

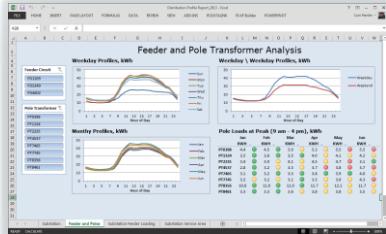
Advanced Analytics - Use Cases Spanning the Value Chain

Presented by **Curt Hertler, Partner Solutions Architect**

Excel 2013 Anatomy

Worksheets

Pivot
Tables &
Charts



Power
Tables
Reports

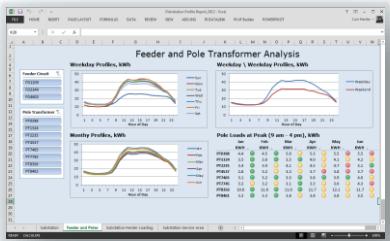
This screenshot shows an Excel PivotTable titled "Bighorn Basin Substation Service Area". The table displays game attendance data across four columns: Location, Opponent, Game Time, and Start Time. The data includes rows for various home games against different opponents at night or day, with attendance figures ranging from 16,091 to 46,026.

Location	Opponent	Game Time	Start Time	Attendance
Home	Athletics	Night	4/13/12 7:00 PM	46,026
Home	Athletics	Day	4/13/12 1:00 PM	30,570
Home	Athletics	Night	4/15/12 1:00 PM	19,650
Home	Indians	Night	4/17/12 7:00 PM	12,461
Home	Indians	Night	4/18/12 7:00 PM	11,341
Home	Red Sox	Night	4/19/12 7:00 PM	12,342
Home	White Sox	Night	4/20/12 7:00 PM	19,947
Home	White Sox	Day	4/21/12 1:00 PM	22,472
Home	White Sox	Day	4/22/12 1:00 PM	19,975
Home	Dodgers	Day	4/23/12 4:00 PM	42,942
Home	Dodgers	Night	4/27/12 7:00 PM	32,450
Home	Dodgers	Night	4/7/12 5:30 PM	31,909
Home	Dodgers	Day	4/8/12 1:00 PM	19,021
Home	Diamondbacks	Night	4/10/12 7:00 PM	18,652
Home	Diamondbacks	Day	4/11/12 3:30 PM	16,091
Home	Diamondbacks	Night	4/12/12 7:00 PM	20,858

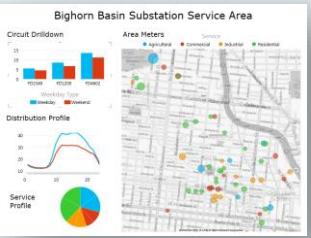
Excel 2013 Anatomy

Worksheets

Pivot Tables & Charts



Power View Reports



Excel Tables

Location	Opponent	Game Time	Start Time	Attendance
Home	Athletics	Night	4/13/12 7:00 PM	46,026
Home	Athletics	Night	4/14/12 6:00 PM	21,071
Home	Red Sox	Night	4/15/12 7:00 PM	59,461
Home	Indians	Night	4/17/12 7:00 PM	12,461
Home	Indians	Night	4/18/12 7:00 PM	11,343
Home	Indians	Night	4/19/12 7:00 PM	12,942
Home	White Sox	Night	4/20/12 7:00 PM	19,947
Home	White Sox	Day	4/21/12 1:00 PM	22,472
Home	White Sox	Day	4/22/12 1:00 PM	20,000
Home	Dodgers	Day	4/25/12 2:00 PM	42,942
Home	Dodgers	Night	4/26/12 7:00 PM	32,490
Home	Dodgers	Night	4/27/12 7:00 PM	31,909
Home	Diamondbacks	Night	4/28/12 7:00 PM	19,023
Home	Diamondbacks	Night	4/29/12 7:00 PM	19,023
Home	Diamondbacks	Day	4/30/12 1:00 PM	16,093
Home	Diamondbacks	Day	4/31/12 1:00 PM	16,093
Home	Diamondbacks	Night	4/32/12 7:00 PM	20,858

