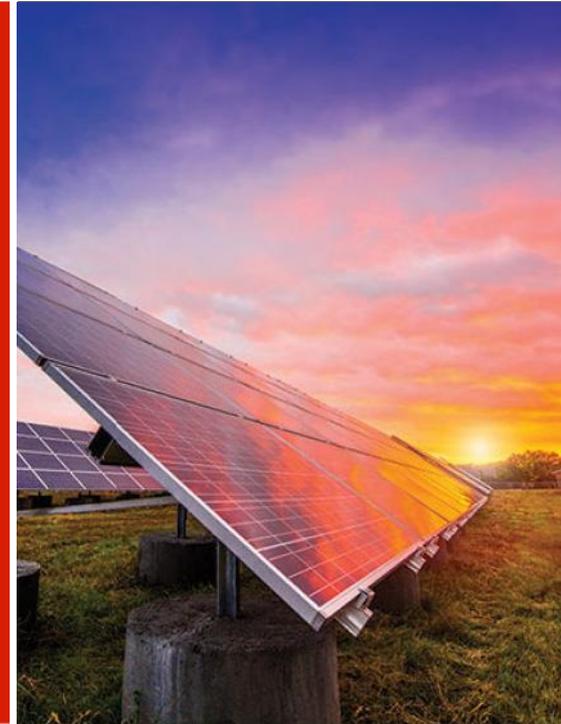


# Day Ahead and Real Time Operations

## A Large Utility Point of View

**Kari Hassler**

**Senior Market Operations Manager, Xcel Energy**



# Overview

- Xcel Energy Structure
- Forecast Process
- Forecast Improvement
- Forecast Value
- Enhancements



# Xcel Energy

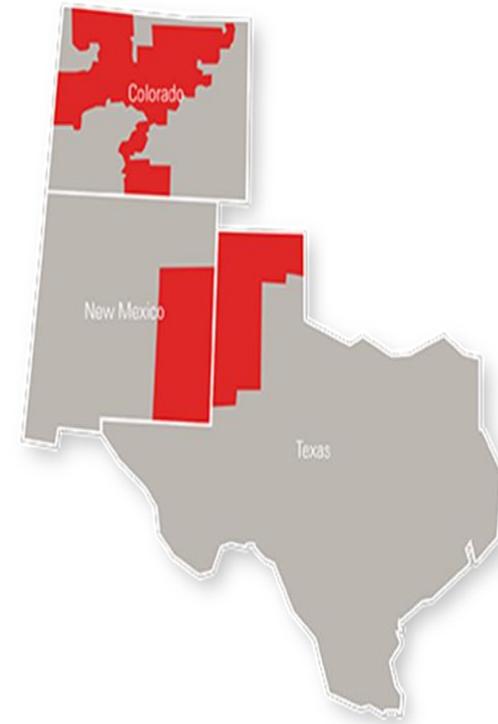


Service jurisdiction across eight states

- 3.6 million electricity customers
- Two million natural gas customers

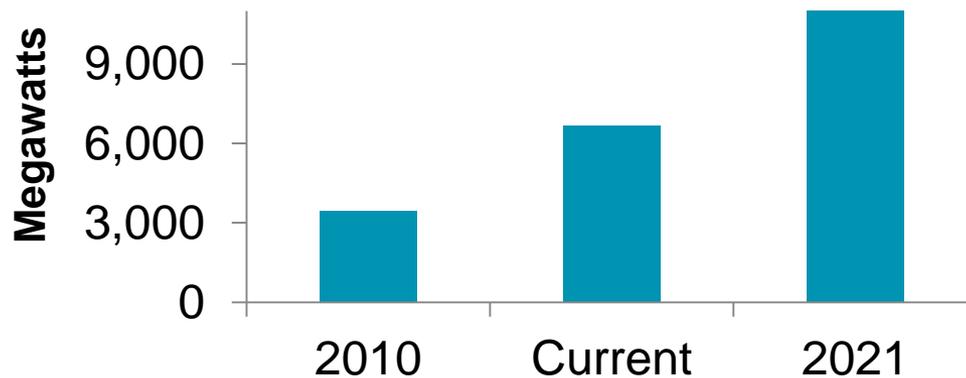
## Operating Companies:

