Jupiter POWER

Jupiter Power Comments to DOER & E3 Storage Study

SEPTEMBER 1, 2023

Storage made strategic

Comments

- Background on Jupiter Power
- Context of Study—Prior Studies of Grid Resiliency
- Winter resiliency in the Boston load pocket in 2030s needs more attention
- Inherent flexibility of SDES/MDES relative to LDES and resulting structural cost advantages requires more attention

About Jupiter Power

Jupiter Power is an independent power producer that provides energy management and reliability services to local electric grids.

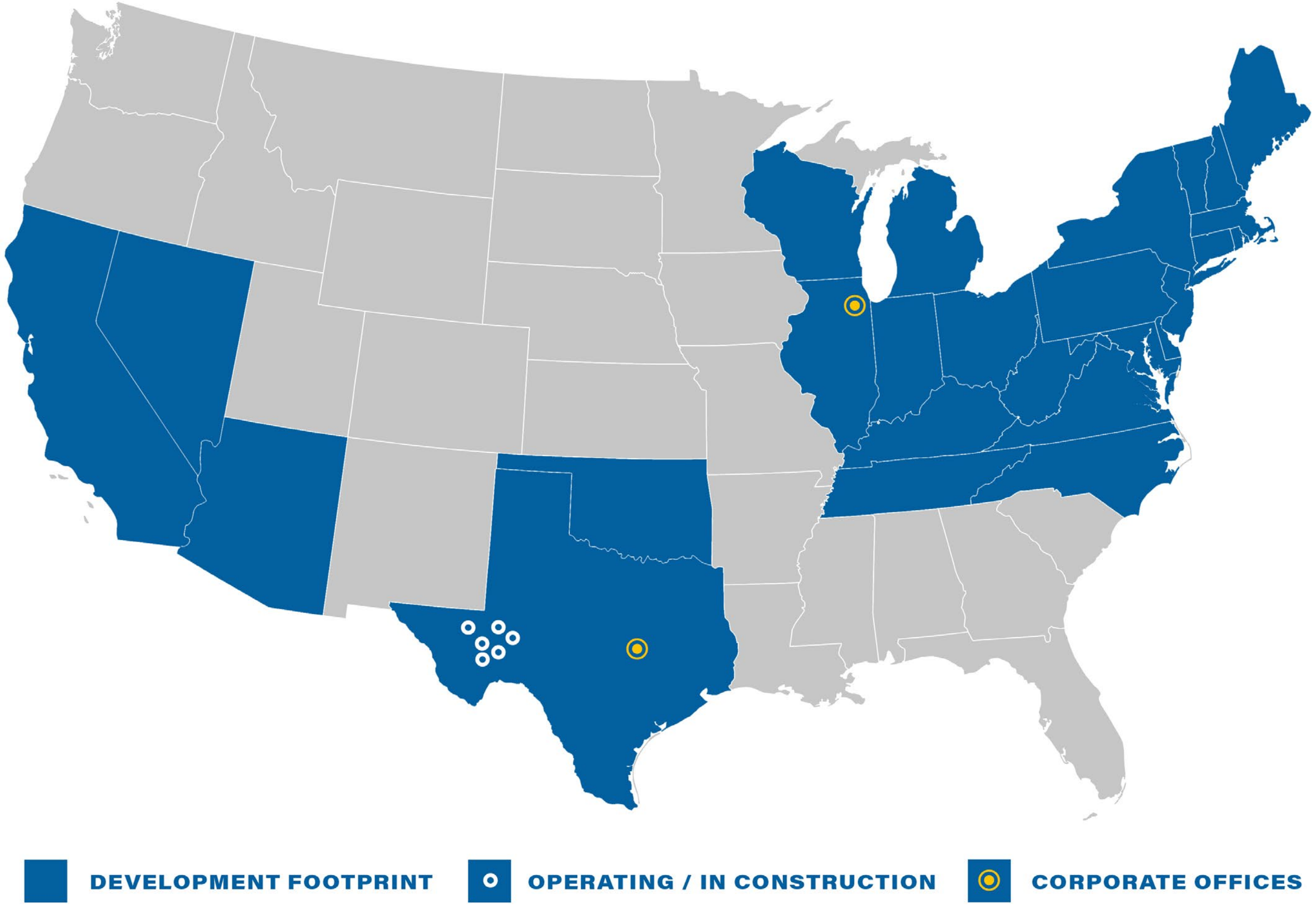
Jupiter Power was founded in 2017 and was acquired by BlackRock Alternatives in 2022. Jupiter is led by a management team with over 75 years of combined experience in the power industry.

