

Retail Automated Transactive Energy System (RATES) Pilot

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2020 Load Management Rulemaking

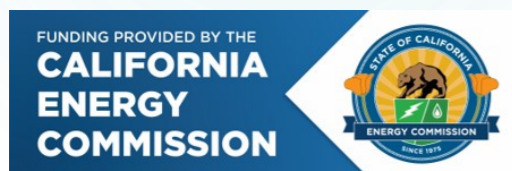
Commissioner Scoping Workshop

California Energy Commission (CEC)

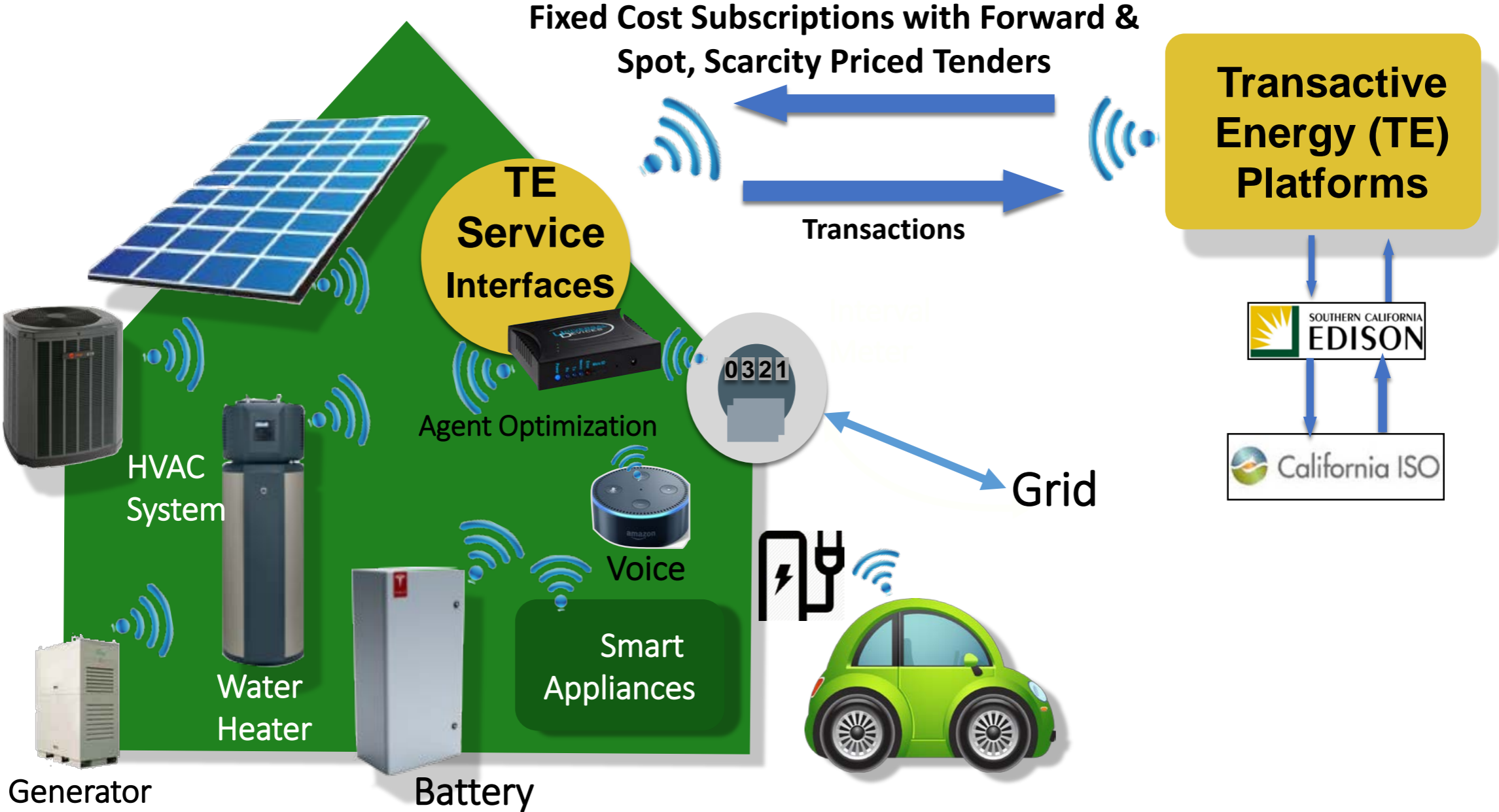
Sacramento, CA

January 14, 2020

GFO 15-311 / Group 2

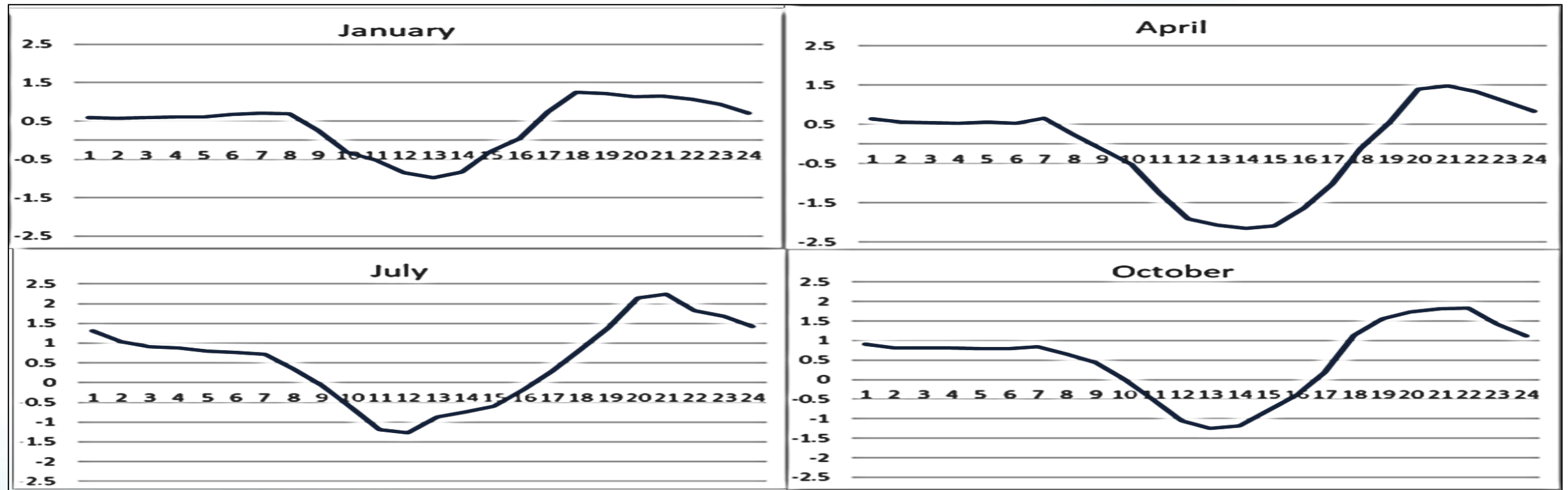


RATES: Subscription Transactive Tariff + TE Platform + IoT



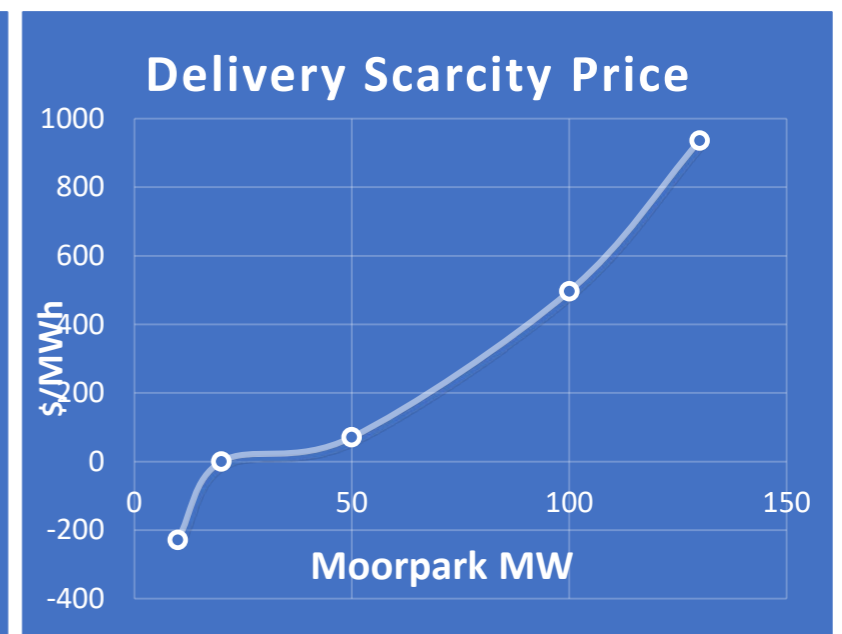