- Upper Midwest – Northern States Power (NSPM and NSPW)
- Texas/New Mexico – Southwestern Public Service (SPS)
- Colorado – Public Service Company of Colorado (PSCo)

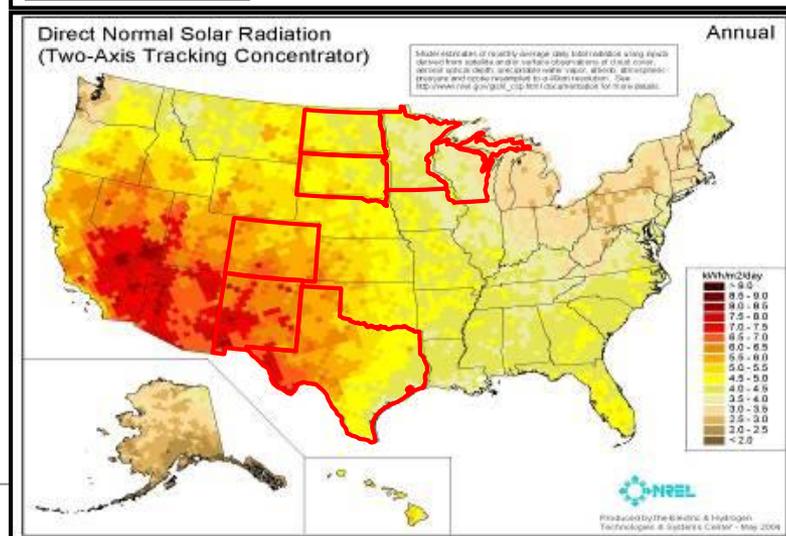
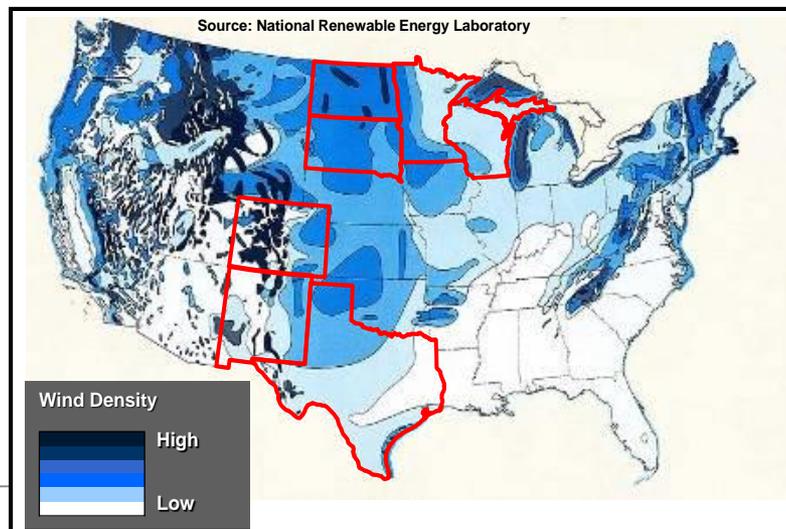
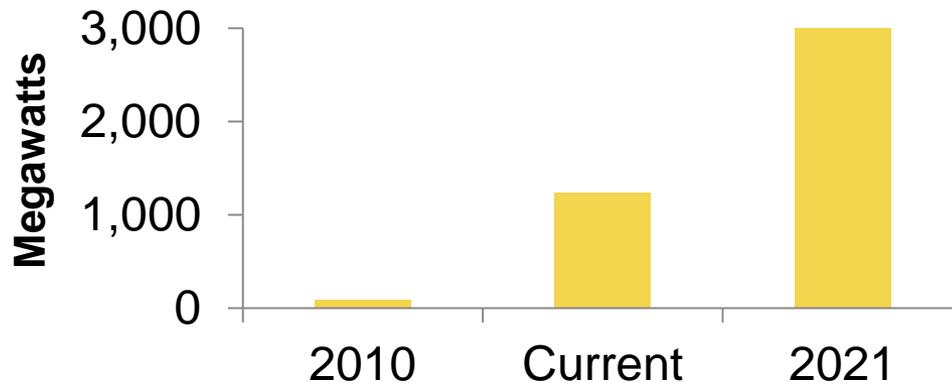


