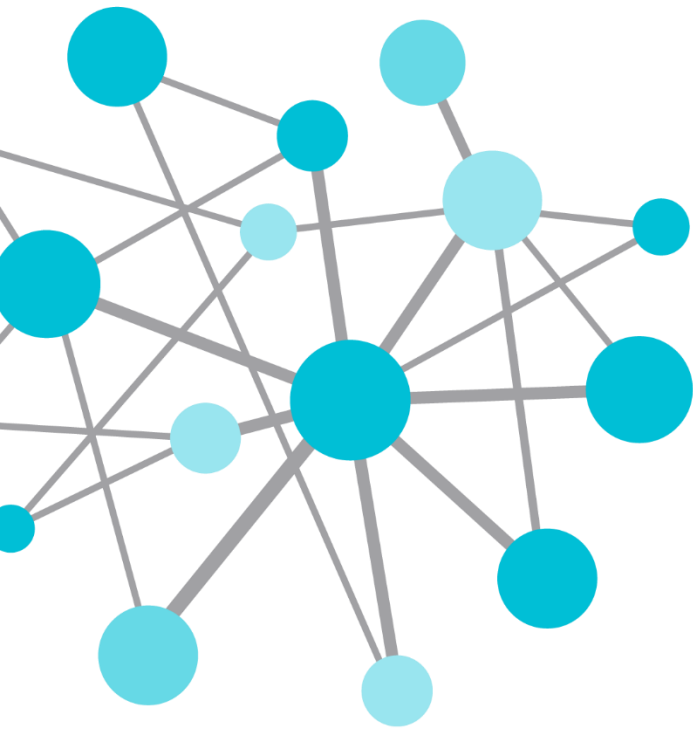




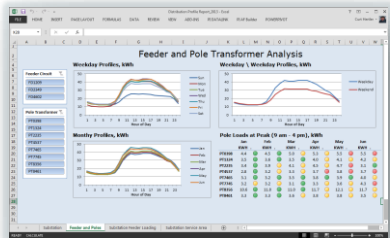
Advanced Analytics - Use Cases Spanning the Value Chain

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

Excel 2013 Anatomy

Worksheets

Pivot
Tables &
Charts



Power
Tables
Reports

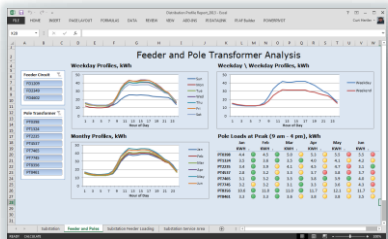
Bighorn Basin Substation Service Area

Location	Opponent	Game Time	Start Time	Attendance
Home	Athletics	Night	4/13/12 7:00 PM	46,036
Home	Athletics	Night	4/14/12 6:00 PM	23,071
Home	Athletics	Day	4/15/12 1:00 PM	19,690
Home	Indians	Night	4/17/12 7:00 PM	12,461
Home	Indians	Night	4/18/12 7:00 PM	12,343
Home	Indians	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	19,575
Home	Dodgers	Day	4/5/12 4:00 PM	42,942
Home	Dodgers	Night	4/6/12 7:00 PM	22,490
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	18,091
Home	Diamondbacks	Night	4/12/12 7:00 PM	20,858

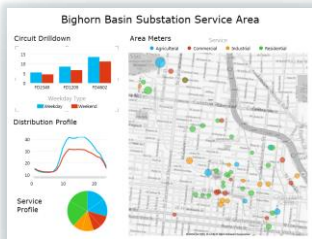
Excel 2013 Anatomy

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	Athletics	Day	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	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	19,975
Home	Dodgers	Day	4/25/12 4:00 PM	62,942
Home	Dodgers	Night	4/26/12 7:00 PM	12,440
Home	Dodgers	Night	4/27/12 5:30 PM	31,909
Home	Dodgers	Day	4/28/12 1:00 PM	19,021
Home	Diamondbacks	Night	4/30/12 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

Data Model

PowerPivot
Tables

A row of four Excel worksheets, each displaying a data table. The first table has columns for "Date", "Time", "City", "State", "Country", and "Population". The second table has columns for "Date", "Time", "City", "State", "Country", and "Population". The third table has columns for "Date", "Time", "City", "State", "Country", and "Population". The fourth table has columns for "Date", "Time", "City", "State", "Country", and "Population".

