



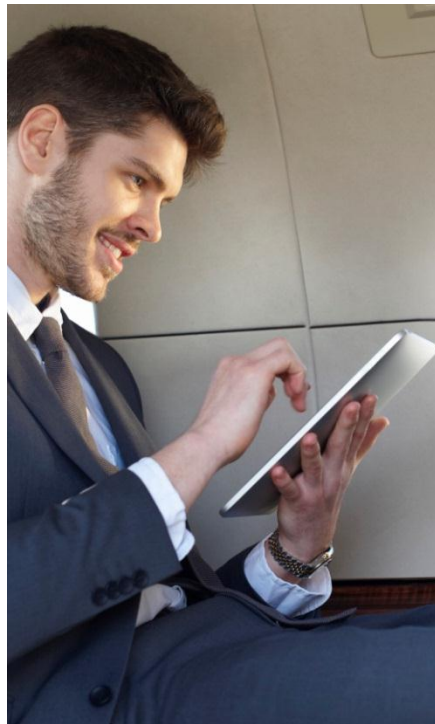
# Operational Insight: Using Self-Service Technologies to Do More with the PI System

Presented by **Matt Ziegler**, OSIsoft

# Overview

- Microsoft's Strategy for Business Insight
  - “Microsoft SQL 2012 Self-Service Business Intelligence”
- OSIssoft'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

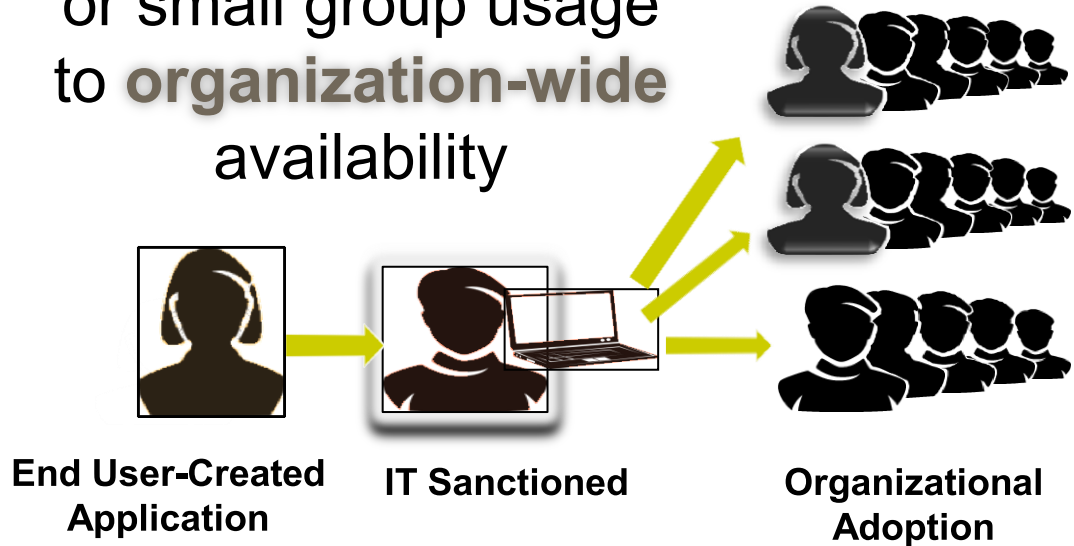
Transform end user-created applications in PowerPivot into corporate-grade solutions

**Import** end user-created PowerPivot models into Analysis Services

**Sanction** applications for broad use

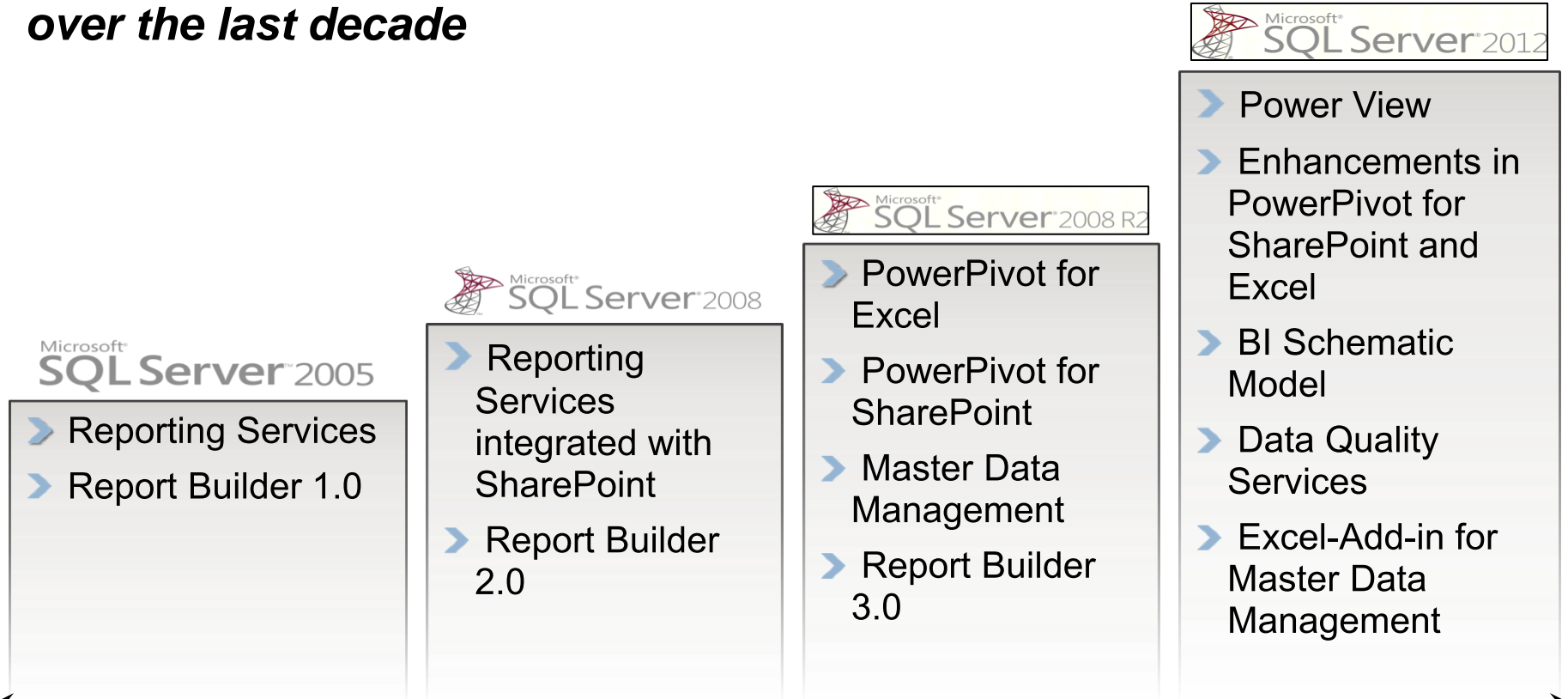
**Publish** for use as a corporate-grade solution

