ERCOT's Use of the OSIsoft Ecosystem for the New Reliability Risk Operator Desk

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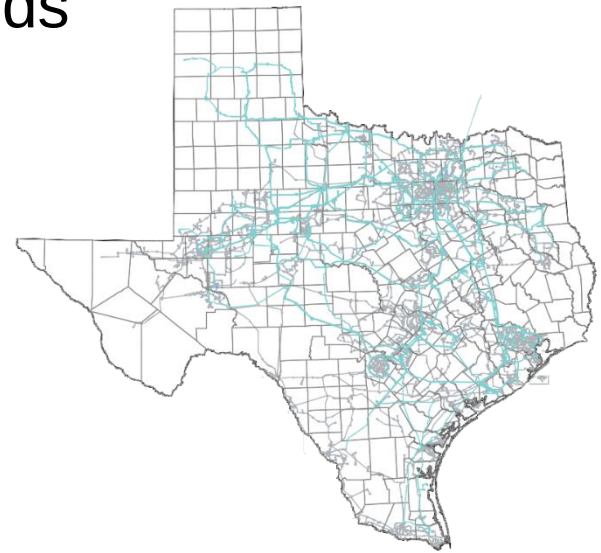
Agenda

- Quick ERCOT overview
- New Reliability Risk Desk Overview
- Using OSIsoft to Meet Those Needs
- Benefits Recap
- Next Steps
- Questions



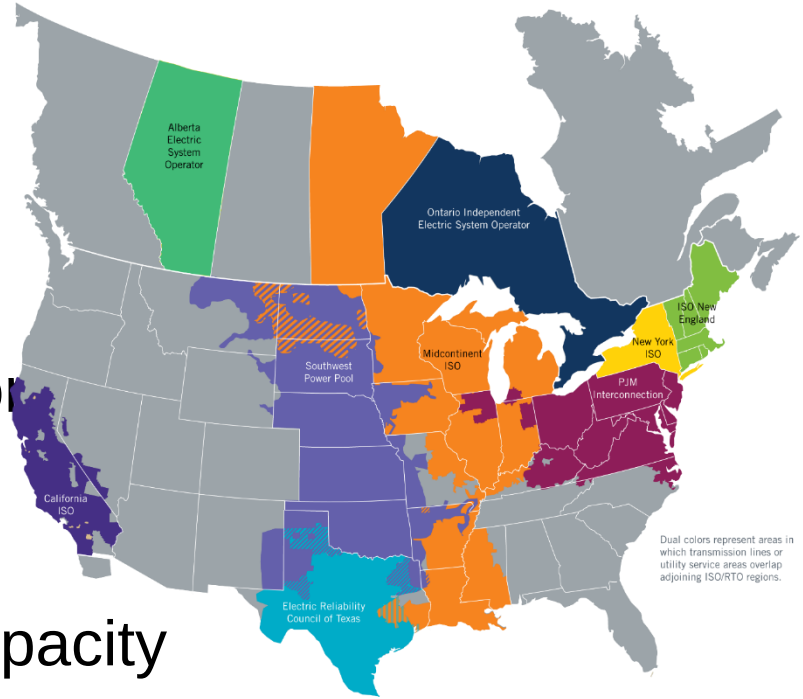
About ERCOT

Introduction – ERCOT

- Electric Reliability Council of Texas, Inc.
  - ISO/RTO for the state of Texas
- Four primary responsibilities
  - System reliability – planning and operations
  - Wholesale market settlement for electricity production and delivery
  - Retail switching process for customer choice
  - Open access to transmission

ERCOT Quick Facts

- 90% of Texas load
  - 24 million customers
  - 75% of load is retail-choice
- 77,000+ MW expected generation
- Record peak load of 71,197 MW
  - August 11, 2016
- 17,000+ MW of installed wind capacity
  - Most of any state in the nation
- 500+ MW of installed solar capacity