Data Sources



PI AF



Relational Data

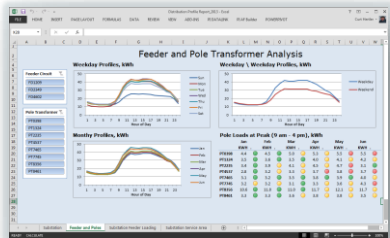


Paste

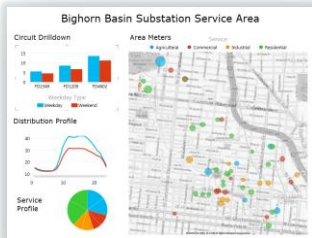
Clipboard

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	Athletics	Day	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	11,343
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	15,975
Home	Dodgers	Day	4/25/12 4:00 PM	62,942
Home	Dodgers	Night	4/26/12 7:00 PM	12,490
Home	Dodgers	Night	4/27/12 3:30 PM	11,909
Home	Dodgers	Day	4/28/12 1:00 PM	19,021
Home	Diamondbacks	Night	4/30/12 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

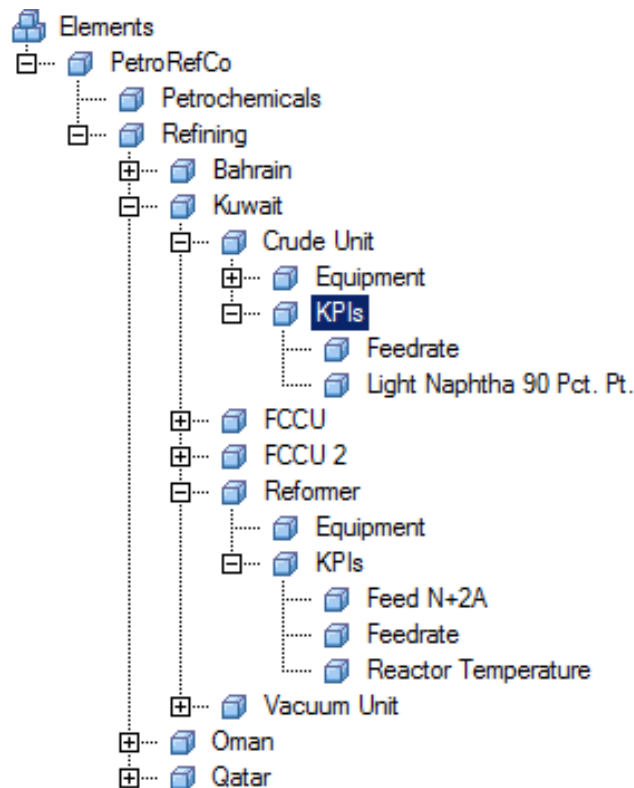
Data Model
PowerPivot
Tables



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

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

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 ...						
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 ...						
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	62.5	64	-1.5	Bahrain	FCCU	Conversion

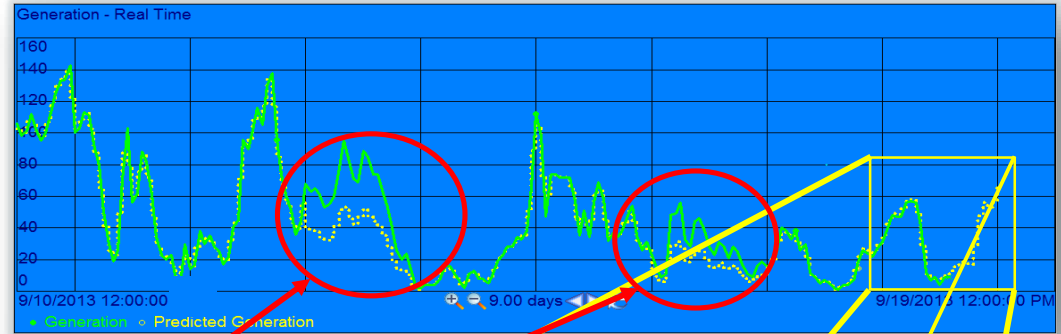
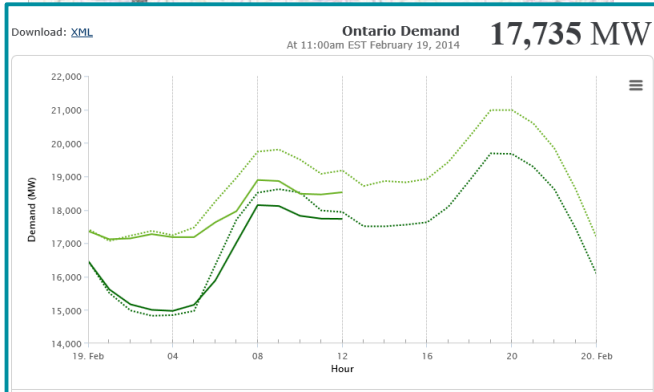
PetroRefCo Refining KPIs Qatar Crude Runs Bahrain Crude Runs Kuwait Crude Runs Oman Crude Runs Bahrain Unit Capacities