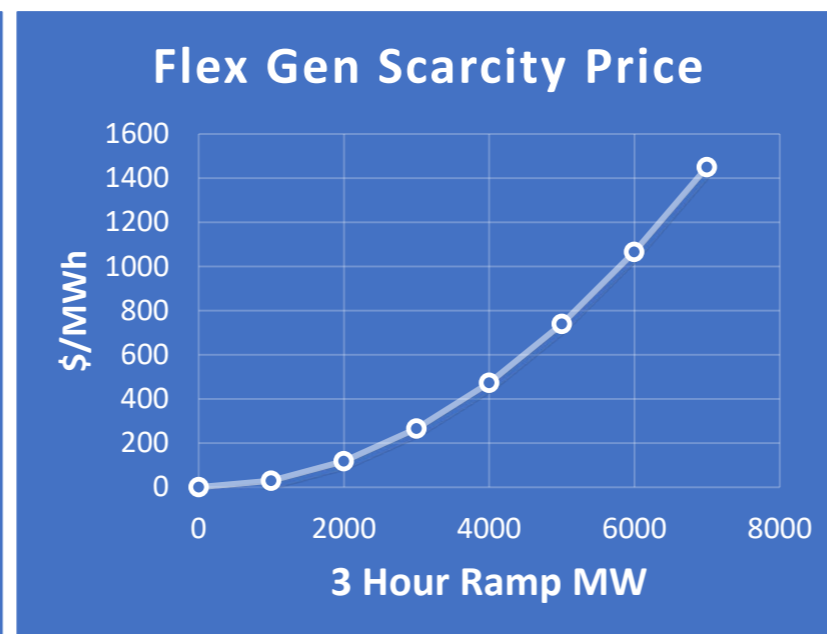
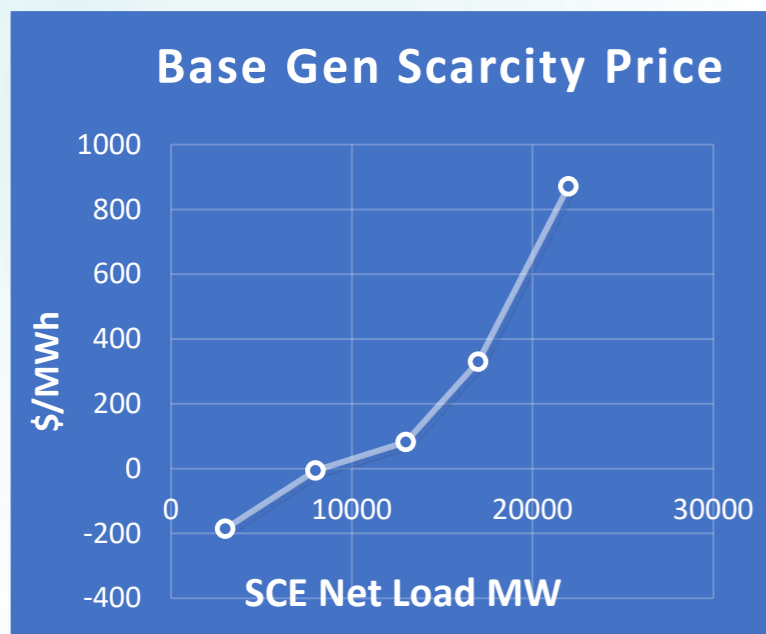
1. Fixed Cost Subscriptions Stabilize Customer Electric Bills
2. Variable Buy and Sell Prices Enable Self-Management & Flexibility
3. TE Platform Communicates Prices and Records Transactions

