NREL
Transforming ENERGY

Front-of-the Meter Battery Service Agreements

Travis Lowder
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Defining Terms

- **Service agreements** denote third-party ownership
- The **sponsor** is the battery owner and, in some cases, the operator (i.e. the developer)
- The **offtaker** is the distribution utility in FOM agreements

Tolling Agreement

- Offtaker pays for energy ($/kWh) to charge the battery
- Offtaker receives right “control” the battery, i.e., to discharge or schedule it for energy or ancillary services
  - This control is subject to operating parameters and limitations as specified in the agreement
- Offtaker pays capacity payment ($/kW) adjusted for availability and round-trip efficiency
- Offtaker also often pays variable O&M ($/kWh) for dispatches (accounting for degradation, among other things)

Capacity Sales or Services Agreement

- Sponsor pays for energy to charge the battery
- Offtaker pays for capacity attributes in fulfillment of resource adequacy (RA) obligations
- Sponsor may contract for other revenue streams and bid other services from the battery on a merchant basis, so long as these do not interfere with its ability to fulfill its obligations under CSA

Hybrid PPA

- Battery paired with RE project to get investment tax credit
  - Battery must be charged 75% from project, at a minimum. Whatever portion it is charged up to and beyond this is multiplied by ITC % (currently 26%)
  - E.g., 80% x 26% = 20.8% ITC
- Commonly structured as a typical take-or-pay contract: sponsor pays $/kWh for as-available energy with storage adder
  - Can also include a fixed capacity payment
- Dispatch authority can reside with sponsor or offtaker (or both, depending on circumstance)

Who Takes What?

- Use cases clearly defined, linked to concrete and reliable future revenue streams
- Availability
- Dispatch authority could jeopardize ITC, affect degradation
- Defining operating parameters and limitations
- Changing laws and regulations (e.g. PJM Reg D)

Pricing

- Backing out installed costs is not as straightforward with a battery as with variable generation technologies (i.e., wind and solar)
- Variable generation is commonly contracted on a take-or-pay basis, and total projected lifetime generation is a known quantity. As such, system installed costs can be roughly determined by multiplying the PPA price by lifetime generation (divide by system size to get $/W)
- Battery operation can be dynamic and services varied. Even singular capacity service payments may not reveal the whole revenue picture.
- Best avenue to determine underlying installed cost is to understand the sponsor's revenue models

Resources

- Battery Storage Laws, Regs, and Contracting
  - K&L Gates Battery Storage Handbook
- Battery Storage Costs
  - Energy Storage Technology and Cost Characterization Report (DOE 2018)
  - 2018 U.S. Utility-Scale Photovoltaics Plus-Energy Storage System Costs Benchmark (NREL 2019)
  - Annual Technology Baseline (NREL)

Thank you

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travis.lowder@nrel.gov