U.S. Battery Storage Market Trends

For

2020 EIA Energy Storage Workshop

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By

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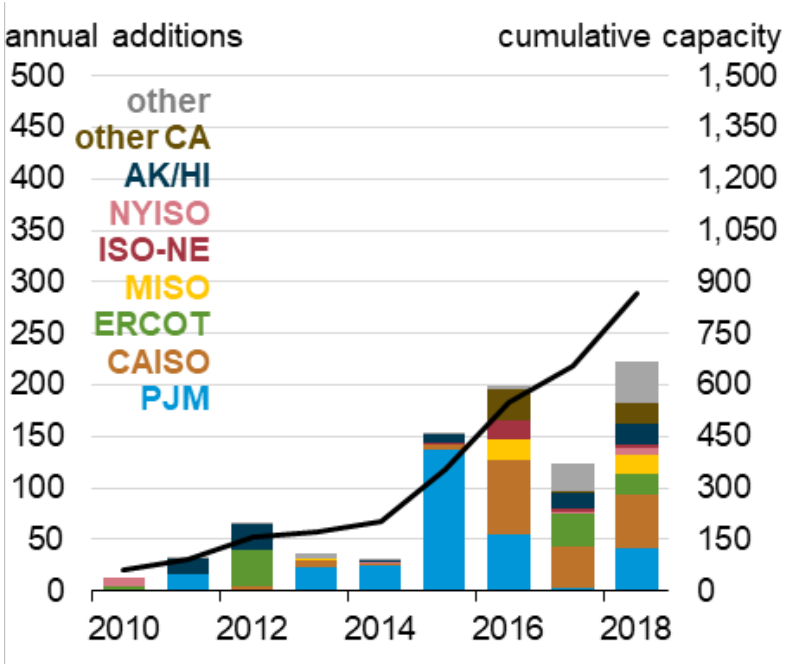
Key Takeaways

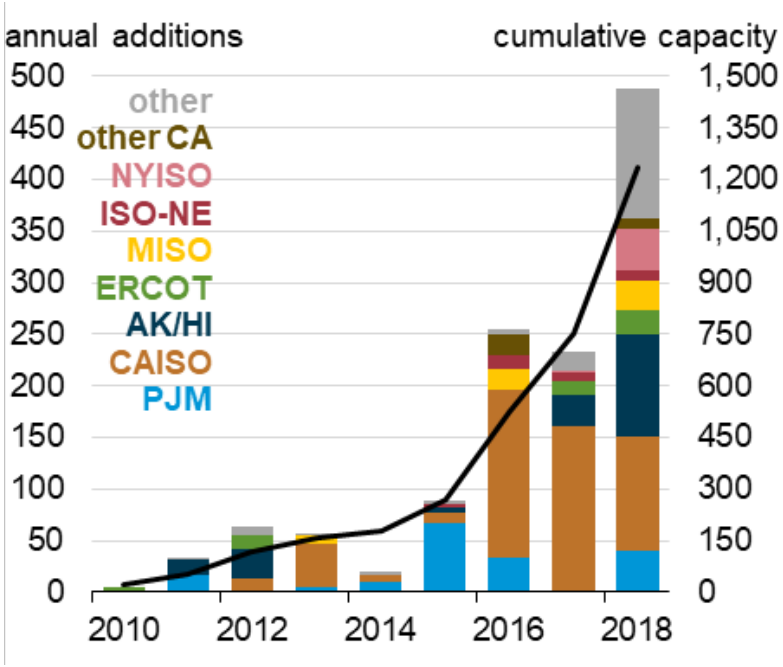
- As of 2018, there was 869 MW/1,236 MWh of batteries installed in the United States
- Growth in battery installations as a whole is shifting towards an emphasis on energy capacity
- In 2018, 58% of power capacity additions and 69% of energy capacity additions have occurred in states outside of PJM and CAISO
- Energy capacity costs have decreased from $2,153/kWh in 2015 to $834/kWh in 2017
- Other states outside of the ISO/RTO markets will make up a third of projects to be operational by 2023
- 8 GW of renewables plus storage projects are expected to be online by the end of 2023

In 2018, batteries in states outside of CAISO and PJM make up over 58% of power capacity and 69% of energy capacity additions

power capacity
megawatts (MW)

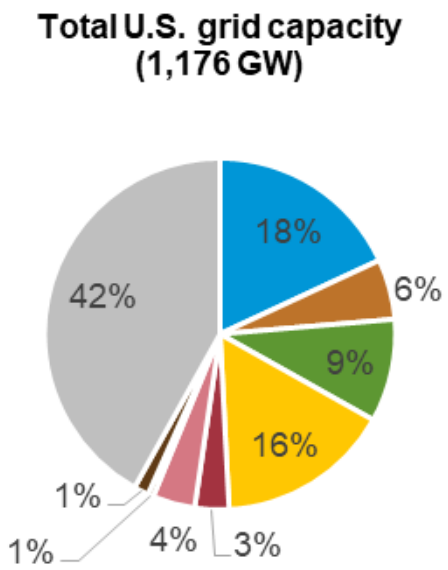


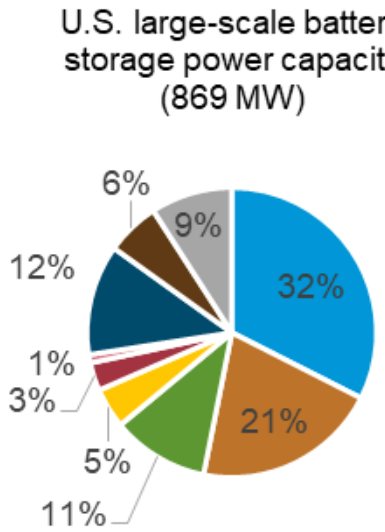
energy capacity
megawatthours (MWh)

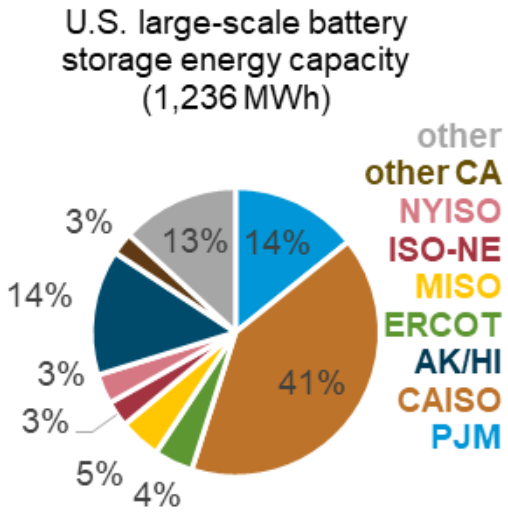


Sources: EIA-860 Annual Electric Generator Report, EIA-860M Preliminary Monthly Electric Generator Inventory

PJM emphasizes power capacity while CAISO emphasizes energy capacity (2018)

