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STORAGE AND DEMAND RESPONSE IN THE U.S. AN OVERVIEW OF MARKET TRENDS

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Consultant

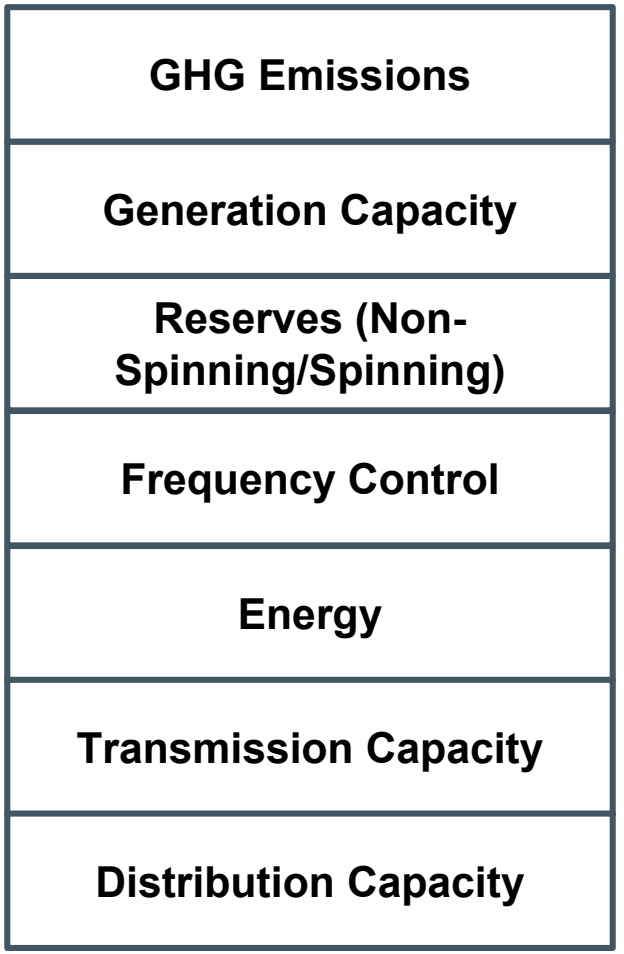
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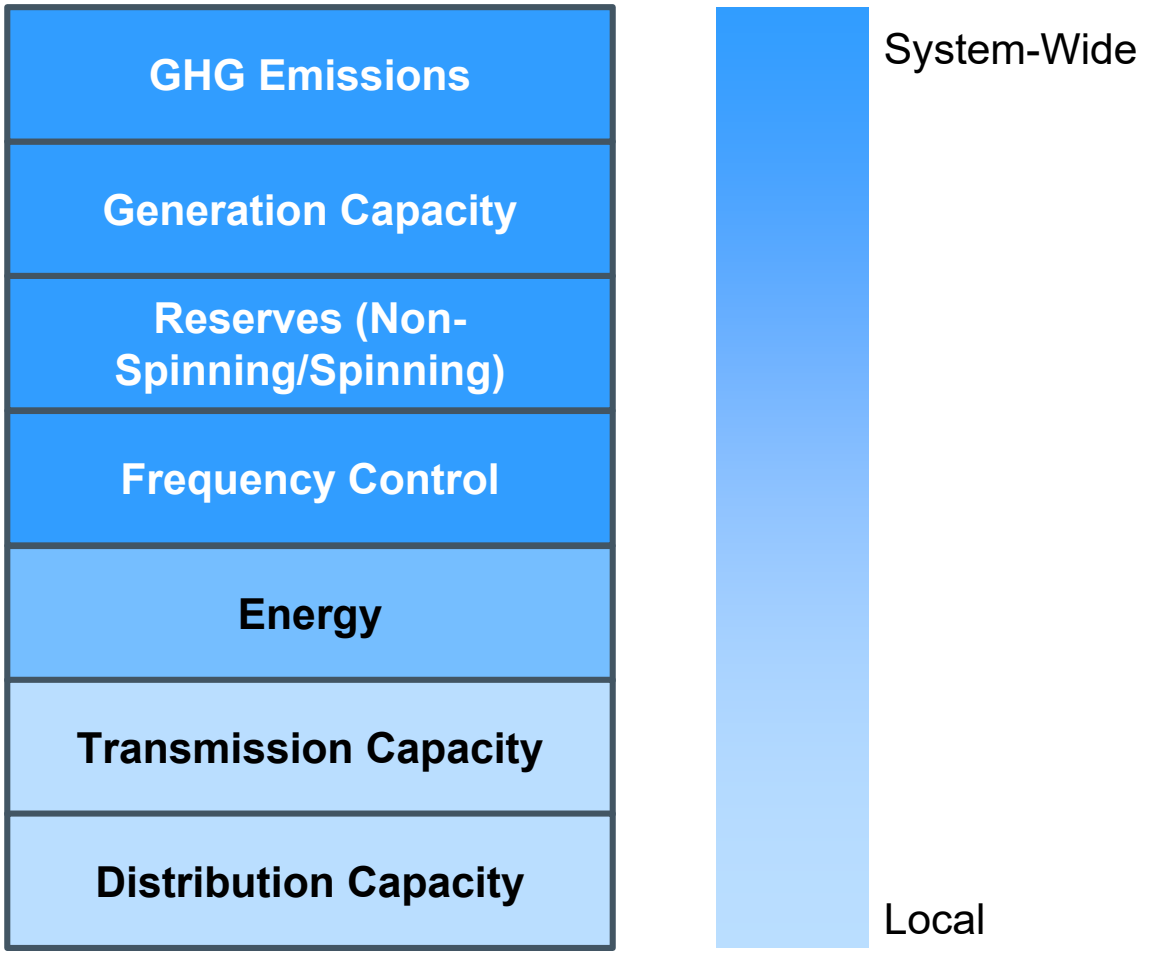
1 Storage and Demand Response Provide “Stacks” of Value