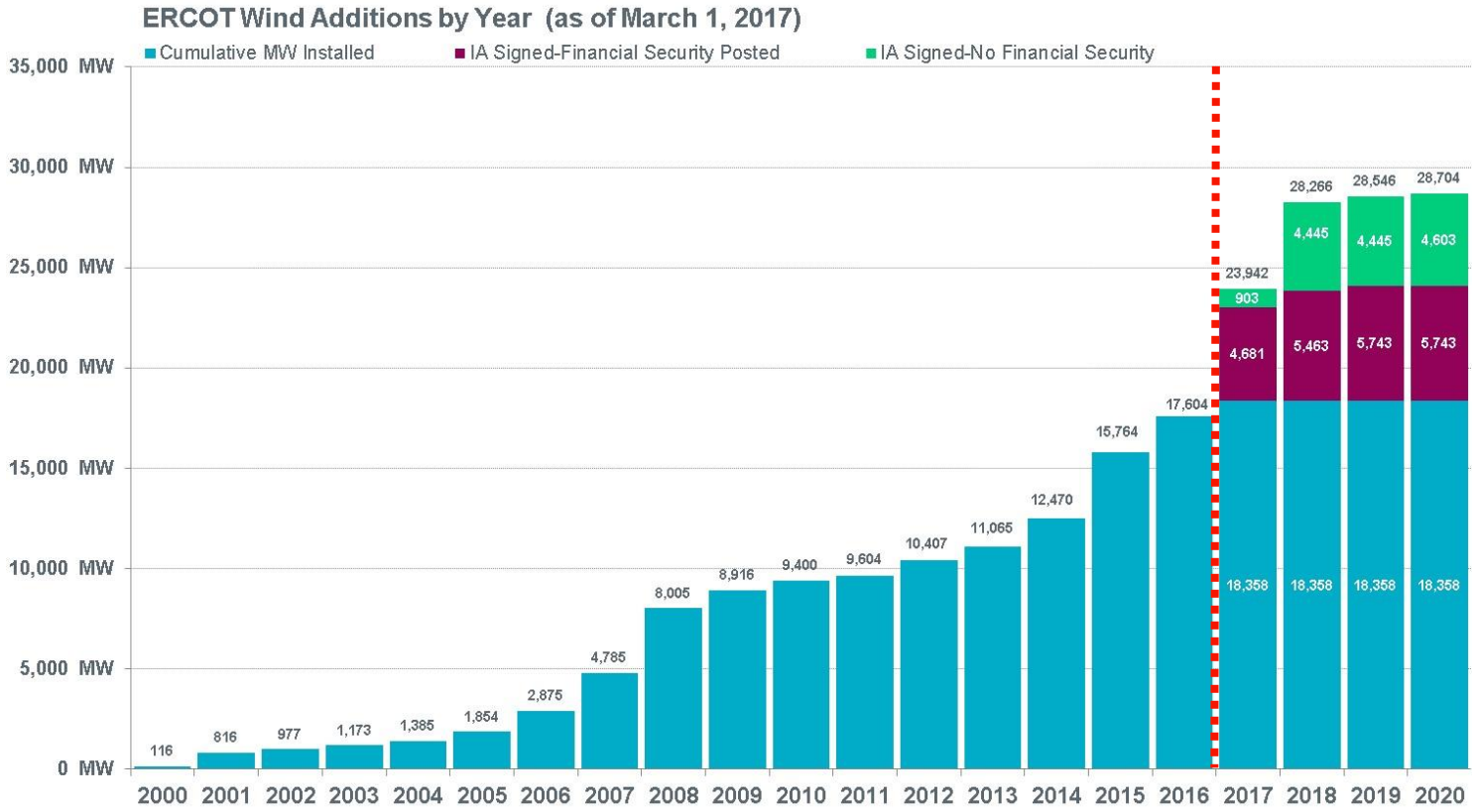


OSIsoft at ERCOT

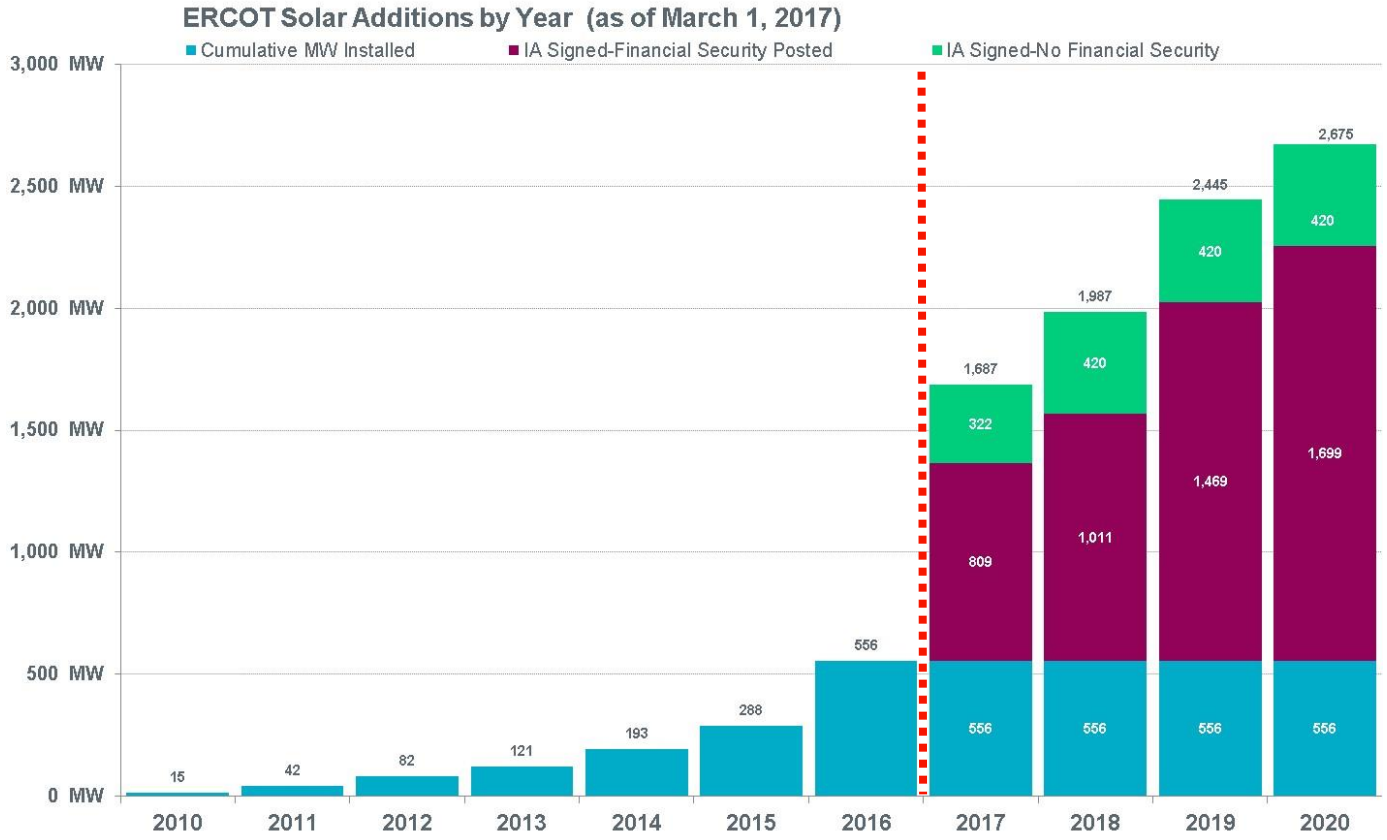
- Started using PI System in ~2004
- 530,000+ PI Tags
  - ~303,000 from SCADA
  - ~123,000 for Performance Equations
  - ~61,000 for AF analyses
- 2TB total used archive space
  - ~2GB daily archive size

