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EIA Energy Storage Workshop

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Outline

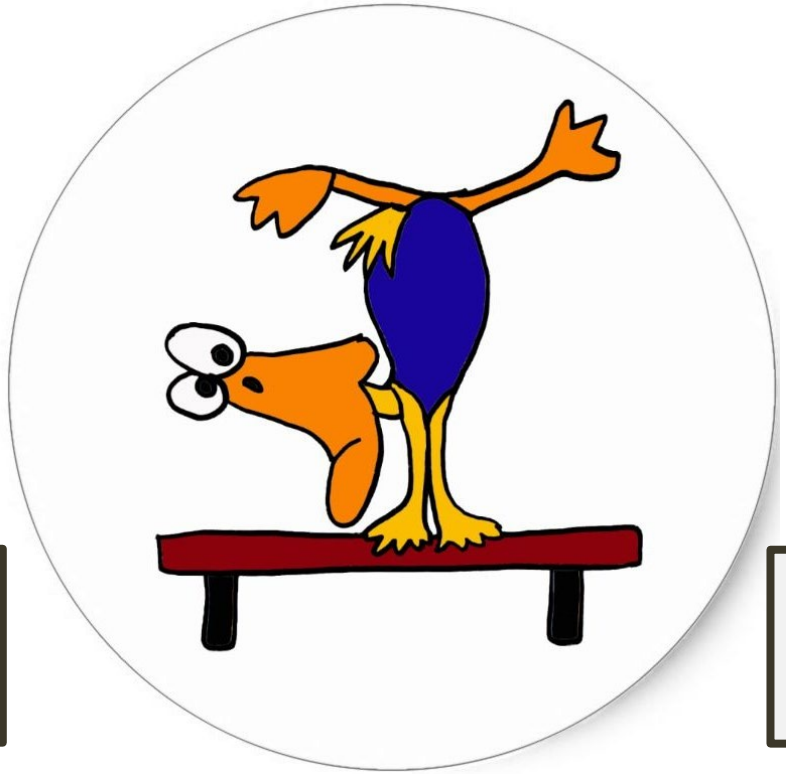
- Scope & Perspective
- Drivers
- Challenges
  - Supply
  - Revenue
  - Performance & Operation
  - Miscellaneous
- 5-Year forecast

Scope & Perspective

- Developers
  - PPAs, Energy Savings Agreements, EPC, Supply Agreements, other Material Project Documents
  - Solar/Wind/Gas + Storage
  - Stand-Alone Storage
- Offtakers
  - CCAs, MUSH, C&I, Utility Procurement
- Lenders & Other Investors
  - Construction, Term Loans, Tax Equity
  - Stand-Alone Storage and Storage+ projects

Scope & Perspective – Caveat

- Contracting Certainty
- Lender Evidence
- Facilitating Progress



- Compliance Burden
- Non-Compliance Risk
- Competitive Advantage

on the Balance ... *by tickleyourfunnybone*

Drivers

Market Drivers

- **Decreasing Costs & "Proven" Technologies**
- **Government Policies & Subsidies**
  - California Storage Mandate & SGIP
  - Investment Tax Credit for Solar + Storage
  - FERC Order Nos. 845 & 841
- **Price Arbitrage; Shared Savings Arrangements**
  - Energy Savings Agreements
  - Municipal demand charge reductions

Market Drivers (cont.)

- **Reliability & Self-Sufficiency**
  - Behind-the-meter applications
  - Supporting critical operations (e.g., AES's BESS projects at Chilean mines)
- **Renewable Integration / Grid Stability**
  - Hawaii, Chile, and S. Africa have seen development of BESS projects to stabilize and smooth renewable energy output
  - CA "shifting" solar surplus; non-RTO utilities with limited balancing resources
- **Dearth or Degradation of Existing Transmission Infrastructure**
  - National Grid RFP soliciting BESS to avoid Transformer Costs
  - "Leapfrogging" transmission infrastructure in developing nations

