Deriving wholesale market revenue opportunities and maximizing customer utility bill savings with behind-the-meter distributed energy resources (DER) – demonstration pilot

2019 Getting to Zero Forum

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Pierre Bull, Manager

Center for Sustainable Energy™

Overview

- **About CSE**
- **3 things about California**
- **CSE's distributed energy resources (DER) demonstration project**

About CSE

501(c)(3) nonprofit organization
Offering clean energy program administration and technical advisory services.

Headquarters: San Diego, CA
Regional offices: Boston, Brooklyn, Stony Brook, Oakland, Sacramento and Los Angeles

185+ dedicated, mission-driven employees
Managing ~50 projects and programs
National programs | Statewide incentive projects | Region-specific solutions

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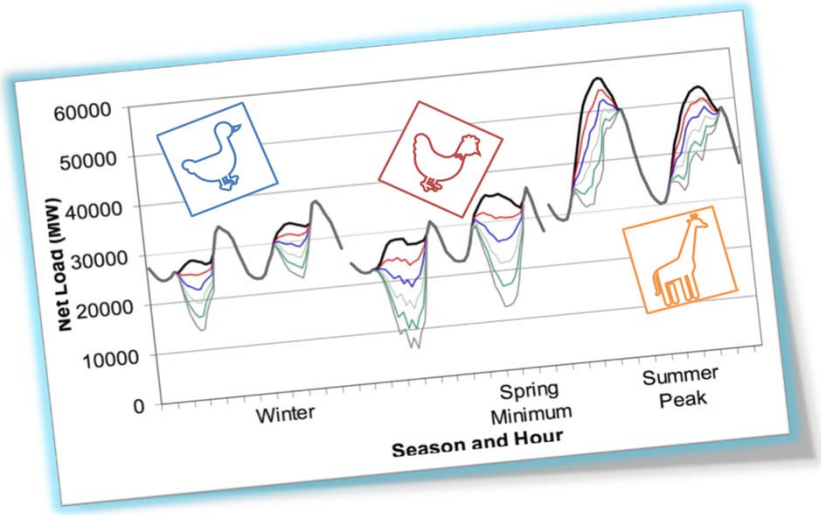
3 things about California

(1) Solar Drives California's Grid



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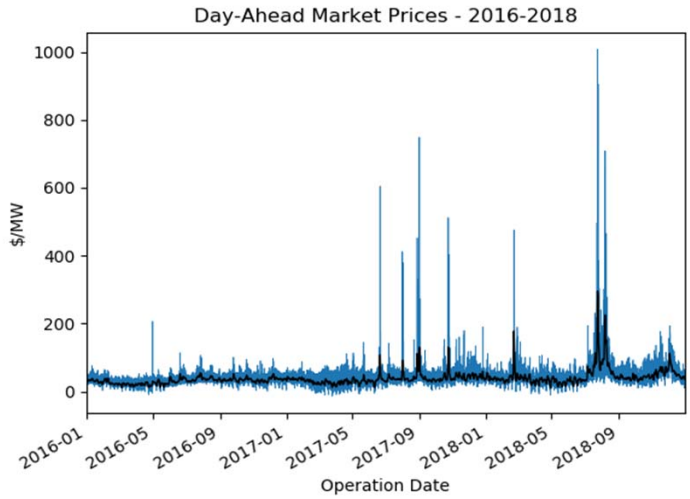
(2) Wholesale Market Volatility Increasing



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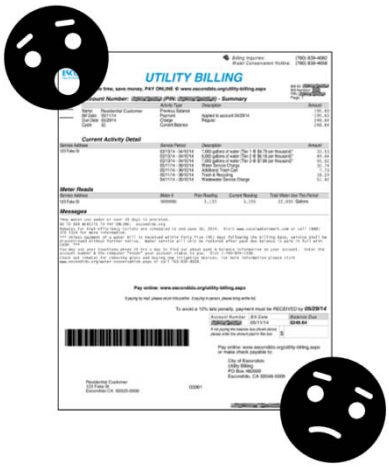
(3) Changing Electric Utility Bill [Retail Tariff]



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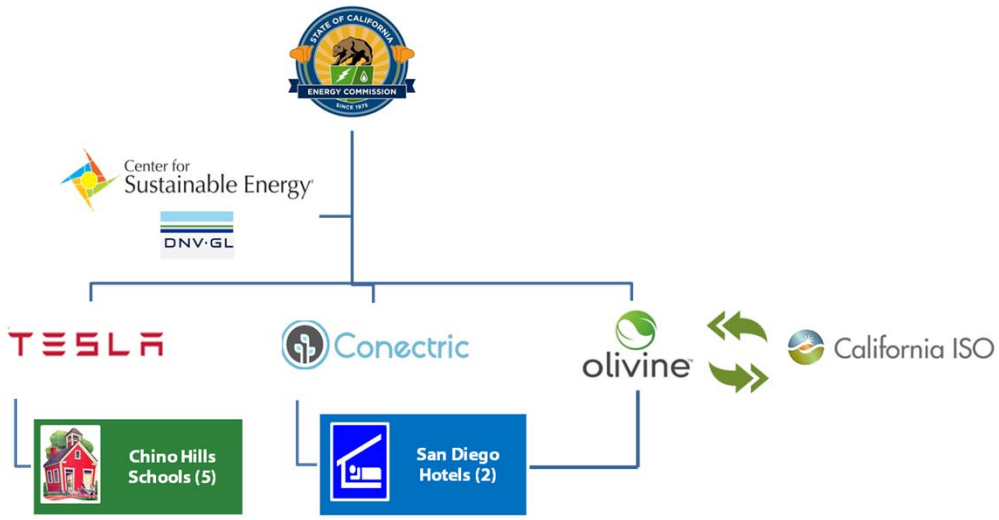
CSE's DER-to-wholesale market demonstration project

