

KEY INSIGHTS ON ENERGY STORAGE

Jesse D. Jenkins

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**Massachusetts
Institute of
Technology**

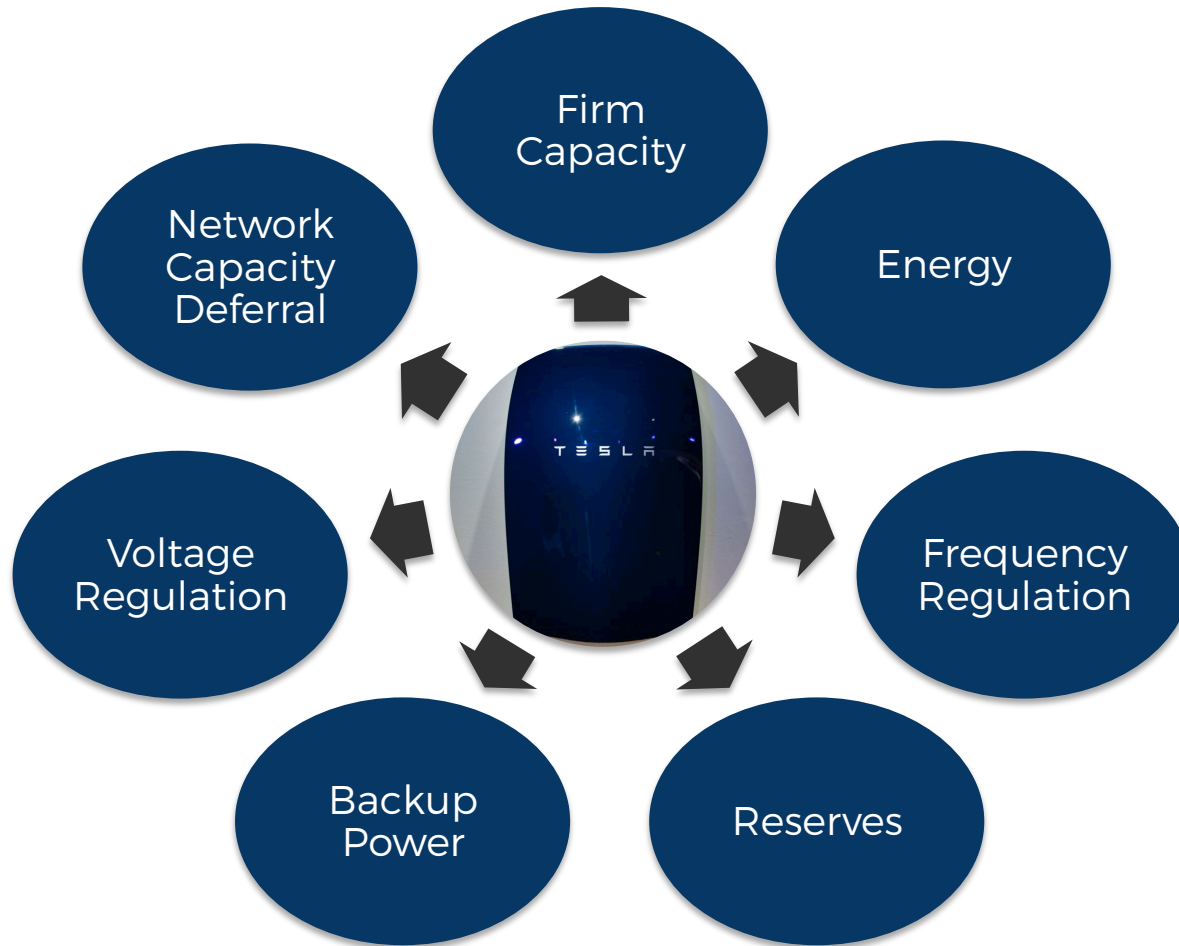