Plan Deviation

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

Example - “Improving Predicted Generation”

Future Data coming in PI Data Archive 2014

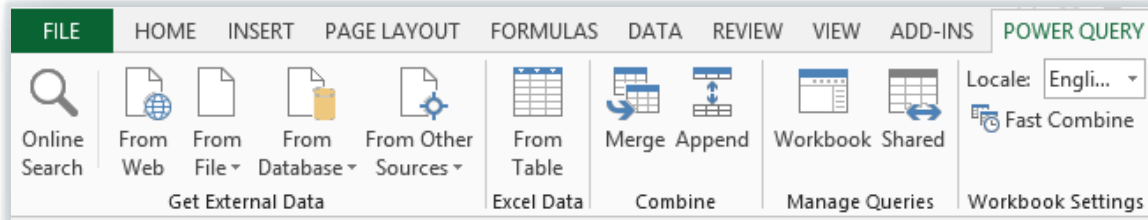


Prediction
Errors

Weather Effects ?

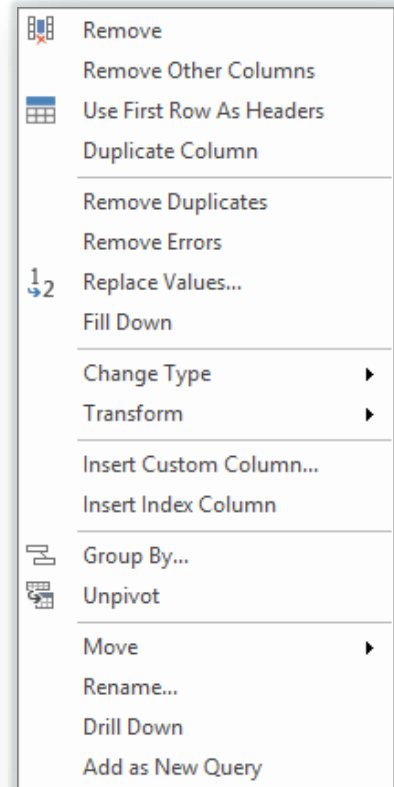
Predicted Wind speed – turbine velocity
Wind direction - geography
Temperature - mechanical
Humidity - air density

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 displays the PI Web API OData interface. A table titled "KPI Total Interpolations" is shown, containing data for Feedrate over time. The table has four columns: KPI Total Name, Time, Process Value, and Hourly Product. The data is for the date 3/22/2014, ranging from 12:00:00 AM to 8:00:00 AM. The Process Value and Hourly Product values are also displayed. Below the table, a list of columns is shown, including StartTime, EndTime, TimeStep, KPI Total ID, KPI Total Name, Time, Process Value, Hourly Production Total, Hourly Production Target, Hourly Production Target High, Hourly Production Target Low, Test, Sinusoid, Crude, Noise, and Test1.