Our Projects

Jupiter's fleet of assets in operation and construction includes the largest energy storage fleet in Texas and one of the largest development pipelines in the country – sixty projects totaling over 12,000 megawatts.

Jupiter's current fleet uses lithium-ion technology based on current costs and performance, but Jupiter is open to other and new battery technology platforms and system durations when cost-effective.

Jupiter's pipeline is well over 1,000 MW in New England



The DOER/ E3 Study Needs Greater Reference to Prior Studies

- The current study is useful but the outputs and focus risk removing attention from potential shortfalls in the 2030-2035 period that require immediate policy efforts. Key past studies include:

- The 2014 Polar Vortex Fuel Security Analysis, and
- The Future Grid (FGRS)“Matrix 1” Resource & Load Scenario, and
- Cape Cod Resource Integration Study and need for 3,300MW+ OSW into Boston

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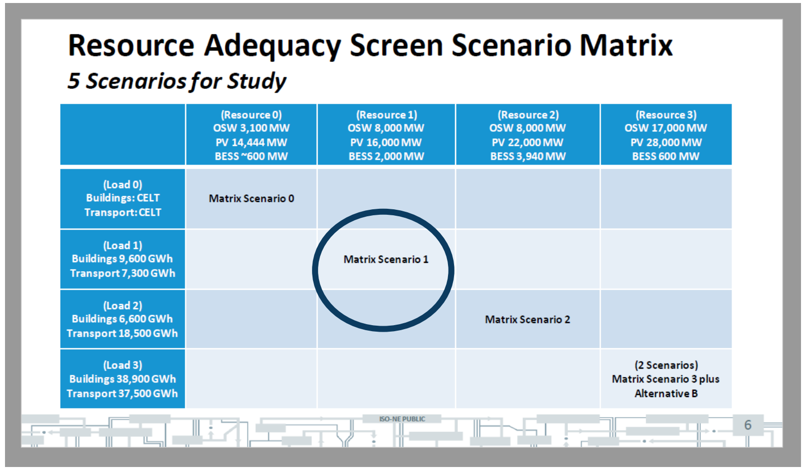

Resource Adequacy Screen Scenario Matrix

5 Scenarios for Study

	(Resource 0) OSW 3,100 MW PV 14,444 MW BESS ~600 MW	(Resource 1) OSW 8,000 MW PV 16,000 MW BESS 2,000 MW	(Resource 2) OSW 8,000 MW PV 22,000 MW BESS 3,940 MW	(Resource 3) OSW 17,000 MW PV 28,000 MW BESS 600 MW
(Load 0) Buildings: CELT Transport: CELT	Matrix Scenario 0			
(Load 1) Buildings 9,600 GWh Transport 7,300 GWh		Matrix Scenario 1		
(Load 2) Buildings 6,600 GWh Transport 18,500 GWh			Matrix Scenario 2	
(Load 3) Buildings 38,900 GWh Transport 37,500 GWh				(2 Scenarios) Matrix Scenario 3 plus Alternative B