Storage and Demand Response Provide “Stacks” of Value



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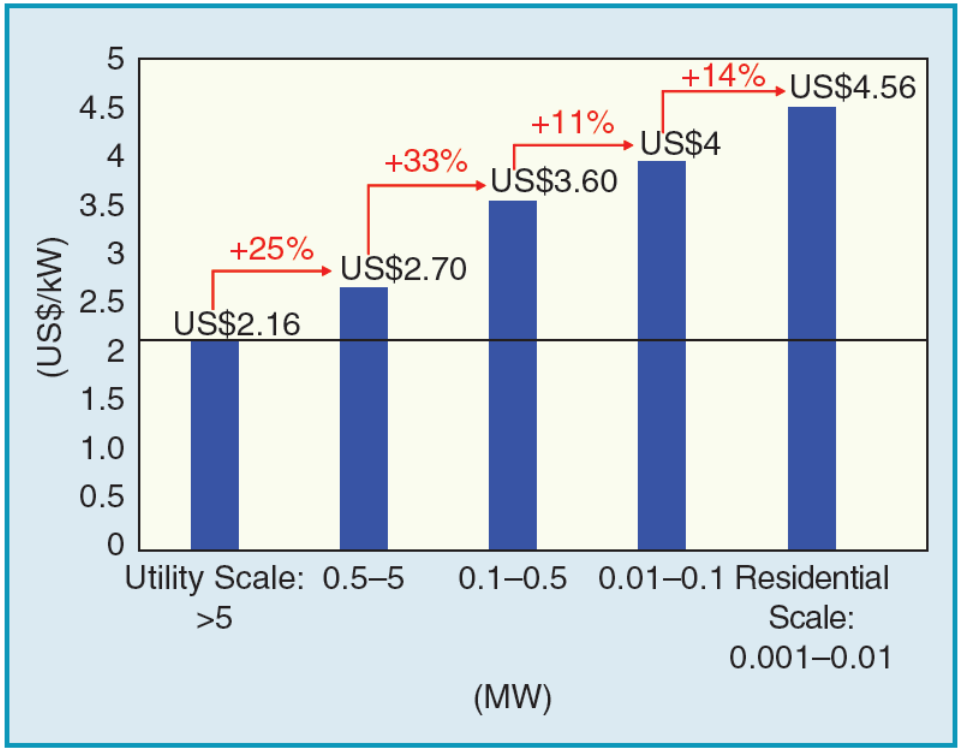
Some Values are System-Wide and Others are Local



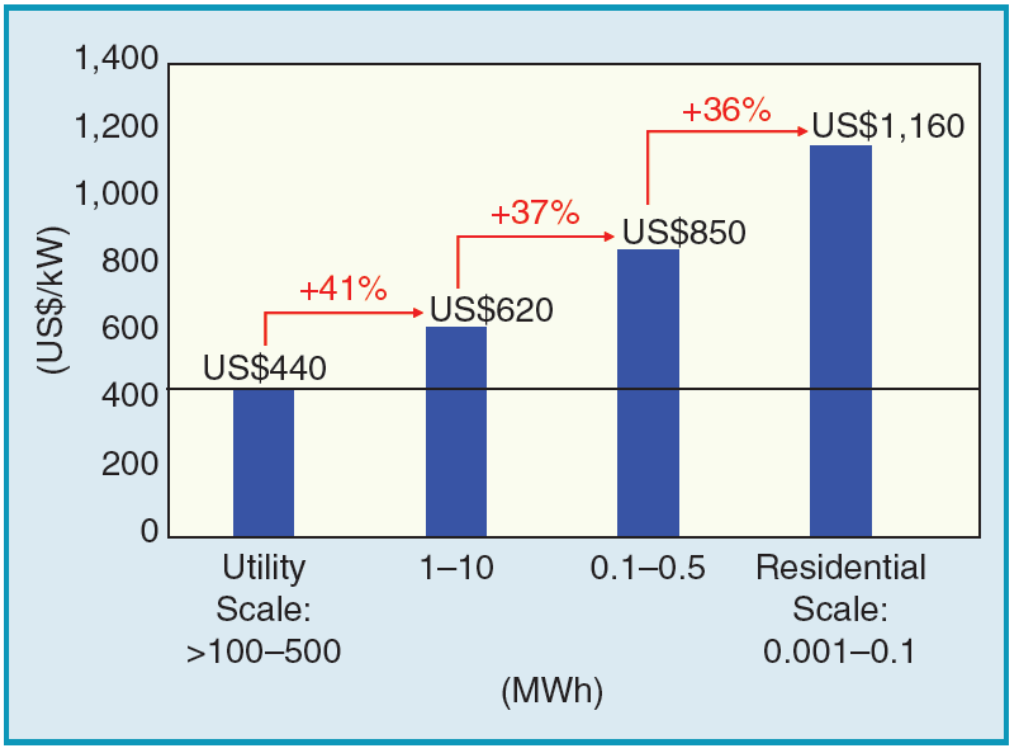
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Larger Resources tend to be Cheaper than Equivalent DERs on a Per-Unit Basis Due to Economies of Scale

