

Emerging Technologies Working Group

March 2, 2016

WMS Update

Presentations from March ETWG Meeting:

- Austin Energy: SHINES (PV + Storage Project)
 - Presentation Link: [02. ETWG Austin SHINES](#)
- Sierra Club: Storage Update
 - Presentation Link: [03. Storage Update ETWG](#)
- ERCOT: NPRR615 Update
 - Presentation Link: [04. ETWG Solar Forecast Update](#)

Austin Energy: SHINES (PV+Storage)



SHINES Award Recipients - \$18M

❖ **Austin Energy will receive \$4.3 million** to create a distributed energy resource management platform that is adaptable to any region and market structure, aiming to establish a template that can help to maximize the penetration of distributed solar PV

❖ Carnegie Mellon University (Pittsburgh, Pa.) \$1 million

❖ Commonwealth Edison Company (Chicago) \$4 million

❖ The Electric Power Research Institute (Knoxville, Tenn.) \$3.1 million

❖ Fraunhofer USA Center for Sustainable Energy Systems (Boston) \$3.5 million

❖ The Hawaiian Electric Company (Honolulu) \$2.4 million

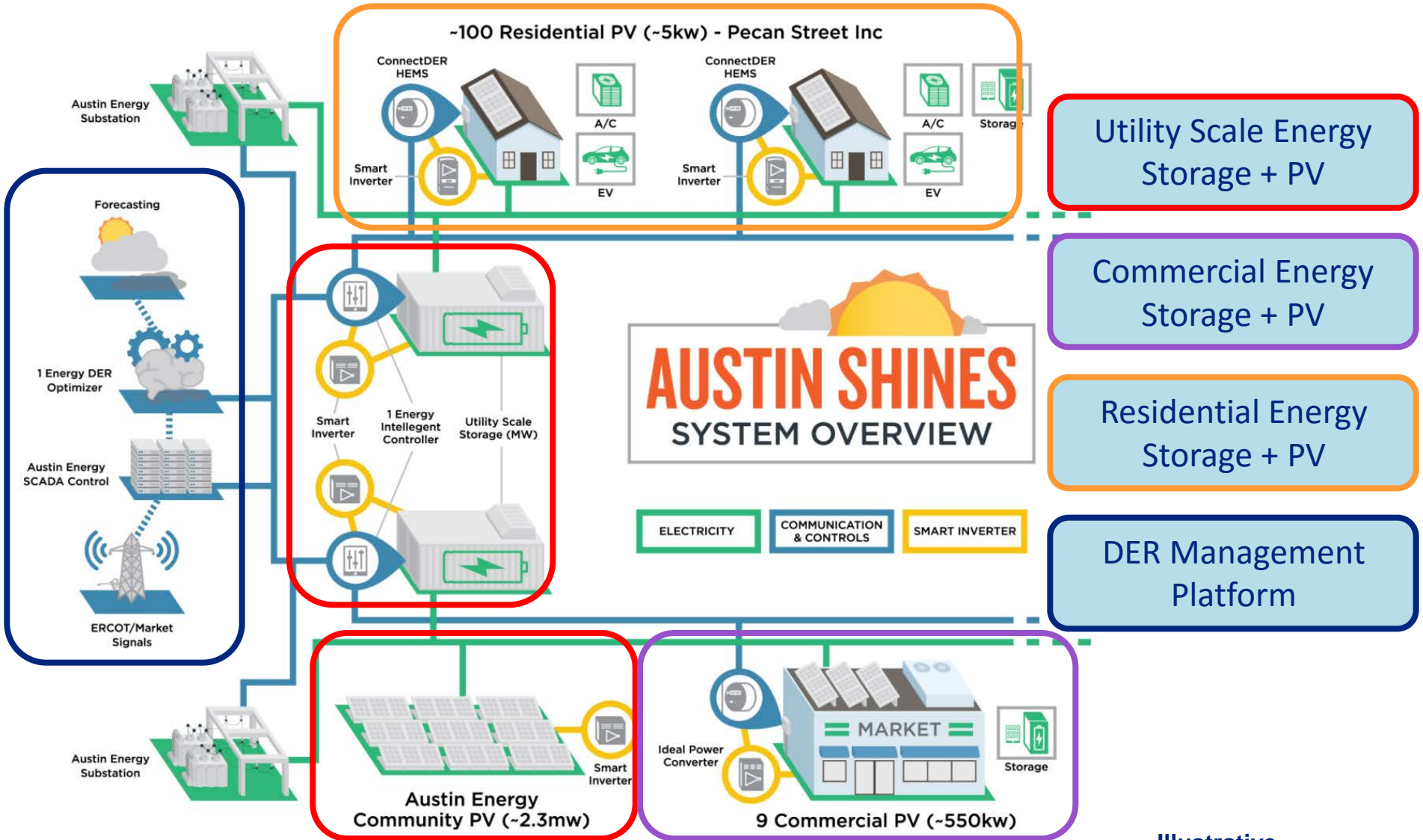


The Austin SHINES Solution

- **Open standards** based Distributed Energy Resource (DER) management platform
- Includes the **integration and optimization of DERs** at the utility distribution level
- Enables **diverse strategies/business models** for both utility and customer owned resources; to include direct, third-party, and autonomous resource management of DERs
- Integrates 4 MW of **distributed PV**, more than 3 MW of distributed **energy storage**, 31 **smart inverters** and includes more than 700 PV customers
- Includes **affordability targets** and captures holistic benefits via System Levelized Cost of Energy metrics



