2016 Storage/RFI Update

Electric Utility Commission
9/16/2016

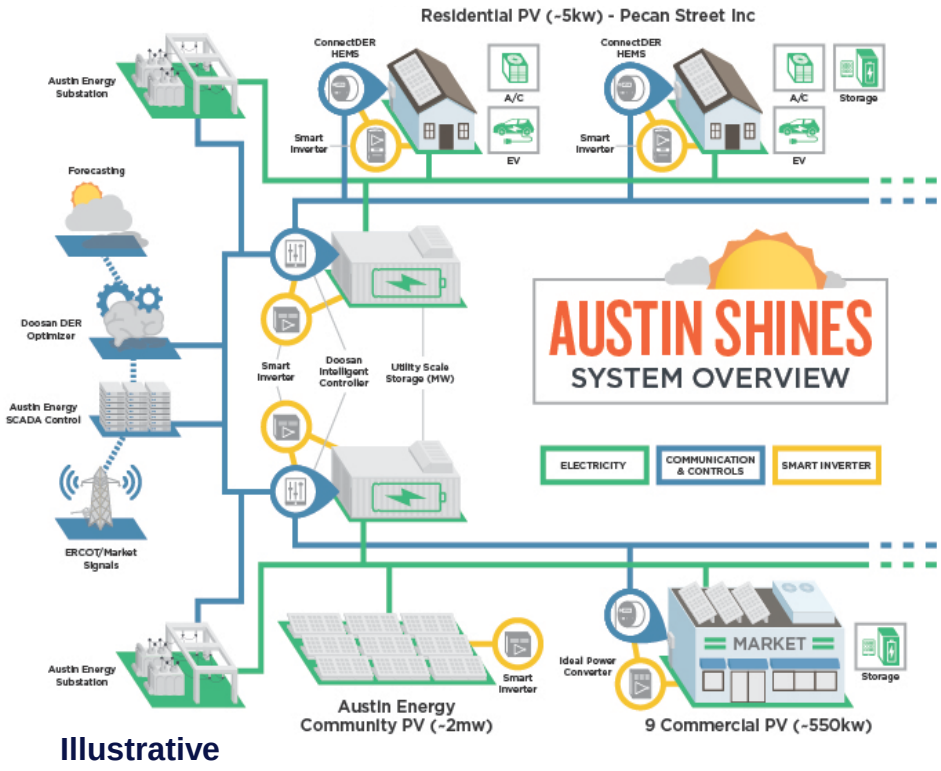
Introduction

- Issued an Request for Information (RFI) as per the 2014 Resource Plan update
  - Intent of the RFI is for information and planning purposes to be used for 2016 resource plan update.
  - Seeks information on commercially-available energy storage technologies to be deployed in the Electric Reliability Council of Texas (ERCOT) market.
  - Issued RFI : December 30, 2015
  - RFI responses due: March 15, 2016
- Status of thermal Storage (Downtown, Mueller, Domain)
  - Has up to 114 MWHr of thermal storage capability
    - Actual (peak) shift is a function of our real time customer load.
    - On the afternoon of August 11, 2016 we set our new high calculated shift at 17.12 MW.

Austin SHINES Update

Estimated Energy Storage Deployment Summary

- Utility Scale
  - 1.5 MW/3 MWh Kingsbery ESS
  - 1.5 MW/3 MWh Mueller ESS
- Commercial Scale
  - (6) “small” size 30-50kW
  - (3) “medium” size 100-150kW
- Residential Scale
  - (6) residential units (size TBD)



Illustrative

Sustainable and Holistic IntegratioN of Energy Storage and Solar PV

www.austinenergy.com/go/shines

RFI High Level Summary

- 37 total respondents
  - 84% Battery Storage, 8% CAES, 8% Other (Molten Salt, Services, Partnership)
- Technologies include
  - Lead-acid, Lithium-ion, Molten salt, Flow batteries, Flywheel
  - Electrolysis (hydrogen)
  - Compressed Air Energy Storage (CAES)
- Capacity ranged from 1-317 MW
- Storage duration from 20 minutes to 96 hours
- Majority of proposals are batteries
  - 3 CAES and 1 Flywheel
- Proposed location include Austin Energy (AE) transmission and distribution and transmission level locations from Galveston to the Panhandle

Technology Summary

- Battery size 0.125 MW (16 hours) - 50 MW (1 hour)
- Maintenance 0-28 days per year
- Forced outage rate 0%-3.5% per year
- Round trip efficiency 80%-95%
- Degradation 0%-2.5% per year
- Cycling:
  - 1-2 per day
  - 400-2,500 per year
  - Unlimited (Vanadium Redox Flow)
- Most battery storage lithium-ion based

Technology Summary CAES

- 2 CAES proposals (1 Salt Dome , 1 Cavern Bedded Salt)
  - 150 MW - 317 MW
    - 96 hours of storage
  - 270 MW
    - 18 hours of storage
- 1 CAES (Salt Dome) + lithium-ion battery
  - 135 + 25 MW Li
    - 33 hours of storage
- Capacity Payment + Variable O&M + Fuel for Expander
- Expander heat-rate less than 5.0 MMBTU/MWH

Terms

- 3, 5, 10, 15, 20 and 30 years (majority 10-20)
- Tolling, PPA, lease and ownership
- Time to delivery 2 days to 133 weeks (most 10-36 weeks)
- 1- to 20 years warranty
- 8 $/KW month -21 $/KW month plus escalation (2%/Year) plus additional cost such as
  - VO&M Cost and Energy Charge or
  - Reservation fee or
  - Storage adder
- Ancillary services provided at additional cost

Others

- Not all proposals meet AE criteria:
  - Distribution level instead of transmission
  - Thermal storage
  - Less than the 10 MW floor AE asked
- Pricing information.
  - 19% provided detail pricing information
  - 32% rough
  - 49% didn't provide any
- Several proposals tying PV to battery systems to take advantage of tax credits