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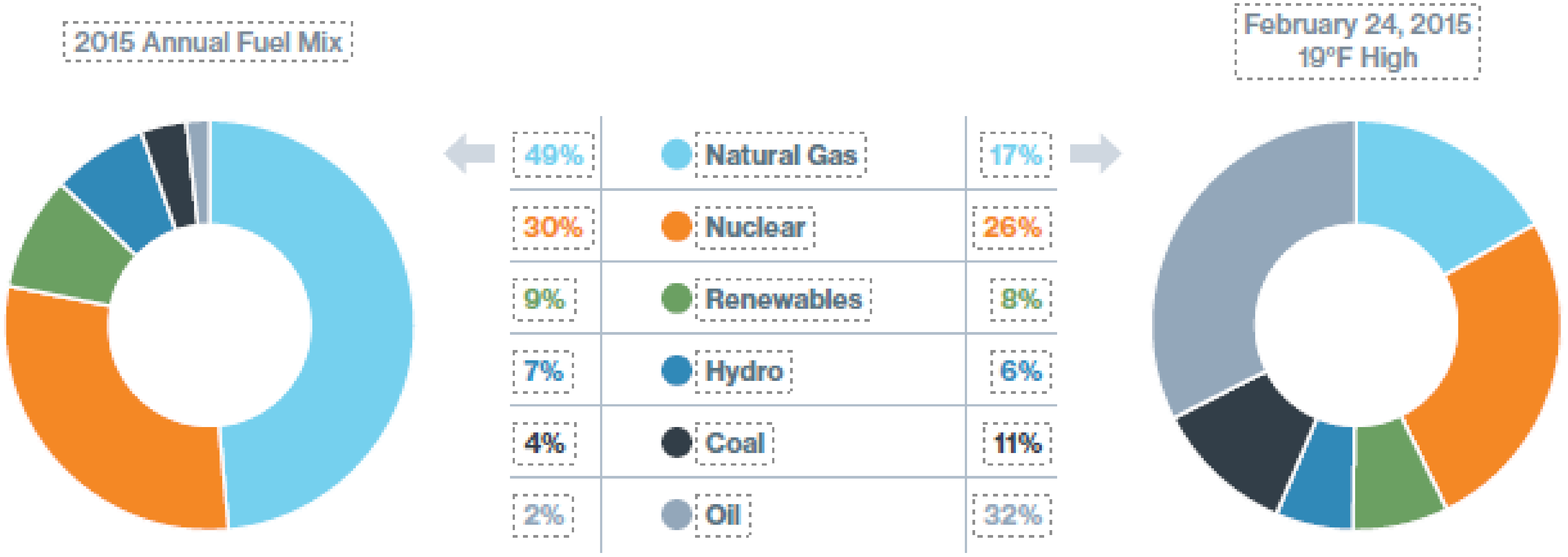
Boston Region Winter Resiliency is a Long-Standing Problem

ISONE 2018 Operational Fuel Security Analysis (Jan 2018)

“Fuel-security risk—the possibility that power plants won’t have or be able to get the fuel they need to run, particularly in winter—is the foremost challenge to a reliable power grid in New England.”

Figure 1: 2015 Annual Fuel Mix Compared with Day of Highest Coal and Oil Generation in 2015