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



# Microsoft SQL Server BI Evolution

*Increased BI functionality and enterprise-level performance over the last decade*



# 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.



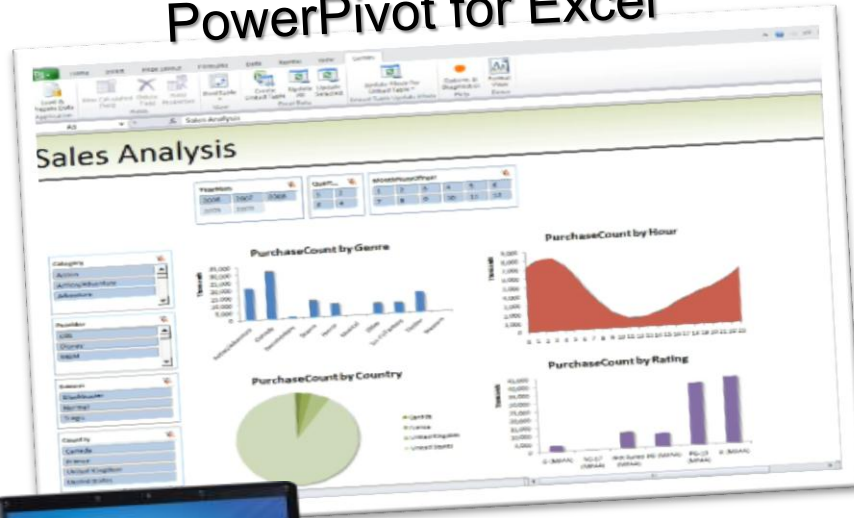
Analysis Services



# 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



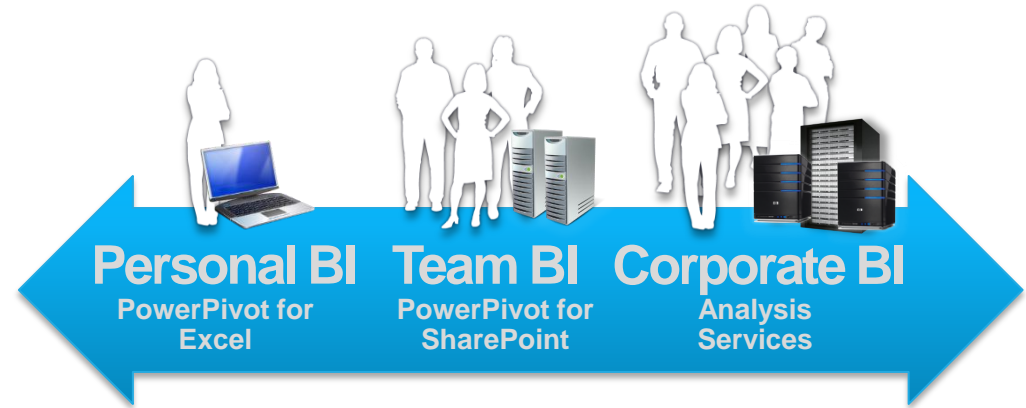
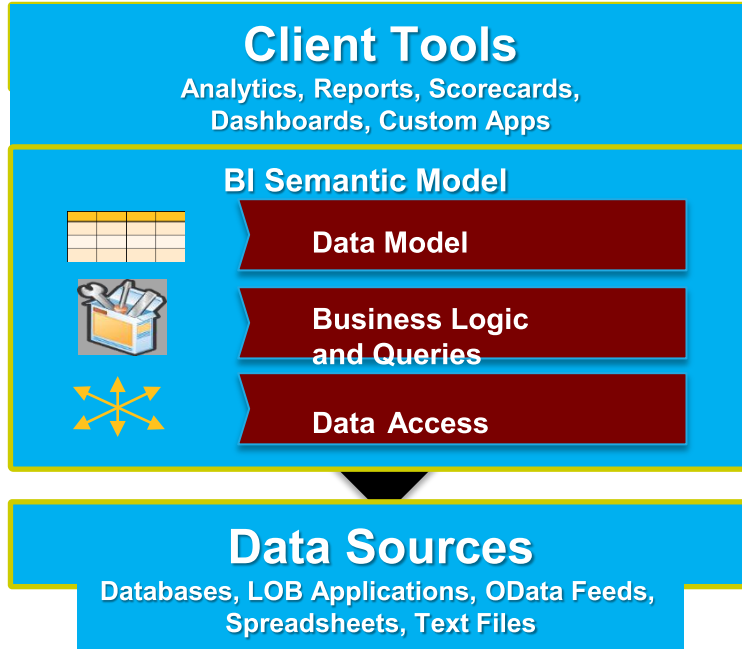
## Presentation-ready at all times

