



**Chris Foster, MPA, CGFO**

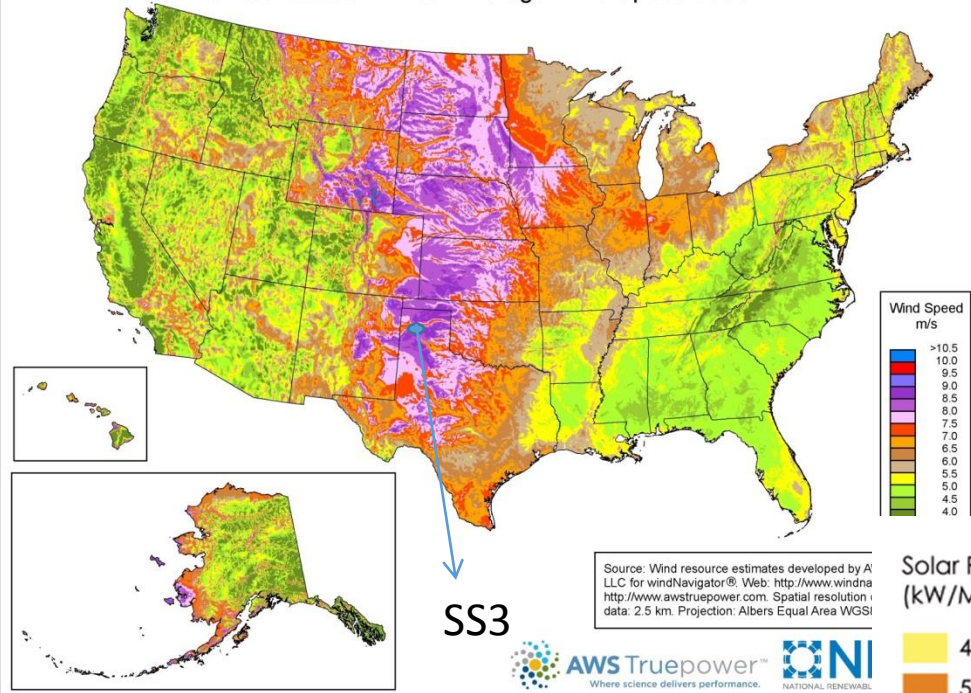
**Manager of Resource Planning and Integration, Georgetown Utility Systems**

# The City of Georgetown

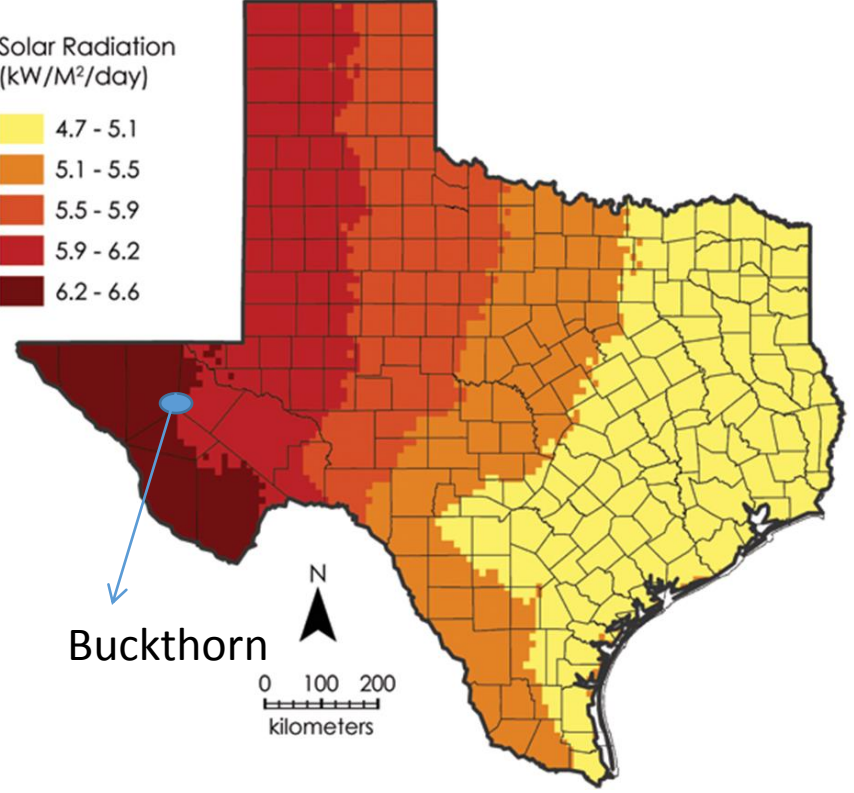
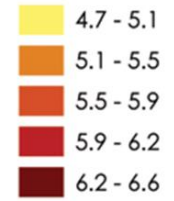
## Renewable Operations and Planning

- Active daily management of renewable resources
  - Hourly Load forecasting
  - Hourly renewable forecasting
  - Bids and offers in ERCOT market
- Long term planning
  - Load growth scenarios
  - Resource availability and costs
  - Regulatory environment
  - Changing Local Grid from Utility scale to Distributed

United States - Annual Average Wind Speed at 80 m



Solar Radiation (kW/M<sup>2</sup>/day)



# Renewable Farm Details

- Solar Farm with NRG
  - COD by July 1, 2018
  - 25 year PPA with fixed/flat price
  - 150 MW capacity
  - Expected production of about 400,000 mWhs annually
- Wind Farm with EDF-RE
  - COD 9/28/2015 getting GUS to 90% renewable power
  - 20 year PPA with fixed/flat price
  - 144 MW capacity for GUS, 50 MW for GP&L
  - 600,000 mWhs annually