Subscription Transactive Tariff

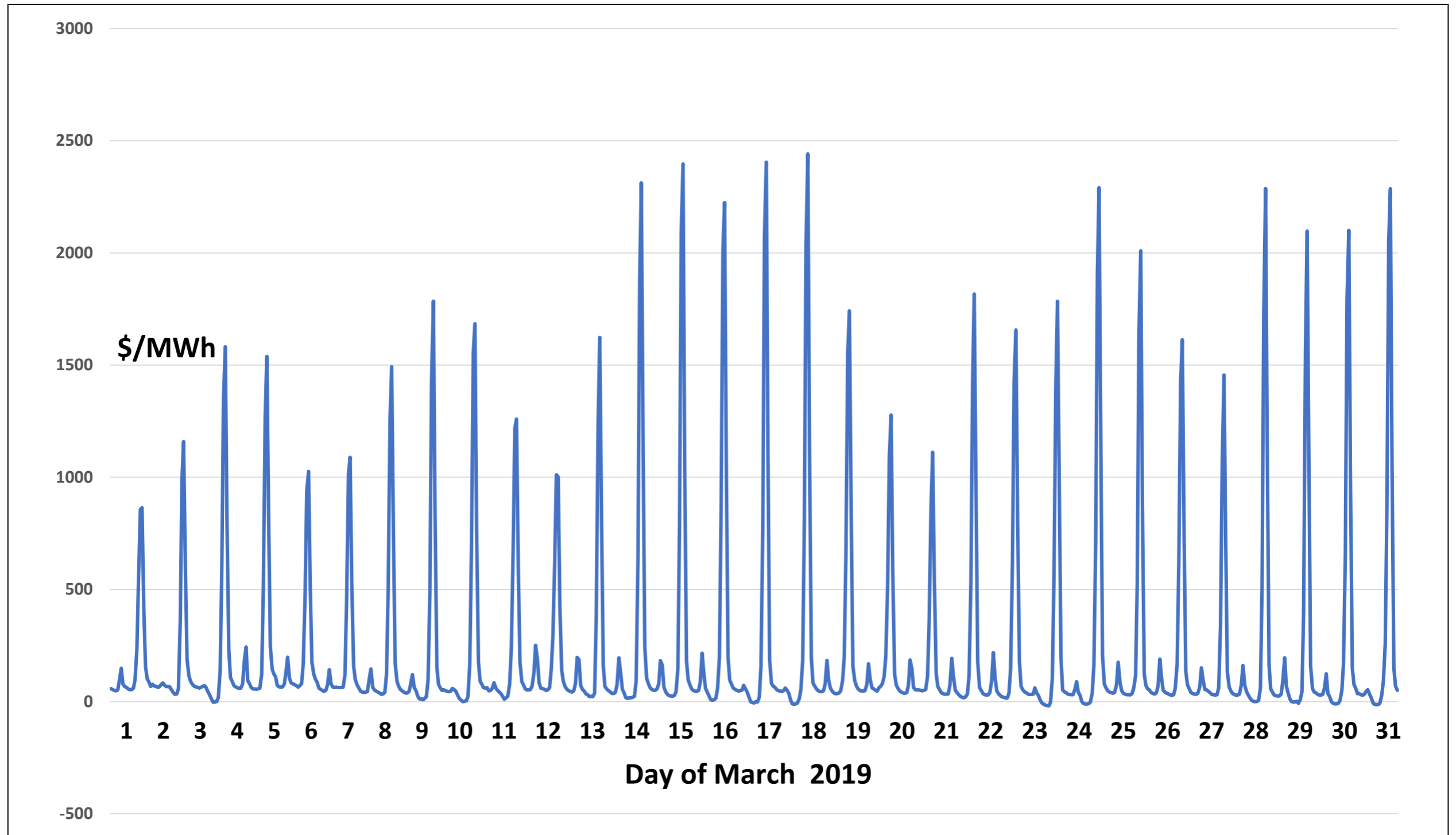


Solar Customer Subscription Hourly kW @ Fixed Monthly Cost based on Existing Tariff

$$\text{Tender Price} = \text{LMP@pNode} + \text{Base Gen Price} + \text{Flex Gen Price} + \text{Delivery Price}$$



