

MADRI: Battery Storage

July 18, 2019

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Business Solutions

Current Centrica Investments

- Constructed and operate:
 - A large battery storage asset, 49 MW (c. 25MWh) at Roosecote in North England, on a site of an old gas station. In front of the meter
 - 2 batteries totalling 1 MW on our Windsor office site (BTM)
- Operate and optimise some assets on customer sites, including a 3 MW (3 MWh) battery on behalf of Gateshead council (North East) (BTM)
- 90 kw - Cornwall – 2 kw paired with solar
- Terhills, Belgium, partnering with Tesla – 18.2 MW – solar PV and CHP
- NREL project to combine new and used batteries to reduce cost and enhance battery efficiency

Why use Battery storage: Because our customers want it!

- Ensure ability to run during power outage
- Pair with renewable resources to improve generation flexibility
 - CA duck curve
- Leverage market incentives to manage power use
 - Manage peak load
 - Others may use for capacity revenue
- Limit the need for more conventional generation and transmission upgrades

Uses and Types – Data from Lazard study

- Utility grid
 - Rationalizes solar investment
 - Transmission and distribution asset
 - Defer investment
- Commercial/Industrial Wholesale
- Commercial/Industrial Retail
 - Stand alone (cost prohibitive at this point) (in the thousands)
 - With Solar
 - Residential with solar

Investment Considerations/Value Stacking

- Distribution rates
 - Charging costs
 - Distribution demand charges/Time of Use rates
 - Demand Response programs
 - Tax incentives and charges
 - Operational Incentives:
 - Utility tells customers it will black them out: See PG&E!
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- Market Revenues
 - Capacity reductions or contributions (BTM vs. in front of the meter)
 - Wholesale: reduce peak load
 - Retail: avoid distribution demand charges
 - Ancillary services
 - Regulation Frequency (Europe)
 - Fast start (PJM?) (in front of the meter)
 - Energy arbitrage

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- Lazard paper indicates wholesale needs 16% IRR
 - Centrica looks at this as “services” offering – not just installation of generation; pair with DERs and DR to make financial sense
 - We develop, build and then operate our battery storage investments

Order 841: Unfinished business - impediments to investment

- The Good:
 - Creates viable framework for development of battery storage
 - Encourages open access/removes barriers to entry
 - Encourages development of rational settlement rules
- The Bad:
 - Jurisdictional challenges: do we get to the Supremes?
 - Rules are still uncertain about aggregation
 - Allows RTOs to establish requirements to meet capacity definition
 - Limits on ability of third party to be in parity with PJM for Wholesale Market Participation Agreement (WMPA)
 - Enables utilities too much discretion in interconnection

Take aways

- Still some regulatory uncertainties for investors
 - Retail:
 - Utility resistance to development
 - Retail tariffs
 - RTO settlement rules
 - Wholesale:
 - Discharge requirements (e.g. 10 hours)
 - Robust ancillary services to recognize value
 - Consistent rules
- Capital costs continue to decline
- Customers looking for more control over usage and costs
- Do not need to have utilities providing the services
 - They lock in look term rates and technology; shift risks to customers
 - Do not provide the value add that third parties can provide

Thank you