# GUS' Profile

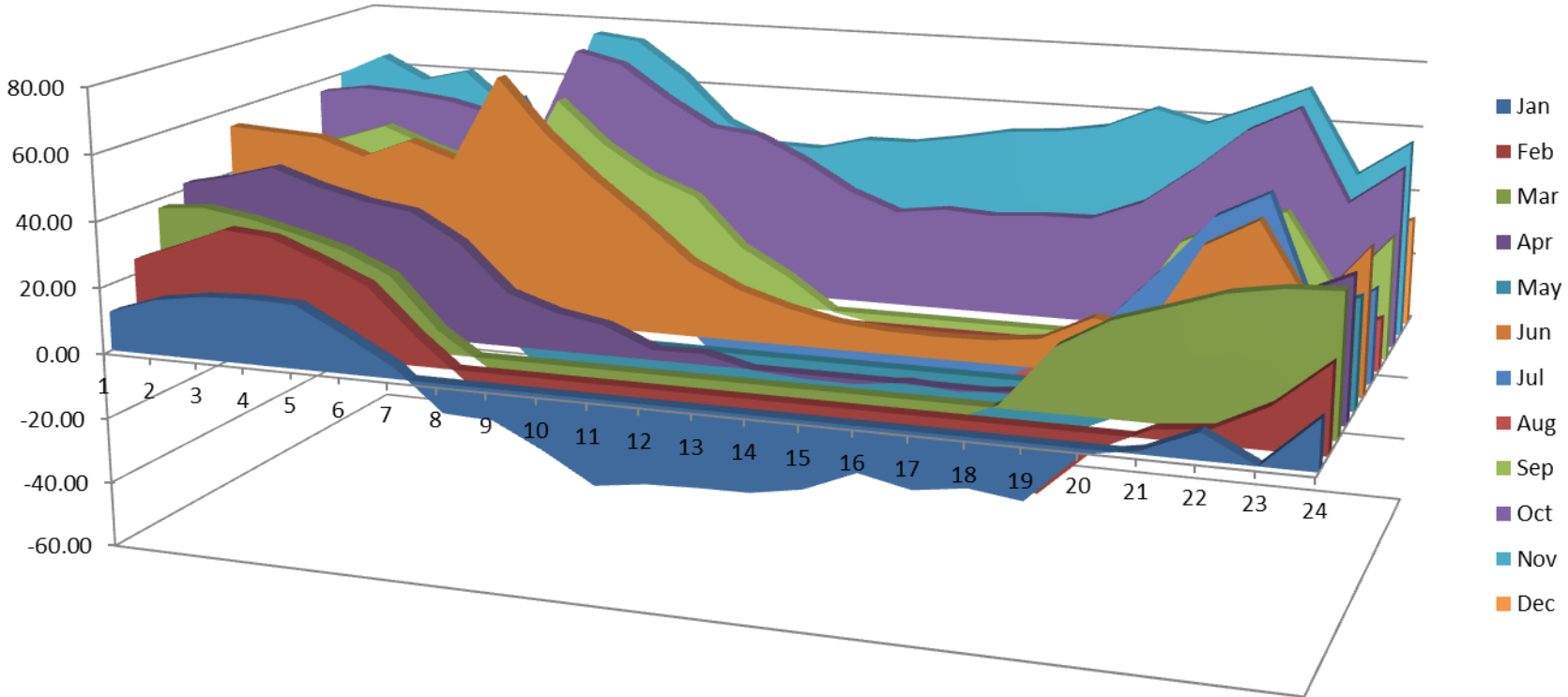
- 177 MW peak in 2016
  - 153 MW peak in 2015
  - 145 MW peak in 2014
- SS3 Mwths from Oct.15 to Sept. 16: 575,058
- AEP Mwths from Oct.15 to Sept. 16: 66,355

Oct. 15- Sept. 16	Residential	C&I	Gov't, Schools	Total
Meters	22,428	2,288	368	25,084
Mwths consumed	247,250	283,334	67,938	605,020