UTILITY OF THE FUTURE

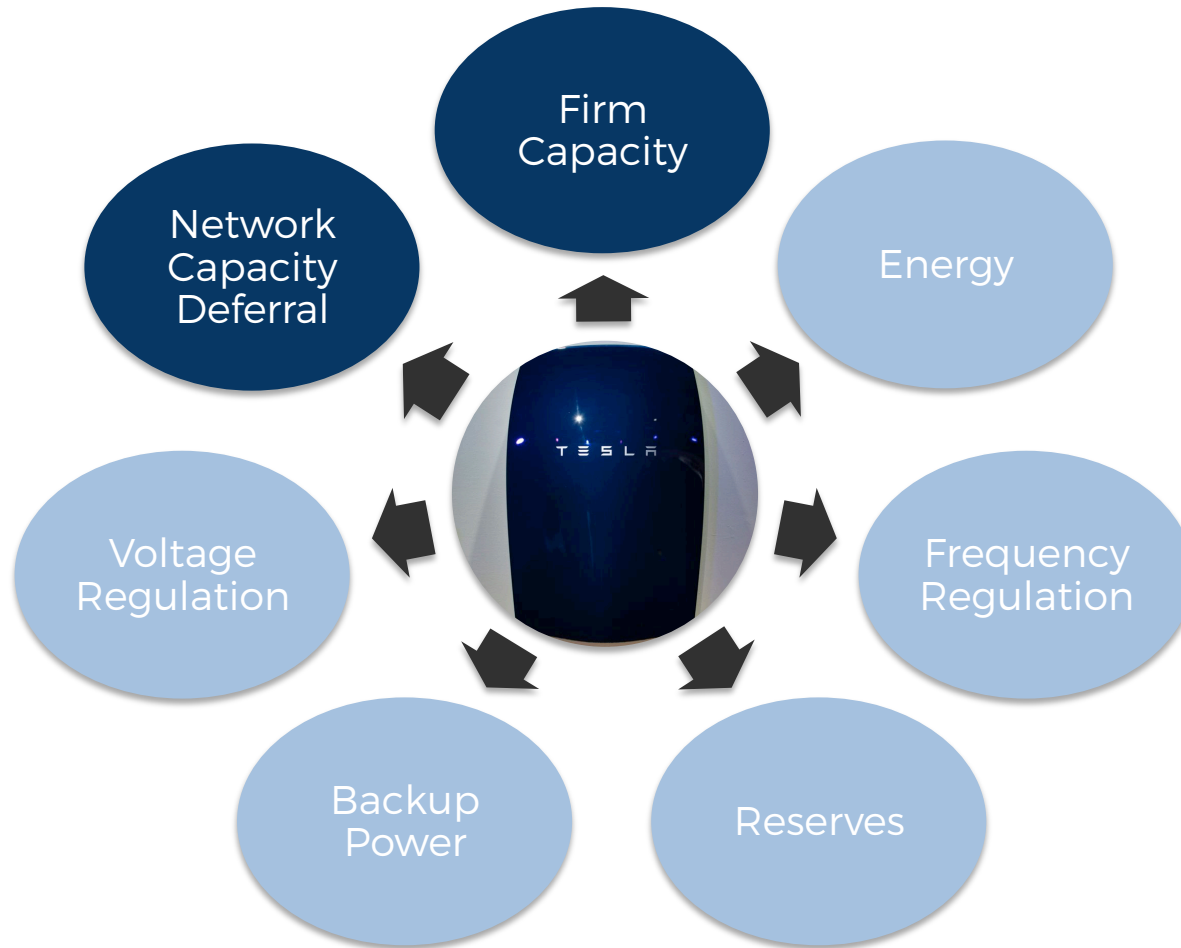
Understanding how distributed energy resources are changing
the provision of electricity services