Reliability Risk Desk

Past Trend - Increasing Wind



Upcoming Trend - Increasing Solar



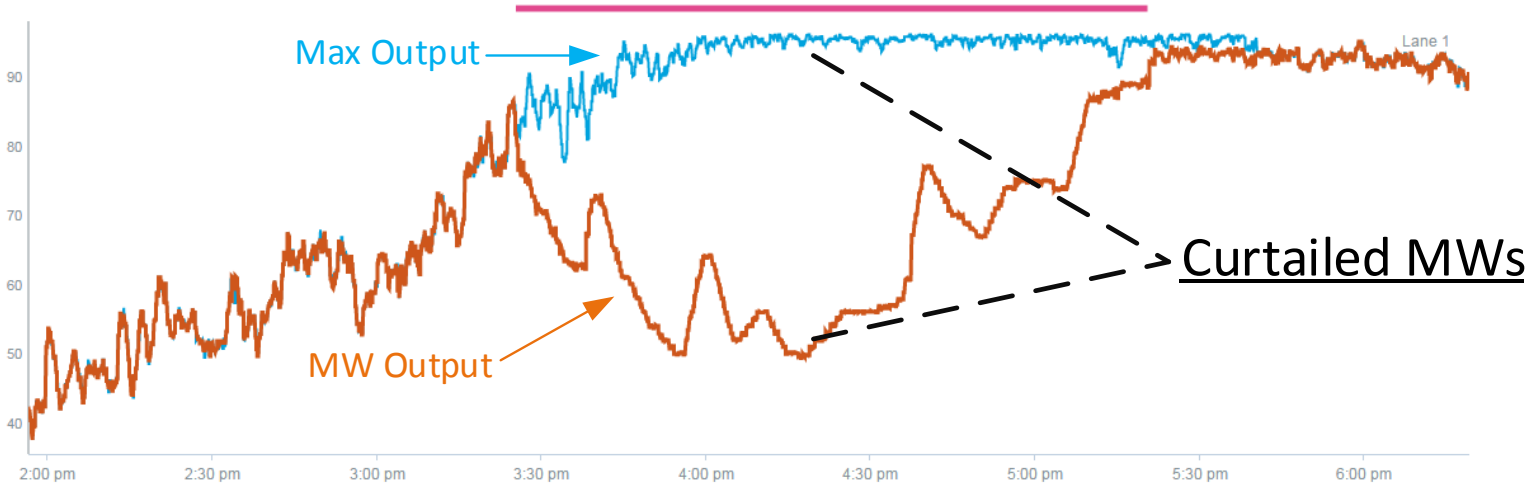
New Reliability Risk Desk

Increasing amounts of renewable generation requires ERCOT to assess and manage more-infrequent yet potentially severe risks.

- 8th operating desk in the ERCOT control room
- Key areas of focus:
  - Real-time performance of wind and solar generators
  - Monitoring and identifying forecast error risk