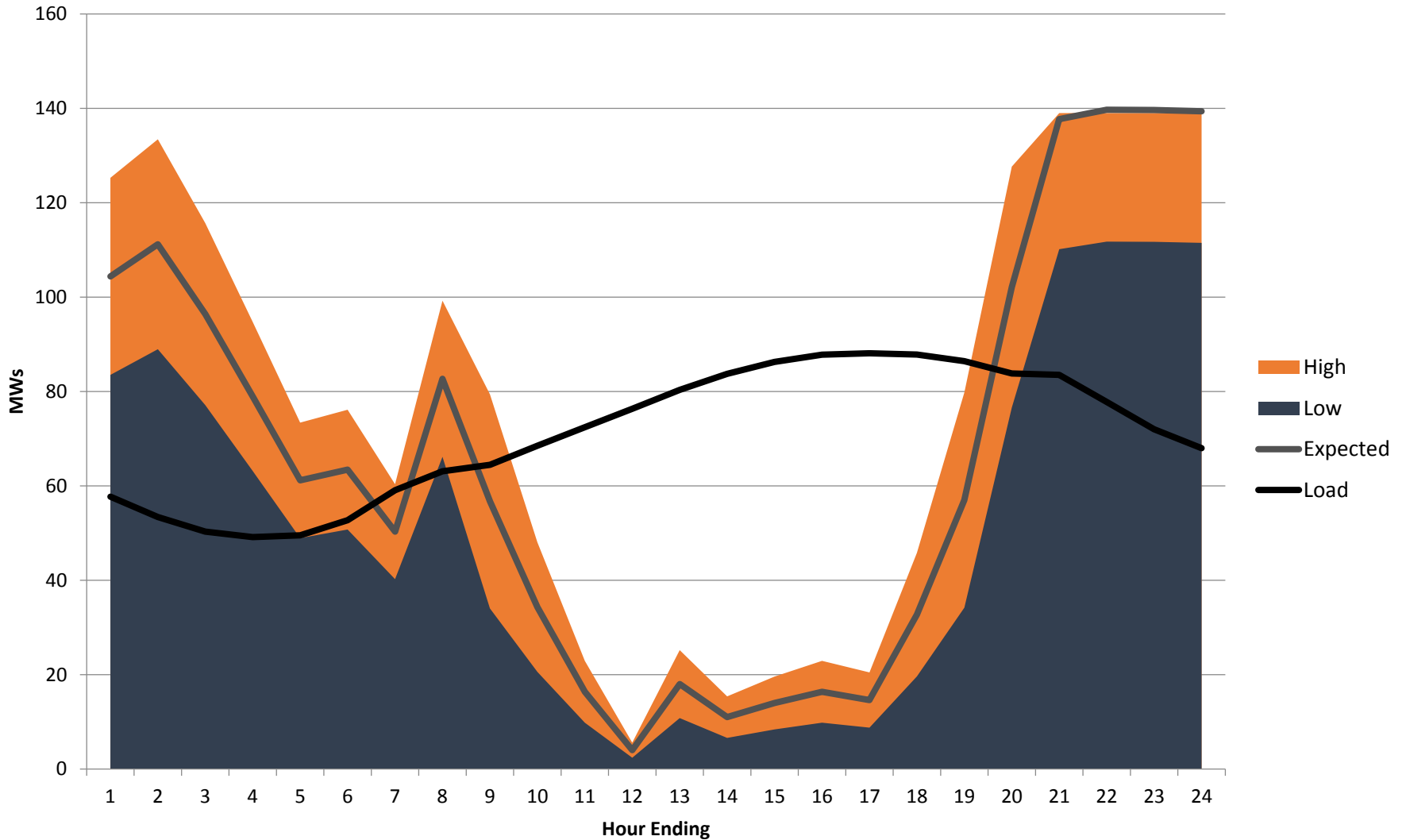
Net surplus:  
36,393 Mwths

# 100% but mismatched to Load

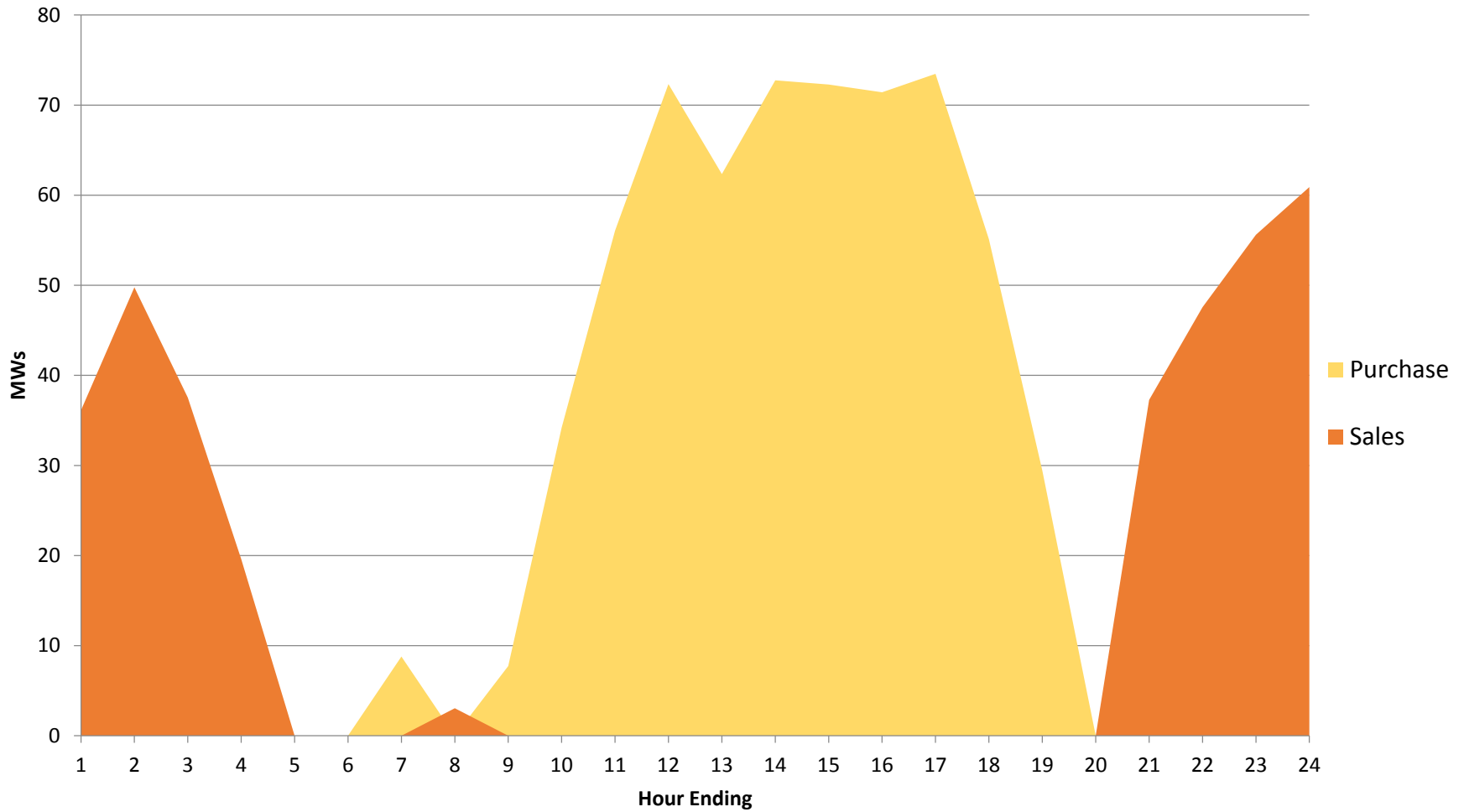
## 2016 Monthly Net Supply by Average Hour