Full report available at: <http://energy.mit.edu/uof>

ENERGY STORAGE CAN PROVIDE MULTIPLE SERVICES



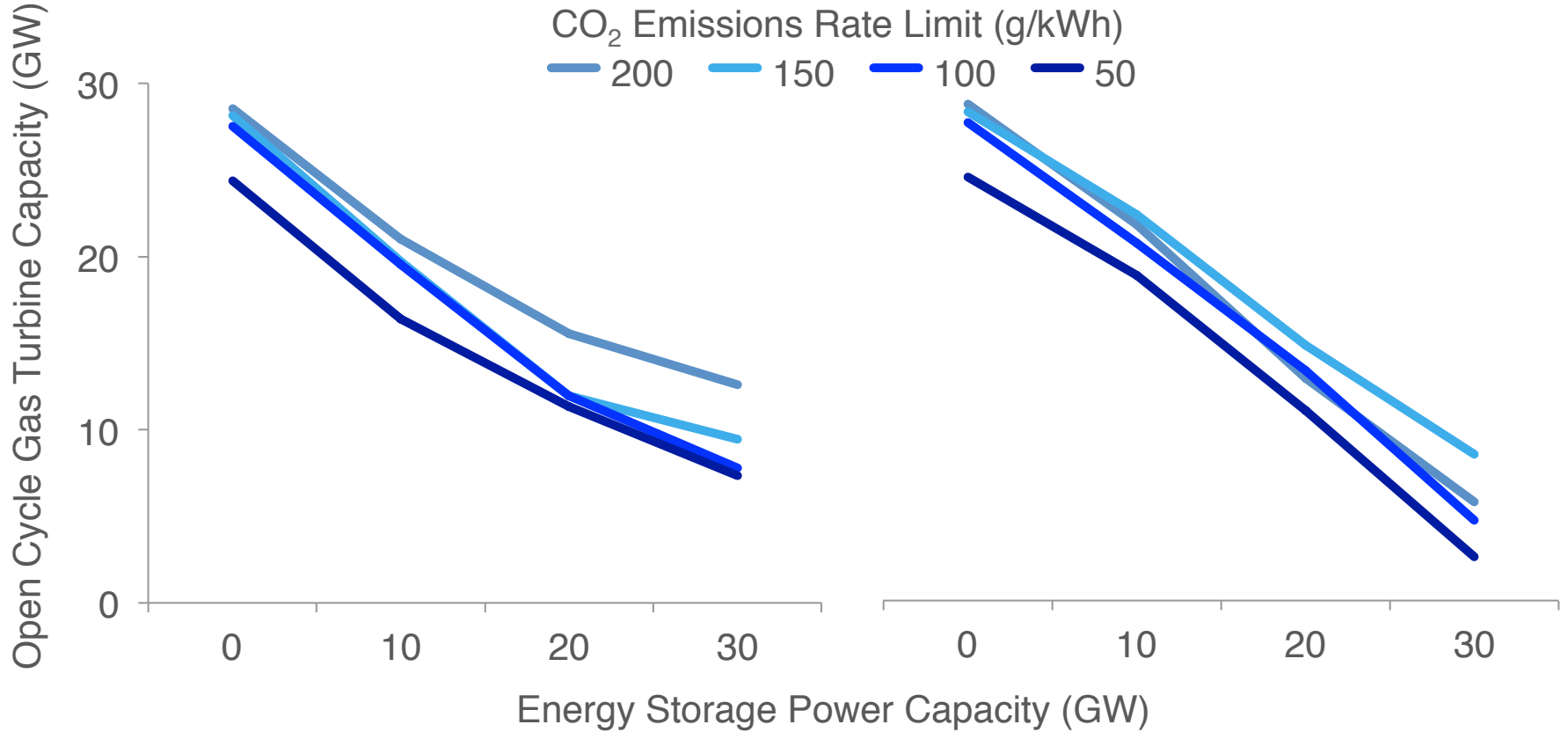
BIG PLAYS ARE CAPACITY PLAYS



STORAGE IS A STRONG SUBSTITUTE FOR PEAKERS

2-hour storage, Texas case study

