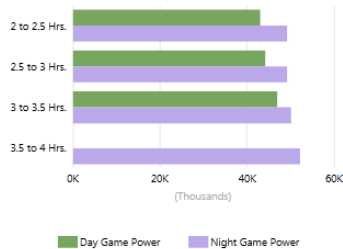
Use by Month, kWh/game



Hourly Use by Attendance, kWh/hour

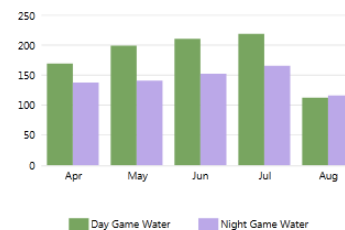


Use by Game Duration, kWh/game

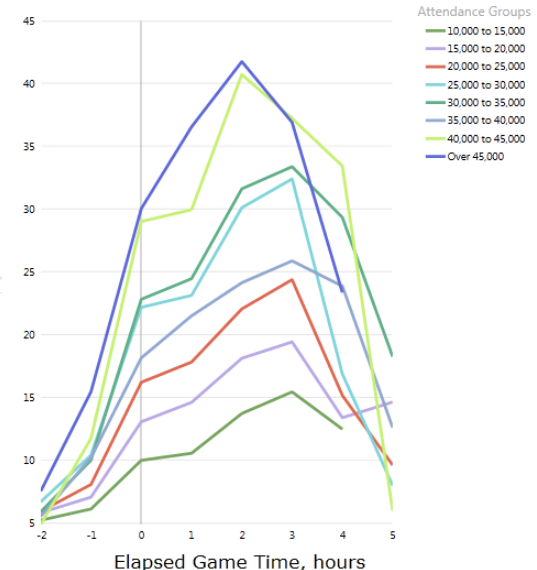


Safeco Field Water Use Profile - 2012 Season

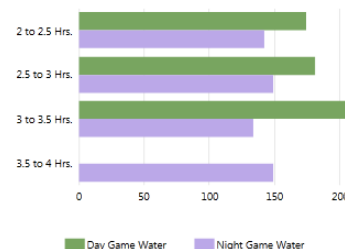
Use by Month, CCF/game



Hourly Use by Attendance, CCF/hour



Use by Game Duration, CCF/game



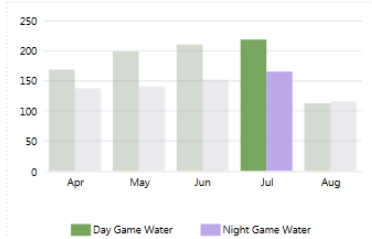
Season Utility Profile – Selected Conditions