Data Model

PowerPivot Tables

Start Date	End Date	Start Time	End Time	Event Type	Event Length	Event Status
5/30/2012 11:00:00 AM	5/30/2012				14,300.3	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,300.3	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,273.4	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,277.2	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,281.3	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,287.4	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,291.5	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,294.2	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,295.1	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,296.0	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,300.7	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,313.3	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,316.3	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,270.1	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,291.8	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,293.5	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,294.0	14,000
5/30/2012 11:00:00 AM	5/30/2012				14,275.2	14,000

Data Sources



PIAF



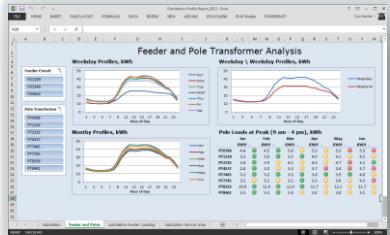
Relational Data



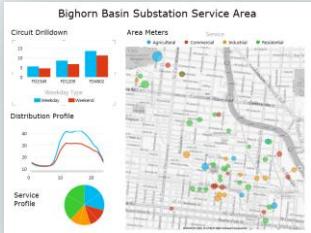
Excel 2013 Anatomy

Worksheets

Pivot
Tables &
Charts

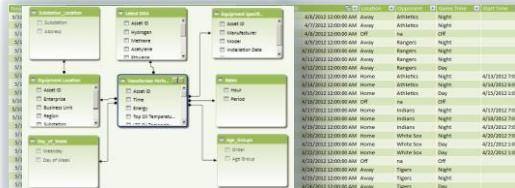


Power View Reports



Data Model

PowerPivot
Tables



Date	Game Time	Start Time	Attendance
Home	Athletics	Night	4/14/12 6:00 PM
Home	Athletics	Day	4/14/12 1:00 PM
Home	Indians	Night	4/17/12 7:00 PM
Home	Indians	Night	4/18/12 7:00 PM
Home	Indians	Night	4/19/12 7:00 PM
Home	White Sox	Night	4/20/12 7:00 PM
Home	Red Sox	Day	4/21/12 1:00 PM
Home	White Sox	Day	4/22/12 1:00 PM
Home	Dodgers	Day	4/23/12 4:00 PM
Home	Dodgers	Night	4/24/12 7:00 PM
Home	Dodgers	Day	4/25/12 1:00 PM
Home	Dodgers	Day	4/26/12 1:00 PM
Home	Diamondbacks	Night	4/10/12 7:00 PM
Home	Diamondbacks	Day	4/11/12 3:30 PM
Home	Diamondbacks	Night	4/12/12 7:00 PM

Excel Tables

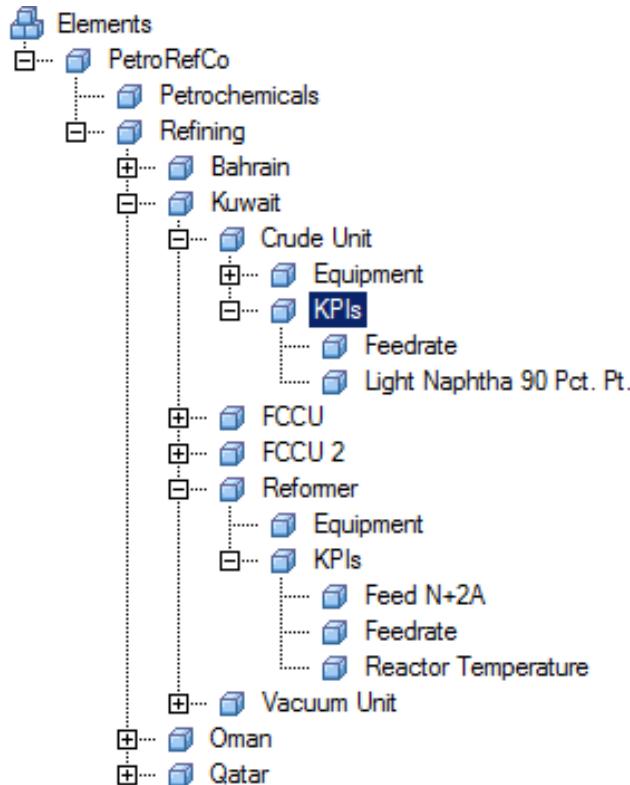
Location	Opponent	Game Time	Start Time	Attendance
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Home	Athletics	Day	4/14/12 1:00 PM	21,073
Home	Indians	Night	4/17/12 7:00 PM	12,463
Home	Indians	Night	4/18/12 7:00 PM	11,343
Home	Indians	Night	4/19/12 7:00 PM	12,942
Home	White Sox	Night	4/20/12 7:00 PM	19,547
Home	Red Sox	Day	4/21/12 1:00 PM	22,477
Home	White Sox	Day	4/22/12 1:00 PM	19,975
Home	Dodgers	Day	4/23/12 4:00 PM	42,942
Home	Dodgers	Night	4/24/12 7:00 PM	32,490
Home	Dodgers	Day	4/25/12 1:00 PM	12,383
Home	Dodgers	Day	4/26/12 1:00 PM	19,023
Home	Diamondbacks	Night	4/10/12 7:00 PM	18,652
Home	Diamondbacks	Day	4/11/12 3:30 PM	16,091
Home	Diamondbacks	Night	4/12/12 7:00 PM	20,858