Solar PV



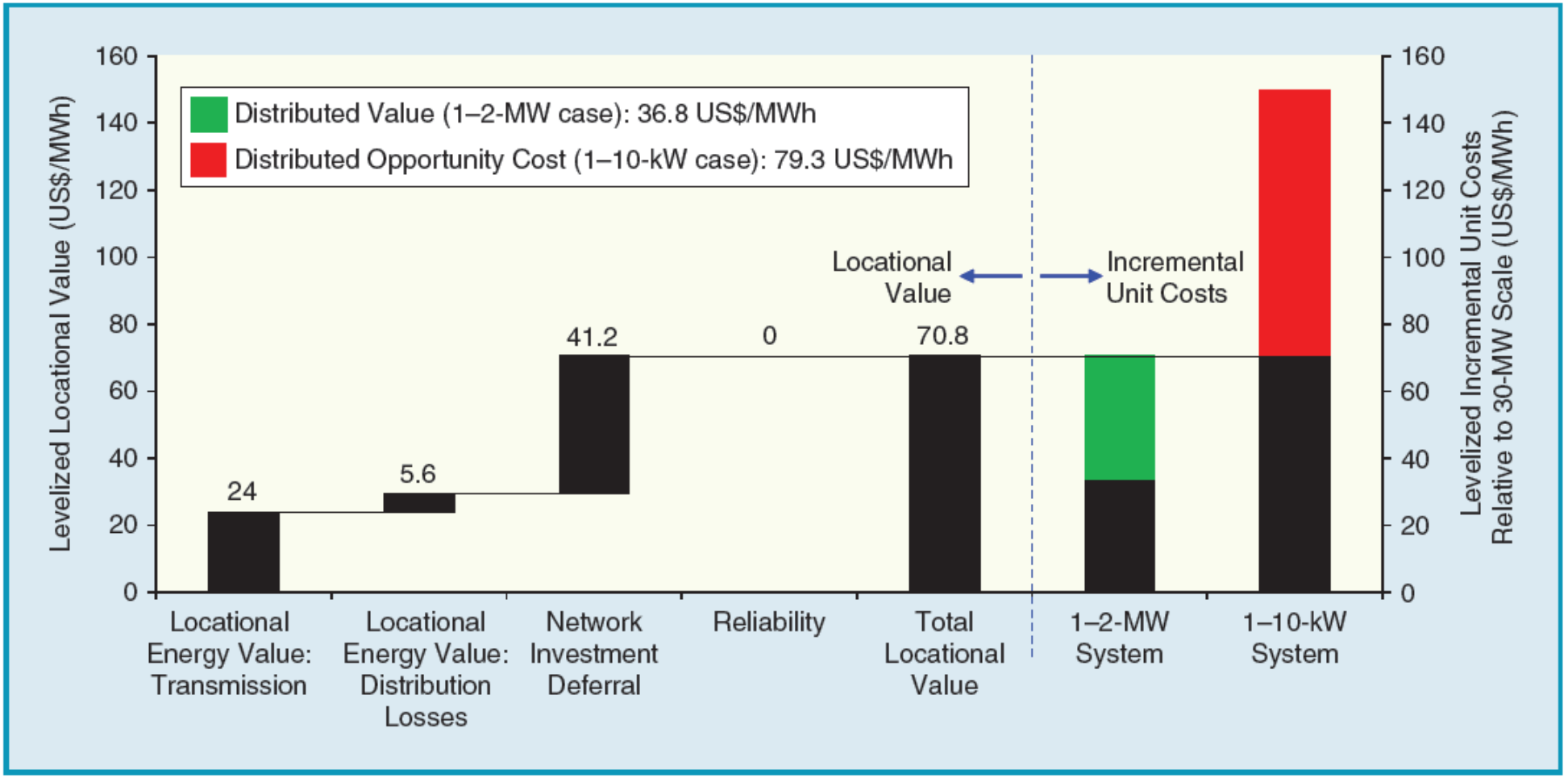
Solar PV



Sources: (Left) Feldman, D., et al. (2018), "Q4 2017/Q1 2018 solar industry update," National Renewable Energy Laboratory; (Right) Burger, S. P., et al. (2019)

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Regulators and Policymakers Must Consider the "Distributed Opportunity Cost" when Developing DER Support Policies