Hourly Tender Prices for Moorpark for 31 Days of March 2019



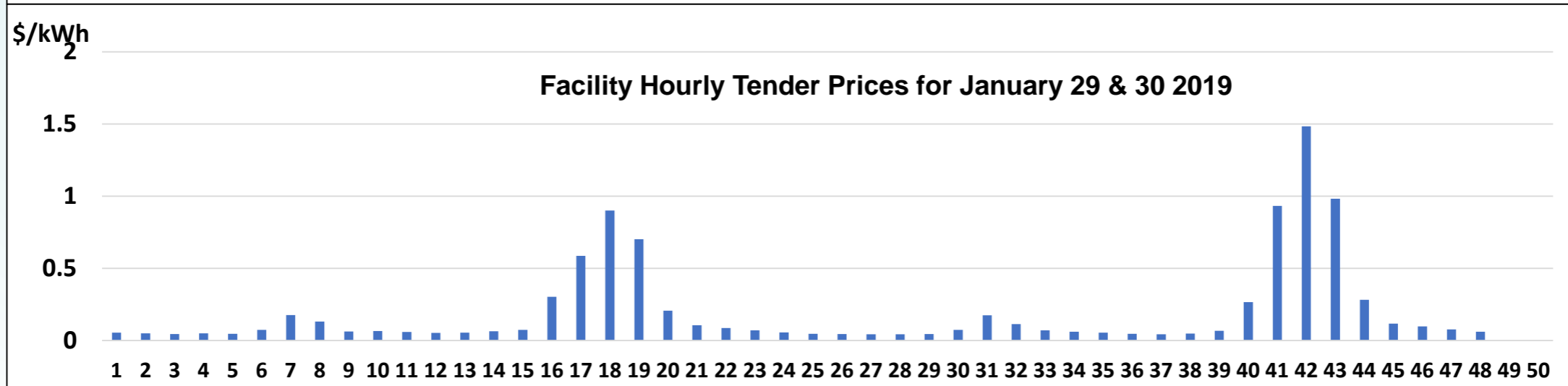
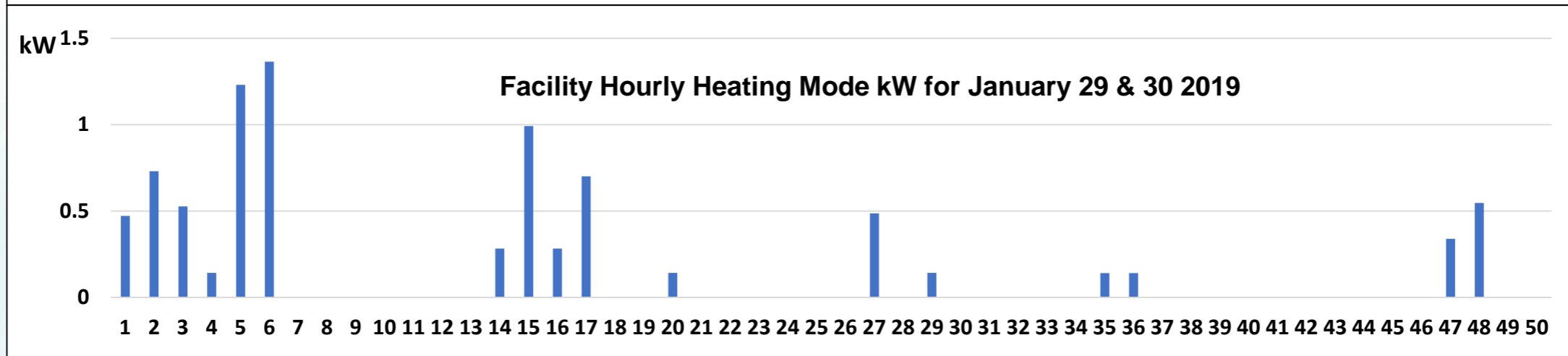
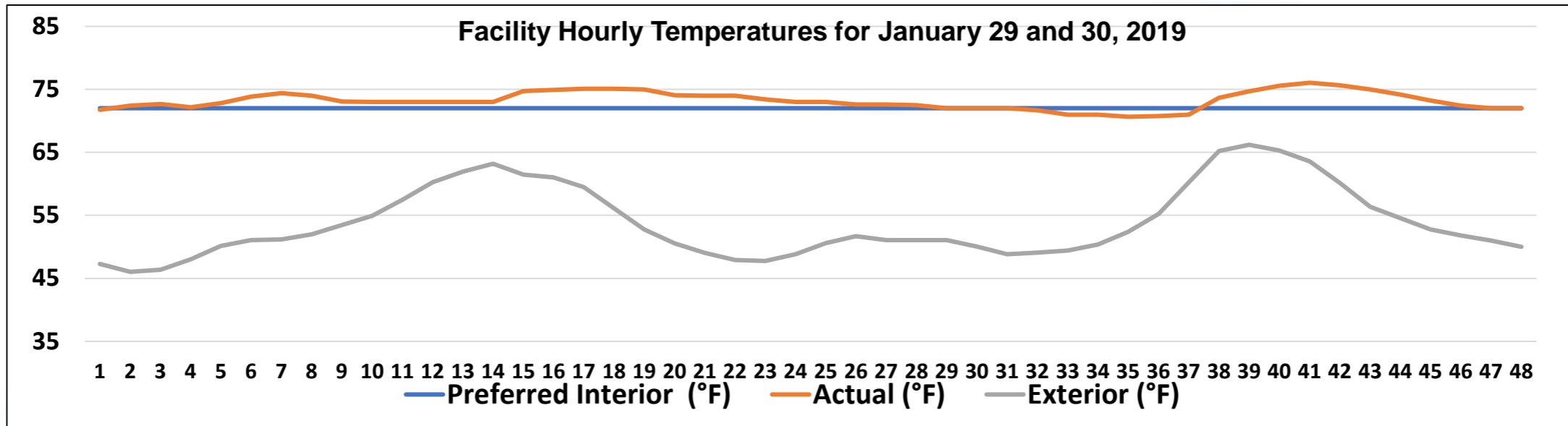
Note: Scarcity pricing recovers all of the variable costs and most of the fixed costs with higher prices when generation capacity and distribution capacity is more heavily loaded.