SHINES Conceptual Architecture



Utility Scale Energy Storage + PV

Commercial Energy Storage + PV

Residential Energy Storage + PV

DER Management Platform

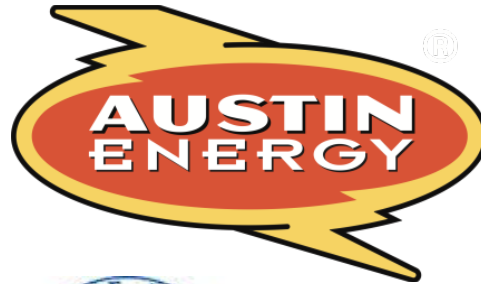
Illustrative



Austin SHINES Partnership



U.S. DEPARTMENT OF
ENERGY



TEXAS COMMISSION
ON ENVIRONMENTAL QUALITY



PECAN STREET



Clean Power Research®

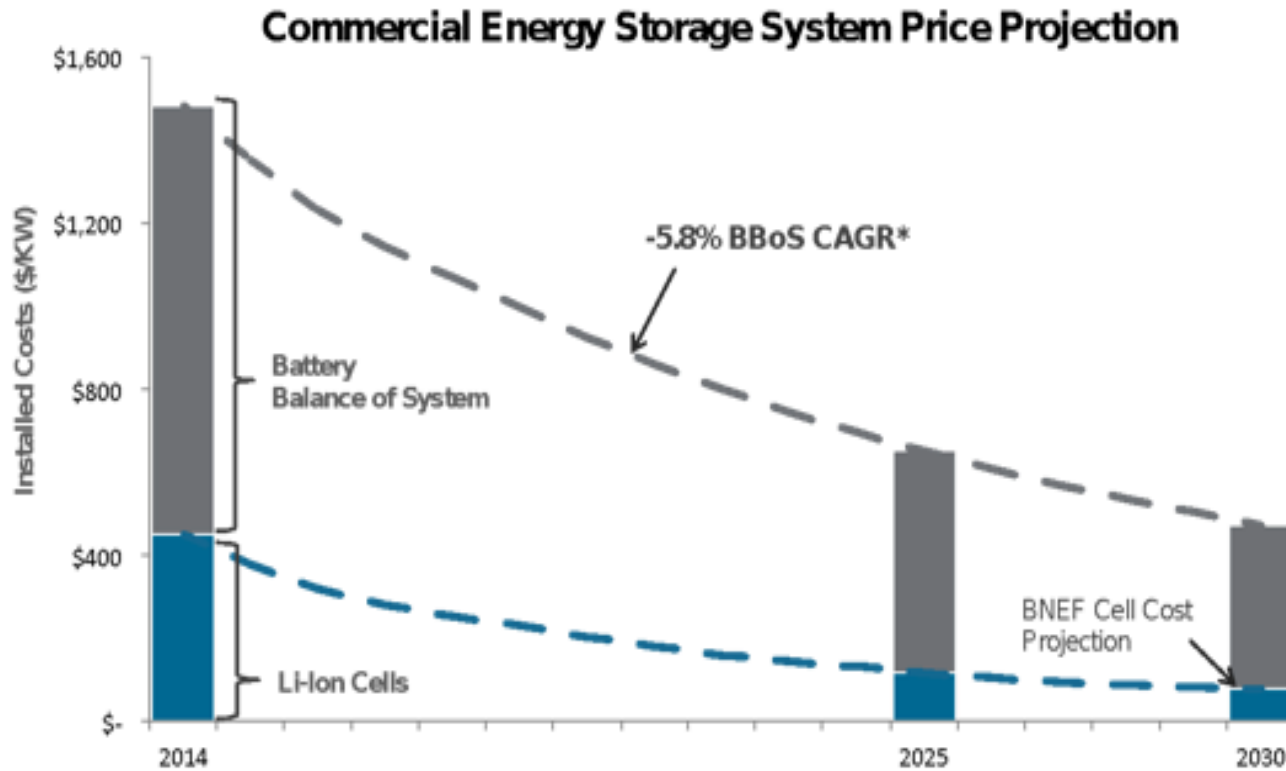


SAMSUNG SDI



Sierra Club: Storage Update

COSTS EXPECTED TO CONTINUE FALLING



Based on: 200 kW system with 1 hour discharge capacity; Sandia, BNEF, RMI
* Based on CAGR of Solar BOS from 2008-2014

Navigant: 4-hr battery install cost as low as \$700/kW by 2020

Oncor: \$350/kW install cost by 2020

Morgan Stanley: battery-only costs as low as \$125/kW to come

Tesla: Li-ion battery-only cost \$110/kWh already

Source: Energy Storage Association, 2015

CURRENT/PROCURED UTILITY-SCALE STORAGE

Utility/Company	Amount	Use
Southern Ca. Edison	260 MWs	Variety, including 100 MW Transmission-Tied to provide 3-4 hour peak replacement
AEP	4 MW	Presidio Texas emergency needs at end of line
Duke Energy (NoTrees)	36 MW Lead-Acid Battery but being replaced with Lithium-Ion	Mainly for fast regulation service - co-located with wind farm
Austin Energy	1.3 MWs Lithium-Ion Battery	To be tied to community solar farm
AES Energy Storage	20 MW	Proposed in DallasAirport area – mainly ancillary services but also some energy use
Austin Energy	Up to 170 MWs RFI	RFI to see potential of utility-scale storage for peak shaving, capacity, ancillary services, etc