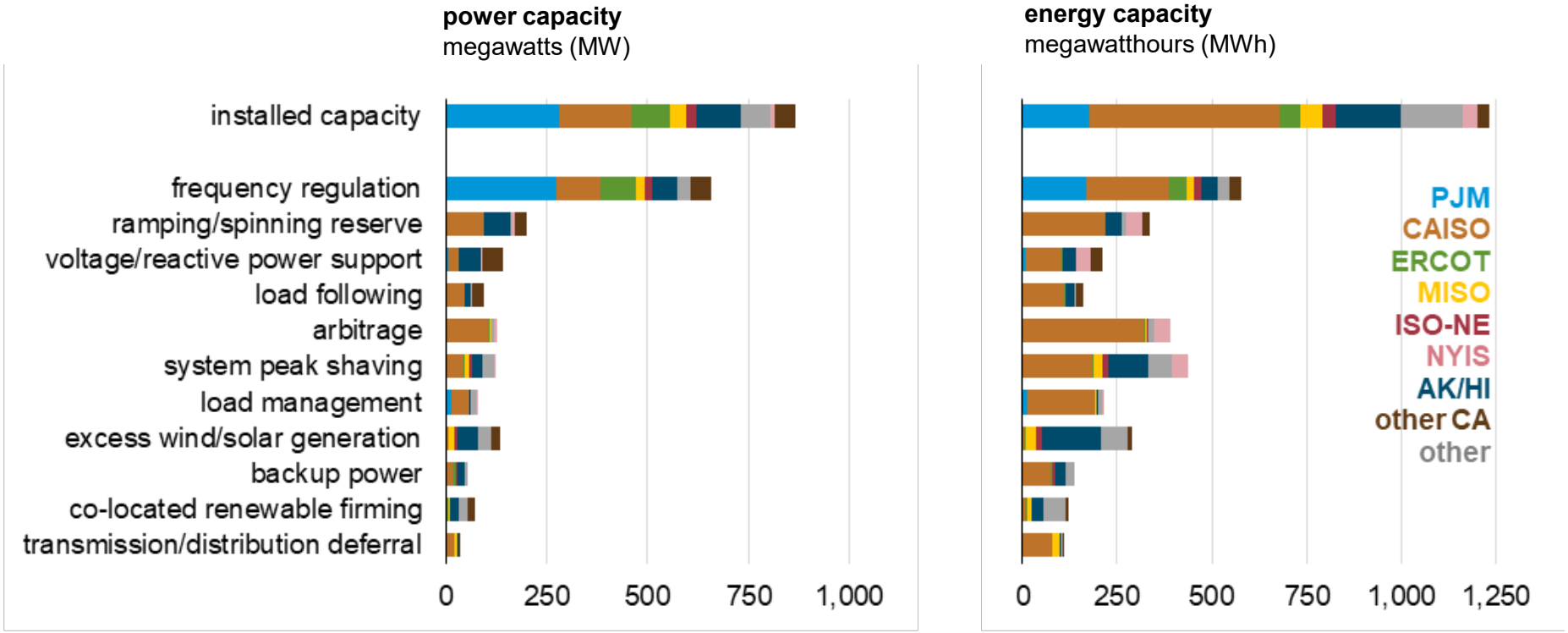






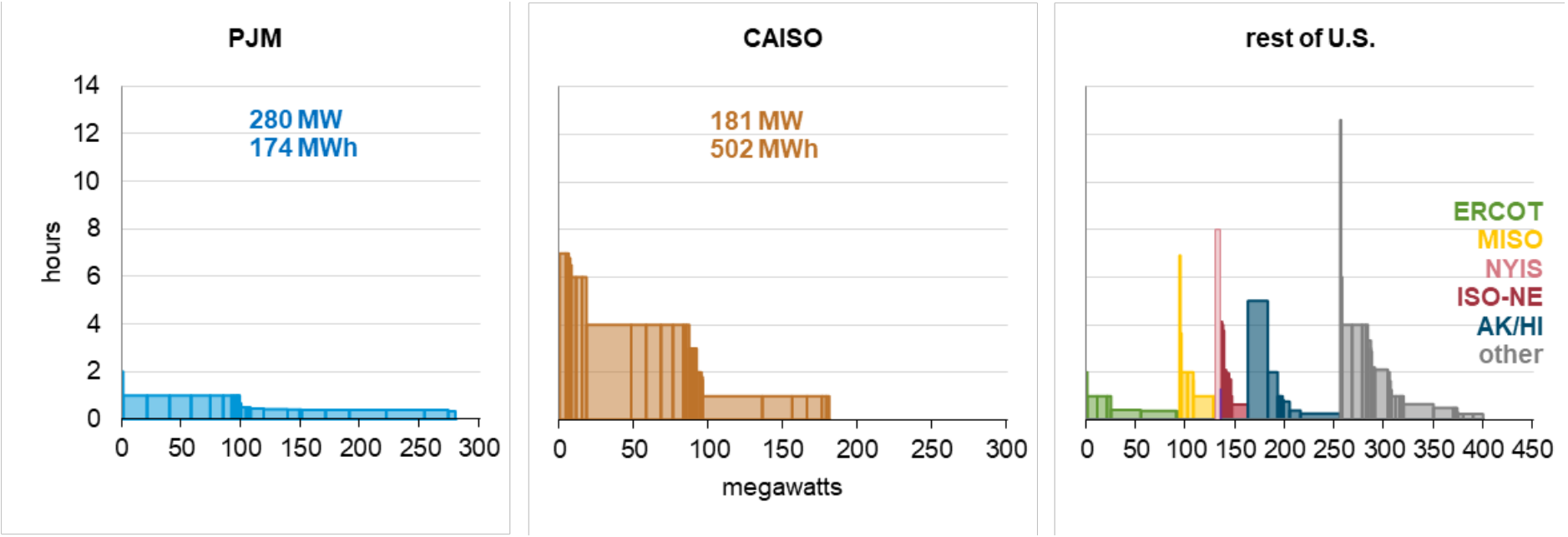
Sources: EIA-860 Annual Electric Generator Report

Batteries in PJM are primarily used in frequency regulation, while batteries in CAISO cover multiple use cases (2018)



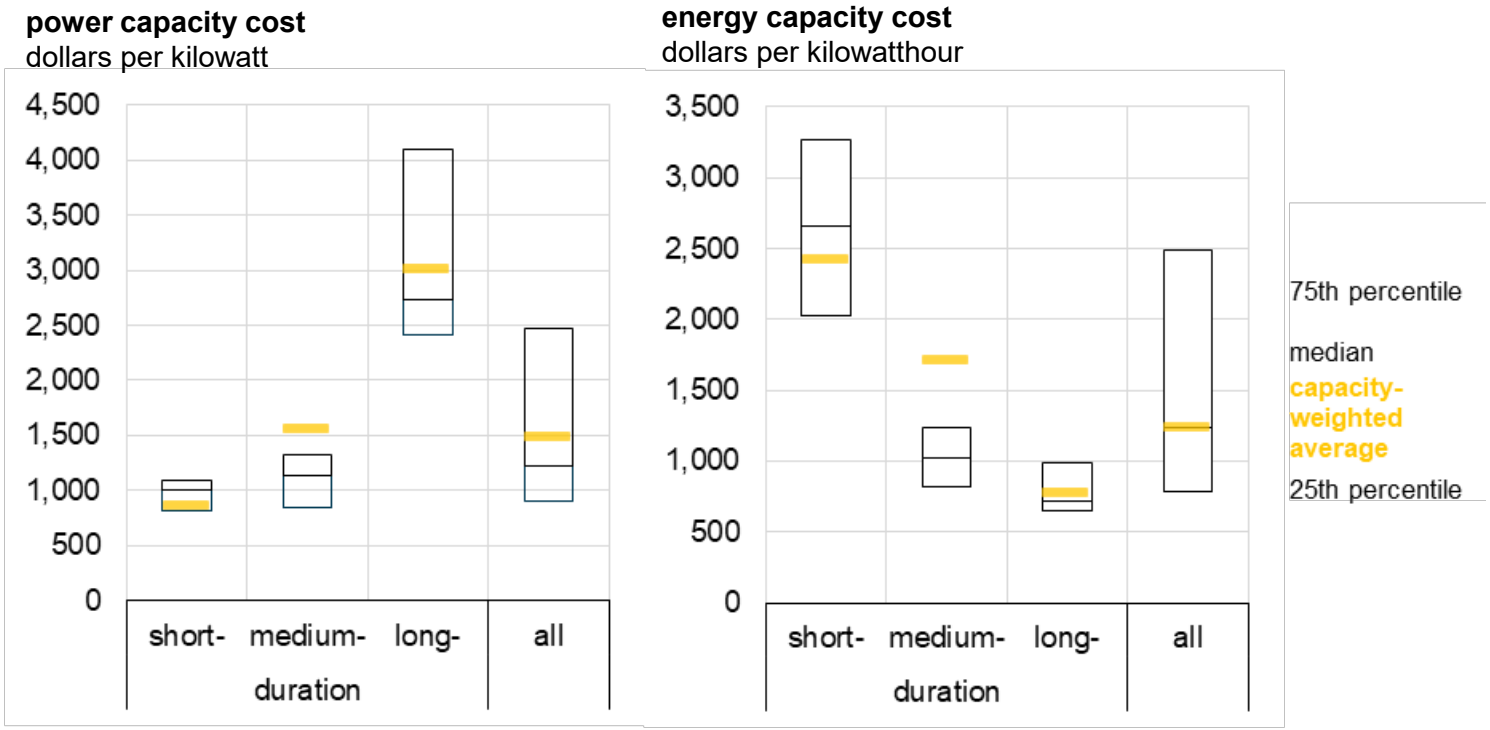
Sources: EIA-860 Annual Electric Generator Report