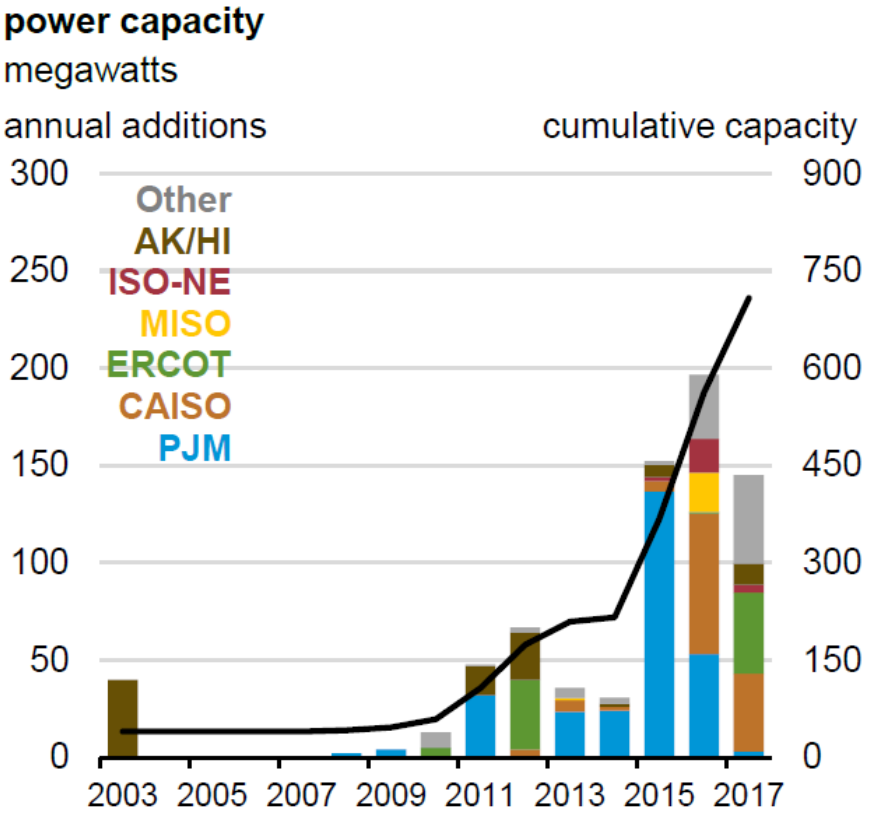


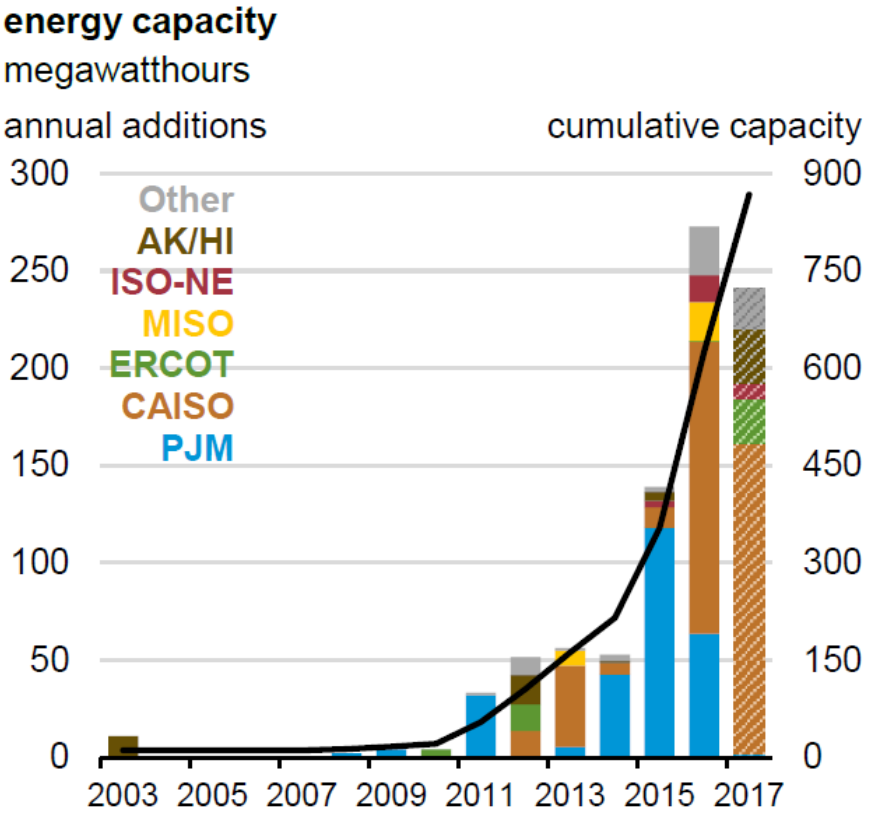
Source: Burger, S. P., et al. (2019)

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2 Battery Storage is Growing in U.S. Markets and is an Important Resource for Frequency Control

Applications of Large-Scale Battery Storage in the U.S.