- 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



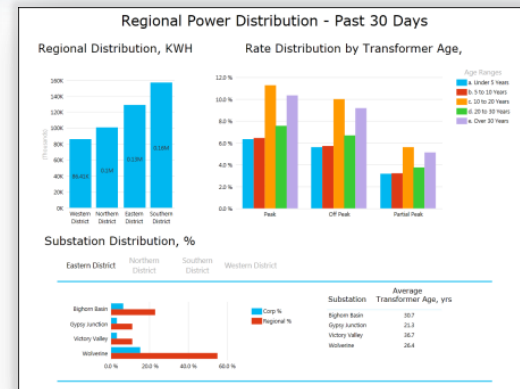
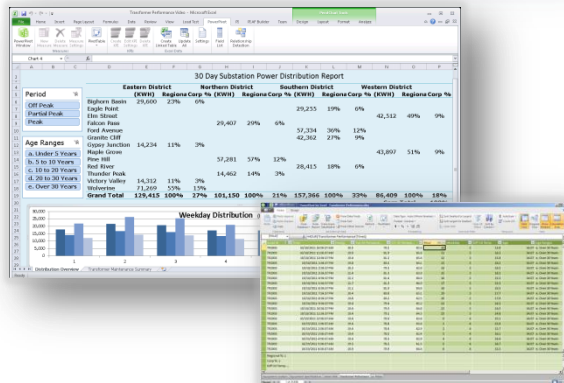
Microsoft

Microsoft®  
Excel 2010

Microsoft®  
SQL Server® 2012  
Business Intelligence

Microsoft®  
SharePoint® 2010  
Enterprise

OSIsoft  
PI Server  
PI OLEDB Enterprise



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 AF\Coresight - PI System Explorer application. The left pane shows a hierarchical tree of elements under 'Seattle Mariners', including 'Electricity' (with sub-elements F1HW\_H8026-1, F1HW\_H8026-2, F6HW\_H8026-1, F6HW\_H8026-2, F6HW\_H8026-3), 'Gas', 'PI Coresight Aliases', 'Water' (with sub-elements UNT82.CwF, UNT82.CwF\_South, VAV-79.CwF, VAV-79.CwF\_NW), and 'Weather Monitor'. The right pane shows the details for the selected element 'F1HW\_H8026-1', with tabs for 'General', 'Child Elements', 'Attributes', 'Ports', and 'Version'. The 'General' tab is active, showing a table of aggregated values and conversion constants.

Name	Value
Category: Aggregated Values	
10 Minute Total Real Power	1.18896064269541 kWh
10 Minute Total Real Power ...	51.7154379572505 kWh
Average Real Power	7.25391006469727 kW
Consumption	218259 kWh
ConsumptionConv	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



## 2012 Seattle Mariners Schedule

Mariners will open the 2012 season in Japan vs. Oakland on March 28 & 29

SUN	MON	TUE	WED	THU	FRI	SAT
<b>MARCH</b>						
					OAK 7:07	OAK 6:07
	TEX 5:05	TEX 5:05	TEX 5:05	TEX 11:05	OAK 7:10	OAK 6:10
OAK 1:10	CLE 7:10	CLE 7:10	CLE 7:10	CWS 7:10	CWS 1:05	
CWS 1:10	DET 4:05	DET 4:05	DET 10:05	TOR 4:07	TOR 1:07	
TOR 10:07	TB 4:10	<b>APRIL</b>				
<b>MAY</b>						
MIN 1:10	DET 7:10	DET 7:10	DET 7:10	MIN 4:05	MIN 1:05	
NYG 10:05	BOS 4:10	BOS 1:05	CLE 4:05	CLE 9:40	COL 1:10	
COL 12:10	TEX 7:10	TEX 7:10	TEX 12:40	LAA 7:10	LAA 4:15	
LAA 1:10	TEX 5:05	TEX 5:05	TEX 5:05			
<b>JUNE</b>						
CWS 11:10	LAA 7:05	LAA 7:05	LAA 7:05	LAD 7:10	LAD 4:15	
LAD 1:10	SD 7:10	SD 7:10	SD 7:10	SF 7:10	SF 7:10	
SF 1:10	ARI 6:40	ARI 6:40	ARI 12:40	SD 7:05	SD 7:05	
SD 1:05	OAK 7:10	OAK 7:10	OAK 12:40	BOS 7:10	BOS 7:10	
<b>JULY</b>						
KC 1:10	TOR 7:10	TOR 7:10				

## Team Schedule

- Home or away
- Start time

2012 Seattle Mariners Schedule, Box Scores and Splits - Baseball-Reference.com - Windows Internet Explorer

http://www.baseball-reference.com/teams/SEA/2012-schedule-scores.shtml

Franchise Encyclopedia | 2012 | Stats | Payroll, Roster & Uniforms | Batting [+] | Pitching [+] | Fielding | **Schedule & Results** | Scoring | Other [+]

Team Game-by-Game Schedule and Results

Glossary · SHARE · Embed · CSV · PRE · LINK · ?