Pool Pump Agent Example

Pool Pump Operation for January 9th to January 14th , 2019

Hour	9	10	11	12	13	14
1	0.74	0.00	0.74	0.73	0.00	0.73
2	0.74	0.74	0.73	0.73	0.00	0.74
3	0.74	0.74	0.00	0.74	0.00	0.74
4	0.74	0.74	0.00	0.74	0.73	0.74
6	0.00	0.00	0.00	0.74	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.74	0.00
9	0.00	0.00	0.00	0.00	0.73	0.00
10	0.00	0.00	0.73	0.00	0.73	0.00
11	0.73	0.74	0.74	0.00	0.73	0.00
12	0.74	0.74	0.00	0.00	0.73	0.74
13	0.74	0.74	0.00	0.74	0.74	0.00
14	0.74	0.73	0.00	0.74	0.74	0.00
15	0.00	0.72	0.00	0.73	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.73	0.00	0.00	0.00
23	0.00	0.00	0.73	0.00	0.00	0.00
24	0.00	0.00	0.74	0.00	0.00	0.73

Heat Pump Agent Example



Behind-the-Meter Battery Agent Example

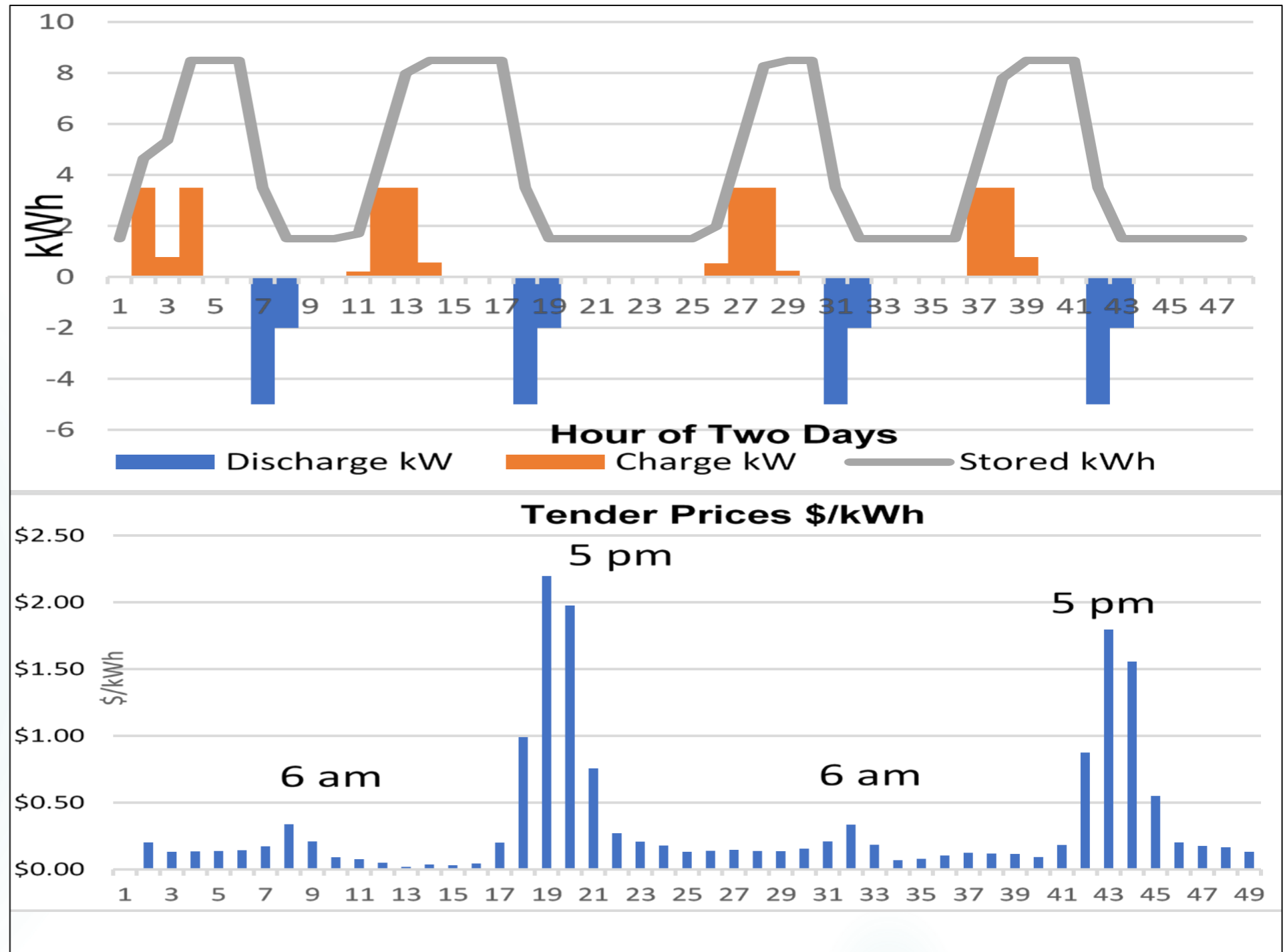
Self-Managed, Automated Battery Charge and Discharge for February 7th and 8th, 2019

Battery Specifications:

- 9.8 kWh Storage Capacity
- 8.5 kWh Maximum Storage
- 1.5 kWh Minimum Storage
- 5 kW Maximum Discharge Rate
- 3.5 kW Maximum Charge Rate
- 90% Round Trip Efficiency

Operating Results:

- 14 kWh / Day Discharge
- 15.56 kWh / Day Charge
- \$17.00** First Day Net Revenues
- \$13.50** Second Day Net Revenues