APEX	317 MWs Compressed Air Energy Storage	Proposed for ancillary and capacity in Anderson County – has interconnection agreement

ANCILLARY SERVICES CONTINUED

- ▶ FAS is more favorable to storage than Enhanced, but both would open up some space for storage
- ▶ ERCOT favors 667 in part because they see need for faster acting resources with our current market and the future integration of large amounts of wind and solar
- ▶ One area that has not been addressed is inertia service – a concern as coal plants come down and is largely replaced by renewables
- ▶ Synchronous Inertial Response Service is a proposal yet to be fully developed
- ▶ Definition:” Synchronous Inertial Response (SIR) is an instantaneous response that is continuously self-deployed from synchronous machines following disturbances” from ERCOT white paper

LONG-TERM SYSTEM ASSESSMENT CONTINUED

- ▶ ERCOT has finished draft current trends for 2016 and it is surprising
- ▶ Current Trends Assumes No Major Storage Component but shows potential for underserved hours and potentially inertia and frequency problems
- ▶ One of the scenarios being developed does include storage in general, as well as integration of EVs
- ▶ Important to note that initial opposition to NPRR 667 was in part based on Brattle Analysis of Old Current Trend Scenario that did not find major issues in 2024... and found combined cycle plants would largely replace reduced output from coal
- ▶ New analysis however would have led to different result in Brattle Study