Project Partners & Structure



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Why Hotels and Schools

California: Service industry economy

Schools

- Typically located in residential grid circuits
- Ample space [solar + storage]
- Community visibility

Hotels

- Mimic residential electricity demand profile
- Unique business and customer challenges

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Project Goals

- Bypassing electric utility demand response programs, show how behind-the-meter DER can participate in California's wholesale electricity market
- Establish a market participation blueprint for interested technology vendors and customers
- Shed light on current constraints and tensions that lie between customers' retail utility bill savings versus wholesale market revenue opportunities.
- Identify and recommend policy, program and market improvements.

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Tesla Batteries at Chino Hills Schools

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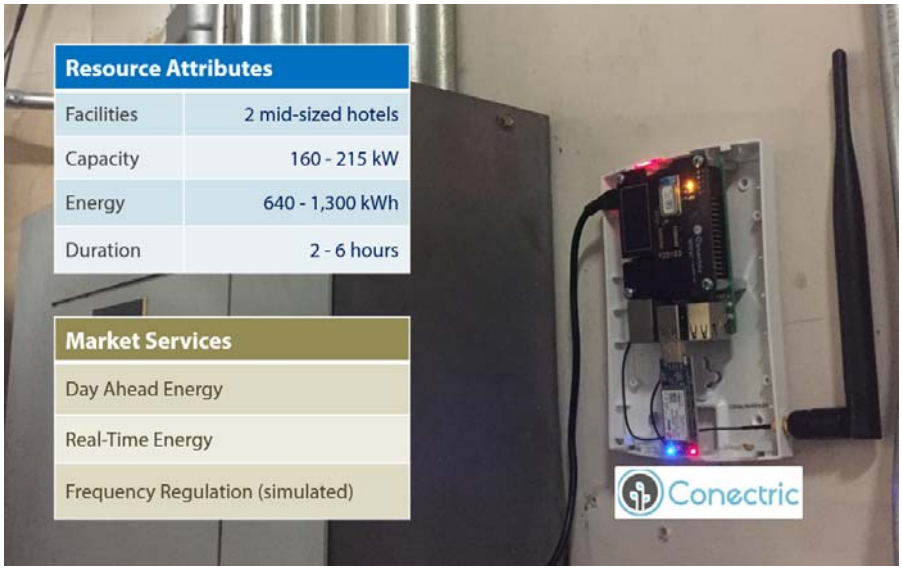
Conectric Networks IoT at Hilton Hotels in San Diego



Resource Attributes	
Facilities	2 mid-sized hotels
Capacity	160 - 215 kW
Energy	640 - 1,300 kWh
Duration	2 - 6 hours

Market Services
Day Ahead Energy
Real-Time Energy
Frequency Regulation (simulated)

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Conectric Networks IoT at Hilton Hotels in San Diego

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Operational Strategies

Tesla's Battery Packs at Schools

- Avoid utility bill demand charges
- Decrease electric grid use during higher-rate evening time-of-use block (i.e., 5:00 – 9:00pm)
- Perform demand response and spinning reserve when market prices exceed price-optimization thresholds

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Operational Strategies

Conectric's IoT in Hotels

- Avoid utility bill demand charges
- Shift loads away from higher-rate evening time-of-use block (i.e., 5:00 – 9:00pm)
- Perform demand response by pre-cooling common areas, vacant rooms, and shift the timing and frequency of certain pumping and air-circulation equipment.