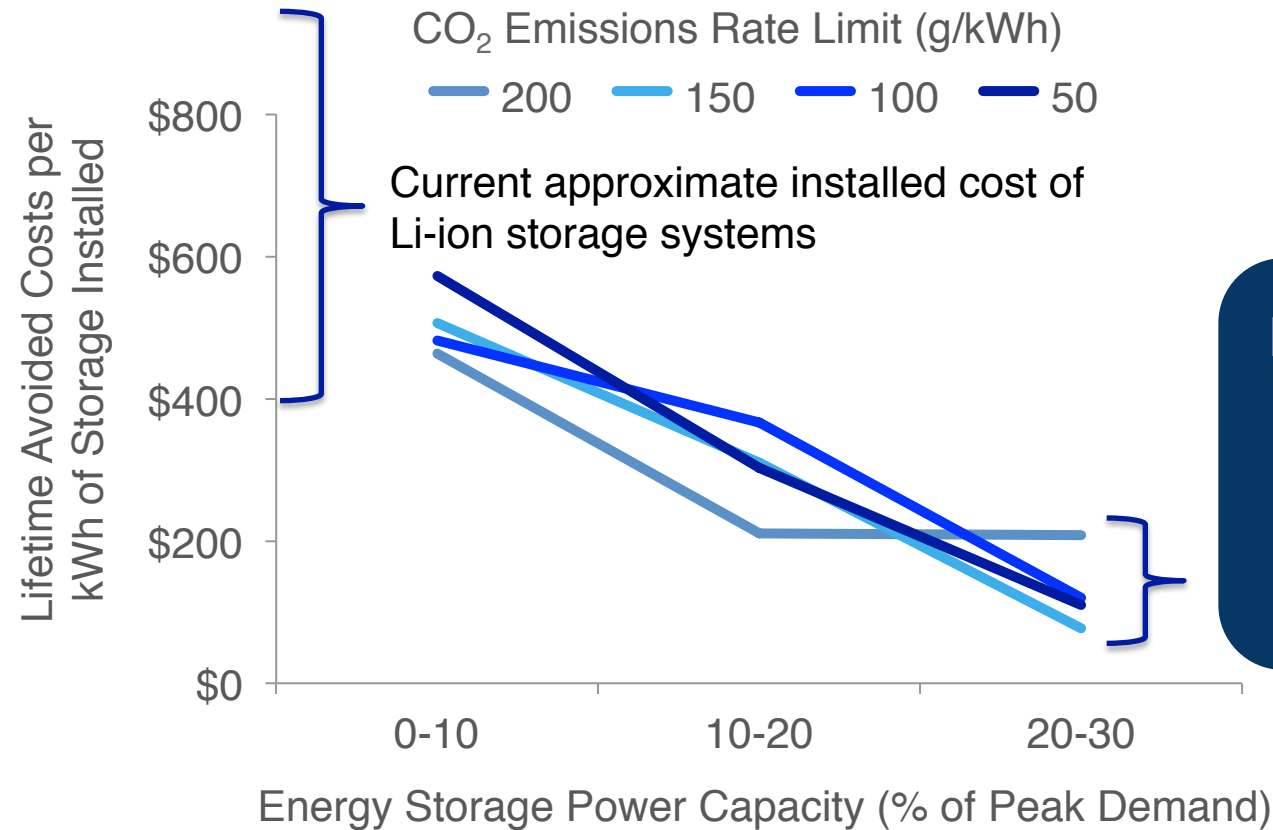
10-hour storage, Texas case study



Graphic is author's own created with data from: de Sisternes, Jenkins & Botterud (2016), "The value of energy storage in decarbonizing the electricity sector," *Applied Energy* 175: 368-379.