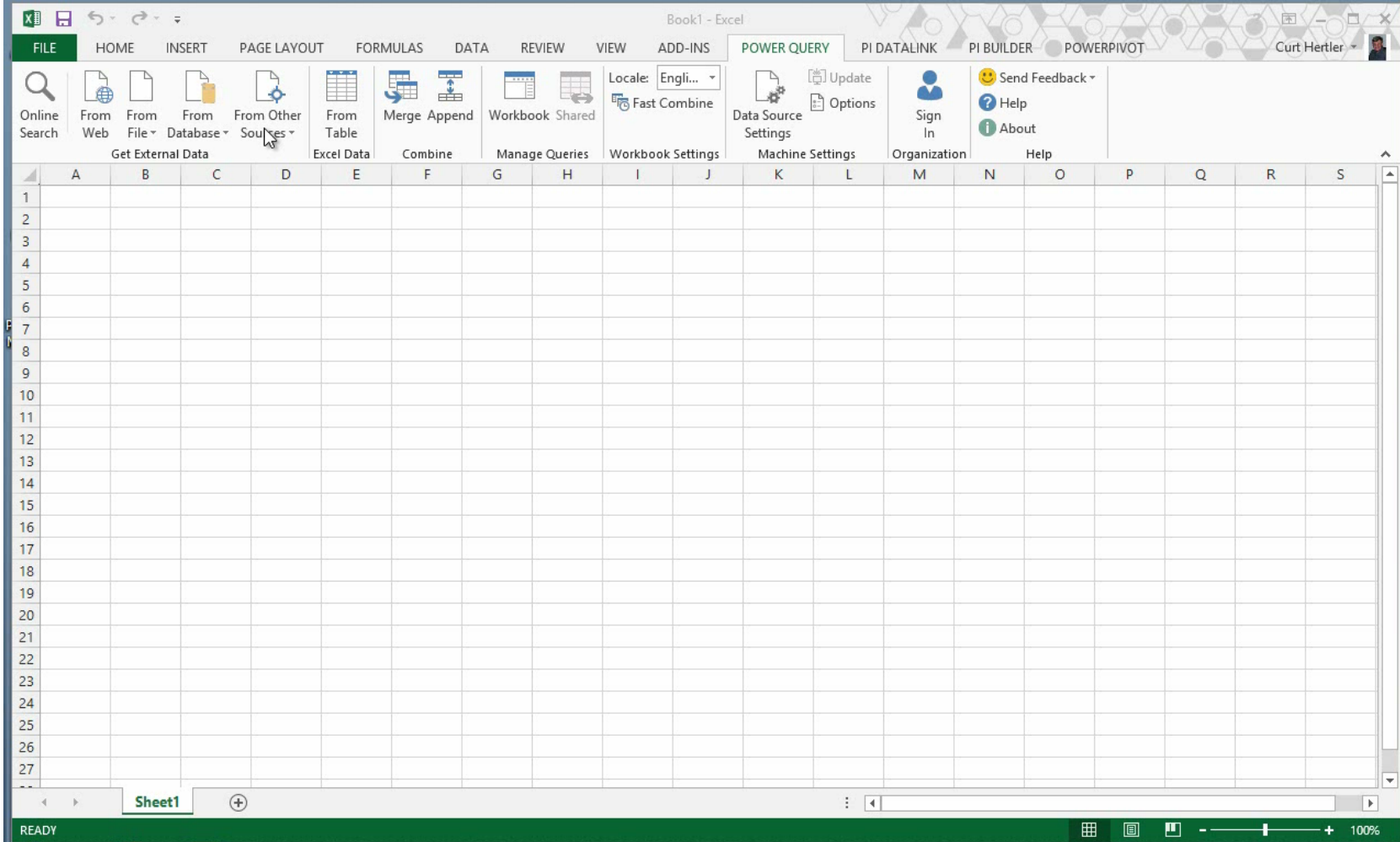
Columns [18]
StartTime, EndTime, TimeStep, KPI Total ID, KPI Total Name, Time, Process Value, Hourly Production Total, Hourly Production Target, Hourly Production Target High, Hourly Production Target Low, Test, Sinusoid, Crude, Noise, Test1

Navigator

- ☐ Select multiple items
- ☐ KPI Laboratory Interpolations
- ☐ KPI Laboratory Snapshots
- ☐ KPI Laboratory Summaries
- ☐ KPIs
- ☐ KPI Snapshots
- ☐ KPI Summaries
- ☐ KPI Total Archive
- ☐ KPI Total Interpolations
- ☐ KPI Totals
- ☐ KPI Total Snapshots
- ☐ KPI Total Summaries
- ☐ KPI Value Archive
- ☐ KPI Value Interpolations
- ☐ KPI Values
- ☐ KPI Value Snapshots
- ☐ KPI Value Summaries



DEMO

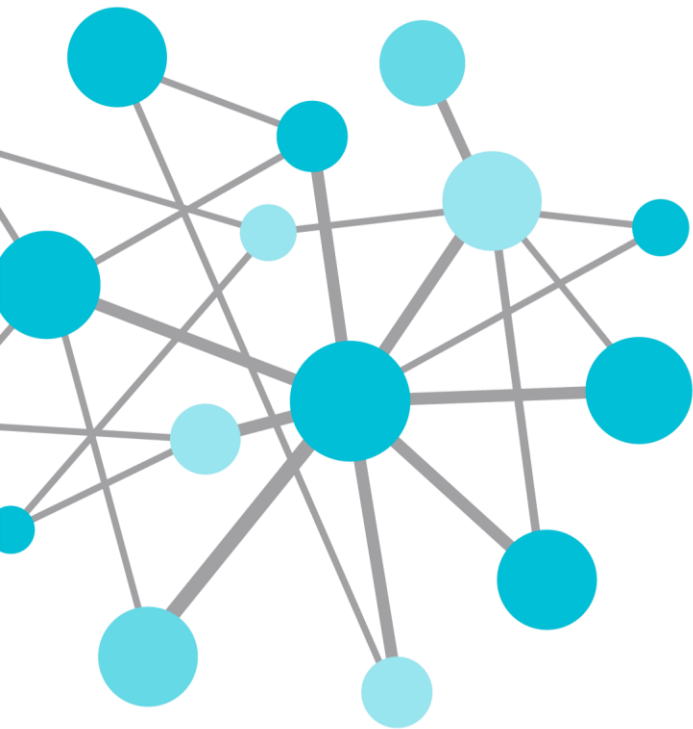


Curt Hertler

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Partner Solutions Architect

OSIsoft, LLC



THANK
YOU

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