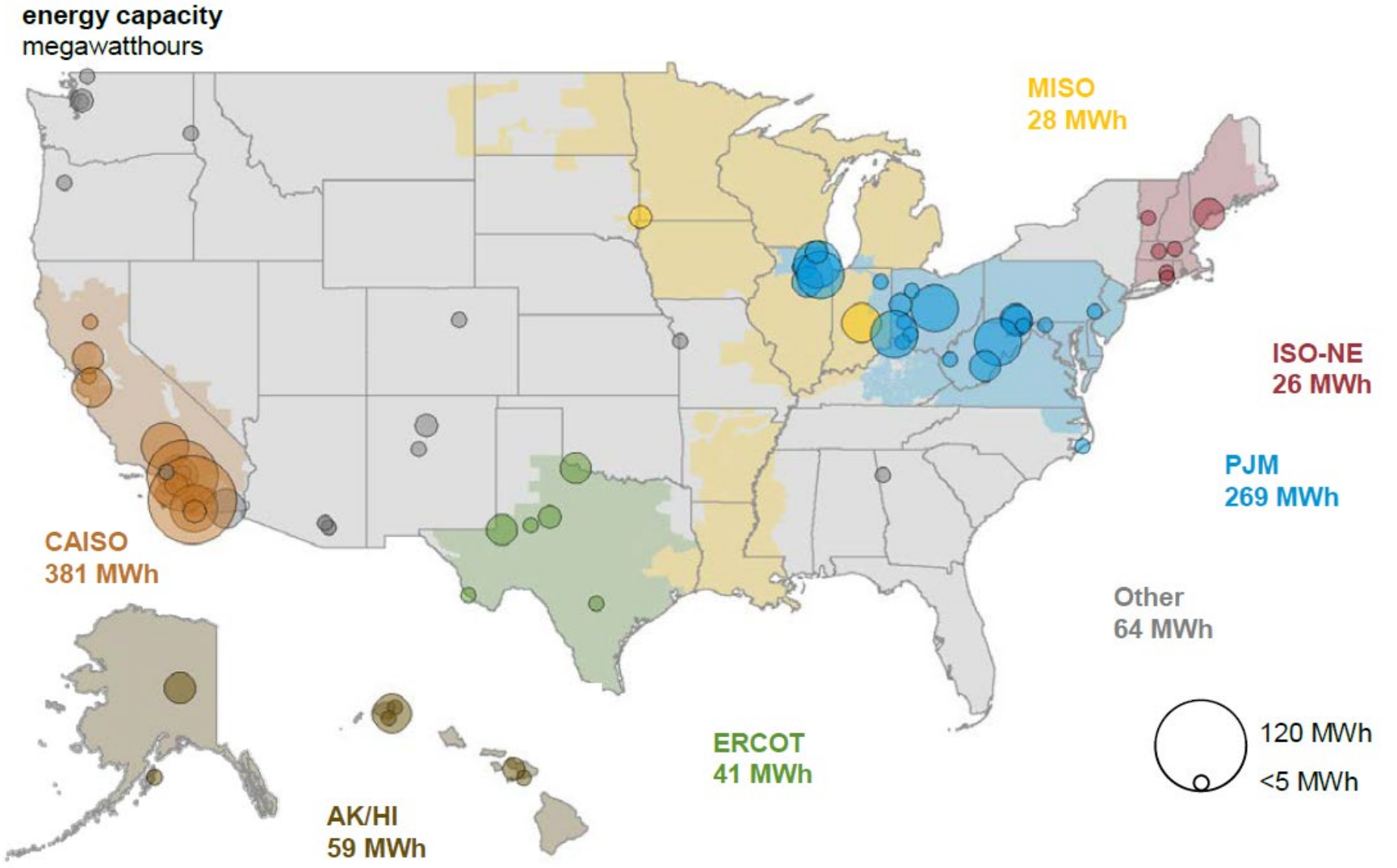




Source: U.S. Energy Information Administration (EIA)