Rk	Gm#	Date	boxscore	SEA	Opp	R	RA	Inn	W-L	Rank	GB	Win	Loss	Save	Time	D/N	Attendance	
1	1	Wednesday, Mar 28	boxscore	SEA	OAK	W	3	1	11	1-0	1 up 0.5	Wilhelmsen	Carignan	League	3:04	N	44,227	
2	2	Thursday, Mar 29	boxscore	SEA	OAK	L	1	4		1-1	1	Tied	Colon	Kelley	Balfour	2:23	N	43,391
3	3	Friday, Apr 6	boxscore	SEA	OAK	W	7	3		2-1	1	Tied	Vargas	McCarthy		3:06	N	35,067
4	4	Saturday, Apr 7	boxscore	SEA	OAK	W	8	7		3-1	1 up 1.0	Hernandez	Colon	League	2:58	N	16,612	
5	5	Monday, Apr 9	boxscore	SEA	TEX	L	5	11		3-2	2	0.5	Darvish	Noesi		3:12	N	42,003
6	6	Tuesday, Apr 10	boxscore	SEA	TEX	L	0	1		3-3	2	1.5	Feliz	Beavan	Nathan	2:23	N	25,753
7	7	Wednesday, Apr 11	boxscore	SEA	TEX	W	4	3		4-3	2	0.5	Luetge	Nathan	League	3:20	N	32,342
8	8	Thursday, Apr 12	boxscore	SEA	TEX	L	3	5		4-4	2	1.5	Holland	Vargas	Adams	2:33	D	31,513
9	9	Friday, Apr 13	boxscore	SEA	OAK	L	0	4		4-5	3	2.5	Colon	Hernandez		3:02	N	46,026
10	10	Saturday, Apr 14	boxscore	SEA	OAK	W	4	0		5-5	2	2.5	Noesi	Milone		2:29	N	21,071
11	11	Sunday, Apr 15	boxscore	SEA	OAK	W	5	3		6-5	2	2.5	Beavan	Godfrey	League	2:36	D	19,650
12	12	Tuesday, Apr 17	boxscore	SEA	CLE	L	8	9		6-6	2	3.5	Perez	Furbush	Perez	3:33	N	12,461
13	13	Wednesday, Apr 18	boxscore	SEA	CLE	W	4	1		7-6	2	3.5	Vargas	Lowe	League	2:47	N	11,343
14	14	Thursday, Apr 19	boxscore	SEA	CLE	L	1	2		7-7	2	4.5	Tomlin	League	Perez	2:29	N	12,942
15	15	Friday, Apr 20	boxscore	SEA	CHW	L	3	7		7-8	2	5.0	Sale	Noesi		2:45	N	19,947
16	16	Saturday, Apr 21	boxscore	SEA	CHW	L	0	4		7-9	2	5.5	Humber	Beavan		2:17	D	22,472
17	17	Sunday, Apr 22	boxscore	SEA	CHW	L	4	7		7-10	3	6.5	Danks	Millwood	Santiago	2:56	D	19,975
18	18	Tuesday, Apr 24	boxscore	SEA	DET	W	7	4		8-10	3	6.0	Vargas	Scherzer	League	3:01	N	30,073

Internet | Protected Mode: Off

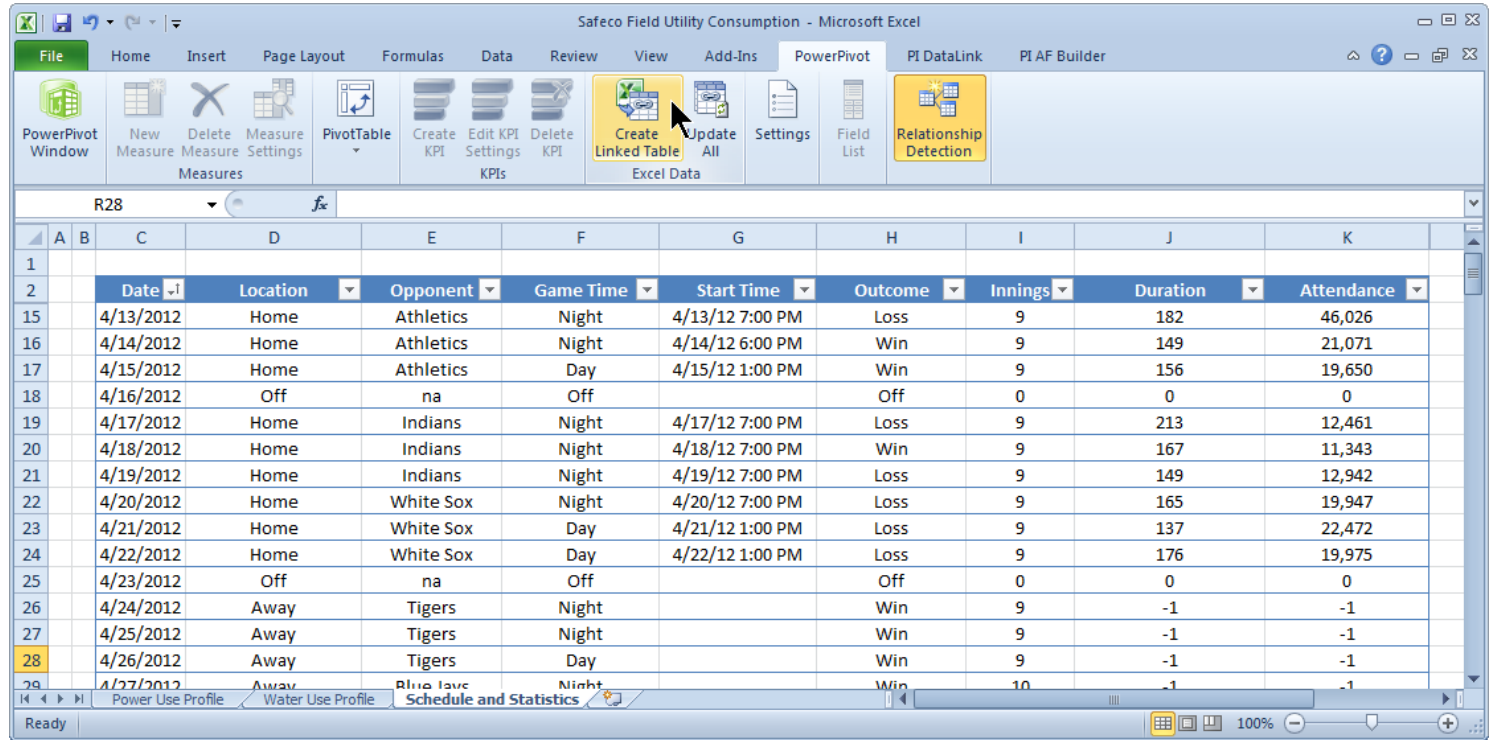
125%

## Team Results

- Attendance
- Time of game
- Win or Loss

# 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 KPIs 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

# PowerPivot Data Tables

The screenshot shows the PowerPivot for Excel interface with the 'Table Tools' ribbon active. The data table is titled 'Safeco Field Utility Consumption.xlsx'. The table has columns: Date, Month, Hour of..., Elapsed Gam..., Hourly Utility Use, Utility, and Attendance Gr... The data shows utility consumption for Safeco Field from August 19, 2012, to August 20, 2012. The table is filtered to show records 1 of 725,970.