# Hourly Load and Resource Forecasts



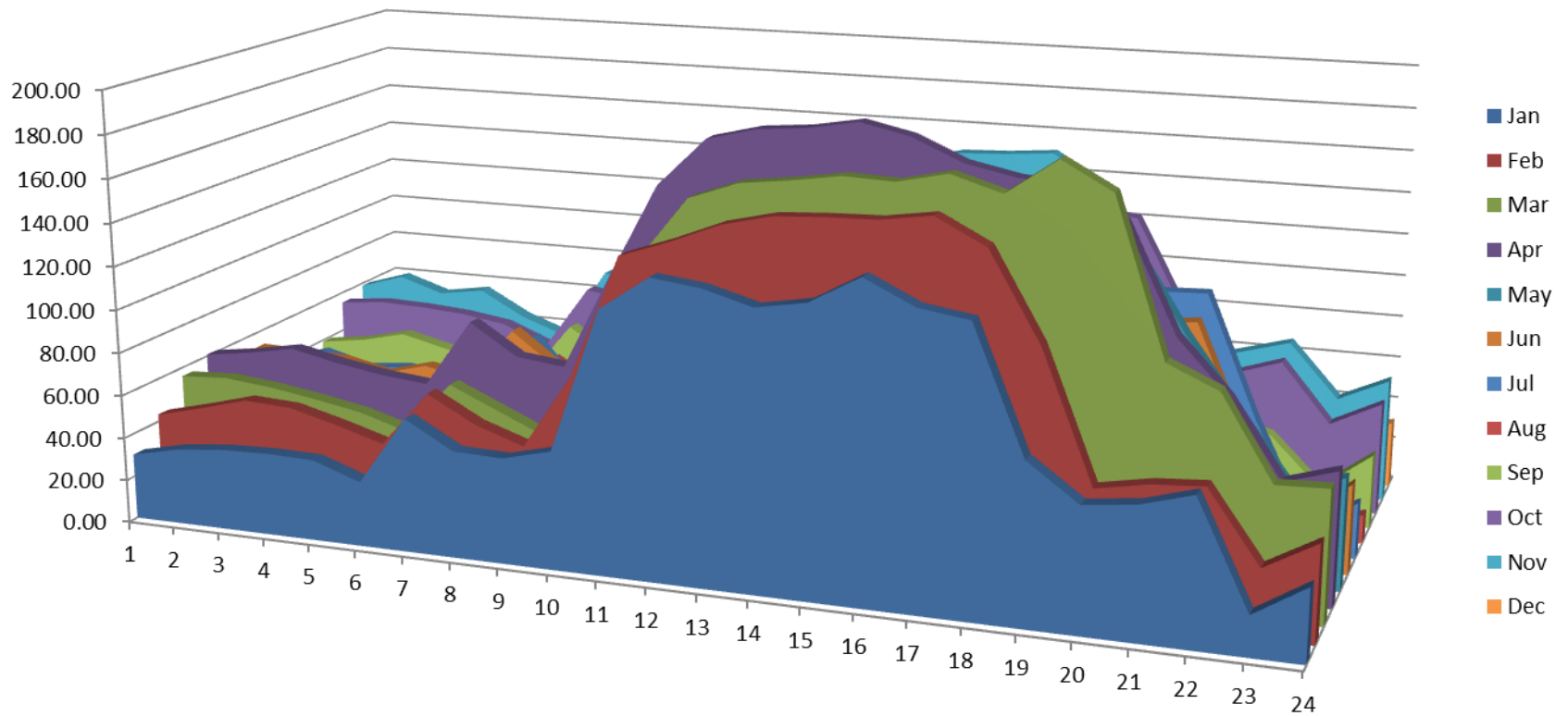
# Hourly Purchases and Sales Through ERCOT Day-ahead Market