Month of July

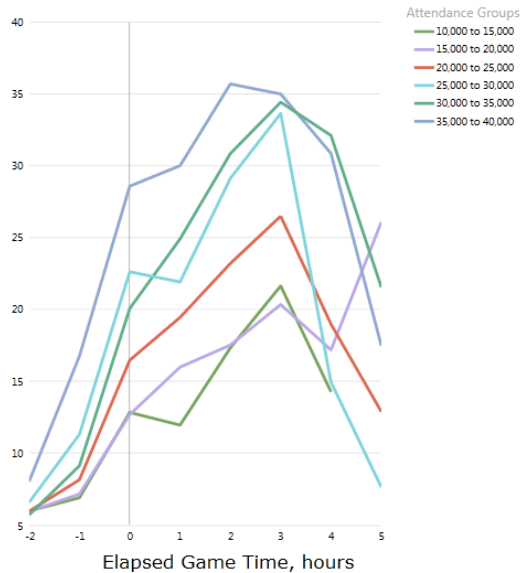
Attendance 25,000 to 30,000

Safeco Field Water Use Profile - 2012 Season

Use by Month, CCF/game

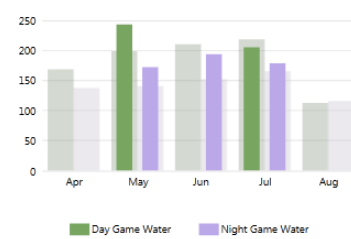


Hourly Use by Attendance, CCF/hour

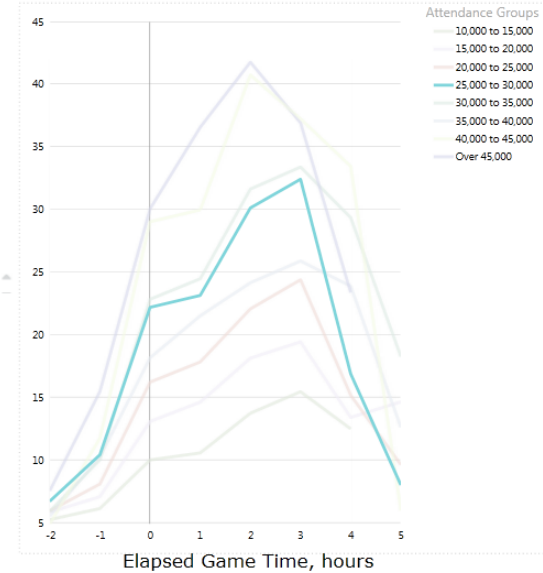


Safeco Field Water Use Profile - 2012 Season