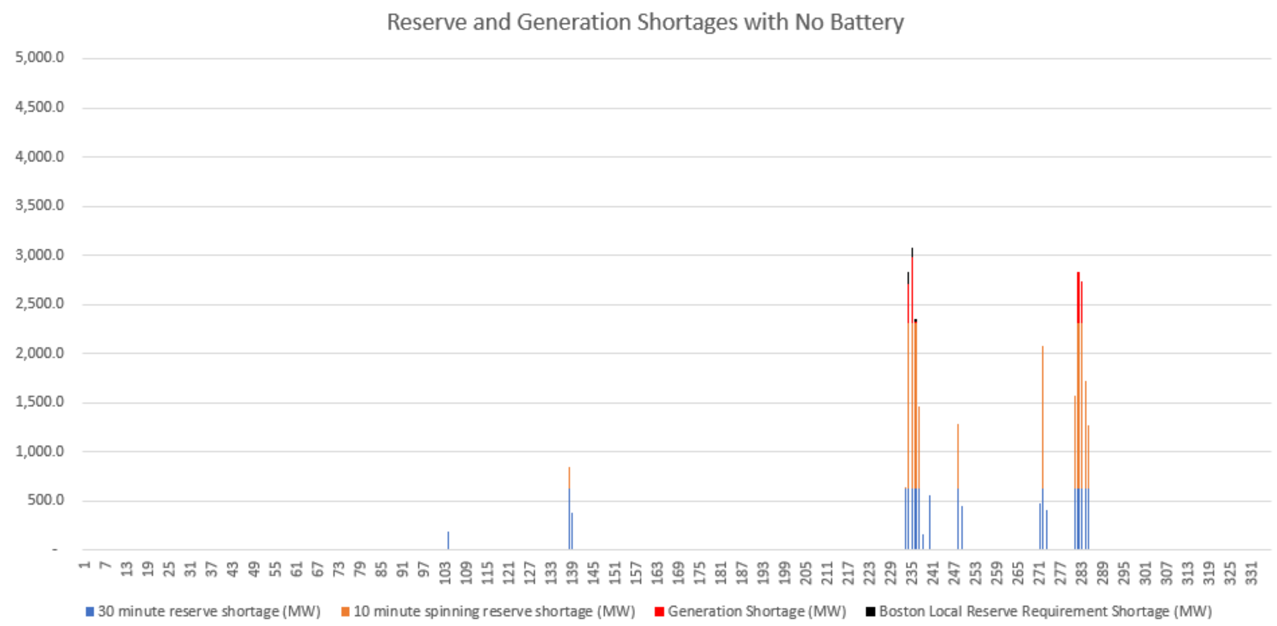
Source: ISO New England, 2000-2015 Net Energy and Peak Load by Source and Daily Generation by Fuel Type 2015

Jupiter Power Commissioned Daymark to Study Battery Performance During Winter Vortex Event

- Jupiter commissioned Daymark to integrate these historic studies to assess potential winter needs for battery storage in Boston load pocket
- Assessed FGRS “Matrix 1” 8,000 MW offshore wind, 6,000 MW PV, 2,000 MW BESS, 9,600 GWh building electrification, 7,300 MWh EV load in context of two-week polar vortex and Cape Cod resource integration limits
- Both HVDC direct from OSW into Boston and Boston 4-hour storage found to be critical to reducing load shedding events
- Focused Study Year 2030

Winter Resiliency: Study Results Find Major Problems in 2030

- Daymark Study finds 5 winter load shedding events in 2-week period in Boston load pocket without batteries (OP-7)
- 2,055 MWh of firm load shedding—almost 40% of Boston (NEMA) load
- Also 20 events of 30-minute spinning reserve shortages in Boston load pocket (OP-4)



Winter Resiliency: Boston Batteries + HVDC resolve firm load shed

Solution:

- 700 MW of 4-hour duration batteries in load pocket, plus
- 3300 MW of HVDC cables direct from offshore wind into Boston

Results:

- Elimination of OP-7 generation shortages (firm load shedding)
- 25% reduction in 30-minute reserve shortages

4-hour storage is helpful during polar vortex events because of ability to recharge during the vortex window, unlike LDES which is "one and done." E3 has identified this phenomena (p. 33, "SDES ELCC is less sensitive to amount of renewable generation as it…requires less energy to recharge") and needs to draw appropriate conclusions from the finding.