VALUE OF STORAGE FALLS STEADILY WITH SCALE

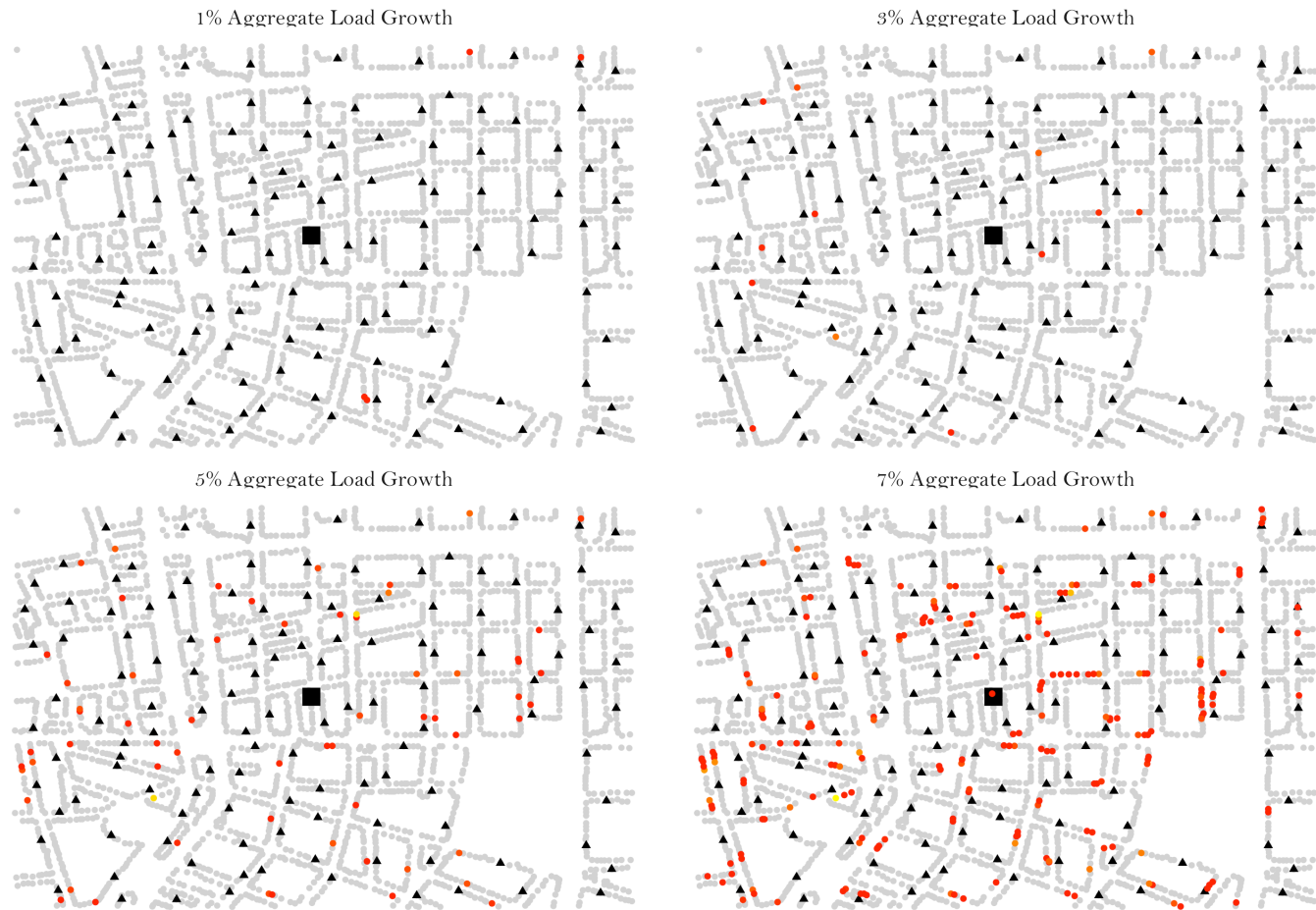
2-hour storage, 10-year asset life, Texas case study



Marginal value of storage falls 60-85% as installed capacity increases from 10% to 30% of system peak demand