Asset Context – *PI Asset Framework*

Asset Hierarchy

- Plant
- Process
- KPI



“KPI Total” Template

Name	Value
Category: Operating Plan Data	
Operating Plan Target	16700 bbl
Category: Process Data	
Hourly Throughput	16761.332951708042
Process Value	401676.21875 bbl/d

“KPI Laboratory” Template

Name	Value
Category: Operating Plan Data	
Operating Plan Target	175 °F
Category: Process Data	
Laboratory Value	177.199996948242 °F

Operating Data with Context - PI OLEDB Enterprise

PowerPivot Table

- AF Attributes
- PI Data
- Table Lookup
- Calculations
- AF Hierarchy
- Process Context

Time	KPI Value	Plan Target	Plan Deviation	Refinery	Process	KPI
5/15/2012 2:00:00 PM	60.2	61	-0.3	Oman	Reformer	Feed N+2A
5/15/2012 3:00:00 PM	60.2	61	-0.3	Oman	Reformer	Feed N+2A
5/15/2012 4:00:00 PM	60.2	61	-0.3	Oman	Reformer	Feed N+2A
5/15/2012 5:00:00 PM	60.2	61	-0.3	Oman	Reformer	Feed N+2A
5/15/2012 6:00:00 PM	60.2	61	-0.3	Oman	Reformer	Feed N+2A

... Assets and KPI's ...

Plan Deviation

$$=[\text{KPI Value}] - [\text{Plan Target}]$$

Time	KPI Value	Plan Target	Plan Deviation	Refinery	Process	KPI
5/11/2012 11:00:00 AM	1,118.3	1,200				
5/11/2012 12:00:00 PM	1,114.8	1,200				
5/11/2012 1:00:00 PM	1,115.7	1,200	-84.3	Bahrain	Isomerization	Feedrate
5/11/2012 2:00:00 PM	1,114.0	1,200	-86.0	Bahrain	Isomerization	Feedrate

... Assets and KPI's ...