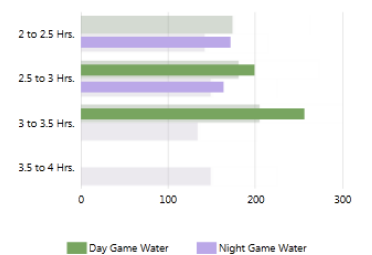
Use by Month, CCF/game



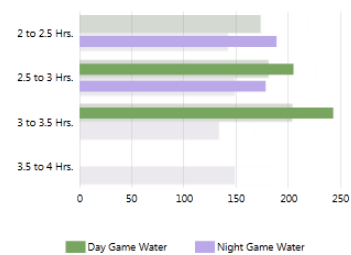
Hourly Use by Attendance, CCF/hour



Use by Game Duration, CCF/game



Use by Game Duration, CCF/game

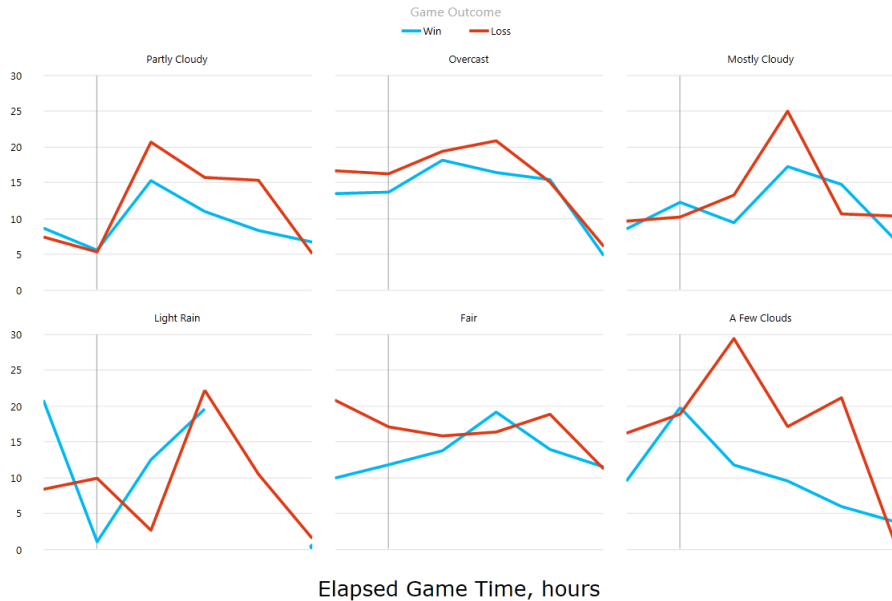


Season Utility Profile – Weather Impact

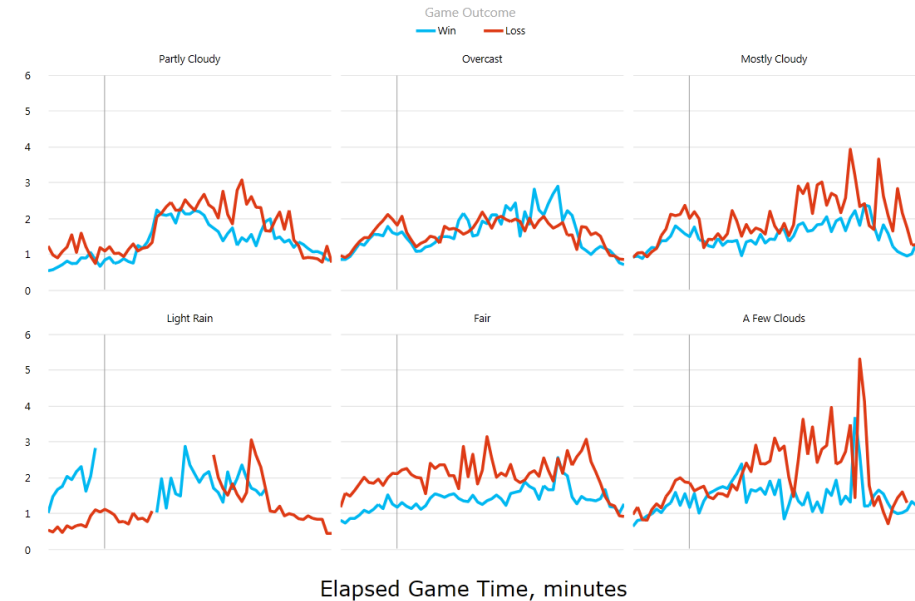
Elapsed Game Time, hrs.