CAN STORAGE PROVIDE RELIABILITY SERVICES

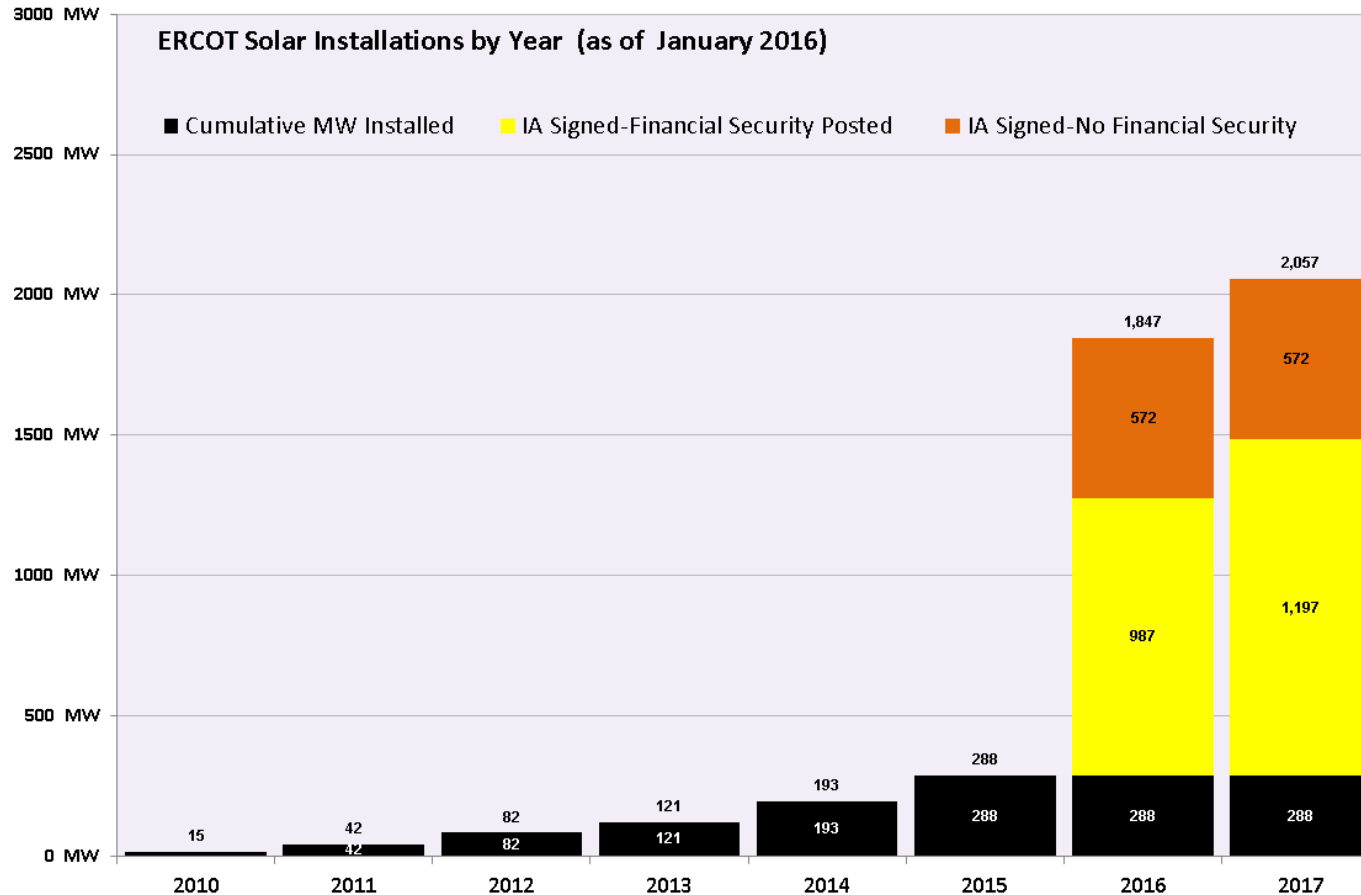
- ▶ Brattle Oncor proposal (to allow TDUs to build storage, charge ratepayers and then have third-parties operate them for energy and ancillary services) would require PUC and LEG change, but...
- ▶ TDUs today can potentially use storage as reliability product today (ie AEP Presidio battery)
- ▶ Capacitors already accepted as a transmission reliability device
- ▶ ERCOT should place storage as an alternative that is assessed as part of discussion of RMR, Constraints and Needs report and annual Regional Transmission Plan
- ▶ The RTP “shall identify reliability needs and transmission upgrades and additions required to meet the system needs per criteria set in the ERCOT Planning Guide Sections 3 and 4 and NERC TPL-001-4 reliability standard”
- ▶ Storage devices should be assessed as part of this process
- ▶ RMR decision-making should also incorporate storage as a potential alternative