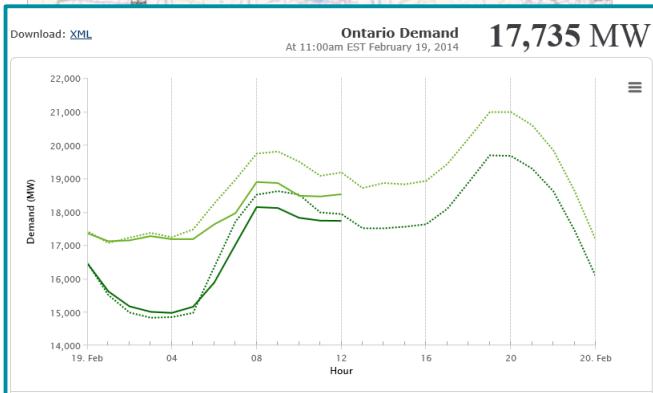
Time	KPI Value	Plan Target	Plan Deviation	Refinery	Process	KPI
5/12/2012 4:00:00 PM	62.4	64	-1.6	Bahrain	FCCU	Conversion
5/12/2012 5:00:00 PM	62.4	64	-1.6	Bahrain	FCCU	Conversion
5/12/2012 6:00:00 PM	62.7	64	-1.3	Bahrain	FCCU	Conversion
5/12/2012 7:00:00 PM	62.7	64	-1.3	Bahrain	FCCU	Conversion
5/12/2012 8:00:00 PM	62.3	64	-1.5	Bahrain	FCCU	Conversion

... Assets and KPI's ...

PetroRefCo Refining KPIs | Qatar Crude Runs | Bahrain Crude Runs | Kuwait Crude Runs | Oman Crude Runs | Bahrain Unit Capacities | ...

Example - “Improving Predicted Generation”

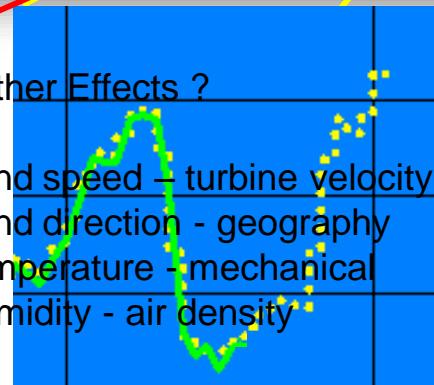
Future Data coming in PI Data Archive 2014



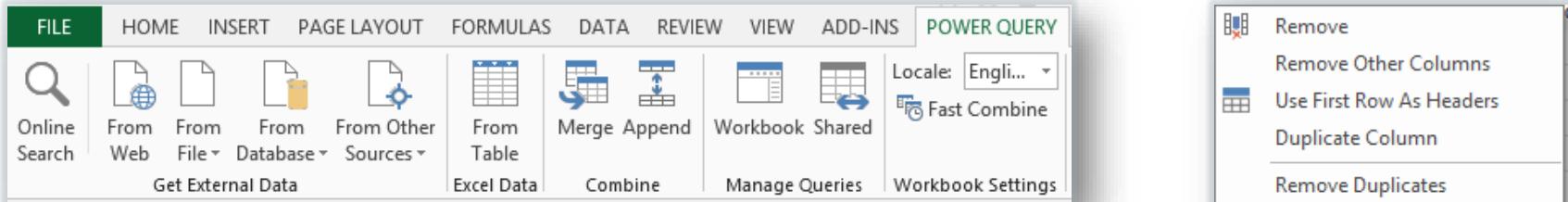
Prediction Errors

Weather Effects ?

Predicted Wind speed - turbine velocity
Generation Wind direction - geography
Temperature - mechanical
Humidity - air density



Power Query for Excel 2013



Free add-In for Excel 2010 or 2013

- Access to useful data sources
 - OData Feeds, like the PI OData feature of the PI Web API
- Shape datasets for Power View analysis
 - Remove columns and filter rows
 - Insert calculated columns
 - Reformat text and numeric data
 - Append and merge

PI Web API's OData Feature

CTP available on vCampus

- Connect to PI AF by URL
- Easy navigation to AF attribute data by element template
- Dataset types
 - Snapshot
 - Archive
 - Interpolated
 - Summaries

<http://localhost/PIOData/OperatingPlan/T>

The screenshot shows a data grid interface for PI Web API's OData feature. The grid displays a dataset titled "KPTotalInterpolations" with columns: KPTotalName, Time, ProcessValue, and HourlyProducti. The data consists of nine rows of feedrate measurements from March 22, 2014, at various times. Below the grid, a "Columns [18]" section lists the available columns: StartTime, EndTime, TimeStep, KPTotalID, KPTotalName, Time, ProcessValue, HourlyProductionTotal, HourlyProductionTarget, HourlyProductionTargetHigh, HourlyProductionTargetLow, Test, Sinusoid, Crude, Noise, and Test1. To the right of the grid is a "Navigator" sidebar containing a tree view of available datasets and elements.