# Renewable Energy Leadership

### Xcel Energy Wind Energy



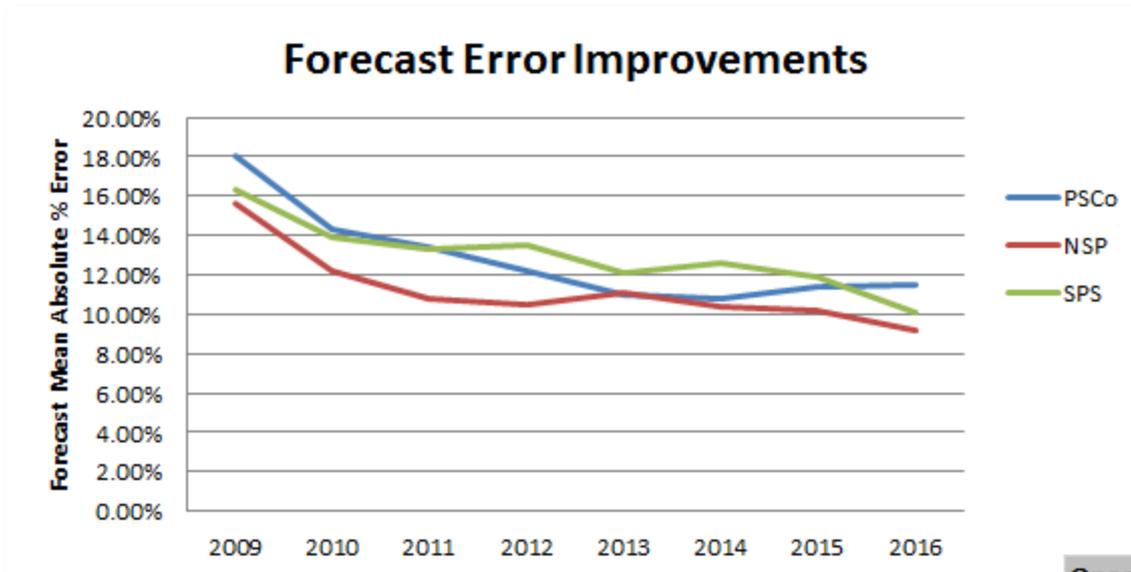
### Xcel Energy Solar Energy



# Forecast Process

- GWC is our vendor for both wind and utility-scale solar forecasts
- Outages for wind resources are incorporated into the forecasts
- In-house meteorologists provide post forecast edits for extreme events