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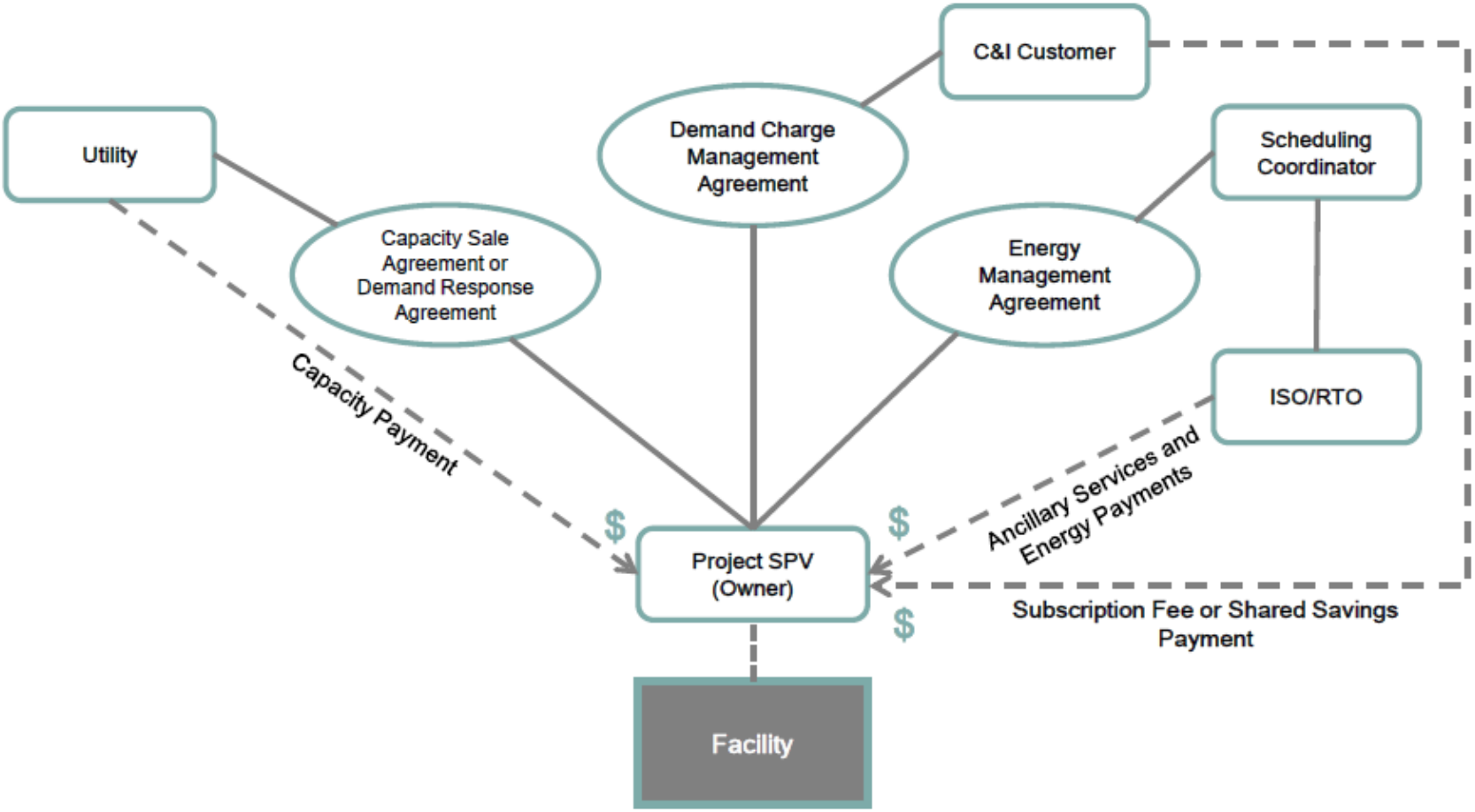
Market Drivers (cont.)

Revenue Stacking Opportunities

- Incentives + Energy + Ancillary Services + Capacity



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Drivers - Offtake Opportunities

Agreement	Counterparty	Market	Key Features
1. Capacity sale agreement	Utility	Front-of-meter	• The project company receives a fixed $/MW capacity payment in exchange for an obligation to be ready to run (charge or discharge energy to the grid) when called on by the ISO. The utility solely purchases capacity, so the project company may be able to earn additional revenue from selling energy or ancillary services.
2. Capacity sale agreement with energy put option	Utility	Front-of-meter	• In addition to capacity sales, the project company has a right to exercise a put option to sell to the utility on an annual basis all of the project's stored energy and ancillary services at a fixed $/MWh price. • Typically structured as a tolling agreement, where the utility provides and pays for all charging energy during the put period. In return, the utility has the right to charge or discharge the facility as it sees fit, 24 hours a day, 7 days a week.
3. Ancillary services financial hedge	Hedge provider	Front-of-meter	• The project company sells ancillary services to the market at the spot price. It swaps floating payments for a fixed $/MWh price calculated on a fixed volume of capacity for each settlement period. As the floating price, the swap references the market clearing price for the specific ancillary service product sold.
4. Demand response grid services agreement	Utility	Behind-the-meter	• Involves aggregation of distributed storage facilities to form a virtual power plant providing demand response service to the utility. • Typically combined with #5 below, i.e. projects may be used by customers for other applications when not providing grid services.
5. Demand charge management agreement	C&I customer	Behind-the-meter	• Power from the storage facility is used to meet peak on-site load, thereby reducing demand charges. Demand charge savings are split between the customer and project company under a shared-savings model. • Alternatively, the customer pays a fixed monthly subscription fee in return for guaranteed savings. This provides revenue certainty for the project company but eliminates upside potential.

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Drivers – Better Financing Terms

- The cost of capital is dropping for utility-scale standalone storage, based on our comparison of pricing terms in transactions we worked on in 2017 versus 2020 (see example Indicative Terms below).
- Debt service coverage ratios are also falling, signaling increased comfort with the predictability of storage revenues.