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

PI System Data – utility meters

The screenshot shows the PowerPivot for Excel interface with the 'Table Tools' ribbon active. The data table is titled 'Table Tools'. The table has columns: Date, Location, Opponent, Game Ti..., Attend..., Duration, Outcome, and Start Time. The data shows game information for the San Francisco Giants from June 6, 2012, to June 22, 2012. The table is filtered to show records 35 of 145.

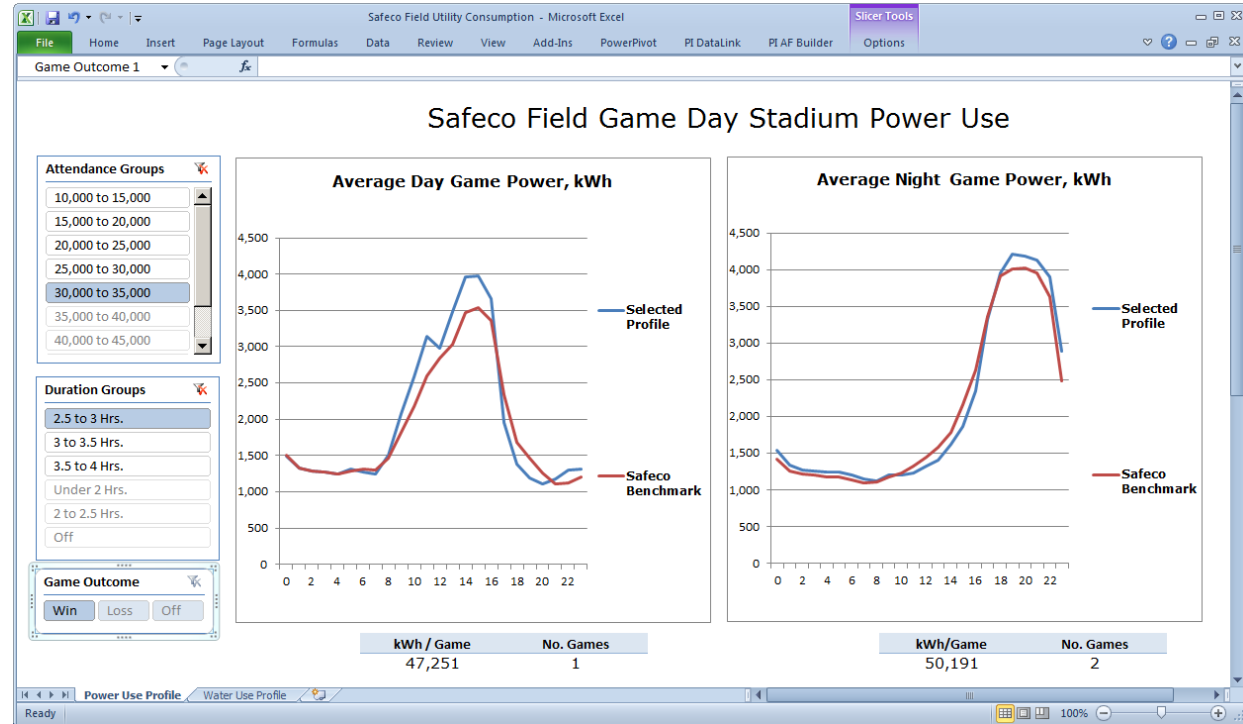
Date	Location	Opponent	Game Ti...	Attend...	Duration	Outcome	Start Time
6/6/12	Away	Angels	Night	-1	-1	Win	
6/7/12	Off	na	Off	0	0	Off	
6/8/12	Home	Dodgers	Night	22028	168	Win	6/8/2012 7:00...
6/9/12	Home	Dodgers	Day	30287	189	Loss	6/9/2012 4:00...
6/10/12	Home	Dodgers	Day	34807	183	Loss	6/10/2012 1:0...
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	

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

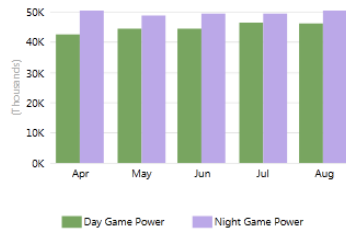


# Season Utility Profiles – Power View

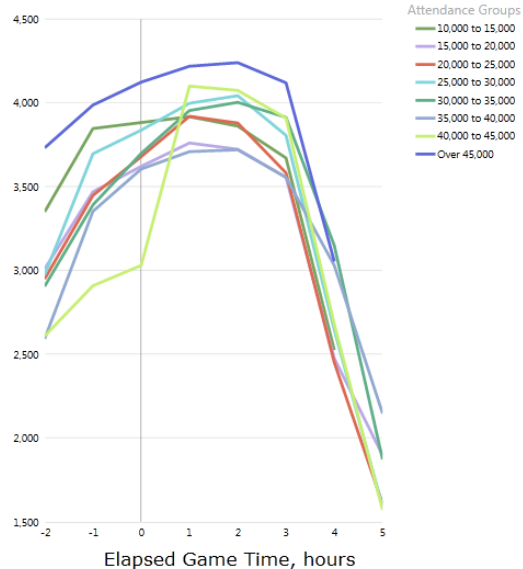
Use by month, time of game and elapsed game time.