CAISO batteries are longer duration and focus on energy applications, while PJM batteries are shorter duration that focus on power applications



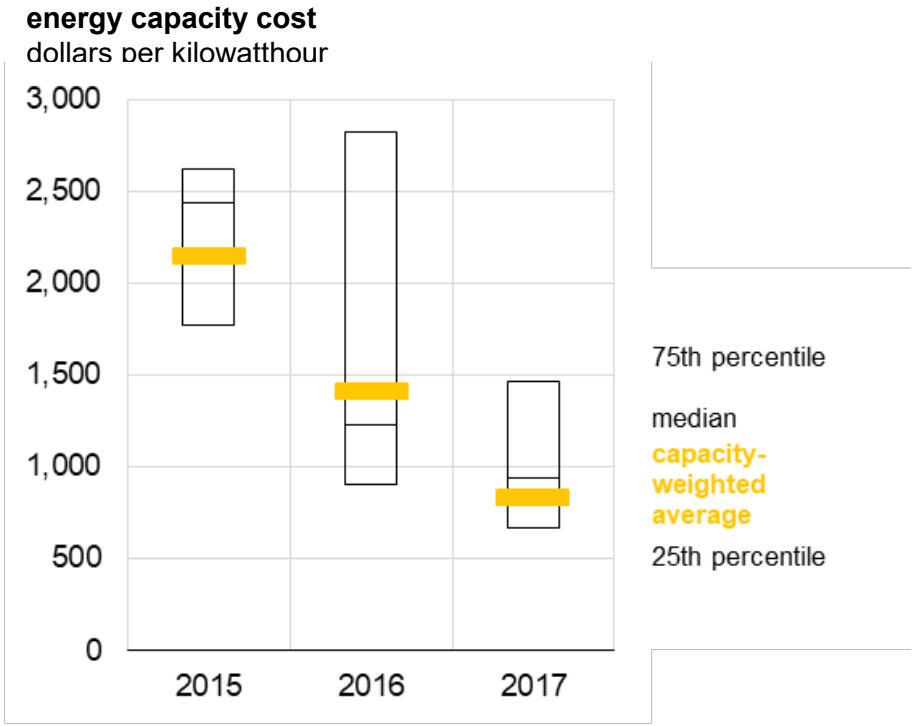
Source: EIA-860 Annual Electric Generator Report

Shorter duration batteries have lower power capacity costs than batteries with longer durations; the opposite is true when analyzing energy capacity



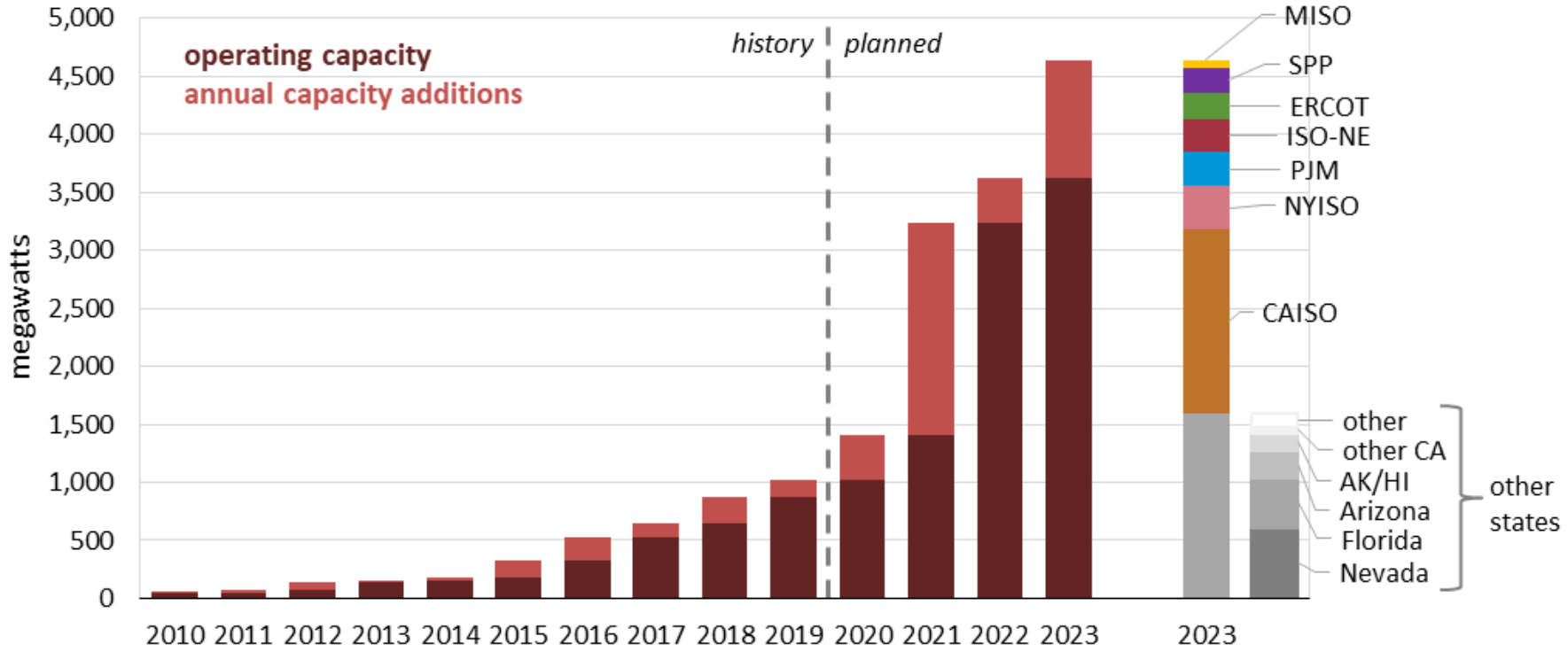
Source: EIA-860 Annual Electric Generator Report