KPTotalName	Time	ProcessValue	HourlyProducti
Feedrate	3/22/2014 12:00:00 AM	64855.210938	2702.28034
Feedrate	3/22/2014 1:00:00 AM	64856.171875	2702.32043
Feedrate	3/22/2014 2:00:00 AM	64857.132812	2702.36052
Feedrate	3/22/2014 3:00:00 AM	64858.097656	2702.40061
Feedrate	3/22/2014 4:00:00 AM	64859.058594	2702.44070
Feedrate	3/22/2014 5:00:00 AM	64860.019531	2702.48079
Feedrate	3/22/2014 6:00:00 AM	64860.980469	2702.52088
Feedrate	3/22/2014 7:00:00 AM	64861.945312	2702.56096
Feedrate	3/22/2014 8:00:00 AM	64862.90625	2702.60105

Columns [18]

StartTime, EndTime, TimeStep, KPTotalID, KPTotalName, Time, ProcessValue, HourlyProductionTotal, HourlyProductionTarget, HourlyProductionTargetHigh, HourlyProductionTargetLow, Test, Sinusoid, Crude, Noise, Test1,

Navigator

- Select multiple items
- KPLaboratoryInterpolations
- KPLaboratorySnapshots
- KPLaboratorySummaries
- KPIs
- KPISnapshots
- KPISummaries
- KPTotalArchive
- KPTotalInterpolations
- KPTotals
- KPTotalSnapshots
- KPTotalSummaries
- KPIValueArchive
- KPIValueInterpolations
- KPIValues
- KPIValueSnapshots
- KPIValueSummaries



Book1 - Excel

Curt Hertler

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ADD-INS POWER QUERY PI DATALINK PI BUILDER POWERPIVOT

Online Search From Web From File From Database From Other Sources From Table Merge Append Workbook Shared Locale: English Fast Combine Data Source Settings Update Options Sign In Send Feedback Help About

Get External Data Excel Data Combine Manage Queries Workbook Settings Machine Settings Organization Help

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Sheet1

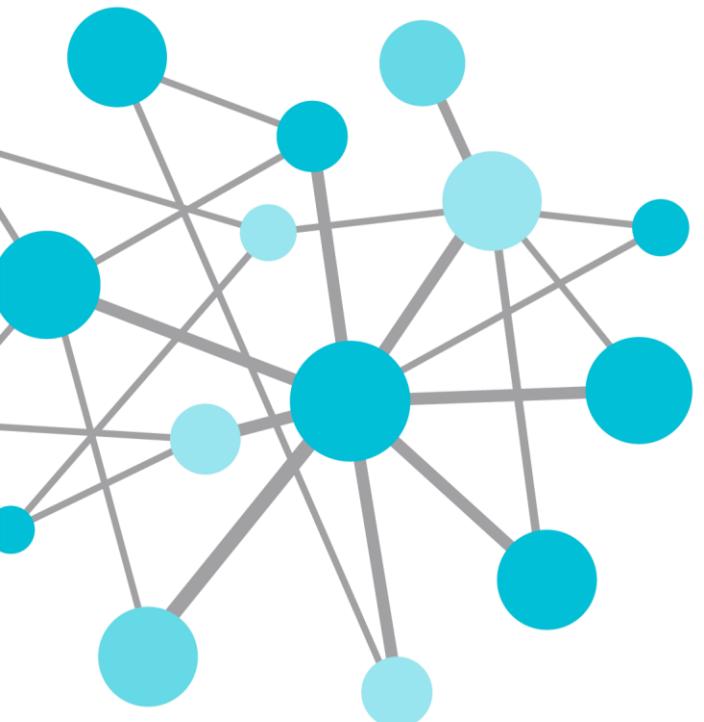
READY

100%

Curt Hertler

curt@osisoft.com

Partner Solutions Architect
OSIsoft, LLC



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YOU

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