Assets	Credit Facility	Margin	Debt Sizing
Standalone front-of-meter, utility-scale battery storage (2020)	Construction/term loan	• 6.5% per annum	• DSCR of 1.1x • Max leverage of 60%
Front-of-meter battery storage co-located with utility-scale solar (2019)	Tax equity bridge loan and construction /term loan	• TE bridge loan: L + 137.5 bps • Construction loan: L + 137.5 bps • Term loan: L + 175 bps	• Construction/ term loan sized based on DSCR of 1.30x P50 and 1.00x P99 • TE bridge loan sized at 98% of TE commitment (aggressive) • Minimum sponsor equity of 10% of total project costs
Standalone front-of-meter, utility-scale battery storage (2017)	Construction/term loan	• L + 175 bps	• DSCR of 1.62x • Max leverage of 85%
Standalone, behind-the-meter, aggregated distributed battery storage (2016)	Construction/term loan	• L + 300 bps	• Debt sized based on state rebate payments for storage, contracted revenues from utility PPA and host customer agreements. • Advance rate of 60%

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Challenges

Challenges – Supply Issues

- Component Supply Constraints
  - Energy generation v. EV industry
  - Price spikes of cobalt and scarce components
  - Tariff and Import Uncertainty
    - Executive Order on Securing the Bulk-Power System
- Costs Relative to Other Generation
- Split EPC vs. Turnkey
  - Multiple equipment supply, construction and installation contracts (+ costs)
  - Interfacing (finger-pointing) risks; Lenders prefer full wrap by one “bankable” contractor
- Special software concerns

Challenges - Revenues

- Energy costs
  - Wholesale volatility on both the purchase and sell-side
  - Retail electricity costs for auxiliary load
- Revenue stacking – Ancillary Services
  - Historic prices
  - Market performance expectations
  - Non-performance fees & penalties
  - Assessing best use case(s), market, location
- Capacity Products
  - *E.g.*: PJM uncertainty and duration barriers; CA Resource Adequacy calculation issues
- Calculating Purchase Prices
  - Typically "higher of" fair market value and pre-agreed price

Challenges – Performance & Operations

- Performance
  - Round-trip efficiencies / conversion losses
  - Ramp rates
  - Degradation / Useful Life
  - Need to “up-size” and/or replace batteries
- Performance & Availability Guarantees
  - Duration
  - Cycles / Year
  - “Rest” time between cycles
- Insurance & Extra Warranties
- Interconnection
  - Congestion risk to both charge and discharge

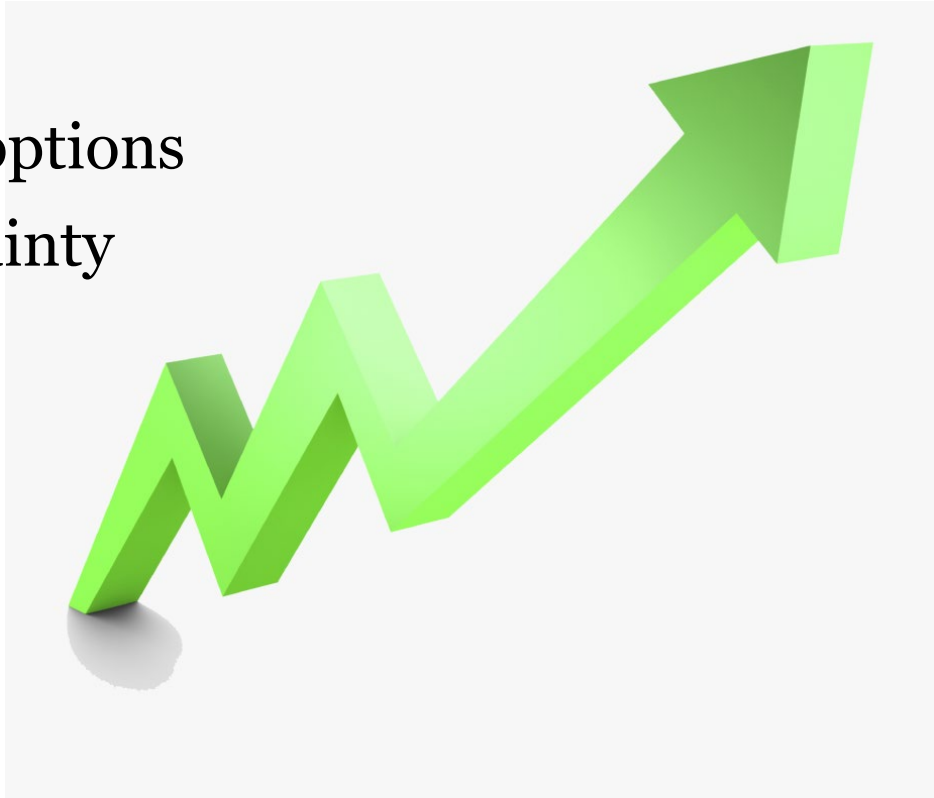
Challenges – Miscellaneous

- Education
  - Use Cases
  - Market examples
- Regulatory & Market Change Risks
- Safety
- Decommissioning & Disposal

5-Year Forecast

5-Year Forecast

- Developers: "*We want every new renewable project that we develop to have a storage component*"
- Increased financing appetite
- Better technology
- More use-cases; revenue options
- Increased regulatory certainty



Thank you!

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