Energy capacity costs have decreased from $2,153/kWh in 2015 to $834/kWh in 2017



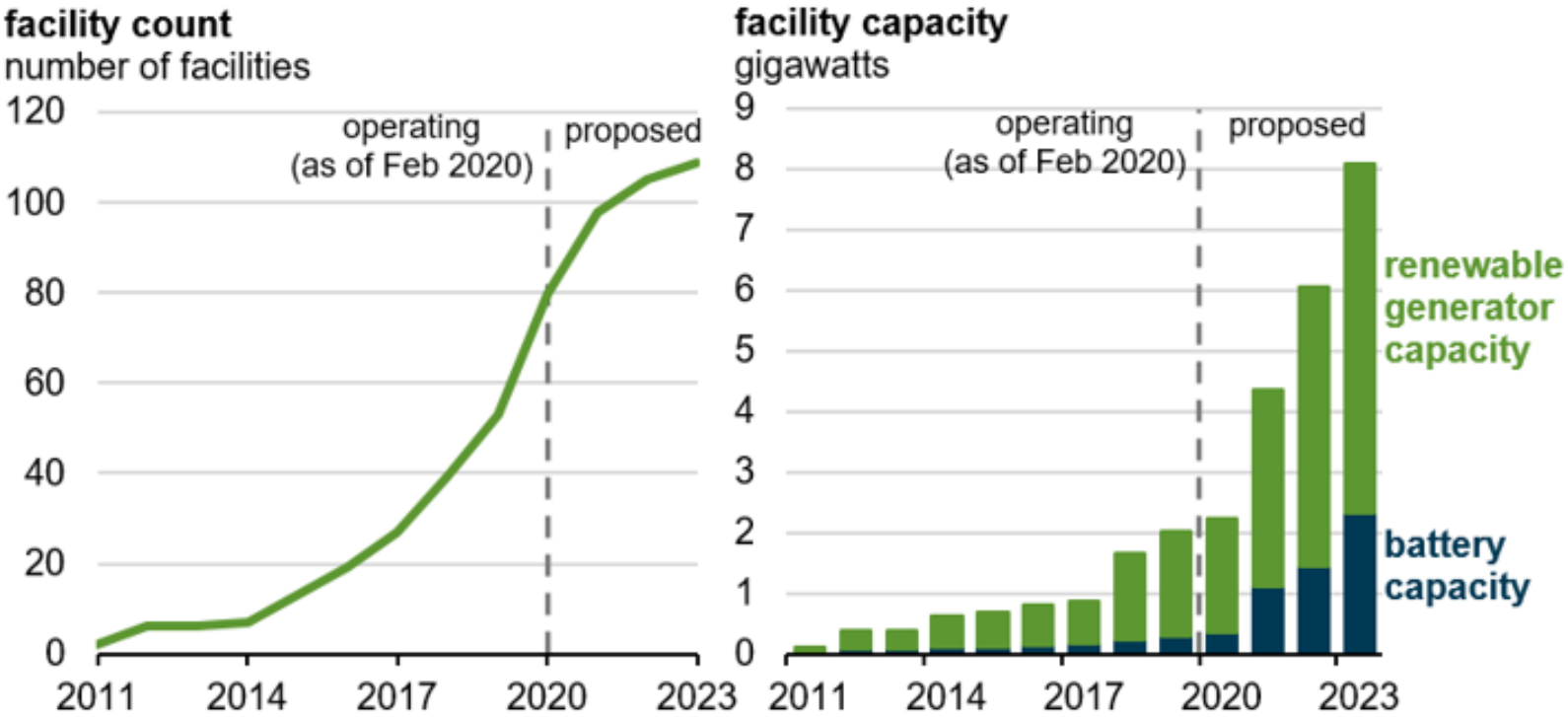
Source: EIA-860 Annual Electric Generator Report

Other states outside of the ISO/RTO areas make up a third of projects to be operational by 2023



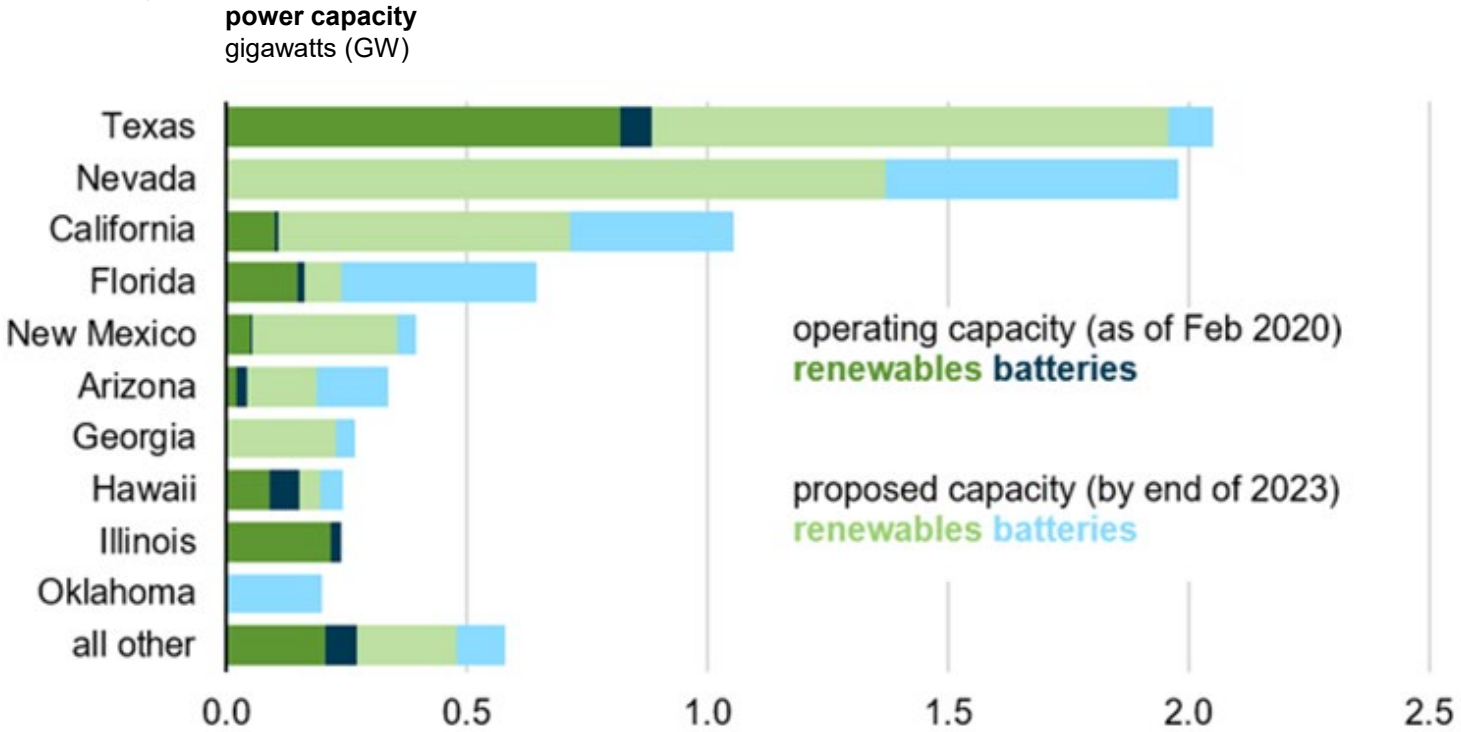
Sources: EIA-860 Annual Electric Generator Report, EIA-860M Preliminary Monthly Electric Generator Inventory

8 GW of renewable plus storage projects are expected to be online by the end of 2023.



U.S. Energy Information Administration, Form EIA-860M, Preliminary Monthly Electric Generator Inventory; U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report

Texas has the most renewable plus storage capacity with 886 MW as of February 2020



U.S. Energy Information Administration, Form EIA-860M, Preliminary Monthly Electric Generator Inventory; U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report