Real Estate Nexus

- When evaluating the need to ensure appropriate energy storage units are sited within the Boston load pocket, policymakers also need to consider relative real estate values.
- Real estate costs in the Boston area can be 5x-10x or more of those in other parts of the state
- When developing energy storage projects in the Boston area, the real-world limit is the availability of large, appropriate, permittable real estate sites near substations that can handle additional charging and discharging associated with BESS
- If policymakers need energy storage in the Boston area, they need to specify it in procurement efforts

Recommendations #1

- DOER should establish bonus Clean Peak Credits for Boston Load pocket to encourage investment in region of state that is otherwise cost-prohibitive
- Policy attention to needs for energy storage ~2050 should complement but not replace more pressing needs
- DOER should also focus attention on long lead time need for HVDC OSW delivery into Boston
- E3 Study Comment: On page 25 of the draft report, where “the greatest resource need, and loss-of-load risk, occurs from 5-7 pm in the summer months,” did the E3 study evaluate extreme weather events/ overlook polar vortex events such as 2013 in the Boston load pocket? If so, E3 should create and study a polar vortex scenario. Not doing so will limit the usefulness of the study.

Inherent flexibility of SDES/MDES relative to LDES and resulting structural cost advantages requires more attention

- LDES can also be understood as low-capacity storage. The highest value periods of typical diurnal peak pricing are of relatively short duration, 1-2 hours currently, perhaps broadening to 1-4 hours as renewable penetrations increase. BESS systems that are low capacity/ mid-to-long duration typically cannot and will not fully utilize their MWh range on a daily basis, unlike short-to-mid duration systems. This both limits LDES utility and adds costs.
- A hypothetical Massachusetts battery fleet of 40,000 MWh that is comprised of 10,000 MW of 4-hour duration batteries would have more flexibility to supply both capacity and duration to the grid than a 4,000 MW fleet of 10-hour duration batteries. The 10,000 MW fleet of 4-hour systems would be able to provide 4,000 MW over 10 hours, or 10,000 MW over 4 hours, but the 4,000 MW 10-hour fleet would only be able to provide 4,000 MW of maximum capacity, limiting its usefulness during a capacity crunch, and inhibiting its ability to recover costs on a daily basis.
- As a result, long duration storage will require much higher policy-based payments to achieve acceptable financial returns than short duration storage.
- This dynamic will not change over time.

Revenue competition between SDES and LDES is not temporary

- The E3 deck on slide 42 indicates that "in the near term, until high levels of renewables or binding carbon targets, LDES must compete with other dispatchable technologies or short duration storage," however, this is not accurate or relevant in the context of SDES versus LDES. Although high renewables penetrations and binding carbon targets will reduce competition with fossil dispatchable units with LDES, neither high levels of renewables nor binding carbon targets will reduce competition with SDES.

Real Estate Nexus #2

- As previously noted, real estate in the Boston area is much more expensive than elsewhere in the state, and the availability of large, appropriate, permittable sites near viable grid substations is the true limit on energy storage development in the region.
- Additionally, we now note that LDES technologies are much lower energy density in terms of the total MWh deployable per acre. If valuable Boston area sites are allocated to low density LDES technologies, not only will the system cost per MWh be higher, but the total MWh of storage available in the Boston area will be less than if allocated to SDES/MDES sites.

Recommendations #2

- Massachusetts policymakers should focus on incentivizing the maximum MWh of total battery installations, not picking winners and losers between short duration and long duration technologies
- To meet needs identified as “long duration” in the E3 study, with a sufficient supply of SDES/MDES units, market dispatch will evolve over time to effectively shape and “stretch” competing SDES/MDES units to dispatch sequentially rather than simultaneously when needed
- If for some reason markets do not evolve , Massachusetts DOER can more cost-effectively shape Clean Peak Credit rules (to ensure that multiple SDES units dispatch sequentially instead of simultaneously when needed) rather than procure long duration storage systems that are largely idle for long periods of time
- In Massachusetts, the real limit on battery system deployment is the combination of viable interconnection locations and available, permittable real estate. Given the high cost of Massachusetts real estate near viable substations, the Commonwealth cannot afford to inefficiently prioritize such sites to lower energy density LDES over total BESS MWh

JUPITER POWER 200 MW BESS
WITH POWER SUBSTATION
CROSETT, TEXAS