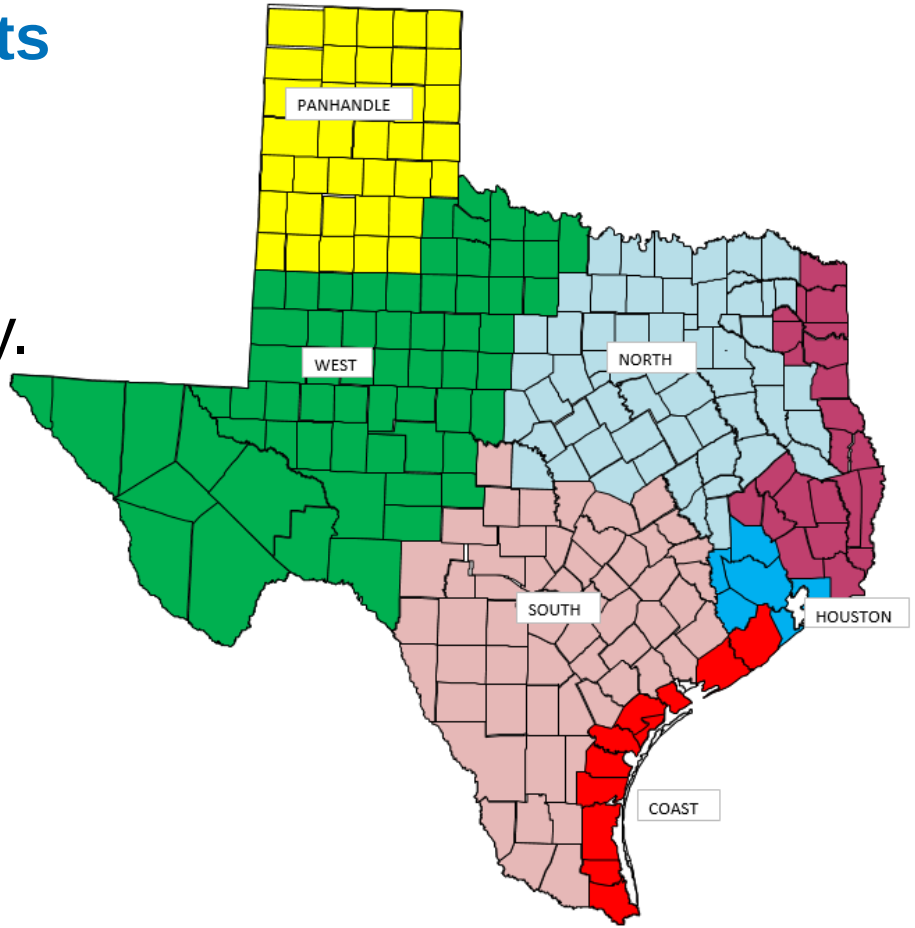
New Desk = New Requirements

- New Calculations
  - Example: Curtailed MWs for Wind and Solar Units



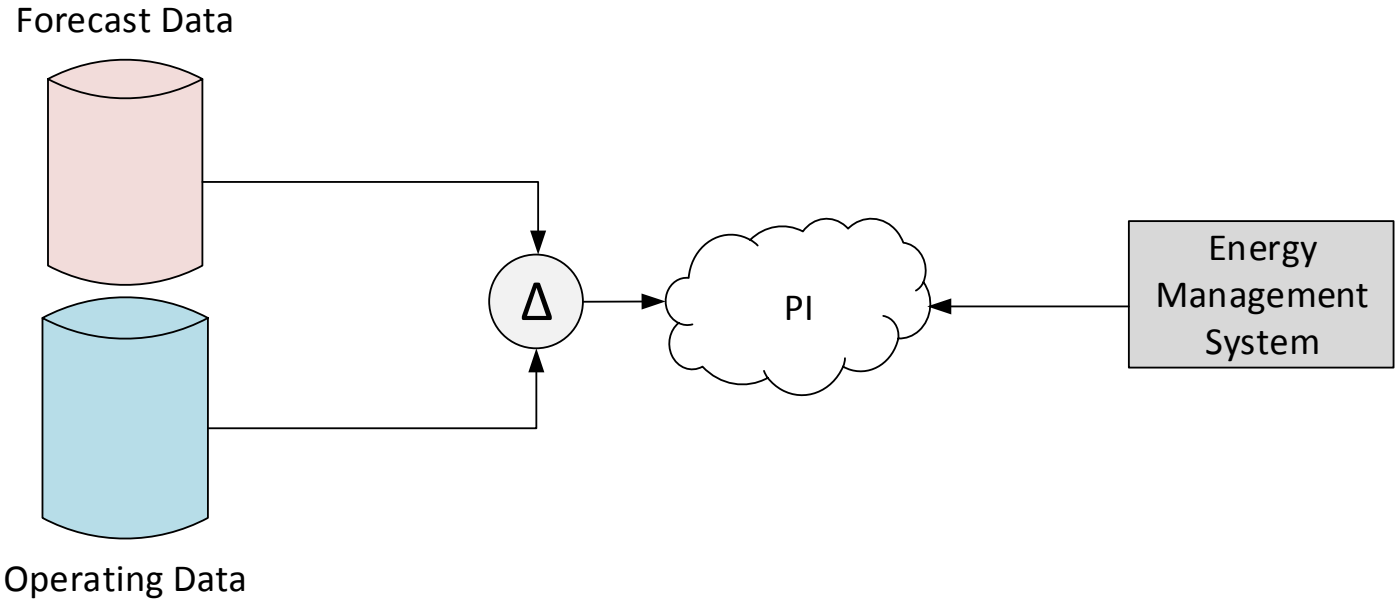
New Desk = New Requirements

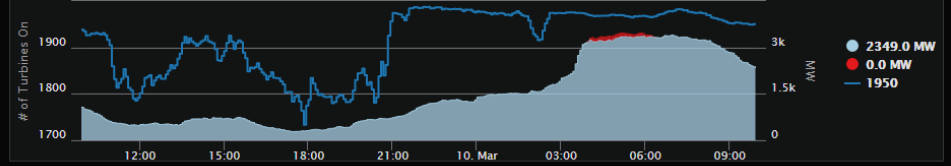
- New Wind Regions
  - Different geographical regions behave differently.
  - Need aggregated values for each region.

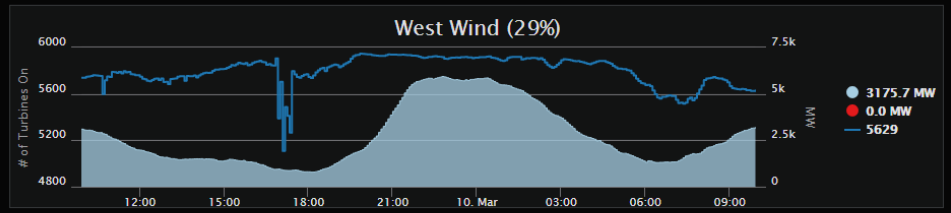


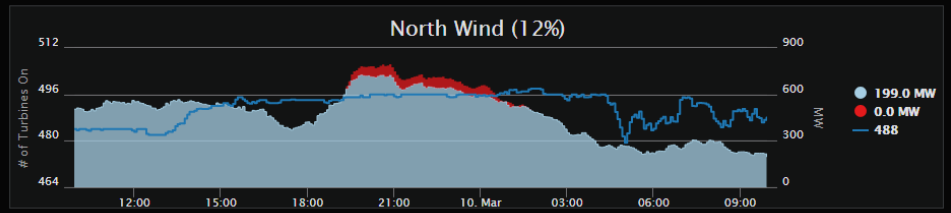
New Desk = New Requirements

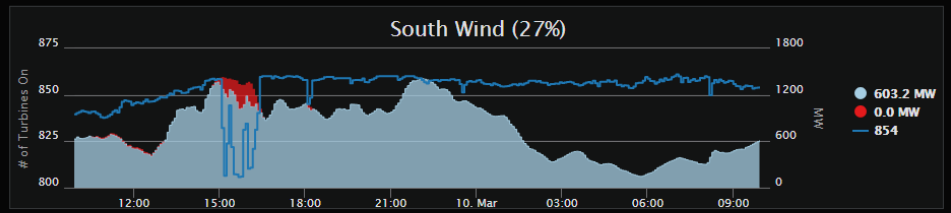
- New Data Sources
  - Forecast and Future Operating Plans do not exist in EMS.