# Forecast Improvement

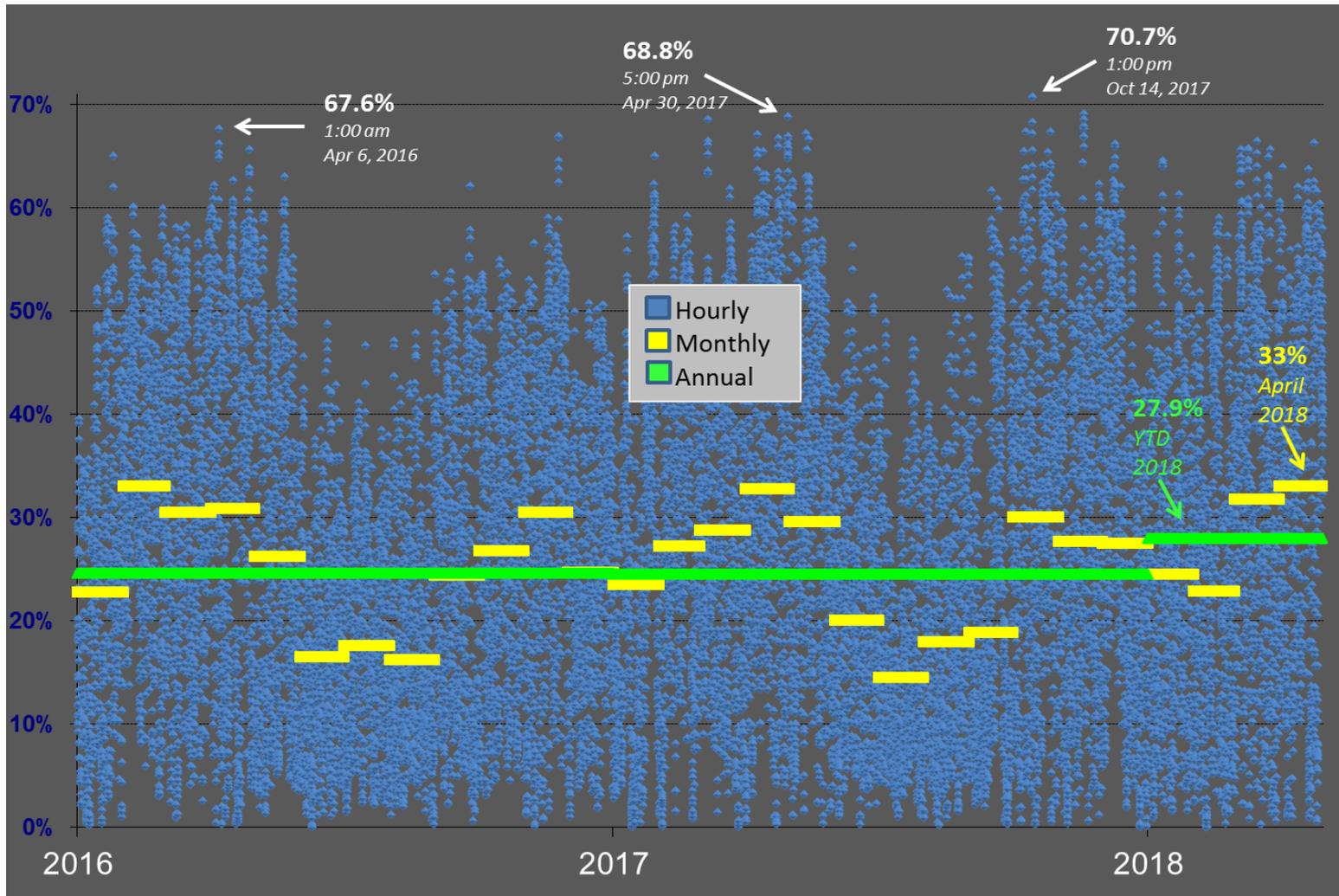


Operating Company	Total Savings 2009-2016
PSCo	\$45,470,492.67
NSP	\$19,311,842.70
SPS	\$1,960,388.71
<b>Total</b>	<b>\$66,742,724.09</b>