Elapsed Game Time, min.

Safeco Field Water Use Profile - Weather Impact

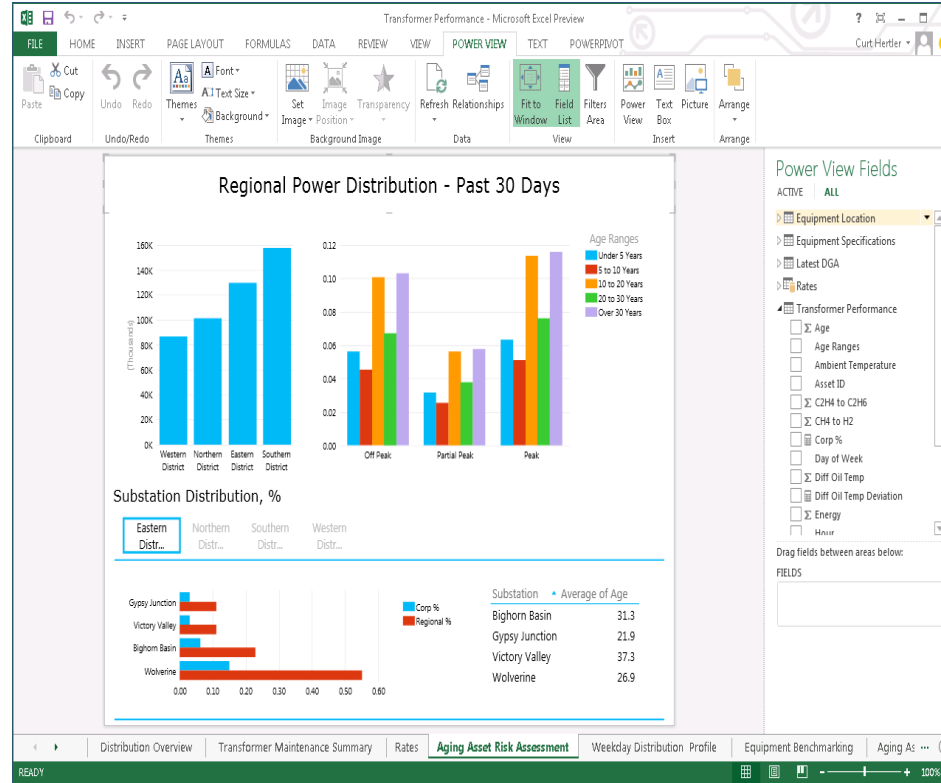


Safeco Field Water Use Profile - Weather Impact



Power View in Excel 2013

Microsoft
Power View
Included with
Excel 2013

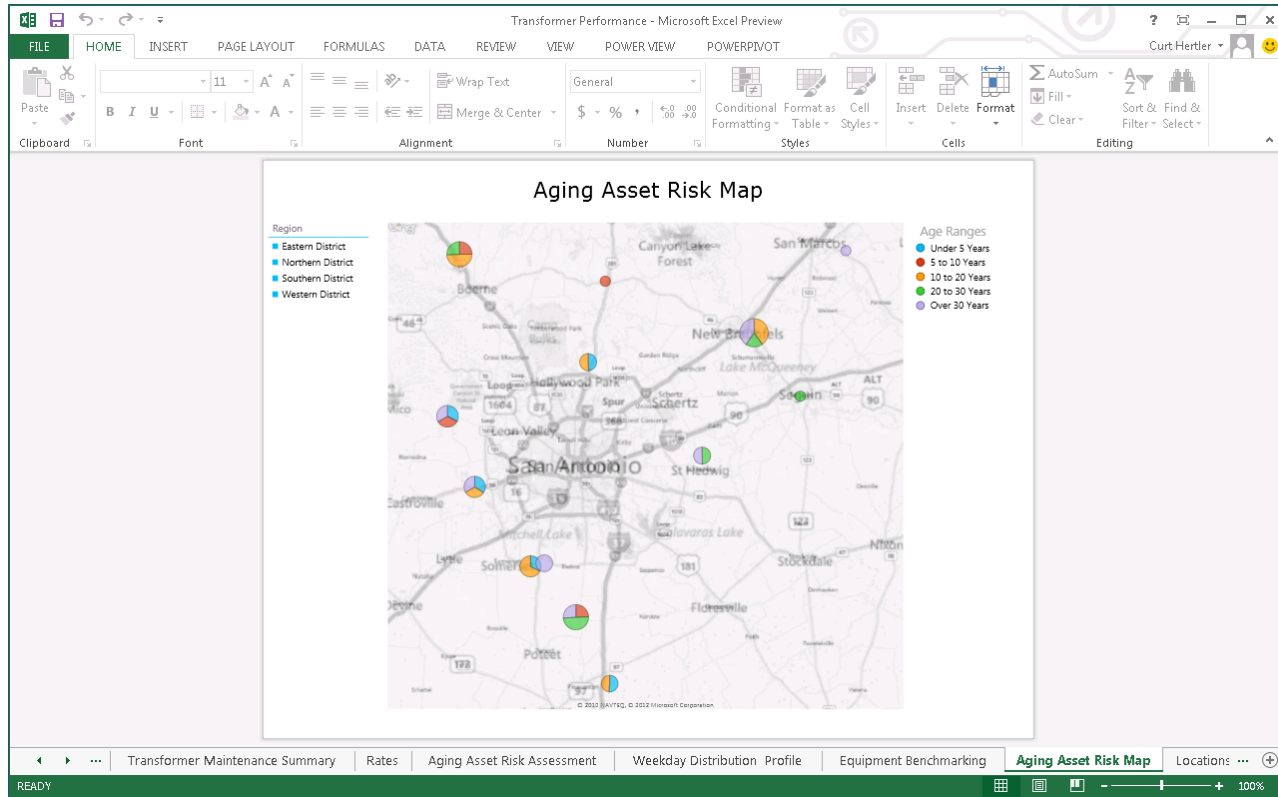


Power View in Excel 2013

Microsoft
Power View
Included with
Excel 2013

Bing Map
Integration

- Street Address
- Lat – Long
- Filtered Zoom and Pan



DEMO

Excel 2013 Power View

Additional Information

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
- For SRP Customers learning.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 OSIsoft logo at the top left. The title is "Business Analytics with your PI System Data Using Microsoft PowerPivot". Below the title, it says "2011 OSIsoft T & D Users Group Meeting" and "September 23, 2011, Philadelphia". The slide content includes an overview section and a table titled "30 Day Substation Power Distribution Report".

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.