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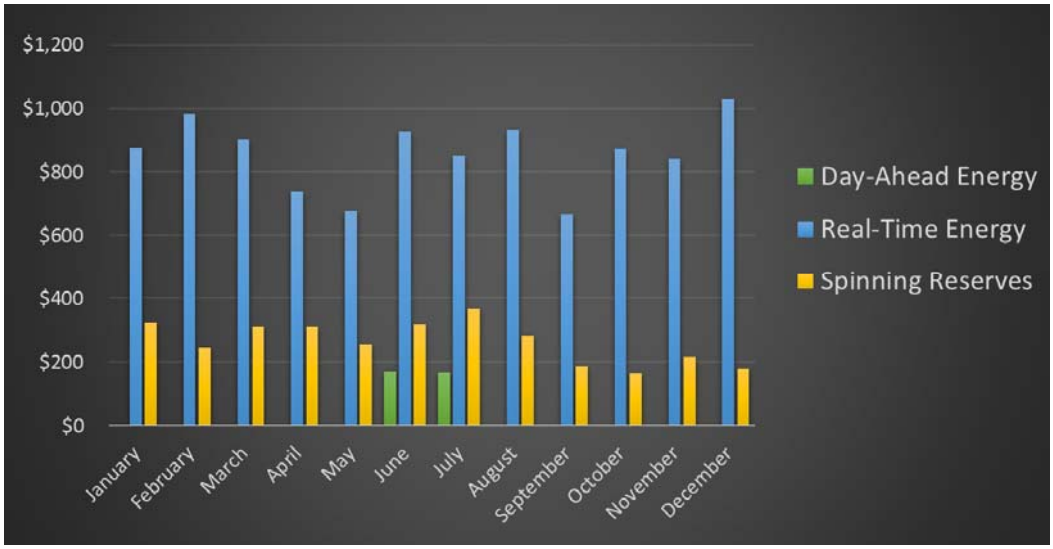
Tesla's School Batteries
Potential Wholesale Market Revenues



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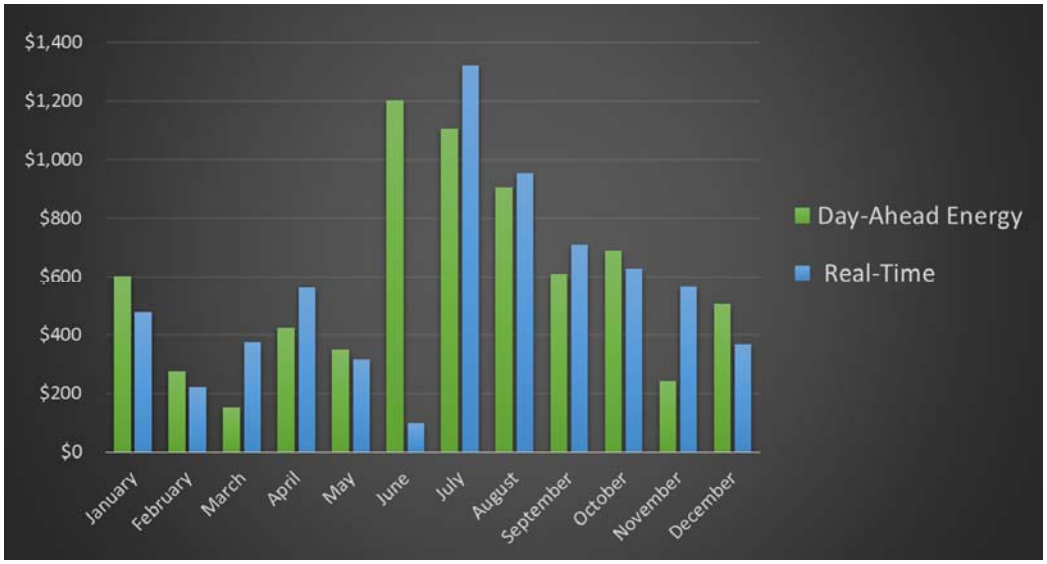
Conectric's Hilton Hotels
Potential Wholesale Market Revenues



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Project Learnings and Insights

Tesla's Battery Packs at Schools

- This project is one of the first behind-the-meter, non-utility program registered resources performing a demand response reliability (ancillary) service in California's wholesale market
  - Registering and testing with the CAISO is a time-consuming and complex process (Though for good reason)
  - De-risking potential market non-performance (i.e., penalties) across two firms (Tesla and Olivine) required significant legal effort
- No wholesale compensation is available for battery-to-grid export
  - The batteries require enough on-site load off-take the battery discharge
  - Limiting the potential 'value stack' of on-site battery storage

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Project Learnings and Insights

Conectric's IoT in Hotels

- Wireless sensor, electric metering and control (IoT) devices are (relatively) cheap
- For a resource that is this small, wholesale market revenues are an order of magnitude smaller than retail utility bill savings, i.e., demand charge reduction and shifting away from high TOU periods
- Energy data science specialists are hard to come by (eh hem, Silicon Valley tech peeps!)

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Project Learnings and Insights

Across Both Portfolios

- Mitigating the non-[peak] coincident customer demand charge may run counter to timing of grid balancing and decarbonization needs
- Process improvements are needed for customer-utility authorization for third-party access to customer utility meter data

Contact Us

EnergyCenter.org

HEADQUARTERS

3980 Sherman Street, Suite 170
San Diego, CA 92110

OFFICES

San Diego, CA • Los Angeles, CA
Oakland, CA • Sacramento, CA
Boston, MA • Brooklyn, NY
Stony Brook, NY

TELEPHONE

858-244-1177

One simple mission —

DECARBONIZE.

Our vision is a future with sustainable, equitable and resilient transportation, buildings and communities.