## Safeco Field Power Use Profile - 2012 Season

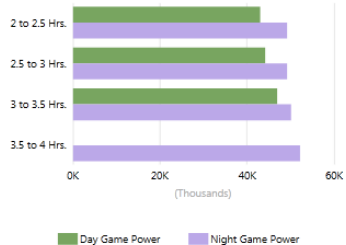
### Use by Month, kWh/game



### Hourly Use by Attendance, kWh/hour

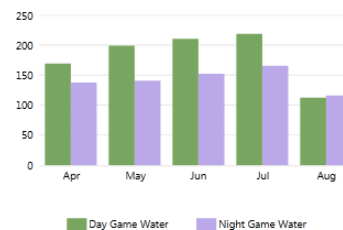


### Use by Game Duration, kWh/game

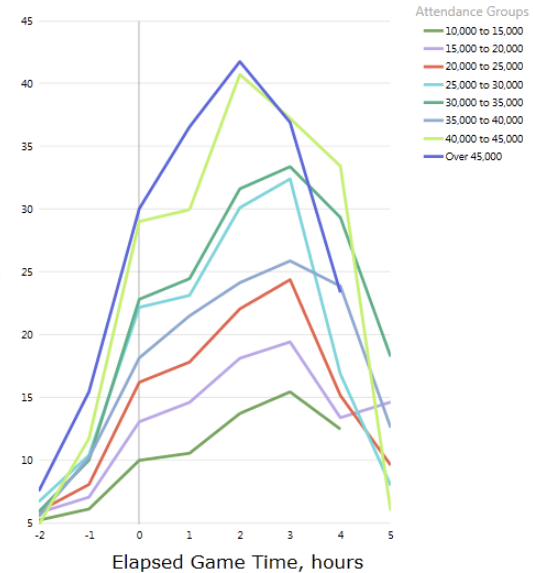


## Safeco Field Water Use Profile - 2012 Season

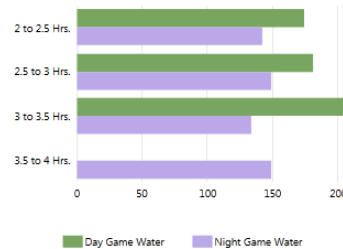
### Use by Month, CCF/game



### Hourly Use by Attendance, CCF/hour



### Use by Game Duration, CCF/game



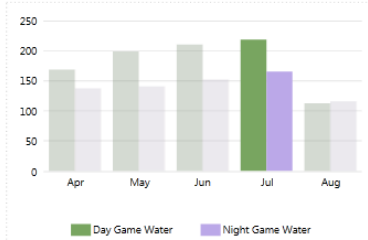
# Season Utility Profile – Selected Conditions