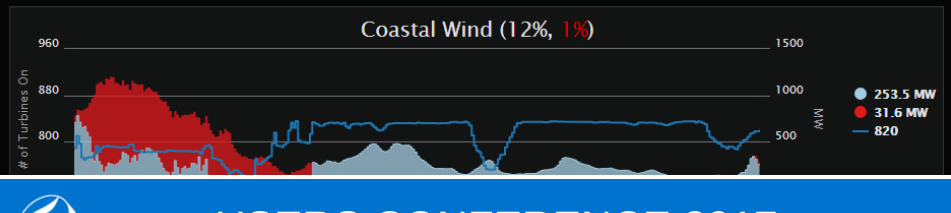


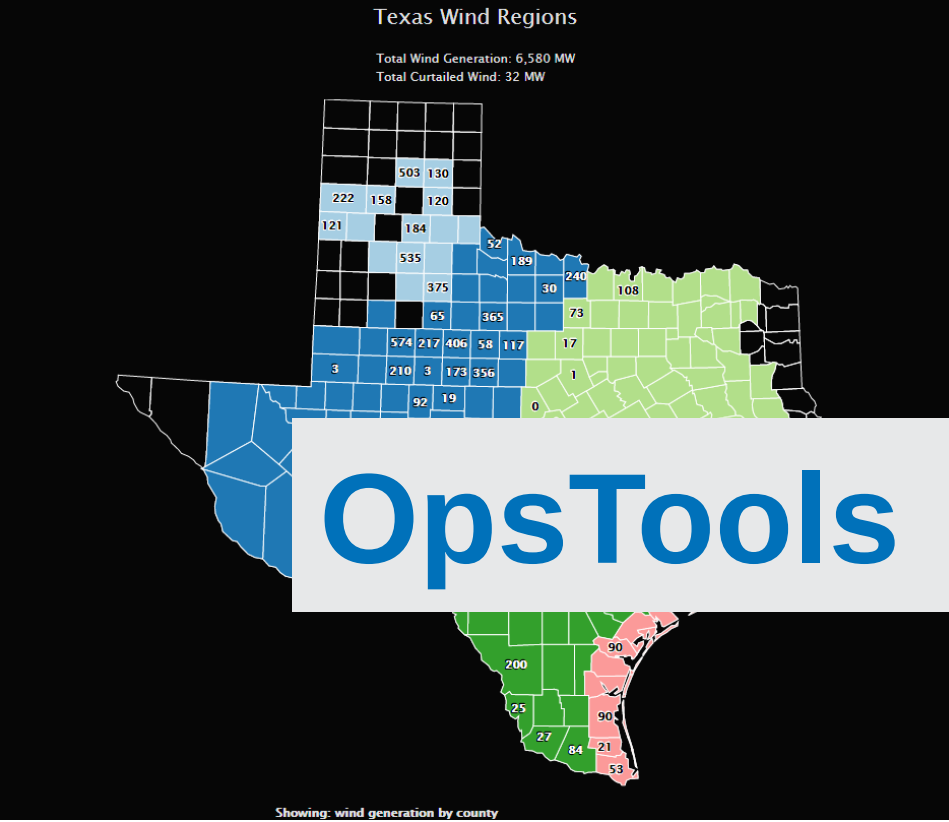








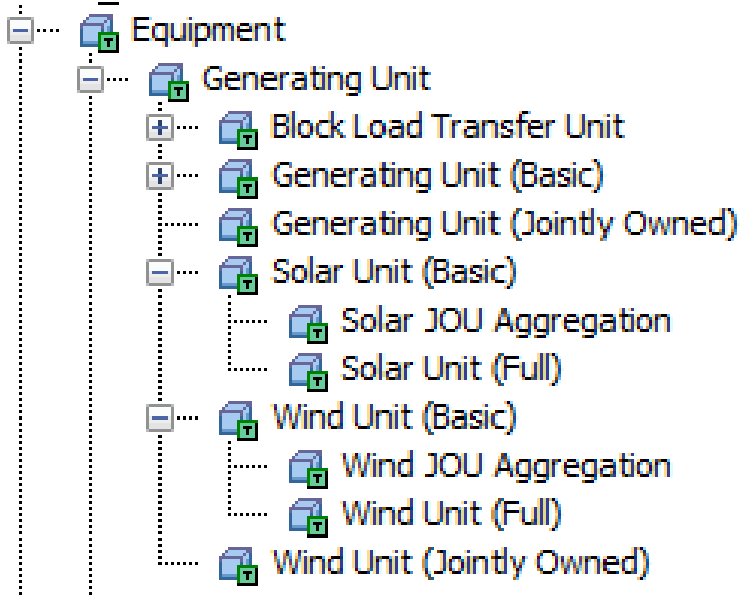




OpsTools

AF Model – Starting Point

- Started building AF model in 2015
- Fully modeled representation of Solar and Wind Units



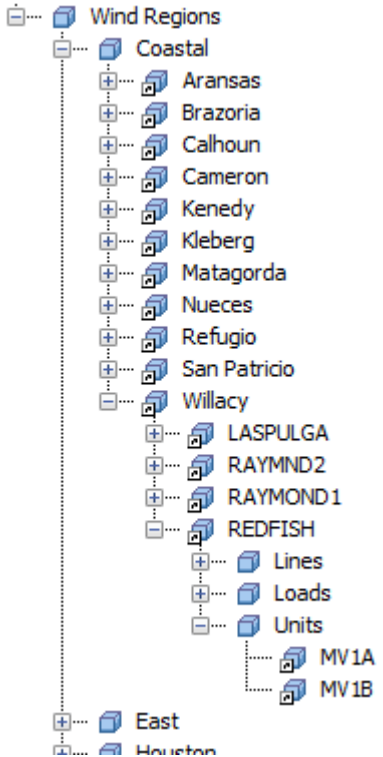
AF Analytics – New Calculations

- Generating unit assets define complex analyses
- Results are written to PI System and rolled up for high-level view
- Example: Curtailed generation calculates how much wind/solar was “held back” due to a constraint on the grid

Name	Expression	Value	Output Attribute
Curtailment	`Max('HSL' - 'MW', 0)`	0	Map
LastSBBH	`PrevVal('SBBH', '*-5m')`	1	Map
LastRST	`PrevVal('RST', '*-5m')`	ON	Map
WasCurtailed	`Not BadVal(LastSBBH) And Not BadVal(LastRST) And LastSBBH And LastRST <> "ONTEST"`	True	Map
IsCurtailed	`Not BadVal('SBBH') And Not BadVal('RST') And 'SBBH' and 'RST' <> "ONTEST"`	True	Map
Result	`If IsCurtailed Or WasCurtailed Then Curtailment Else 0`	0	CurtailedMW

Modeling Wind Regions with AF

- Texas counties grouped into “wind regions” with common meteorological characteristics
- Use of AF element references to organize hierarchical structure

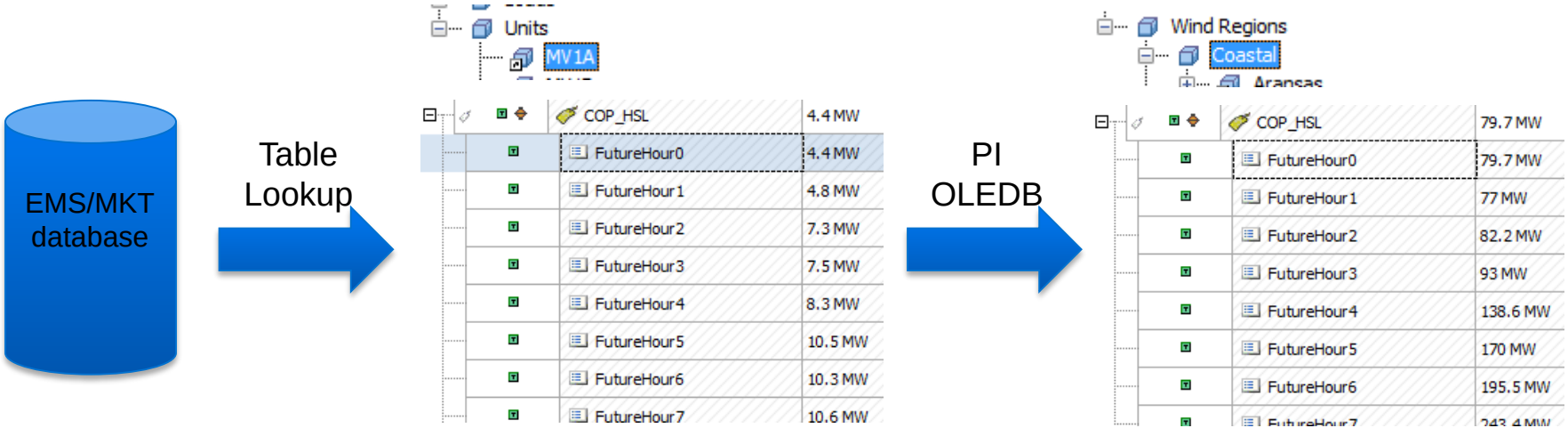


Rollup Analyses with AF

- Use of element categories to target specific assets
- Rollup analyses to county and wind levels for key quantities:
  - Wind/solar generation and HSL
  - Curtailed wind/solar generation
  - Number of turbines on