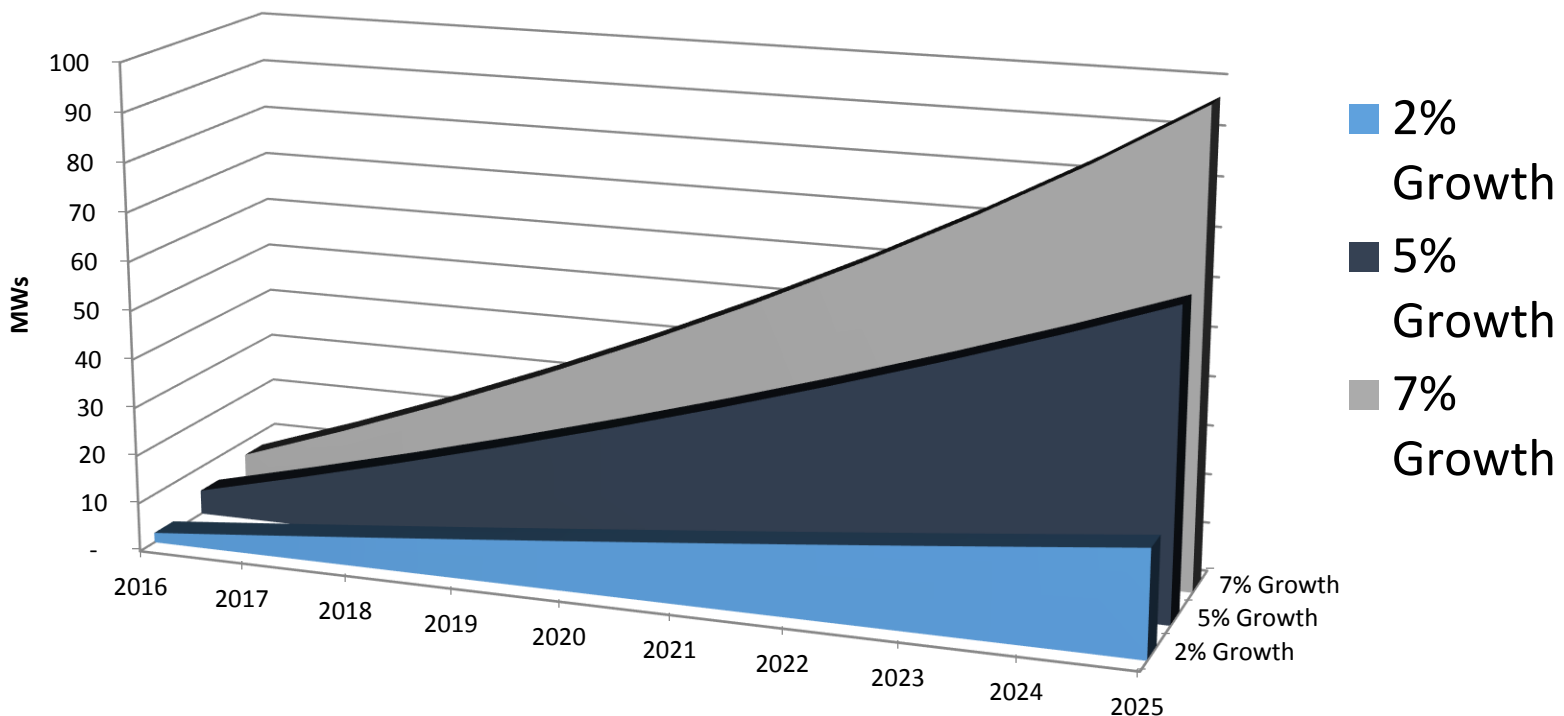
# 100% and matched to profile

## 2019 Monthly Net Supply by Average Hour



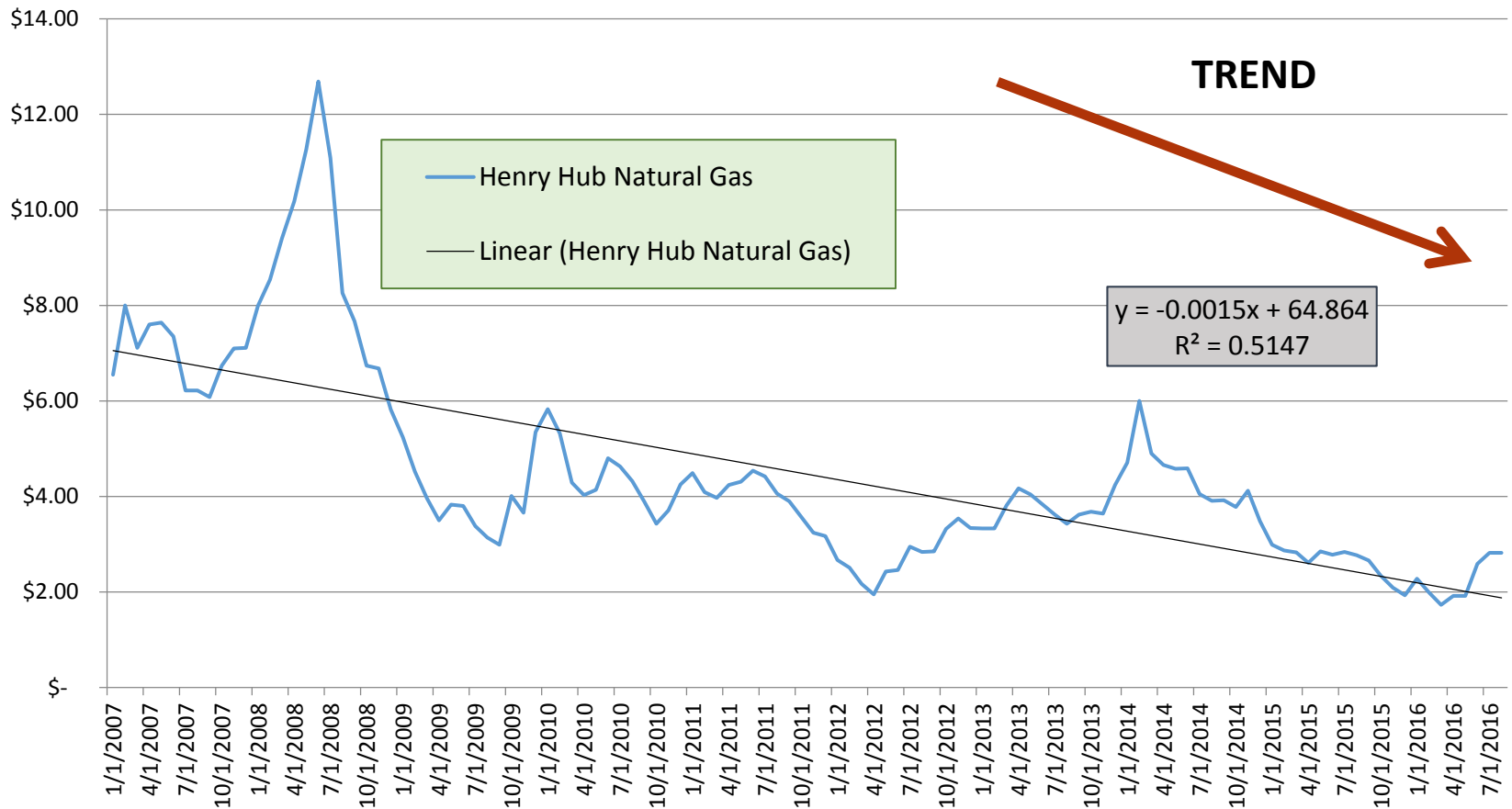
# Different Rates of Load Growth Produce Resource Amount Uncertainty