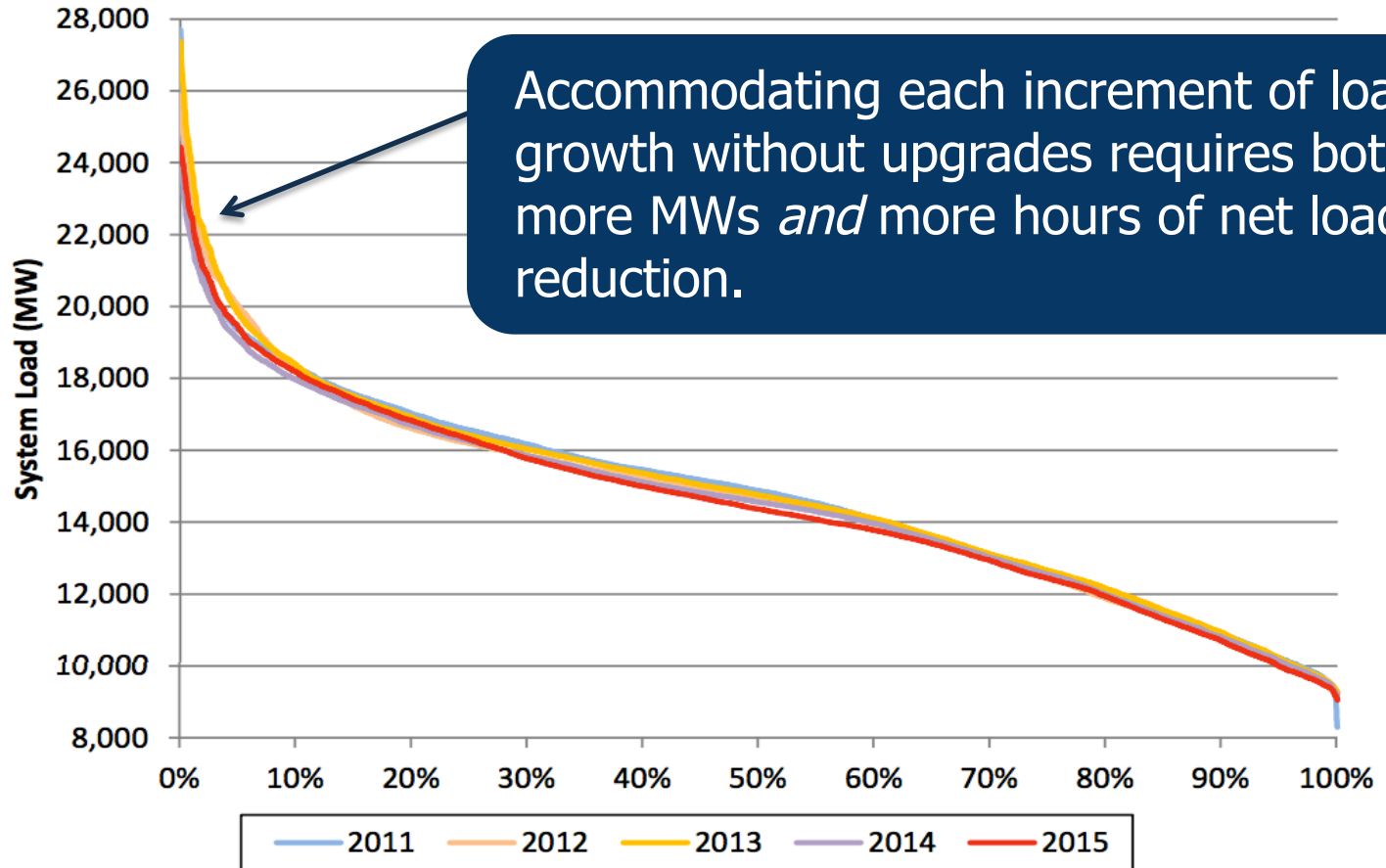
A “NON-WIRES” ALTERNATIVE TO NETWORK CAPACITY?

If ideally sited and operated, small reductions in peak net withdrawals can accommodate modest growth in peak demand without any additional distribution network investments. Storage is well suited to this role.



DECLINING MARGINAL VALUE: MORE HOURS

Load duration curve for ISO New England, 2011-2015, all hours.