Rollup Analyses with OLEDB Queries

- OLEDB queries used for more complicated rollups
- Useful when history/backfilling is not needed
- Allows multi-level rollups with less “clutter”



Web-based Displays

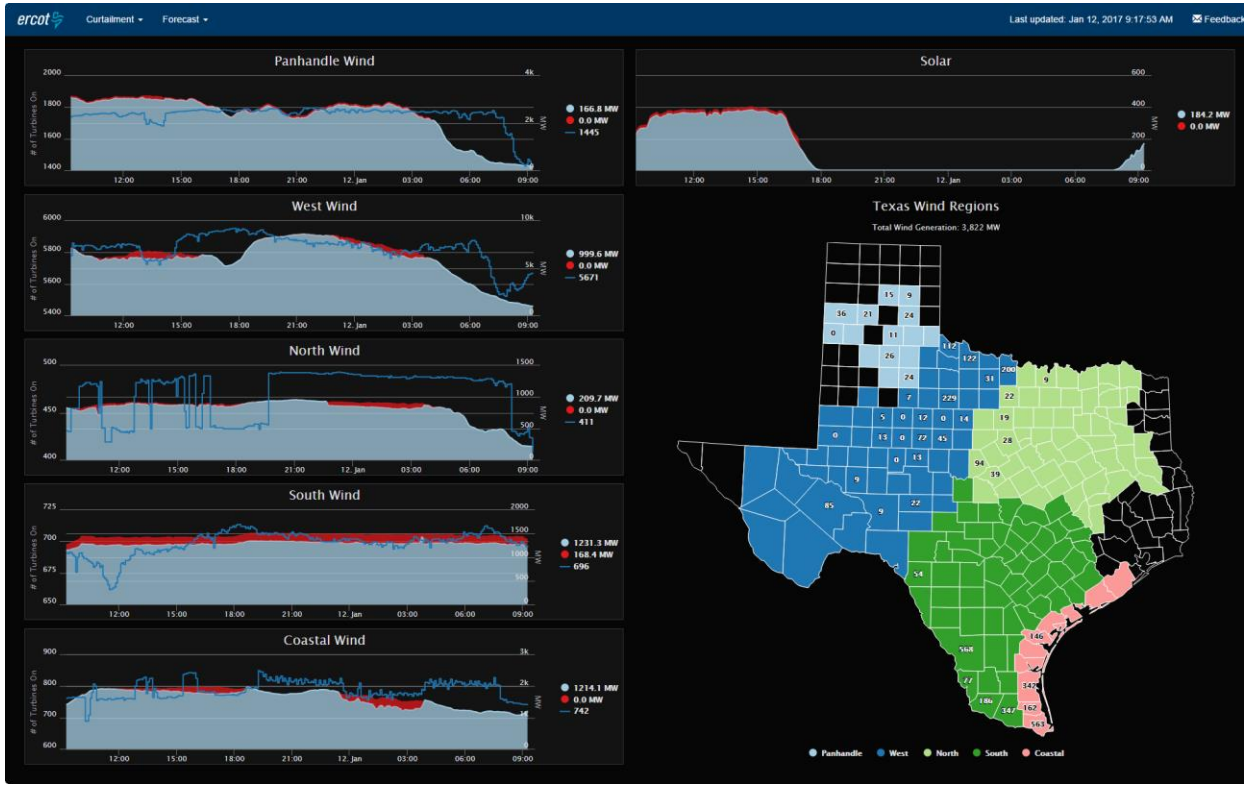
Web-based Displays

- OSIsoft PI Web API opens up access to AF data to be used in web-based displays
- Best-of-breed technologies used, including…
  - Angular
  - Highcharts
  - Node.js

Benefits of Web-based Displays

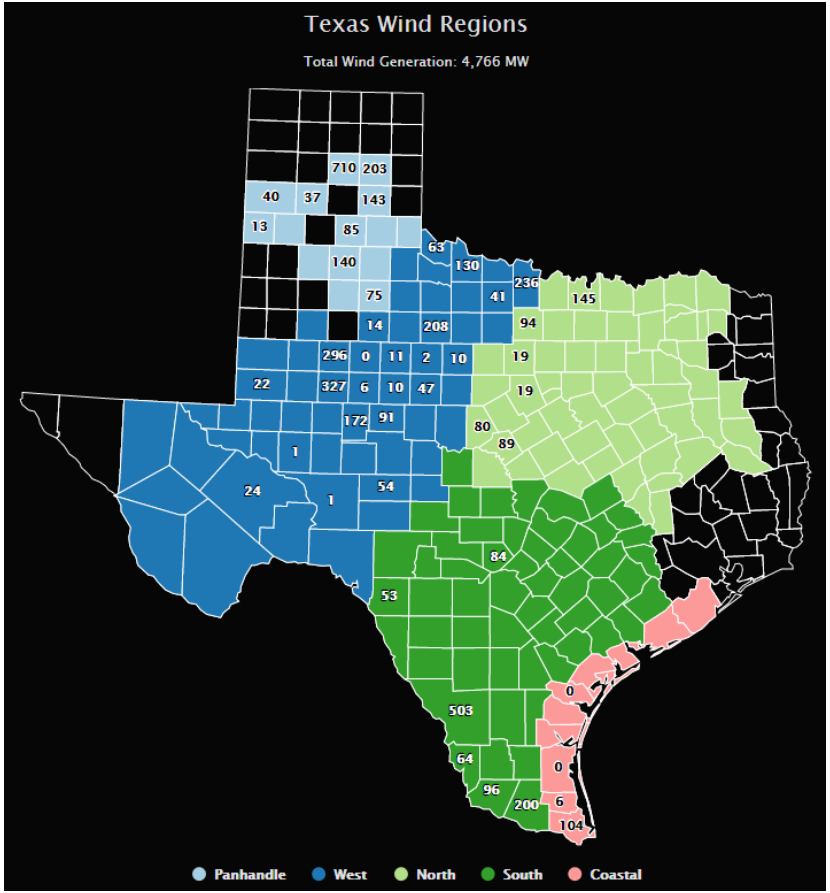
- Centralized location facilitates deployment strategy
- More powerful presentation-layer capabilities than PI ProcessBook by using HTML/CSS
- (More flexibility than allowed by PI ProcessBook)
- (More dynamic UI environment)
- Highly extensible with JavaScript