Month of July

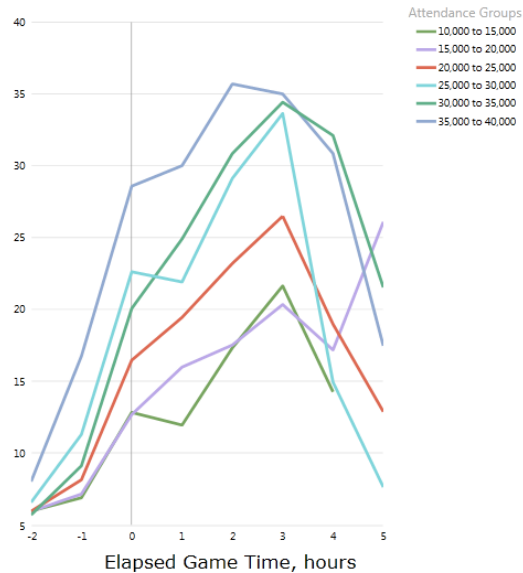
Attendance 25,000 to 30,000

Safeco Field Water Use Profile - 2012 Season

Use by Month, CCF/game

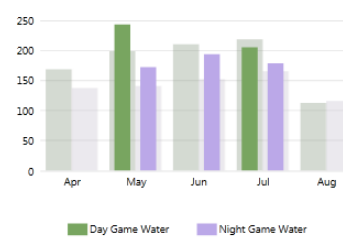


Hourly Use by Attendance, CCF/hour

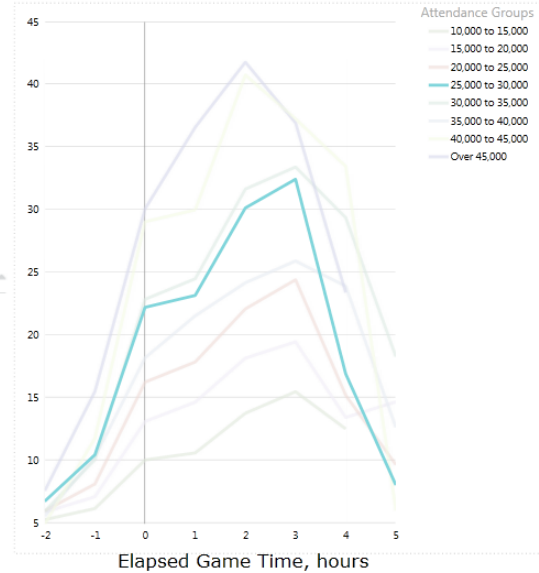


Safeco Field Water Use Profile - 2012 Season

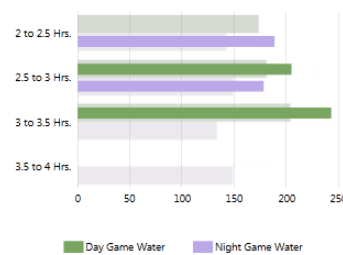
Use by Month, CCF/game



Hourly Use by Attendance, CCF/hour



Use by Game Duration, CCF/game

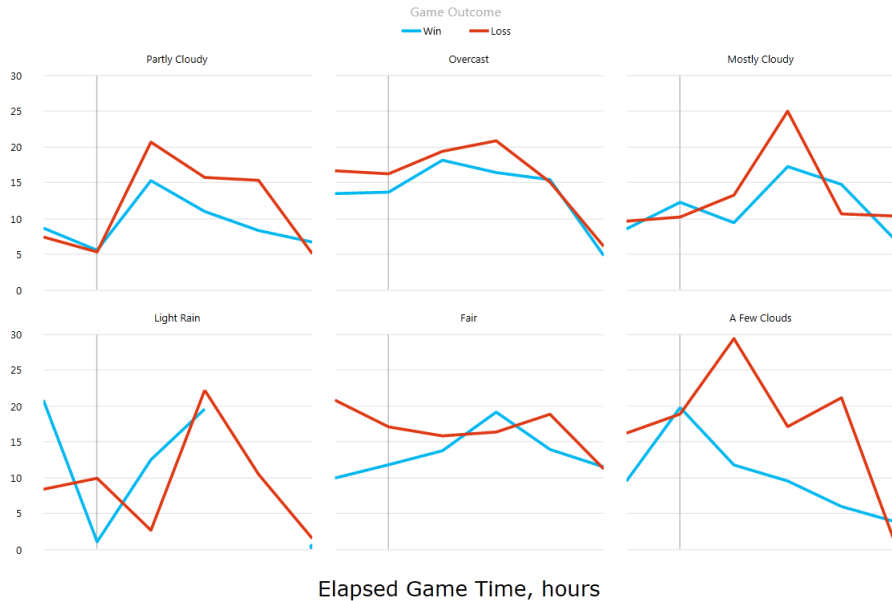




# Season Utility Profile – Weather Impact

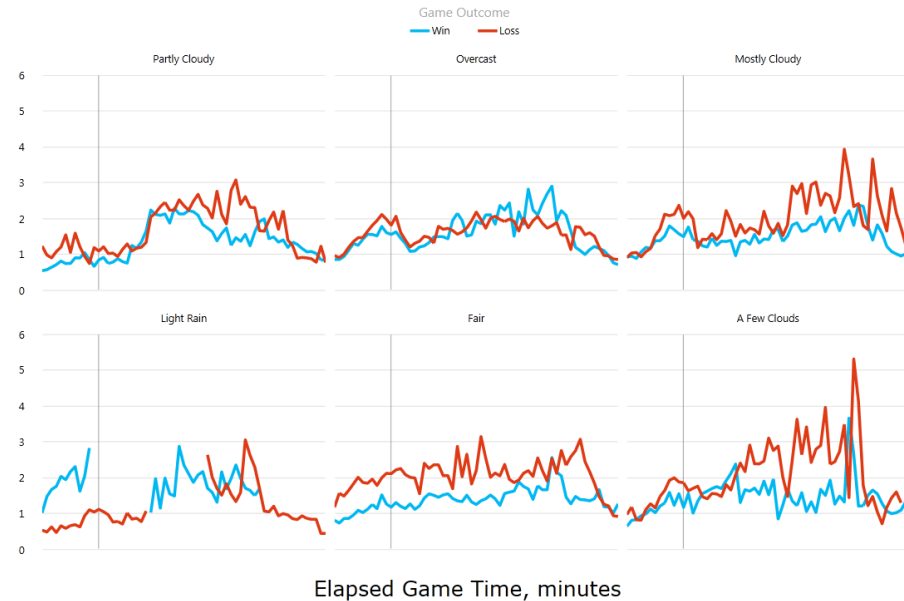
Elapsed Game Time, hrs.

Safeco Field Water Use Profile - Weather Impact



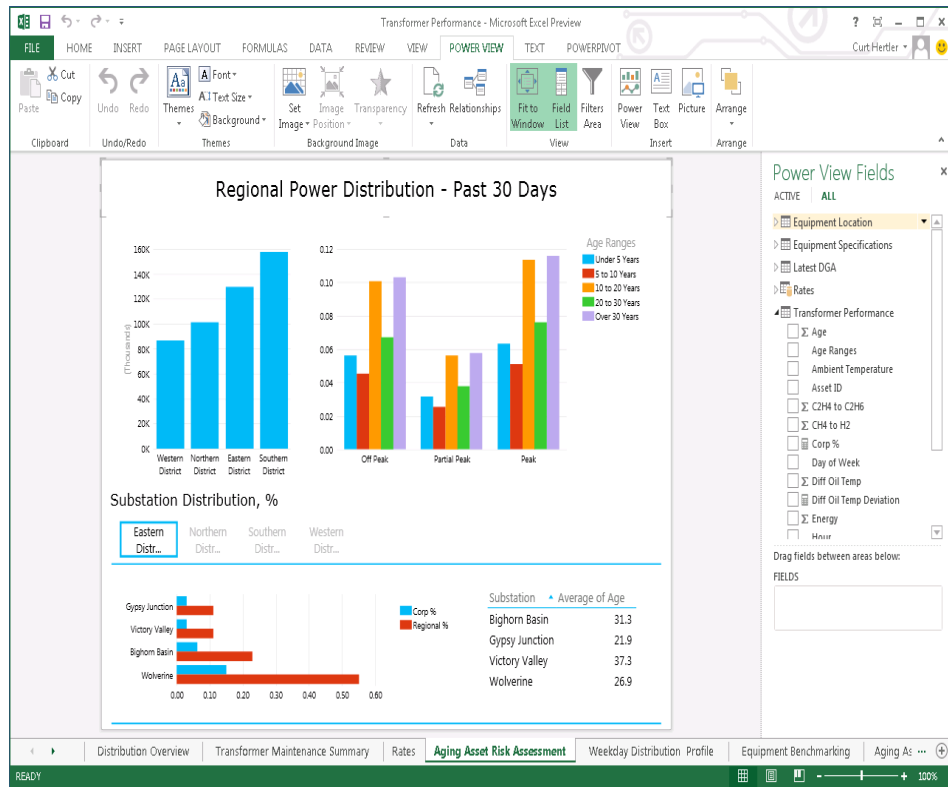
Elapsed Game Time, min.