A 100 MW load will double demand by 2025 if growth averages 7%

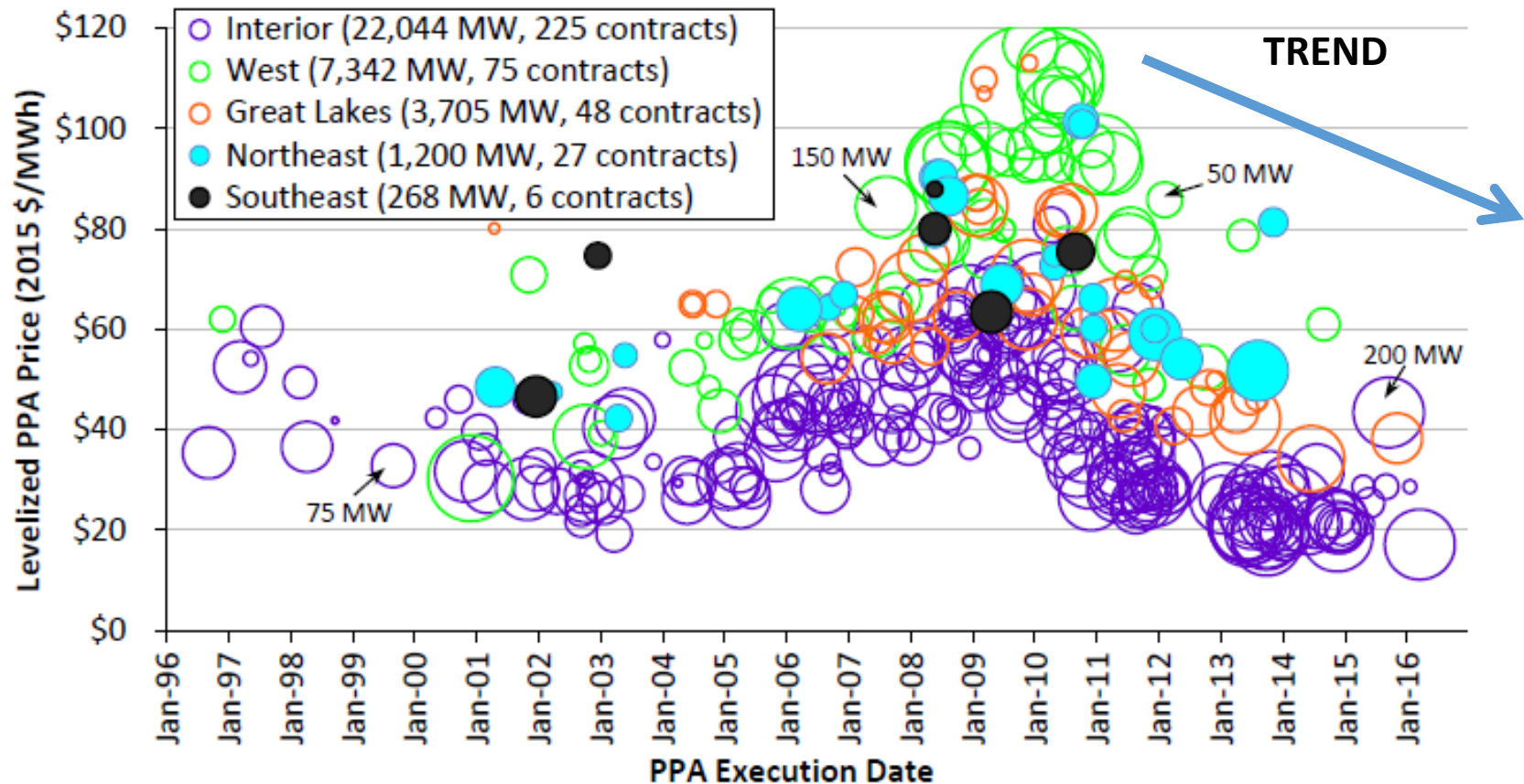


# Marginal Electric Power Fuel: Natural Gas

## Henry Hub Natural Gas



# Wind Cost Declining Over Time



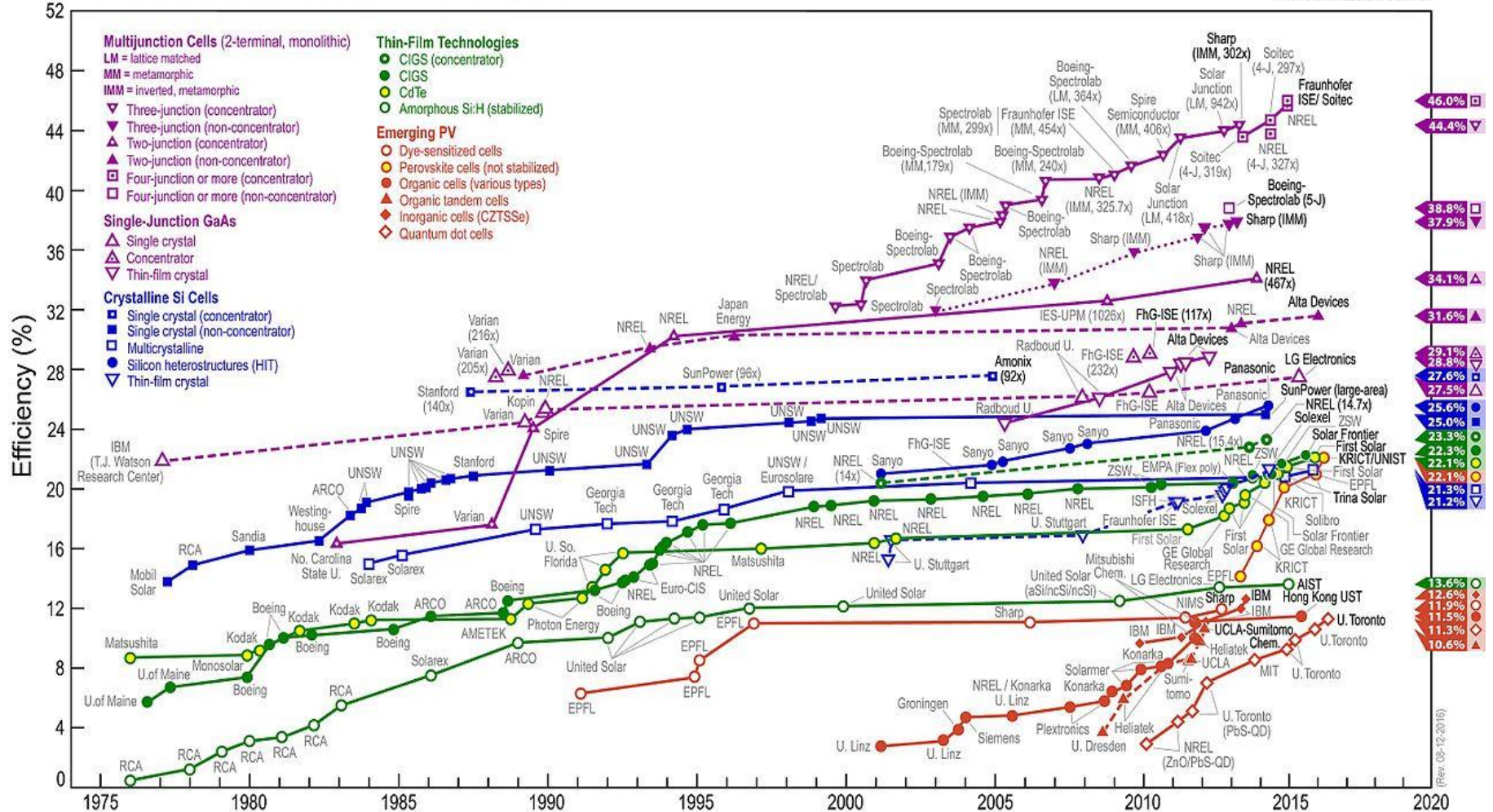
Note: Area of "bubble" is proportional to contract nameplate capacity