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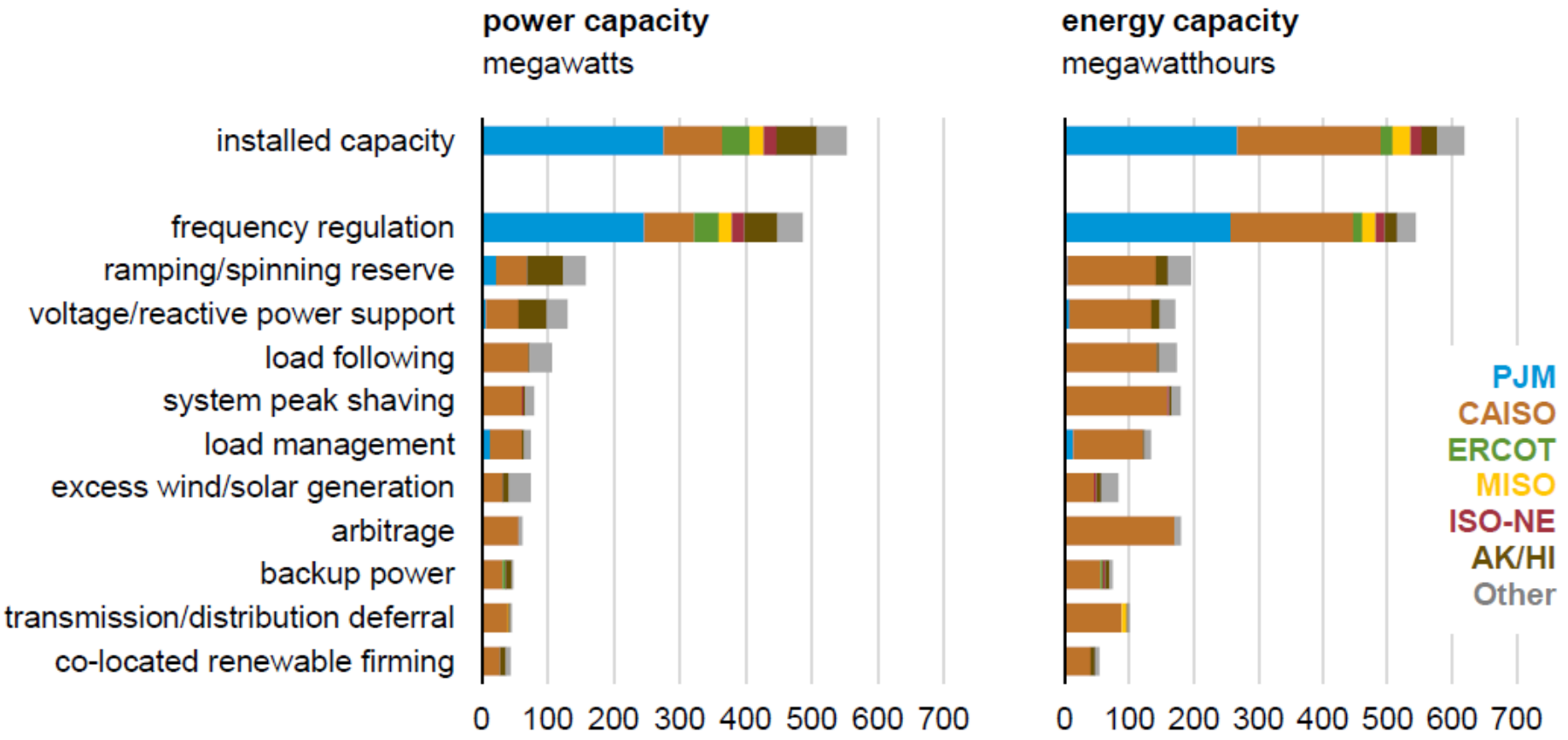
Applications of Large-Scale Battery Storage in the U.S.



Source: U.S. Energy Information Administration (EIA)

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Applications of Large-Scale Battery Storage in the U.S.