State policy mostly correlates with growth in planned storage deployment

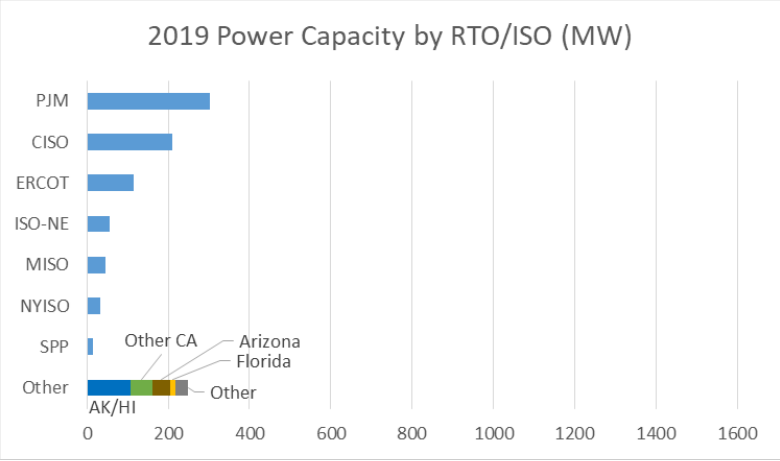
- Targets

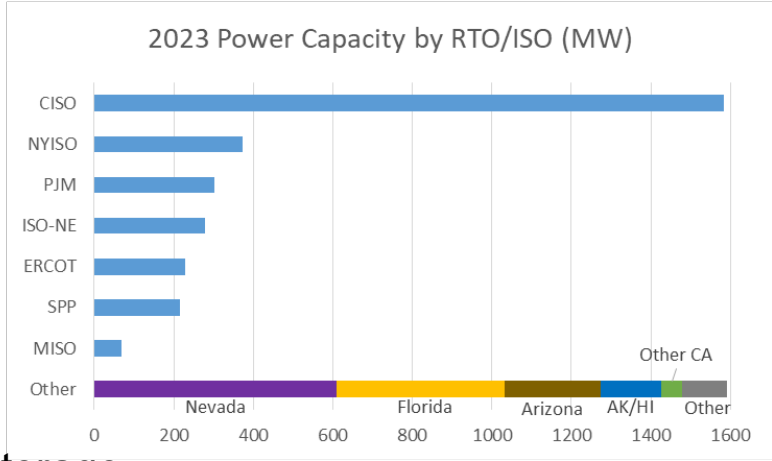
State	Legislation	Year Law Passed*	Target Year
California	1325 MW (Target)	2013	2024
Oregon	10 MWh (Mandate)	2015	2020
Massachusetts	1000 MWh (Mandate)	2018	2025
New York	3000 MW (Target)	2019	2030
New Jersey	2000 MW (Goal)	2018	2030
Nevada	1000 MW (Target)	2020	2030
Virginia	3100 MW (Mandate)	2020	2035

*Most recent revision

ESA Blog, 4/24/20

- Maryland (30% tax credit res/com BES)
- 2017 CA Assembly Bill 2868: IOU's to procure 500 MW additional distributed energy storage





Federal policy has had an effect on storage deployment. FERC Order 841 may be applied differently in

- 2011 FERC Order 755- compensate fast response resources
  - Led to PJM Reg D market and increased deployment of battery storage from 2011-2016

- 2020 (TBD) - FERC Order 841
  - Establish technical criteria for storage participation in capacity, energy, and ancillary markets
  - Establish methods for storage participation in eligible markets when criteria is met
    - Account for physical/operational characteristics of electric storage resources (i.e. SOC)
  - Storage is able to dispatch and set wholesale prices as both a wholesale seller and buyer.
    - Follow existing market rules that govern when a resource can set the wholesale price
    - Sale of energy from wholesale markets to a storage resource at the wholesale LMP
  - Establish a min. size requirement for storage not to exceed 100 kW.

LMP- locational marginal price
SOC- state of charge

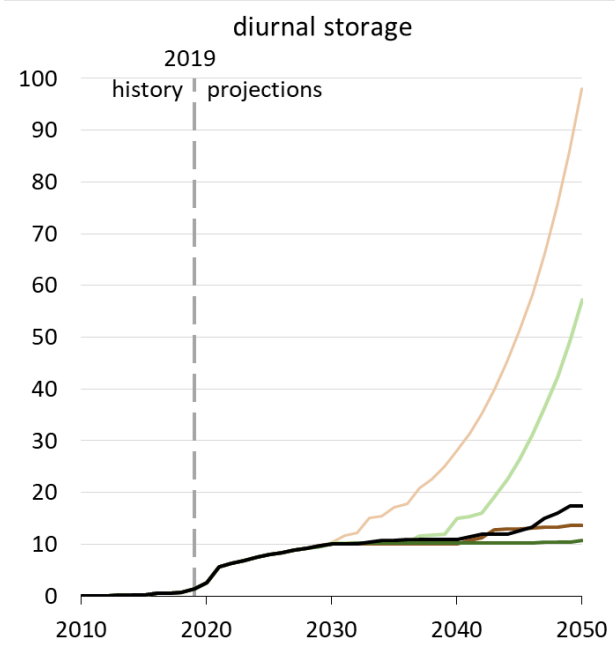
- Other
  - No specific storage tax credit. If >75% charged by PV applicable for ITC