Source: Berkeley Lab

Figure 47. Levelized wind PPA prices by PPA execution date and region

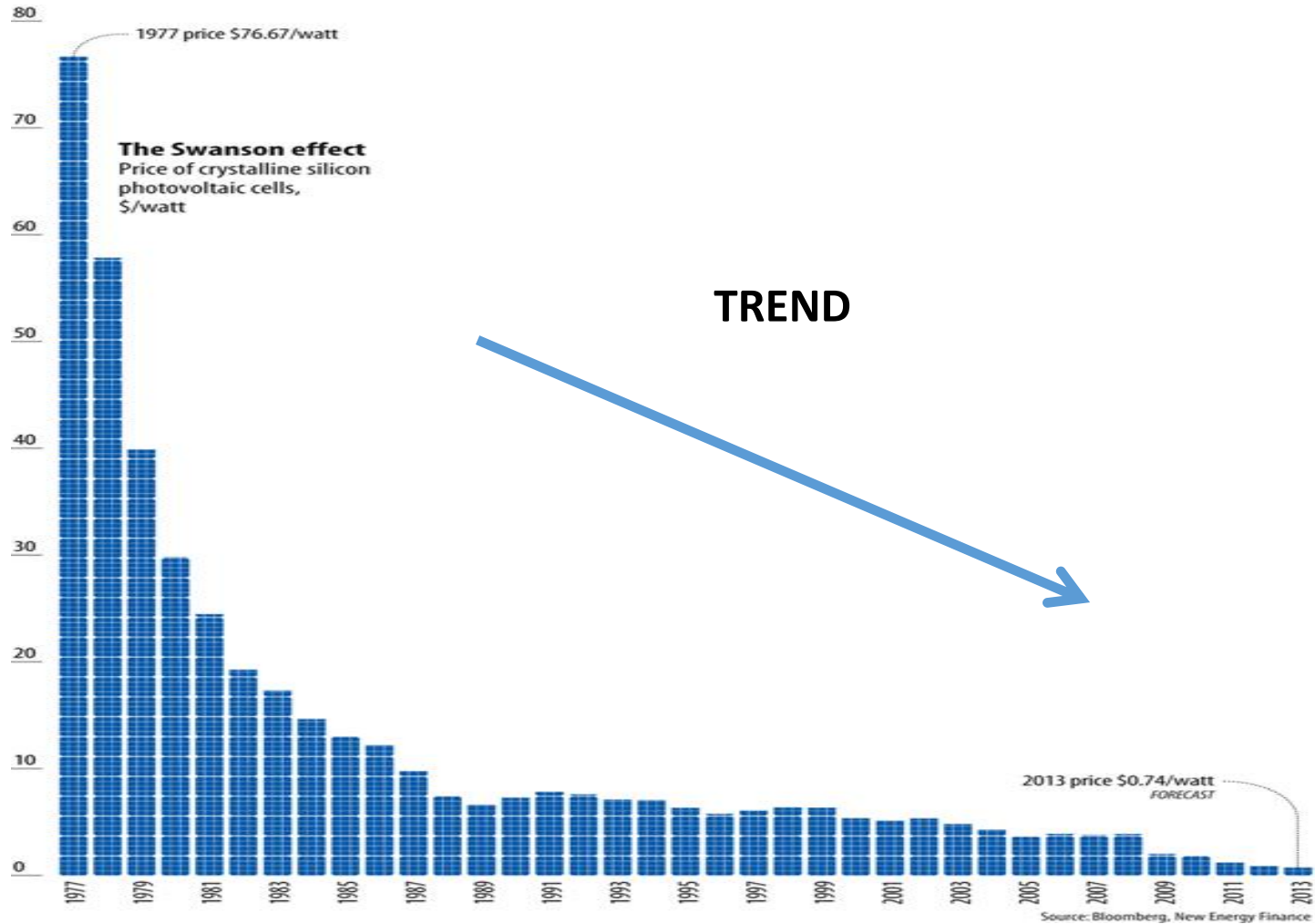
# PV Efficiency Drives Costs Lower

## Best Research-Cell Efficiencies

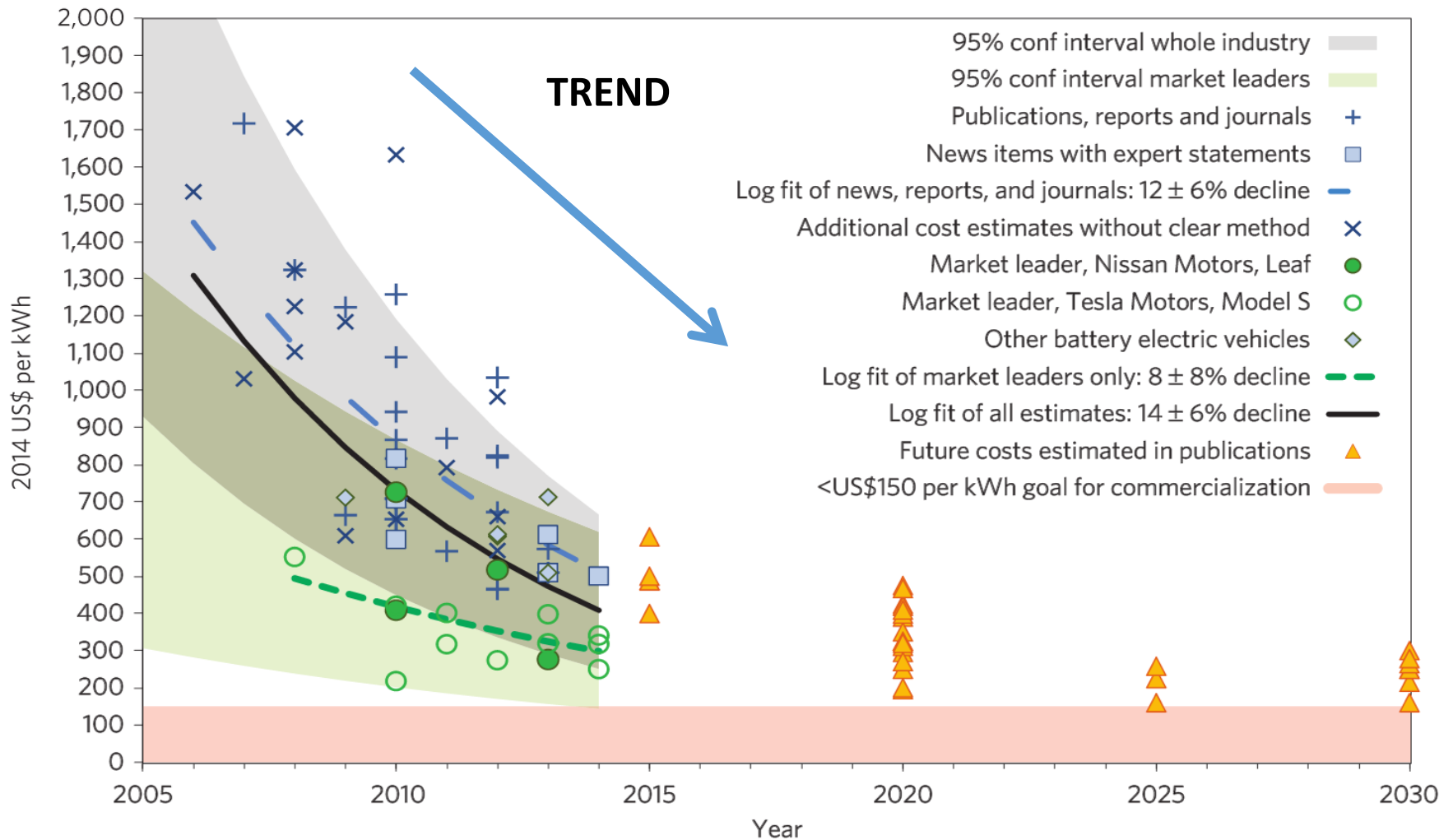




# PV Cost Decline



# Battery Costs – Declining Faster Than Projections



# Solar Roof





# Powerwall 12 Months Between V1 and V2

V1: 24 year Payback

V2: Less than 12 year Payback



# Westside





# Rooftop Resource Potential





# Rooftop Resource Potential





Posted September 1, 2016 by [Alex Gruzen](#) & filed under [Features](#), [Infrastructure Features](#).

By Alex Gruzen, CEO of WiTricity

# WIRELESS CHARGING AND AUTONOMOUS VEHICLES WILL MOBILIZE THE SMART CITY

The impact of the self-driving car will not only dramatically alter transportation, it will paint an entirely new picture of city living.

78 CHARGED

79

By Alex Gruzen, CEO of WiTricity

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