Wind/Solar Curtailment Monitoring

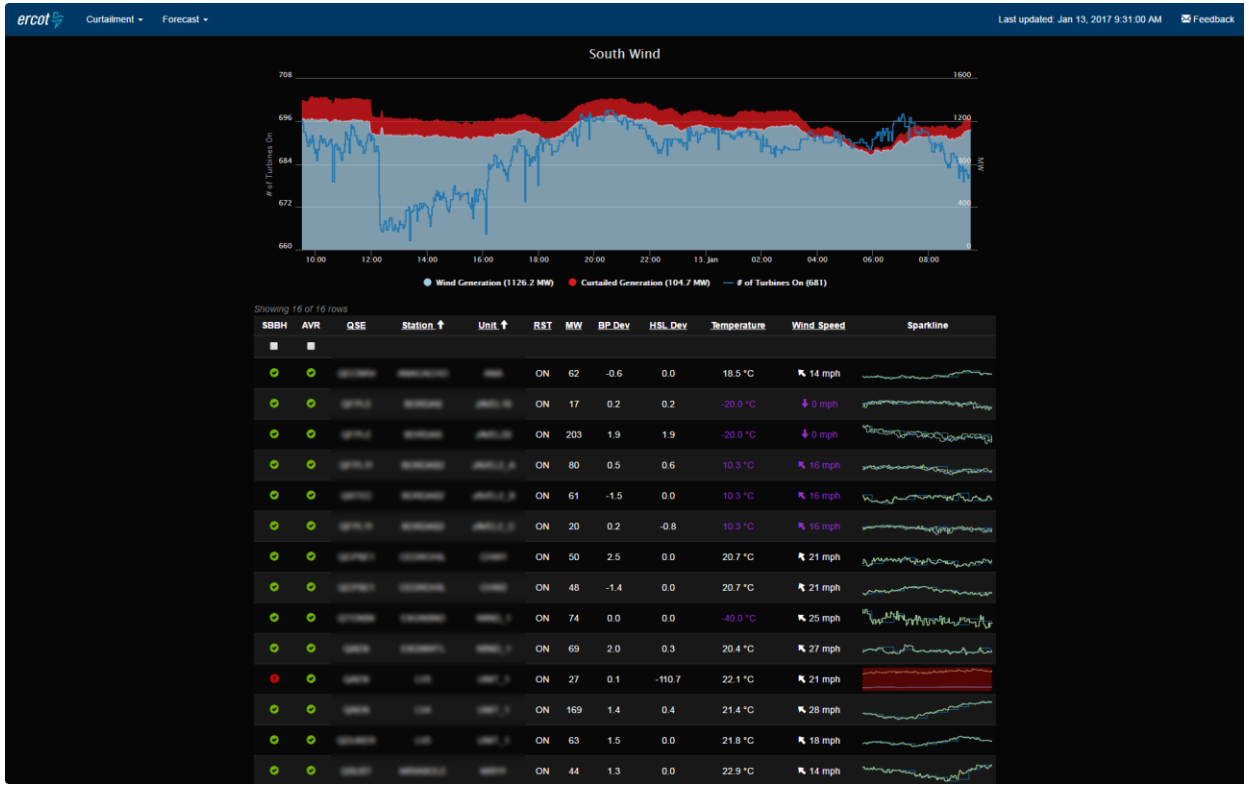


Visualizing Wind Regions

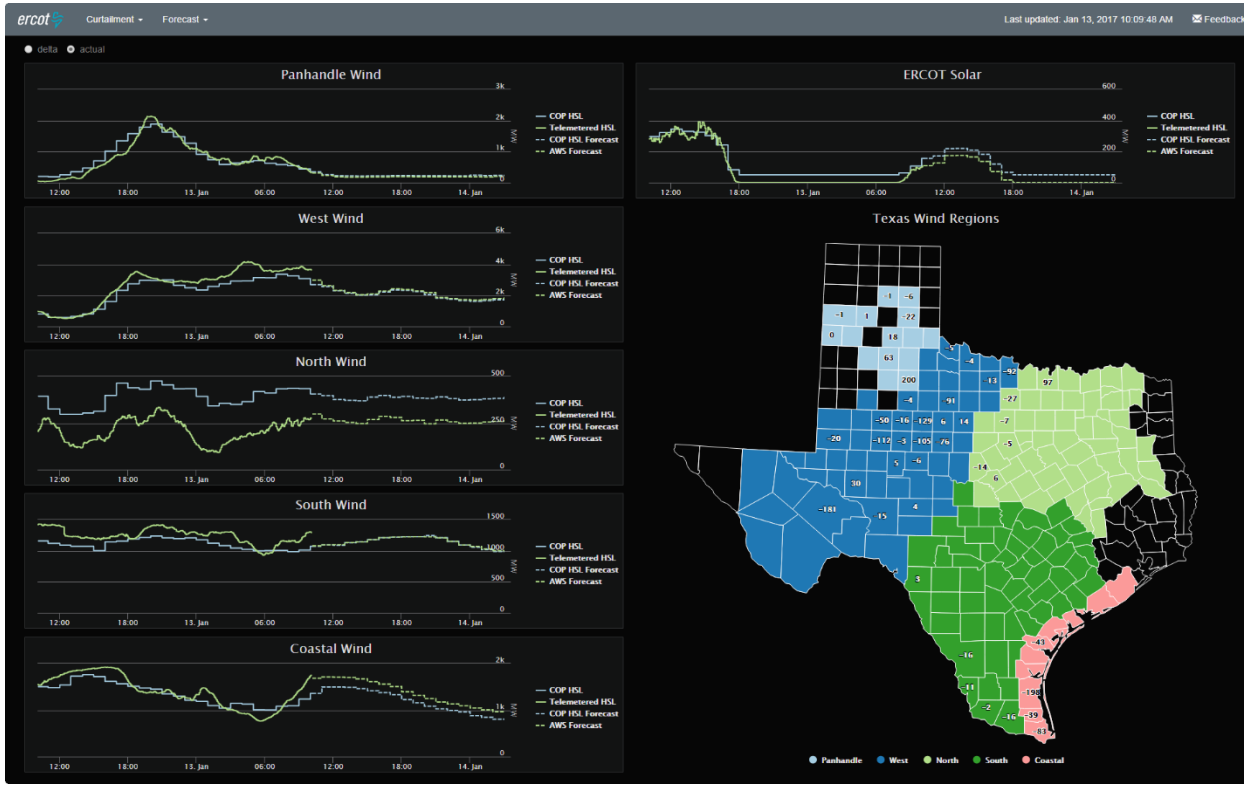
- Wind generation by county displayed on map
- Allows operator to quickly visualize where most wind generation is concentrated