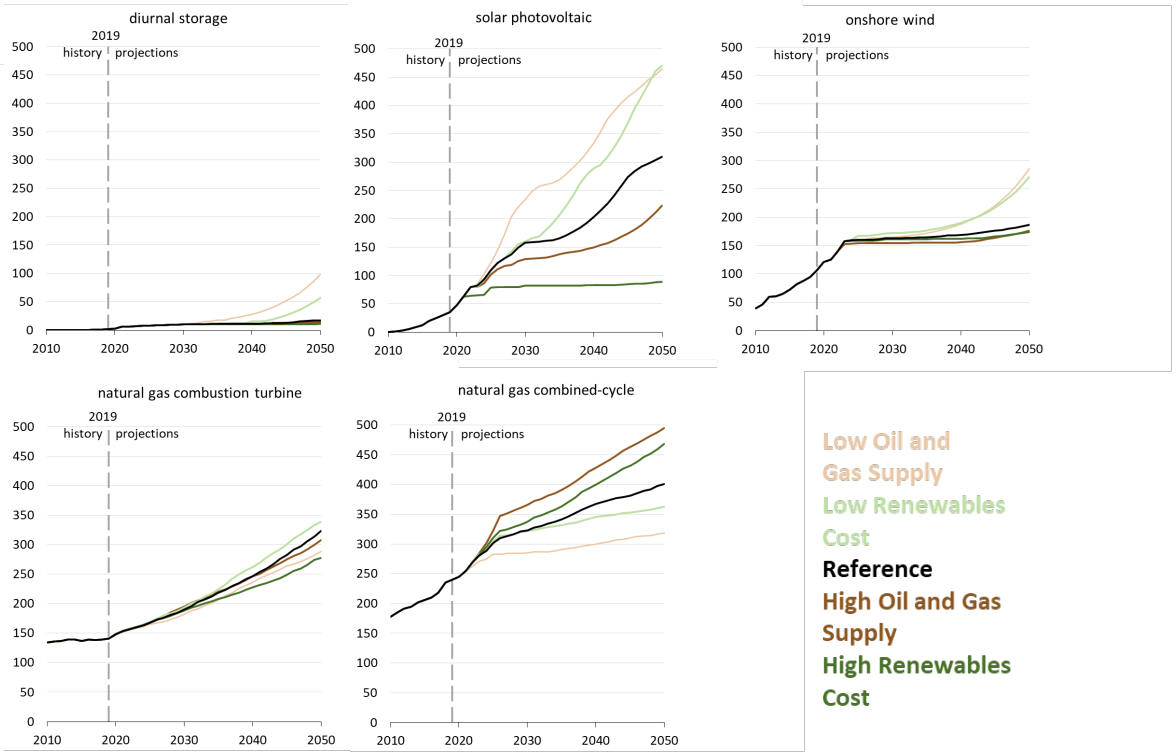
Annual Energy Outlook 2020-

AEO2020 power capacity by case and selected technology, 2050

power capacity

gigawatts





Annual Energy Outlook 2020

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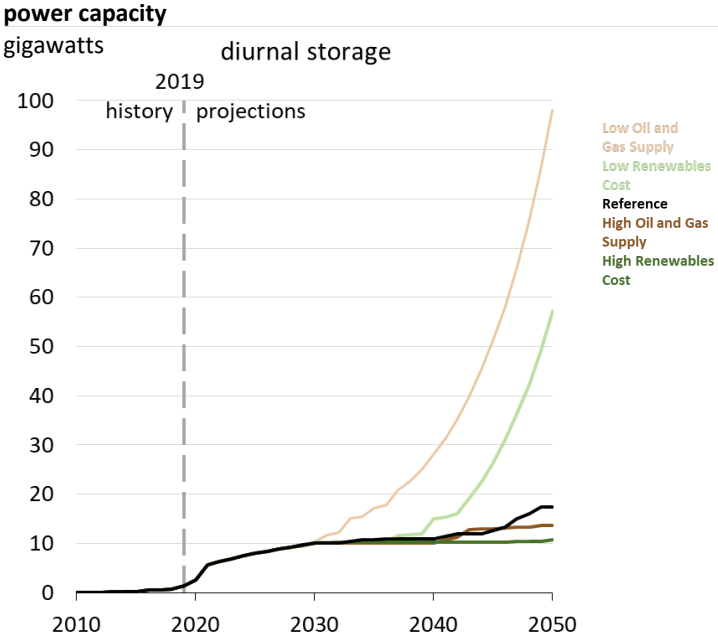
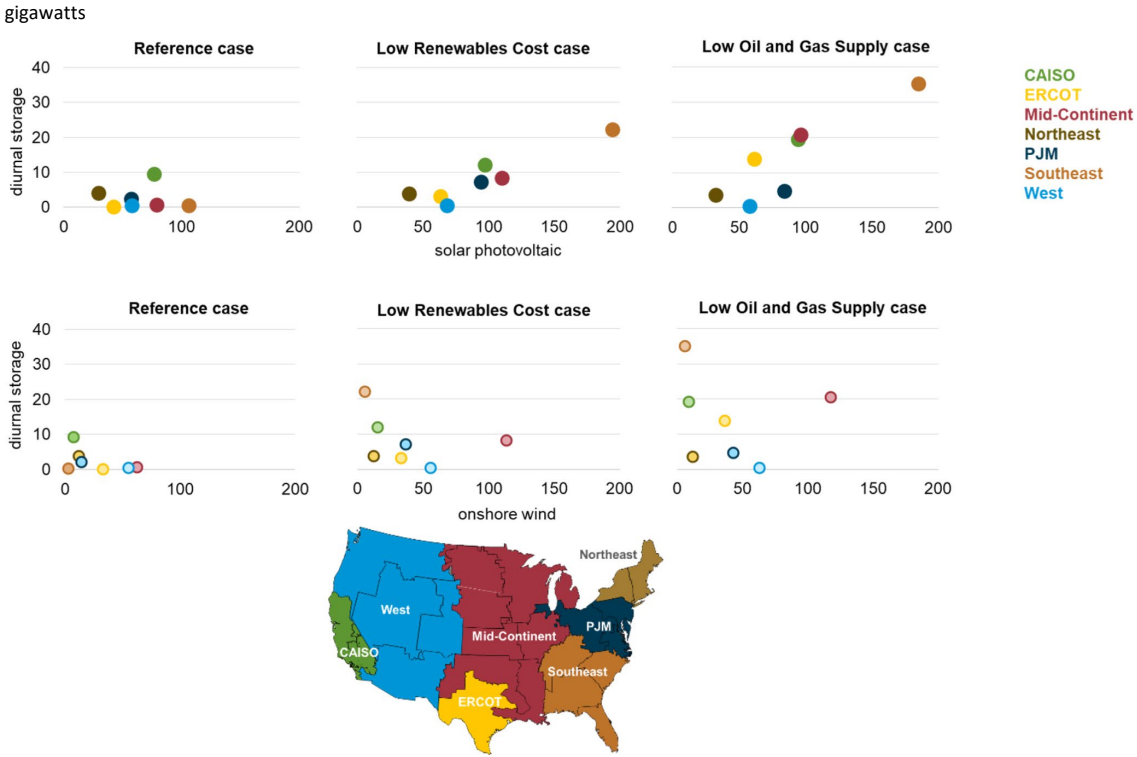


AEO2020 regional diurnal storage versus solar photovoltaic power and wind capacity, 2050

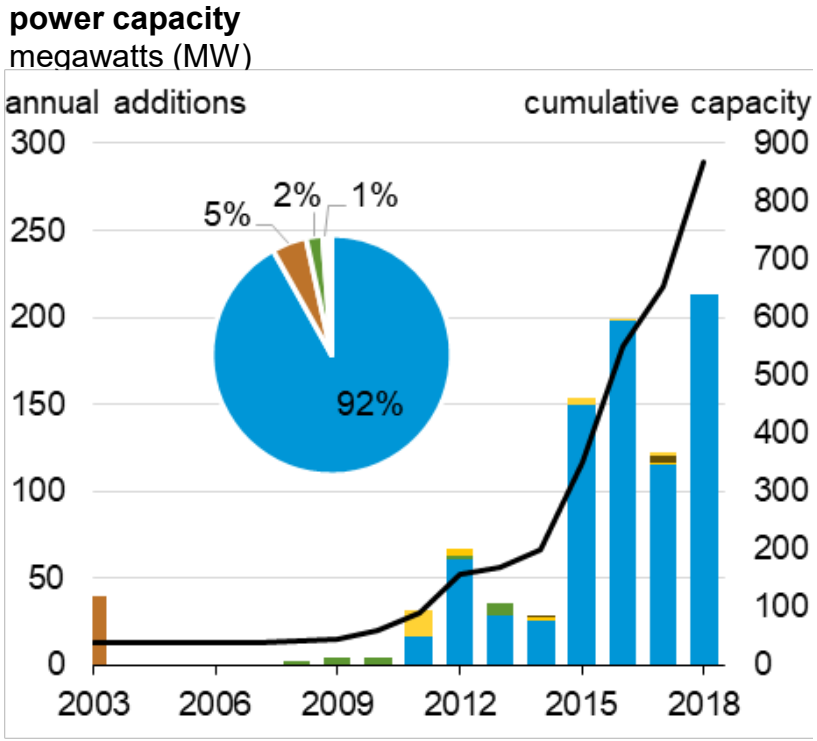


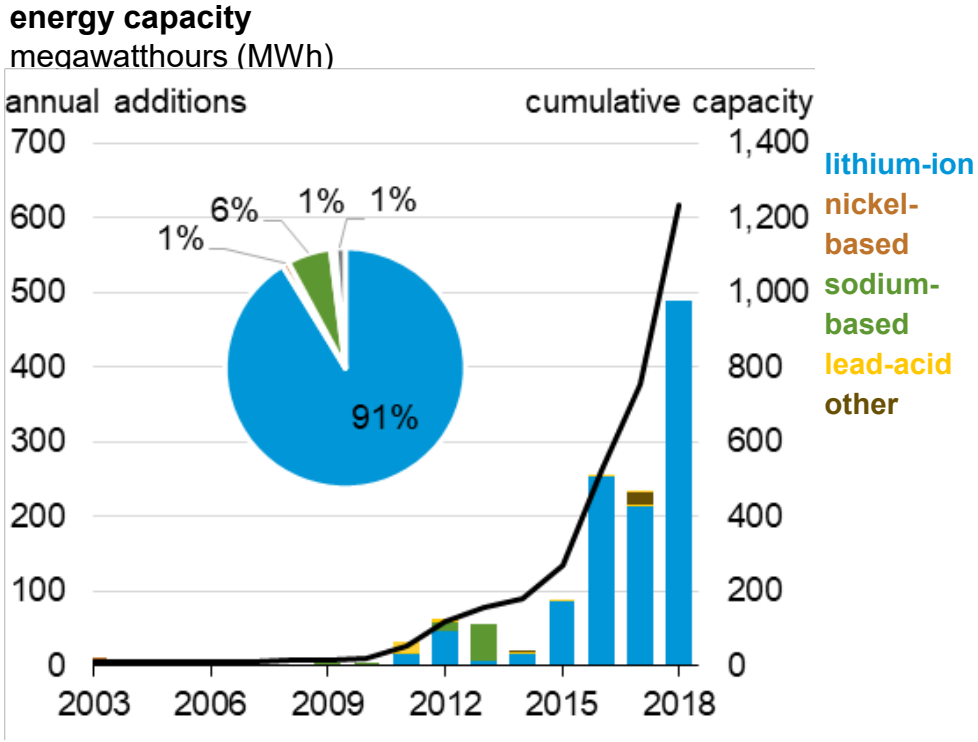
Source: U.S. Energy Information Administration, *Annual Energy Outlook 2020*

Questions?