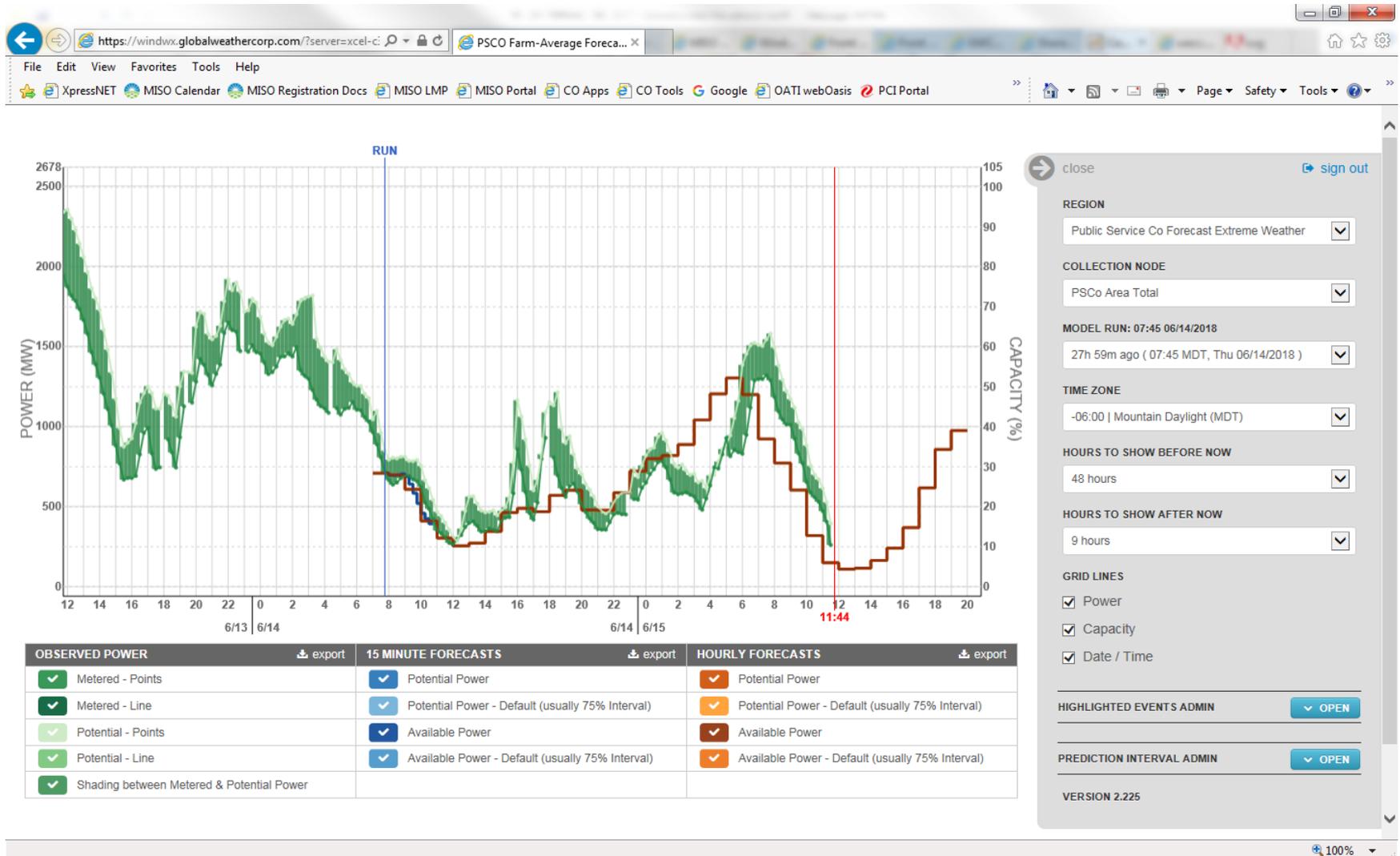
# Forecast Value

- Optimization of DA offer (NSP and SPS)
- Commitment schedules (PSCo)
- Dispatch Reliability and Efficiency (PSCo)
  - Flex Reserve
- Gas Nomination Process
- Off-line Cycling of Baseload Generation