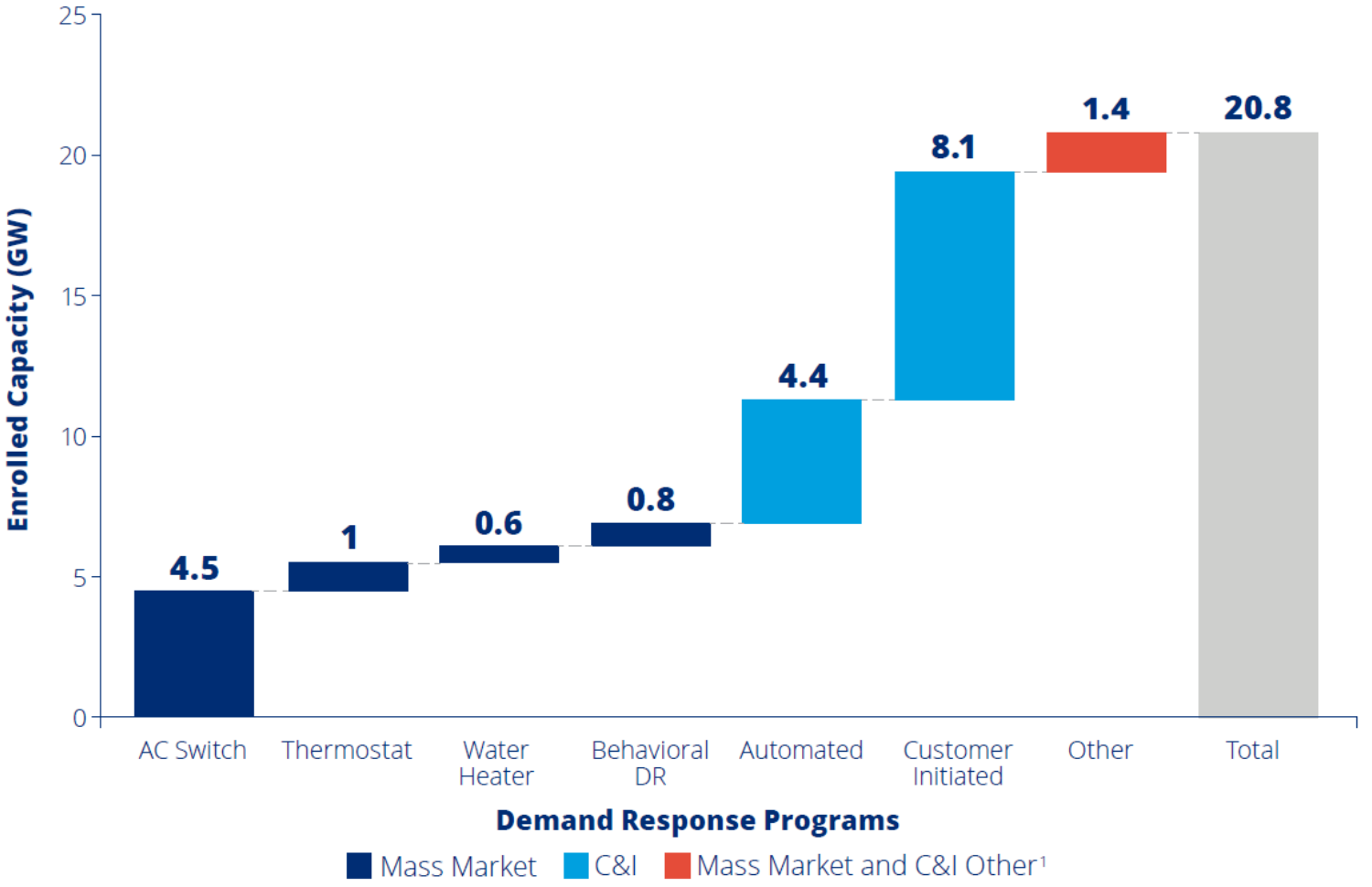


Source: U.S. Energy Information Administration (EIA)

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3 U.S. Demand Response Programs and Markets Incentivize Peak Demand and T&D Cost Reductions

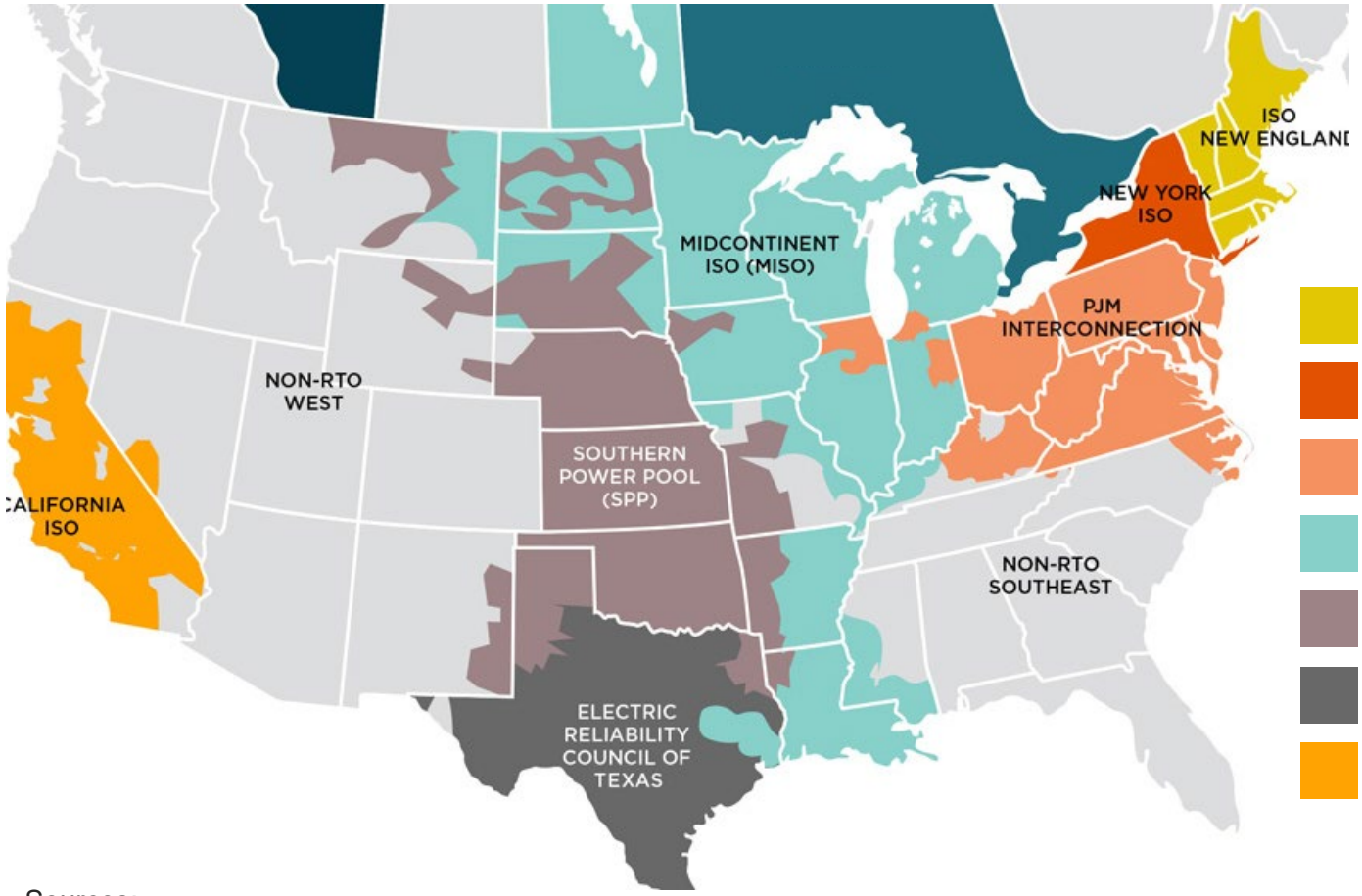
Today, U.S. Utility Companies have Contracts with Customers for more than 20 GW of DR Capacity



Source: Smart Electric Power Alliance (2019), 2019 Utility Demand Response Market Snapshot (n = 190 utility survey participants which collectively serve 64% of all US electricity customer accounts)