Safeco Field Water Use Profile - Weather Impact



# Power View in Excel 2013

Microsoft  
Power View  
Included with  
Excel 2013

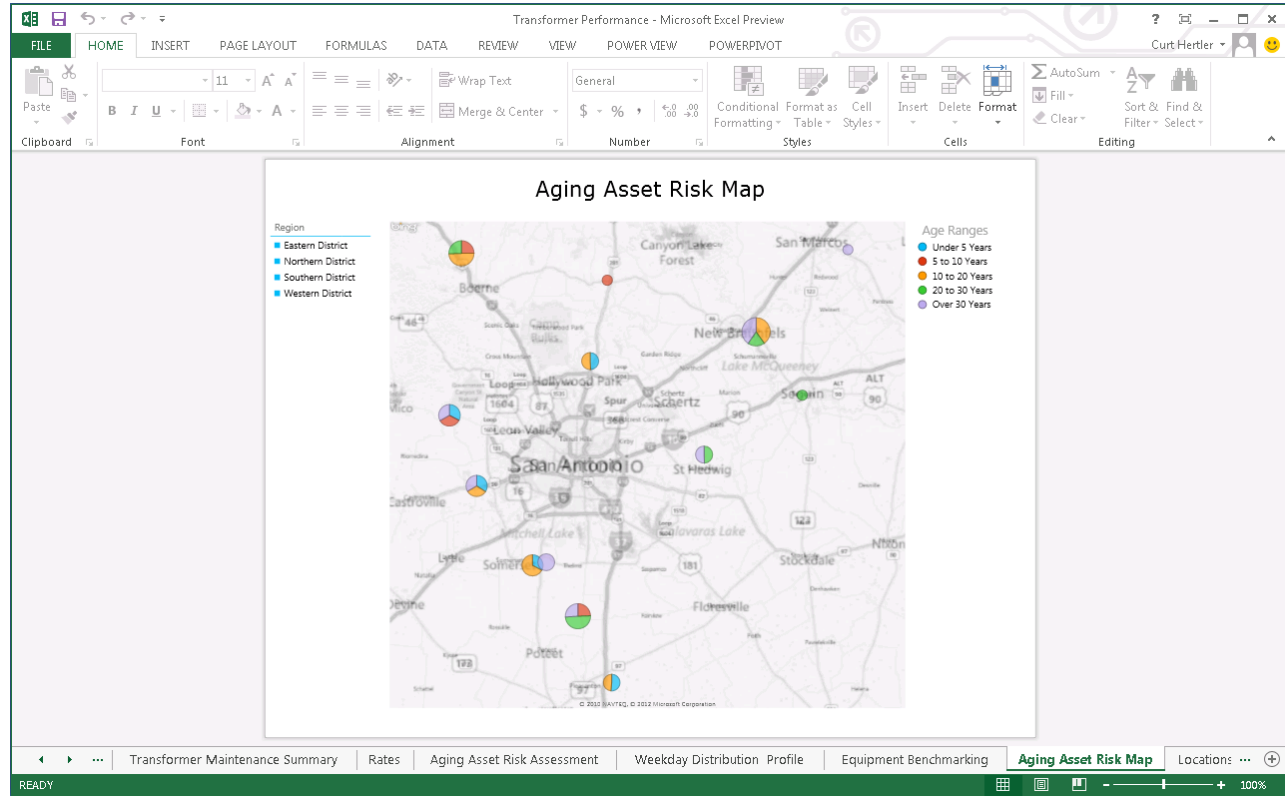


# Power View in Excel 2013

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

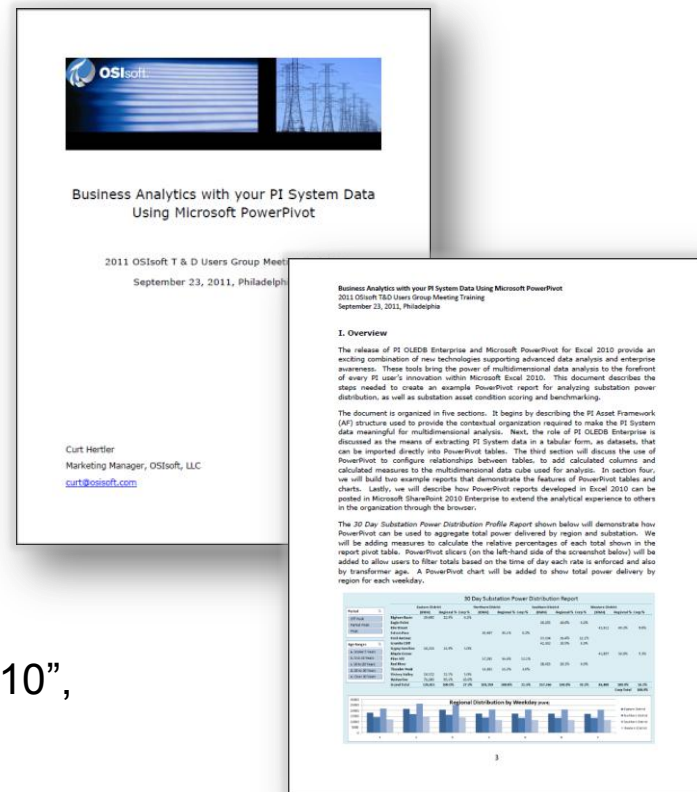
- “Business Analytics with your PI System Data using Microsoft PowerPivot”
- PI T&D Users Group Site [extranet.osisoft.com](http://extranet.osisoft.com)
- OSIsoft vCampus [vcampus.osisoft.com](http://vcampus.osisoft.com)
- For SRP Customers [learning.osisoft.com](http://learning.osisoft.com)

## Microsoft Resources

- [www.microsoft.com/en-us/bi/powerpivot.aspx](http://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



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Product Manager

OSIsoft, LLC





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