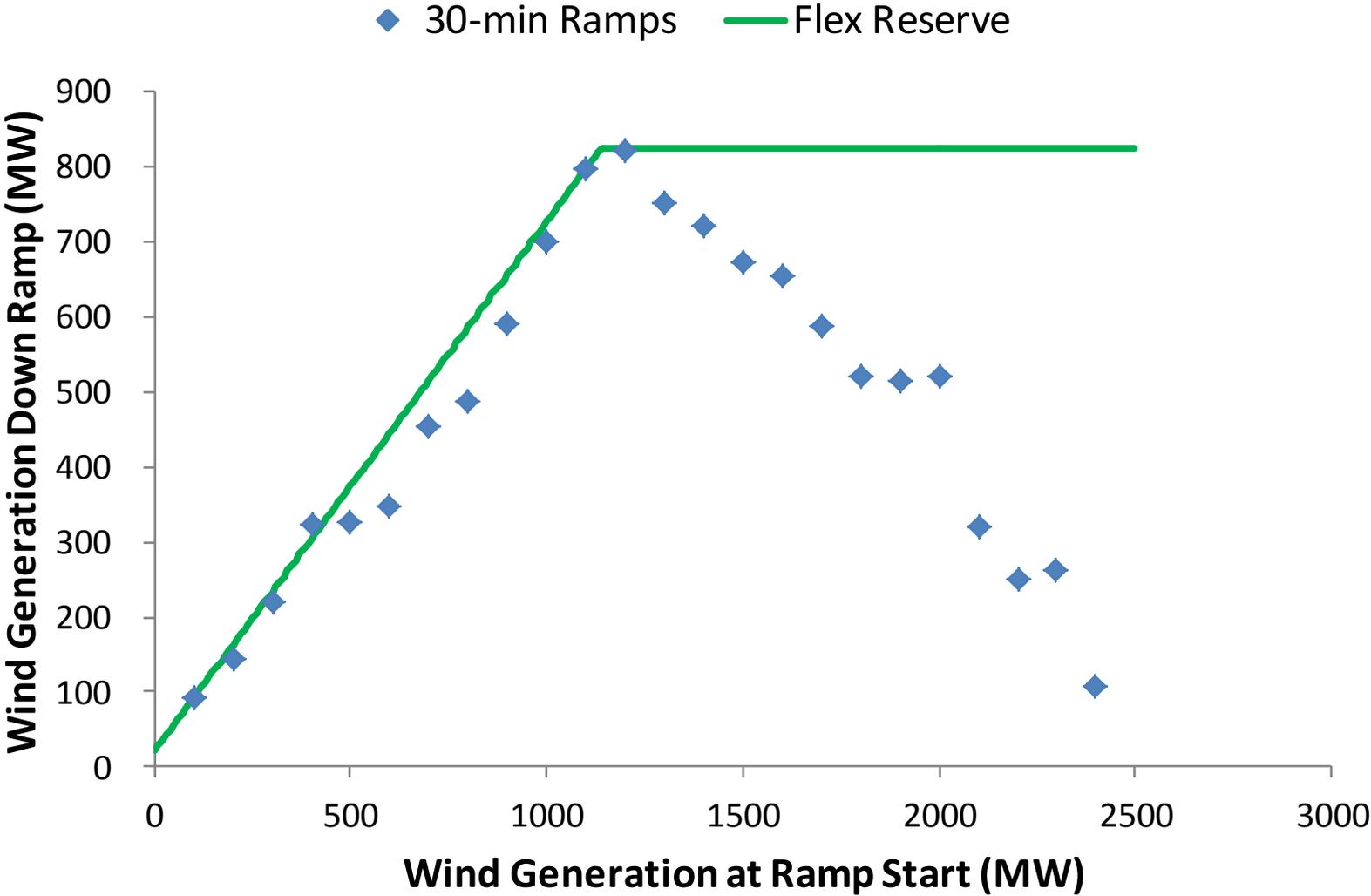
# PSCo Wind Stats



# Impact on Dispatch

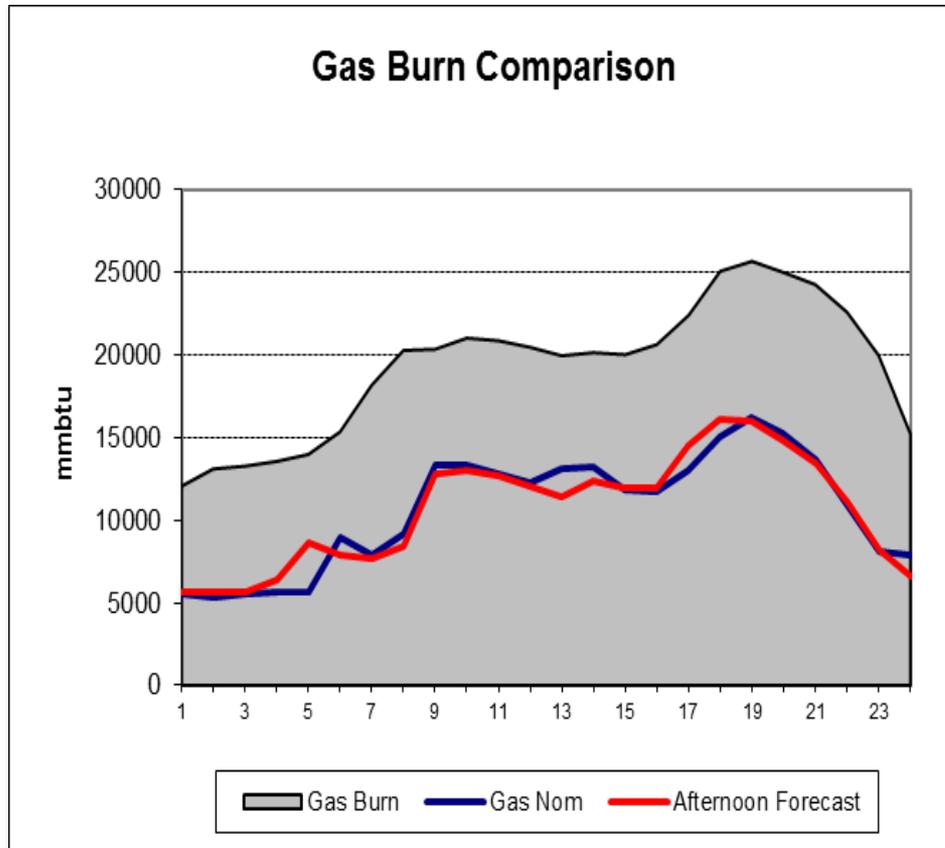


# Flex Reserve - Wind



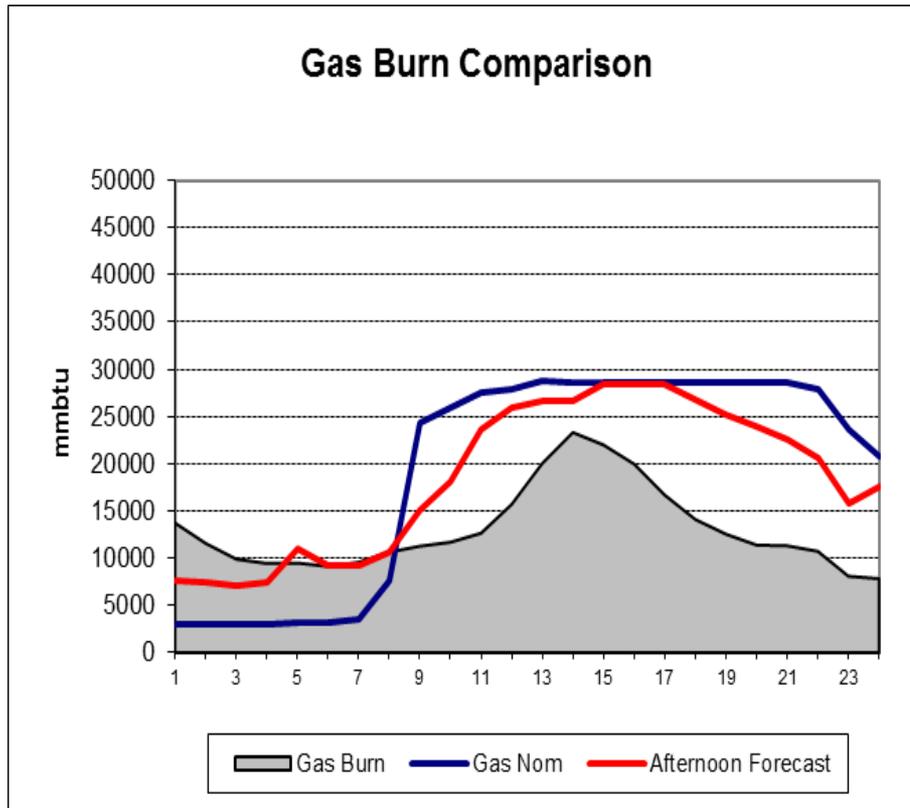
# Gas Nomination Impact

## Production < Wind Forecast



- December 17, 2014 on the PSCo system
- Large coal unit tripped off, wind production significantly below forecast, leaving system 1,000 MW short
- Gas units came online to replace coal and wind generation
- Gas burn ~ 190,000 Dth above nomination
- Storage withdrawal well within limits

# Gas Nomination Impact Production > Wind Forecast



- Wind production significantly more than forecast leaving system 700 MW long
- Coal dispatched ahead of gas
- Gas burn below nomination injected into storage
- If under burn exceeded injection capability, have to curtail wind.

# Future Enhancement

## Forecasting Impact of Distributed Solar Resources

- Currently netted from load but weighted on prior day
- Cloud cover and solar insolation are not incorporated into load forecast – manual adjustments
- Need consistently updated database of distributed resources available to Mets
- Advanced Grid Intelligence and Security (“AGIS”) meter upgrades will enable better forecasting

# Contact Information

**Kari Hassler**

Kari.Hassler@xcelenergy.com