NEXT STEPS ON STORAGE

- ▶ Continue discussion on 667 vs. 752 – assess benefits of FFRS and of having a sliding ratio based upon conditions
- ▶ Develop separate inertia ancillary service – ETWG could help sponsor this
- ▶ Develop rules for distributed storage and energy resources participation, including aggregation
- ▶ Expand planning rules so that in addition to capacitor banks, RTP process looks at storage devices as alternative to new transformers and lines, or a way to downsize
- ▶ When assessing RMRs, look at storage as an alternative to having to run older uneconomic plants
- ▶ This group could take on any of these tasks....

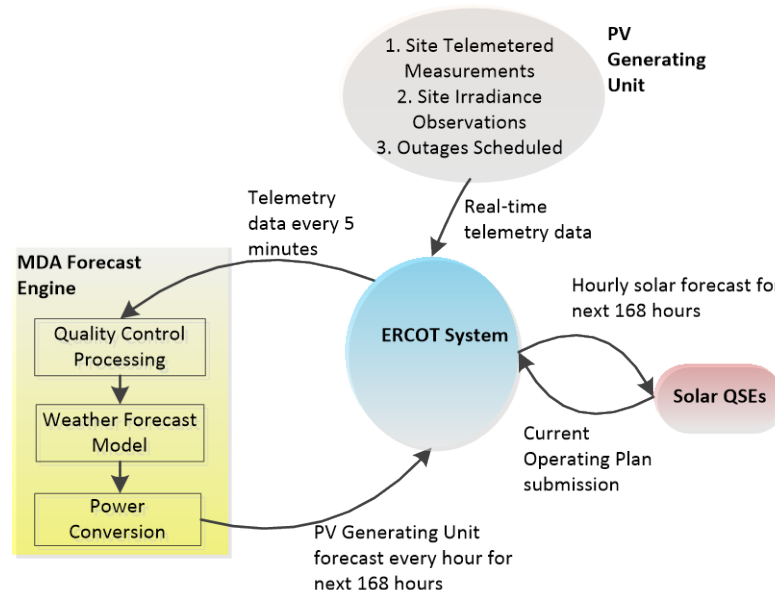
ERCOT: NPRR615 Update

ERCOT Solar Installations by Year



Solar Forecast Implementation

- Conducted RFP selecting MDA as our Solar Forecast vendor
- Pass solar observation data to MDA every 5 minutes
- Receive solar forecast from MDA hourly for the next 168-hour and distribute that to the Solar QSEs
- The Solar QSEs use that forecast to update their COP