30 Day Substation Power Distribution Report

Region	Substation	2011-09-23	2011-09-24	2011-09-25	2011-09-26	2011-09-27	2011-09-28	2011-09-29	2011-09-30
Region 1	Substation 1	1000	1200	1500	1800	2000	2200	2500	2800
Region 1	Substation 2	800	1000	1200	1500	1800	2000	2200	2500
Region 2	Substation 1	1200	1500	1800	2000	2200	2500	2800	3000
Region 2	Substation 2	1000	1200	1500	1800	2000	2200	2500	2800
Region 3	Substation 1	1500	1800	2000	2200	2500	2800	3000	3200
Region 3	Substation 2	1200	1500	1800	2000	2200	2500	2800	3000
Region 4	Substation 1	1800	2000	2200	2500	2800	3000	3200	3500
Region 4	Substation 2	1500	1800	2000	2200	2500	2800	3000	3200
Region 5	Substation 1	2000	2200	2500	2800	3000	3200	3500	3800
Region 5	Substation 2	1800	2000	2200	2500	2800	3000	3200	3500
Region 6	Substation 1	2200	2500	2800	3000	3200	3500	3800	4000
Region 6	Substation 2	2000	2200	2500	2800	3000	3200	3500	3800
Region 7	Substation 1	2500	2800	3000	3200	3500	3800	4000	4200
Region 7	Substation 2	2200	2500	2800	3000	3200	3500	3800	4000
Region 8	Substation 1	2800	3000	3200	3500	3800	4000	4200	4500
Region 8	Substation 2	2500	2800	3000	3200	3500	3800	4000	4200
Region 9	Substation 1	3000	3200	3500	3800	4000	4200	4500	4800
Region 9	Substation 2	2800	3000	3200	3500	3800	4000	4200	4500
Region 10	Substation 1	3200	3500	3800	4000	4200	4500	4800	5000
Region 10	Substation 2	3000	3200	3500	3800	4000	4200	4500	4800
Region 11	Substation 1	3500	3800	4000	4200	4500	4800	5000	5200
Region 11	Substation 2	3200	3500	3800	4000	4200	4500	4800	5000
Region 12	Substation 1	3800	4000	4200	4500	4800	5000	5200	5500
Region 12	Substation 2	3500	3800	4000	4200	4500	4800	5000	5200
Region 13	Substation 1	4000	4200	4500	4800	5000	5200	5500	5800
Region 13	Substation 2	3800	4000	4200	4500	4800	5000	5200	5500
Region 14	Substation 1	4200	4500	4800	5000	5200	5500	5800	6000
Region 14	Substation 2	4000	4200	4500	4800	5000	5200	5500	5800
Region 15	Substation 1	4500	4800	5000	5200	5500	5800	6000	6200
Region 15	Substation 2	4200	4500	4800	5000	5200	5500	5800	6000
Region 16	Substation 1	4800	5000	5200	5500	5800	6000	6200	6500
Region 16	Substation 2	4500	4800	5000	5200	5500	5800	6000	6200
Region 17	Substation 1	5000	5200	5500	5800	6000	6200	6500	6800
Region 17	Substation 2	4800	5000	5200	5500	5800	6000	6200	6500
Region 18	Substation 1	5200	5500	5800	6000	6200	6500	6800	7000
Region 18	Substation 2	5000	5200	5500	5800	6000	6200	6500	6800
Region 19	Substation 1	5500	5800	6000	6200	6500	6800	7000	7200
Region 19	Substation 2	5200	5500	5800	6000	6200	6500	6800	7000
Region 20	Substation 1	5800	6000	6200	6500	6800	7000	7200	7500
Region 20	Substation 2	5500	5800	6000	6200	6500	6800	7000	7200
Region 21	Substation 1	6000	6200	6500	6800	7000	7200	7500	7800
Region 21	Substation 2	5800	6000	6200	6500	6800	7000	7200	7500
Region 22	Substation 1	6200	6500	6800	7000	7200	7500	7800	8000
Region 22	Substation 2	6000	6200	6500	6800	7000	7200	7500	7800
Region 23	Substation 1	6500	6800	7000	7200	7500	7800	8000	8200
Region 23	Substation 2	6200	6500	6800	7000	7200	7500	7800	8000
Region 24	Substation 1	6800	7000	7200	7500	7800	8000	8200	8500
Region 24	Substation 2	6500	6800	7000	7200	7500	7800	8000	8200
Region 25	Substation 1	7000	7200	7500	7800	8000	8200	8500	8800
Region 25	Substation 2	6800	7000	7200	7500	7800	8000	8200	8500
Region 26	Substation 1	7200	7500	7800	8000	8200	8500	8800	9000
Region 26	Substation 2	7000	7200	7500	7800	8000	8200	8500	8800
Region 27	Substation 1	7500	7800	8000	8200	8500	8800	9000	9200
Region 27	Substation 2	7200	7500	7800	8000	8200	8500	8800	9000
Region 28	Substation 1	7800	8000	8200	8500	8800	9000	9200	9500
Region 28	Substation 2	7500	7800	8000	8200	8500	8800	9000	9200
Region 29	Substation 1	8000	8200	8500	8800	9000	9200	9500	9800
Region 29	Substation 2	7800	8000	8200	8500	8800	9000	9200	9500
Region 30	Substation 1	8200	8500	8800	9000	9200	9500	9800	10000
Region 30	Substation 2	8000	8200	8500	8800	9000	9200	9500	9800

Regional Distribution by Weekdays

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Chris Van Dyke and Curt Hertler

cvandyke@microsoft.com

Chief Technology Strategist for Oil and Gas
Microsoft Corporation

curt@osisoft.com

Marketing Manager
OSIsoft, LLC



THANK YOU

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