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Demand Response Providers Contribute more than 23 GW of Capacity to Wholesale Power Markets

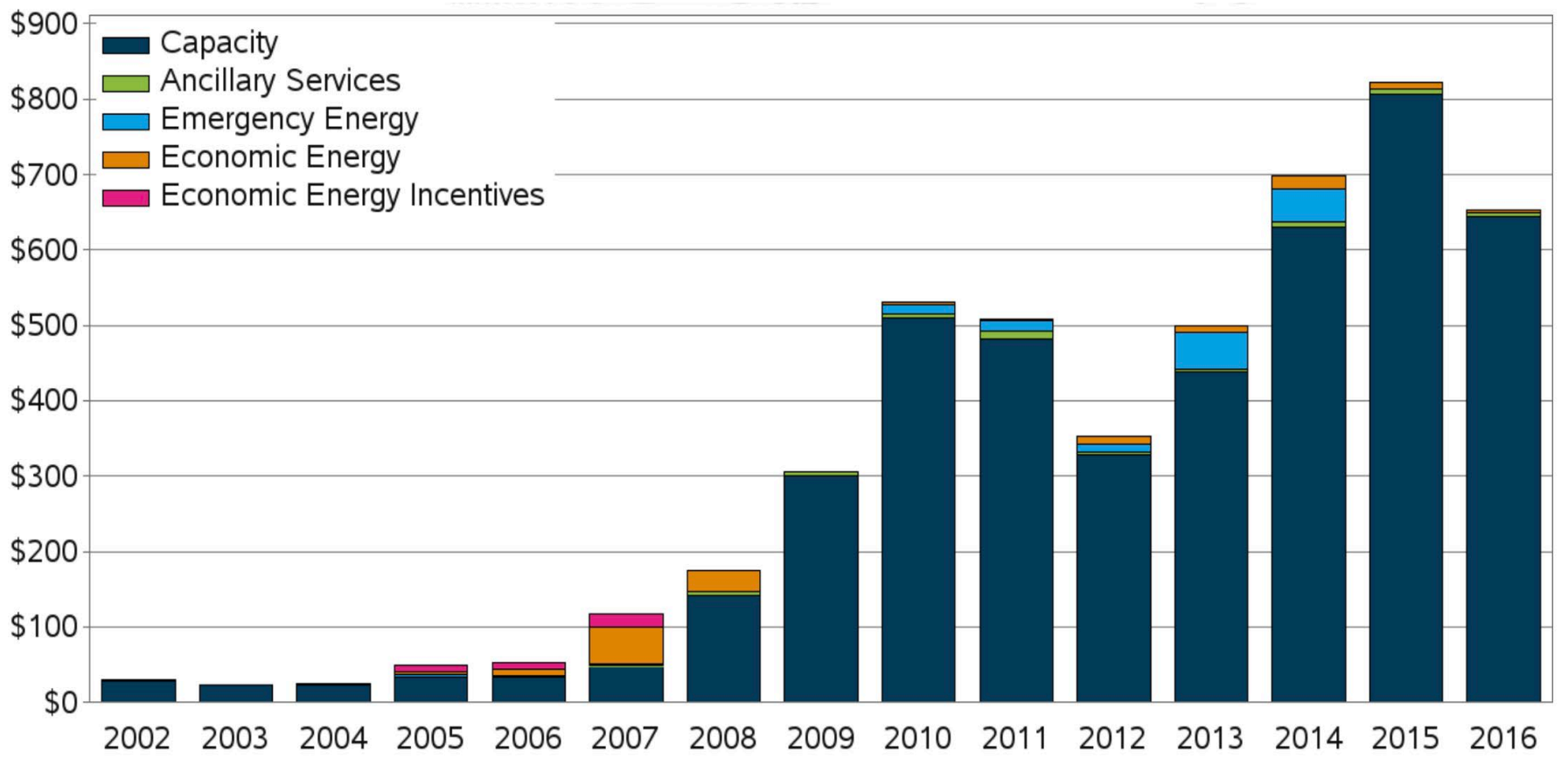


- 363 MW (1.4% of 2019 Capacity)[1]
- 1,217 MW (3% of 2019 Capacity)[2]
- 10,449 MW (6% 2019 Capacity)[3]
- 7,372 MW (5% 2019 Capacity)[4]
- N/A
- 2,329 MW (3% 2018 Capacity)[5]
- 1,700 MW (3.5% 2018 Capacity)[6]

Sources:
[1]ISO-NE. (2019). Demand Resources Working Group Monthly Report.
[2]NYISO. (2019). Special Case Resources Monthly Report.
[3]PJM. (2019). 2019 Demand Response Operations Markets Activity Report: September 2019.
[4]MISO. (2019). 2019/2020 Planning Resource Auction (PRA) Results.
[5]ERCOT. (2018). 2017 Annual Report of Demand Response in the ERCOT Region.
[6]California ISO. (2018, page 42). Annual Report on Market Issues and Performance.

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Most of the Wholesale Market Revenue for Demand Response is Earned Through Capacity Markets



Source: PJM (2017). Markets Report. Webinar delivered on January 23, 2017 by Jennifer Warner-Freeman.

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