Source: ISO New England (2015), "ISO New England's Internal Market Monitor 2015 Annual Markets Report."

ECONOMIES OF SCALE STILL MATTER

Economies of unit scale vs locational value

Utility
Scale



C&I Scale



Residential Scale

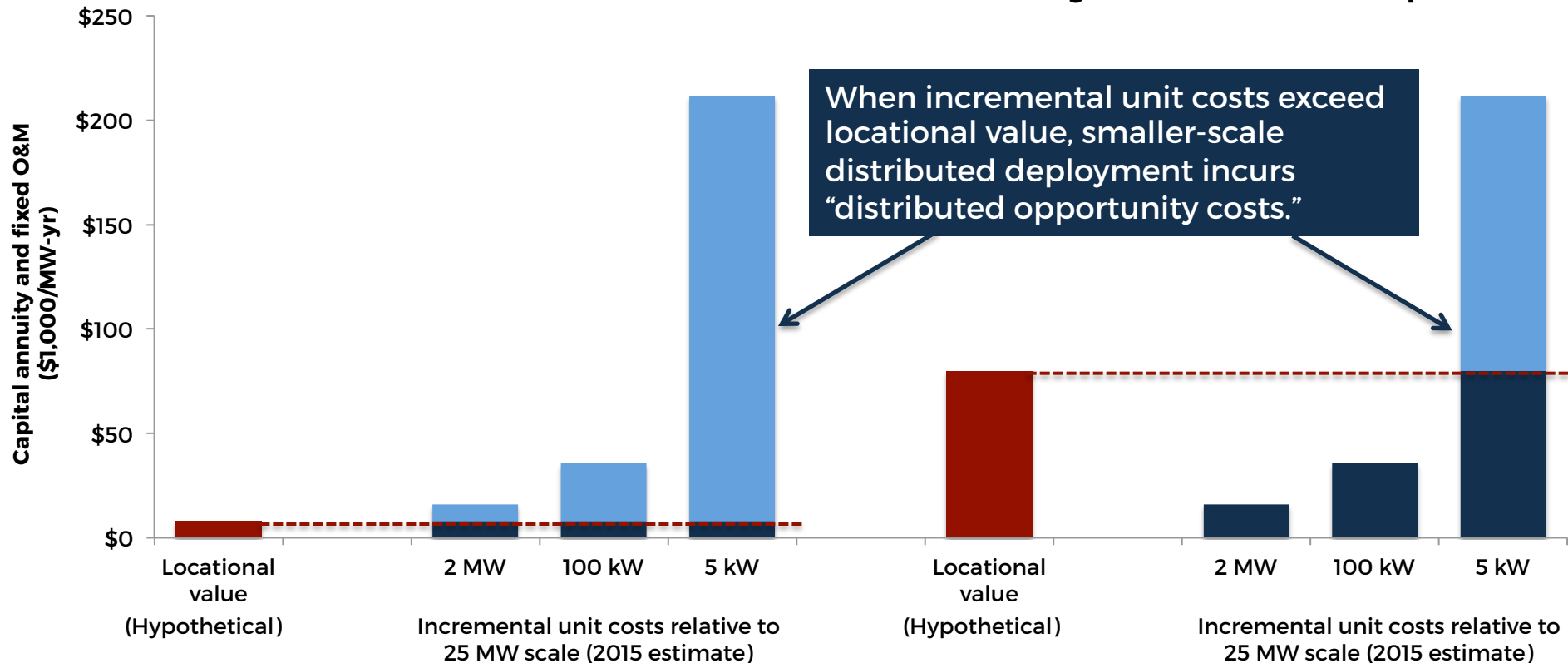


DISTRIBUTED OPPORTUNITY COSTS

Comparison of 2015 estimated incremental unit costs for Li-ion energy storage systems (1:2 power:energy ratio) vs. *hypothetical* locational values.

a. Low locational value case

b. High locational value example



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Questions



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