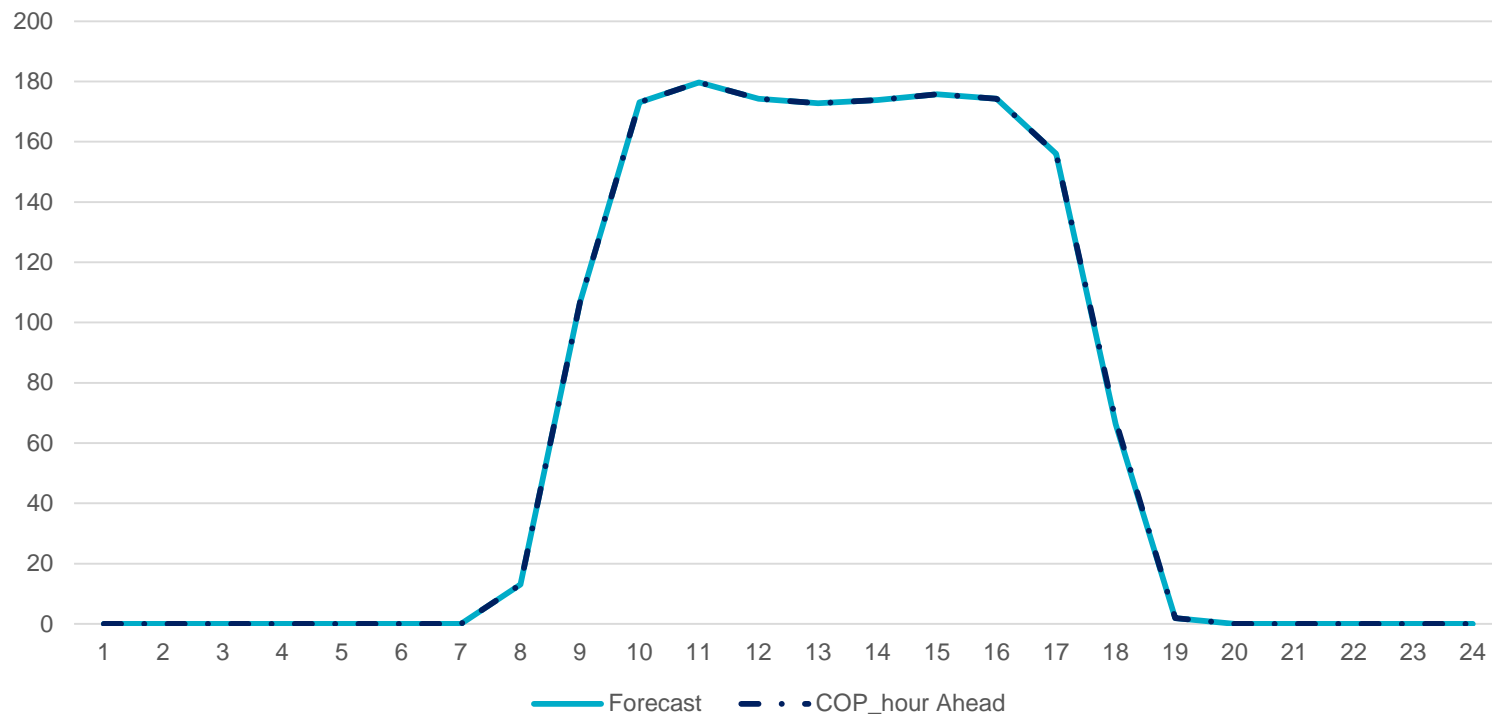
Current Operating Plan (COP) Submission

3.9.1 Current Operating Plan (COP) Criteria

(8) For the first 168 hours of the COP, a QSE representing a Wind-powered Generation Resource (WGR) must enter an HSL value that is less than or equal to the amount for that Resource from the most recent Short-Term Wind Power Forecast (STWPF) provided by ERCOT, and a QSE representing a **PhotoVoltaic Generation Resource (PVGR)** must enter an HSL value that is less than or equal to the amount for that Resource from the most recent **Short-Term PhotoVoltaic Power Forecast (STPPF)** provided by ERCOT.

COP Submission

February 24th Aggregate Hour Ahead COP performance



All photovoltaic solar units are updating their COP on an hourly basis.

Next ETWG Meeting

- Date: April 5
- Meeting Link: <http://ercot.com/calendar/2016/4/5/85515-ETWG>
- Possible Topics:
 - MESA Open Standards (Modular Energy Storage Architecture)
 - Technical Capabilities of Inverters to Provide Inertial Response
 - Austin Energy SHINES Update
 - AE SHINES Related: Telemetry Capabilities of Aggregation Software
 - AE SHINES Related: Presentations by other partners (i.e. Pecan Street)
 - Other?