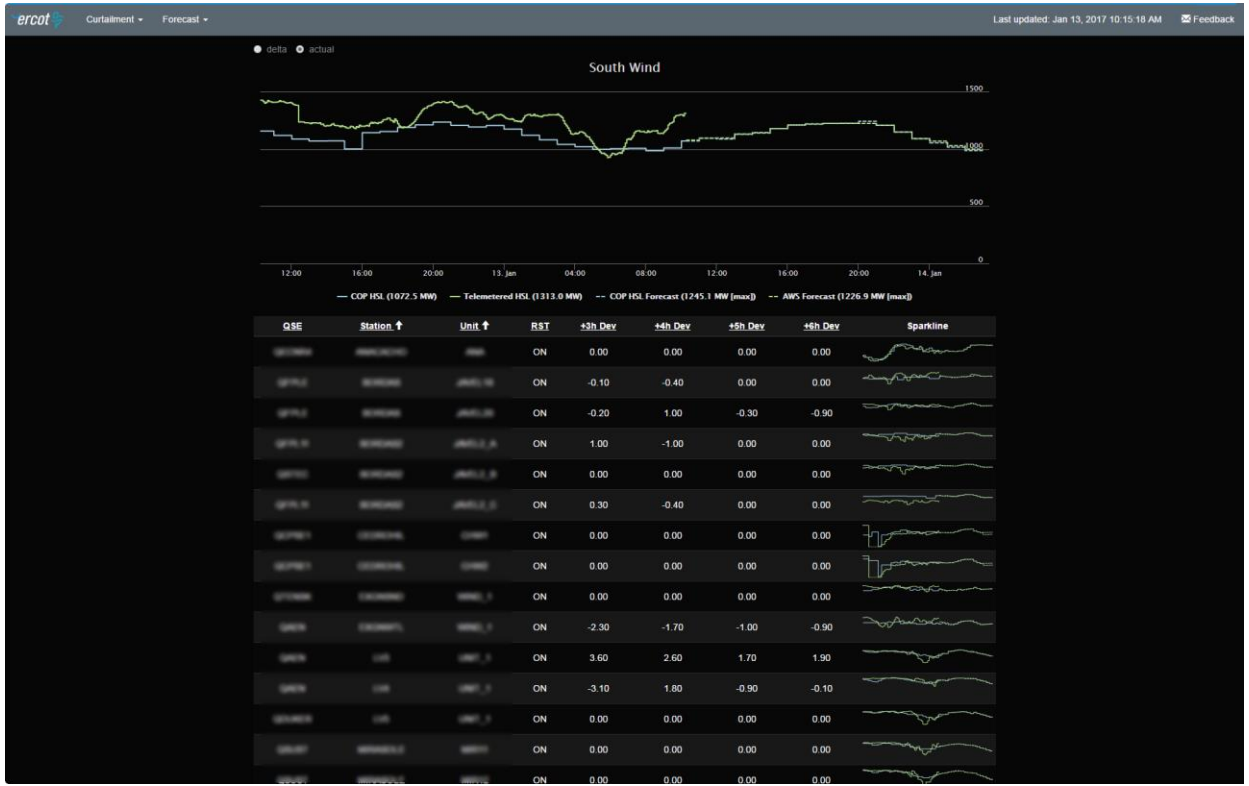
Wind/Solar Curtailment Details



Wind/Solar Forecast Monitoring



Wind/Solar Forecast Details



Future Plans

- Implement Future Data using RDBMS
- Transition PI ProcessBook Displays to Web-Based
- Mobile Dashboards

Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session

http://bit.ly/uc2017-app

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谢谢

Danke

Merci

Gracias

Thank You

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Спасибо

Obrigado

Current Records (As of 2/8/2017)

Peak Demand Record: 71,110 megawatts (MW)

- Aug. 11, 2016, 4-5 p.m.

Weekend Record: 66,921 MW

- Sunday, Aug. 7, 2016, 5-6 p.m.

Winter Peak Record: 59,650 MW

- Jan. 6, 2017, 6-7 p.m.

Wind Generation Records (instantaneous)

- Output: 16,022 MW
  - Dec. 25, 2016, 10:40 a.m.
- Penetration (load served): 48.28%
  - March 23, 2016, 1:10 a.m.
  - Total Load = 27,245 MW

Recent Monthly Peak Demand Records

2017

- January: 59,650 MW* (Jan. 6, 6-7 p.m.)

2016

- August: 71,110 MW
  (All-time record)
- September: 66,949 MW (Sept. 19, 4-5 p.m.)
- October: 59,864 MW (Oct. 5, 4-5 p.m.)
- December: 57,924 MW* (Dec. 19, 7-8 a.m.)
  (New winter record at the time; surpassed Jan. 6, 2017)

2015

- July: 67,650 MW (July 30, 4-5 p.m.)

** Totals subject to change based on final settlement*

Benefits of Asset Framework (AF)

- Ability to group wind units by geographical regions
  - Allows hierarchical rollups, e.g. MW output by county
  - Defines structure for laying out displays, e.g. all wind units on the Coast
- Provides new insight from existing data series
  - Fast prototyping
  - New calculations, e.g. curtailed wind generation
- Integrating outside data sources, e.g. Oracle databases
- PI Web API allows us to develop web-based displays