Supplemental slides

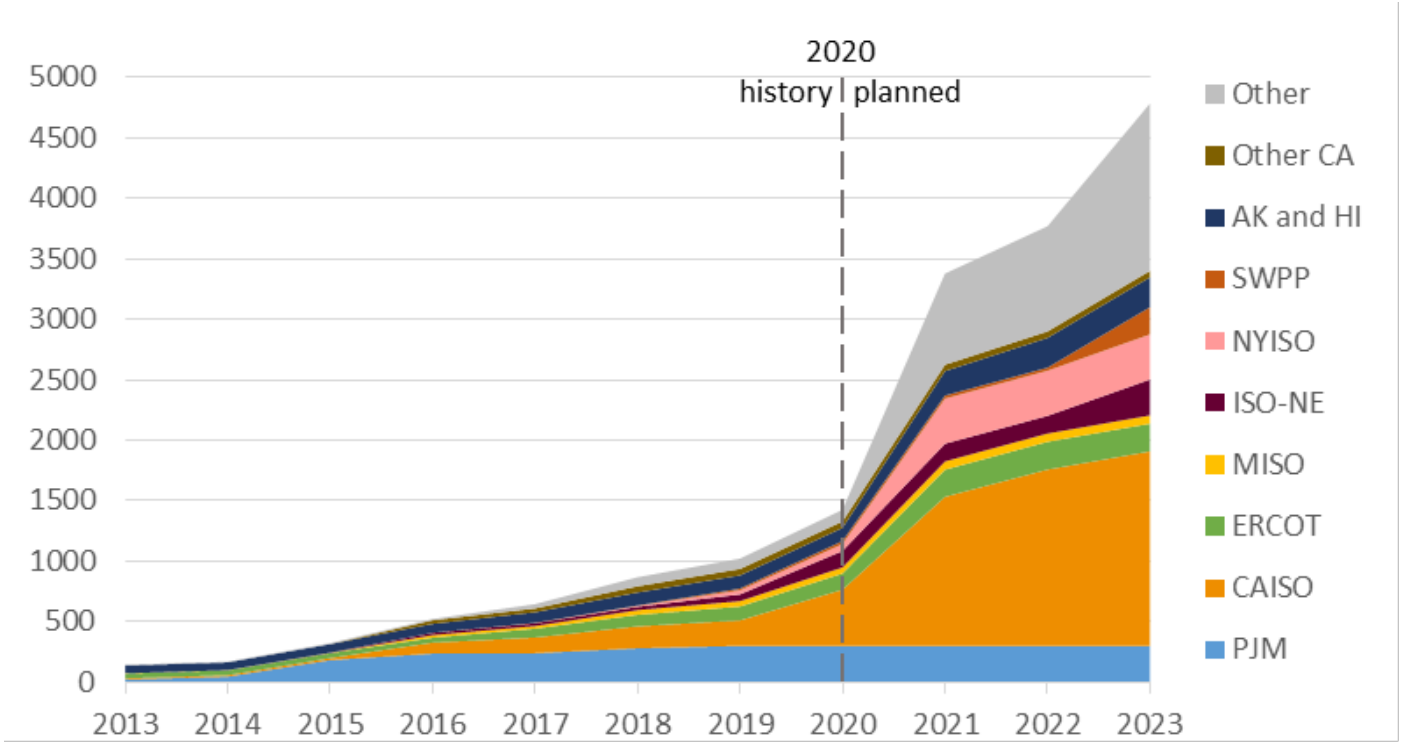
Over 90 percent of U.S. utility-scale battery storage installations are based off of lithium-ion chemistries





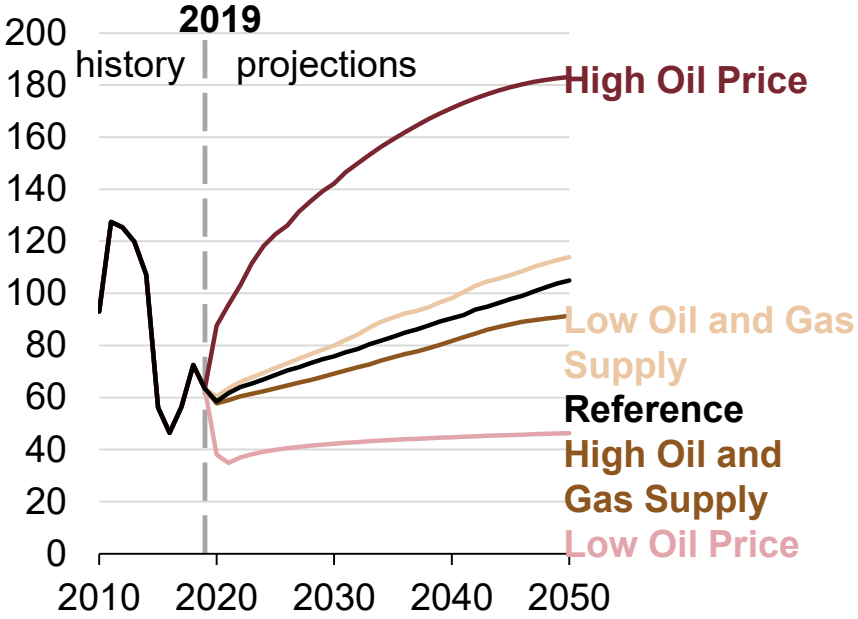
Sources: EIA-860 Annual Electric Generator Report

Cumulative battery storage power capacity additions, historical and planned (MW)

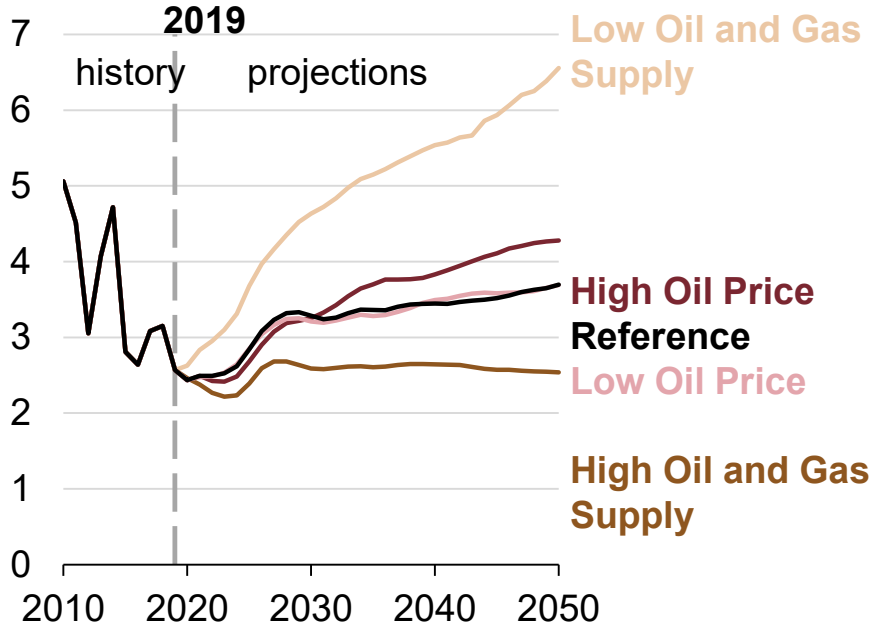


EIA develops oil and natural gas price assumptions by considering international supply and demand and the development of U.S. shale resources—

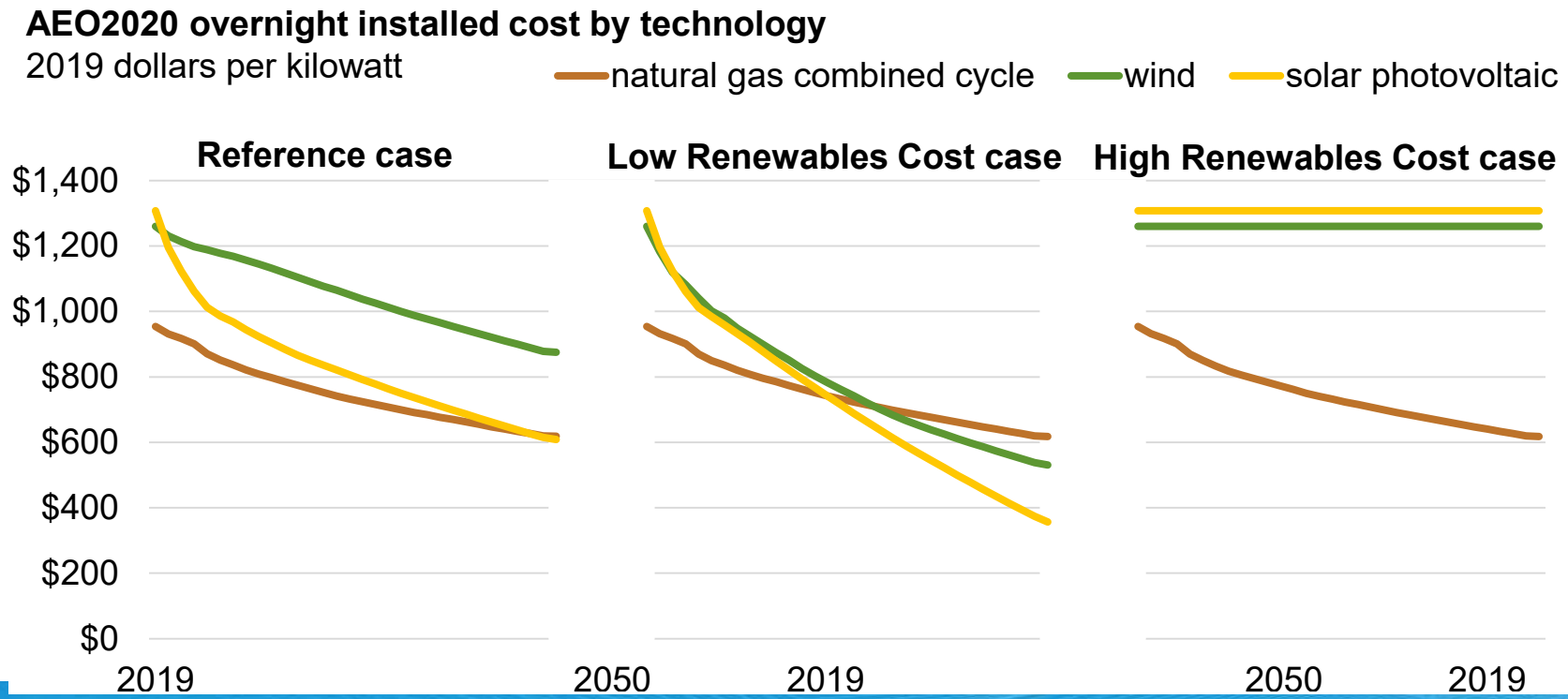
AEO2020 North Sea Brent crude oil price
2019 dollars per barrel



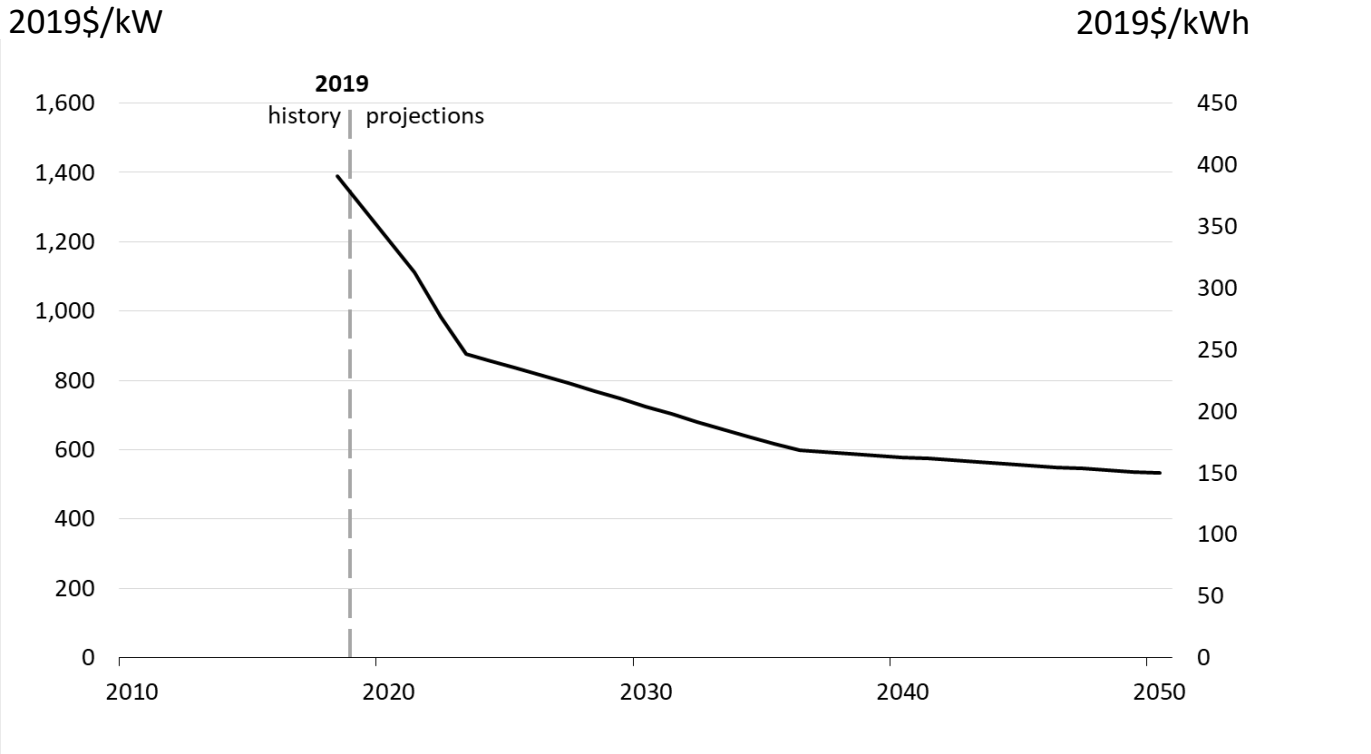
AEO2020 natural gas price at Henry Hub
2019 dollars per million British thermal unit



The High Renewables Cost and Low Renewables Cost cases assume different rates of cost reduction for renewable technologies compared with the Reference case; non-renewables assume the same rates



AEO2020 diurnal storage overnight capital cost



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Electric Power Monthly | www.eia.gov/electricity/monthly/

Electric Monthly Update | www.eia.gov/electricity/monthly/update/

EIA-860 Data Files | www.eia.gov/electricity/data/eia860/

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