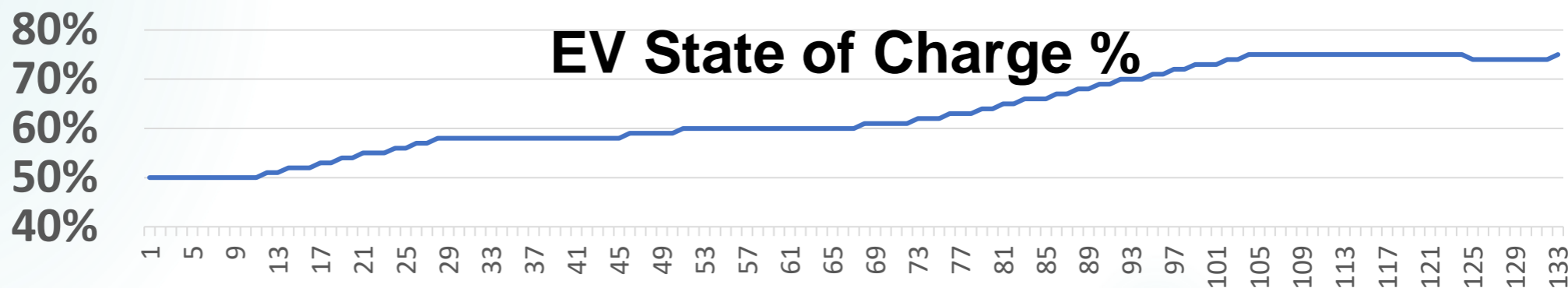
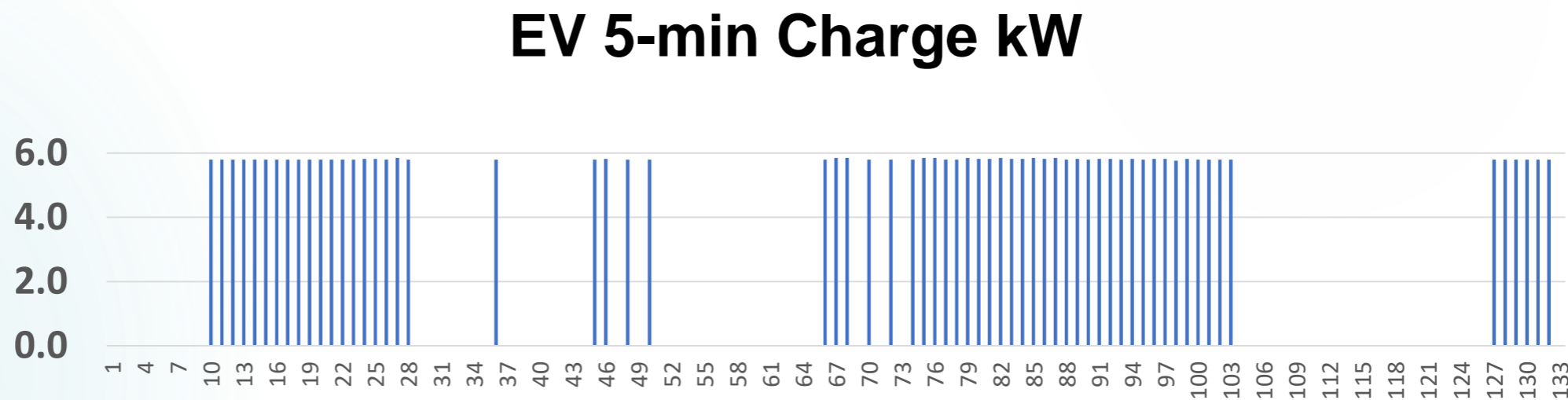
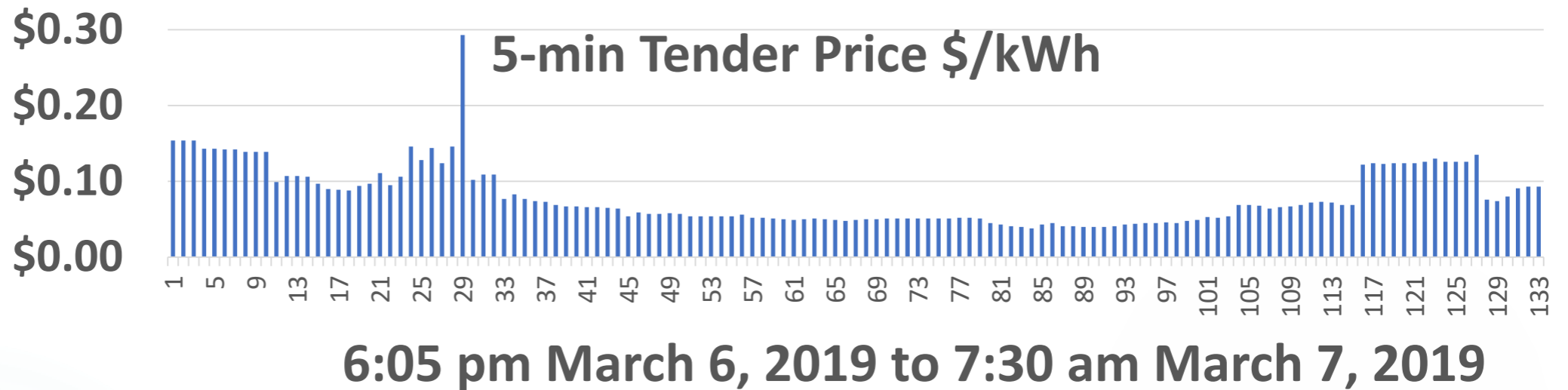
Tesla Model S EV Agent Example

100 kWh Battery

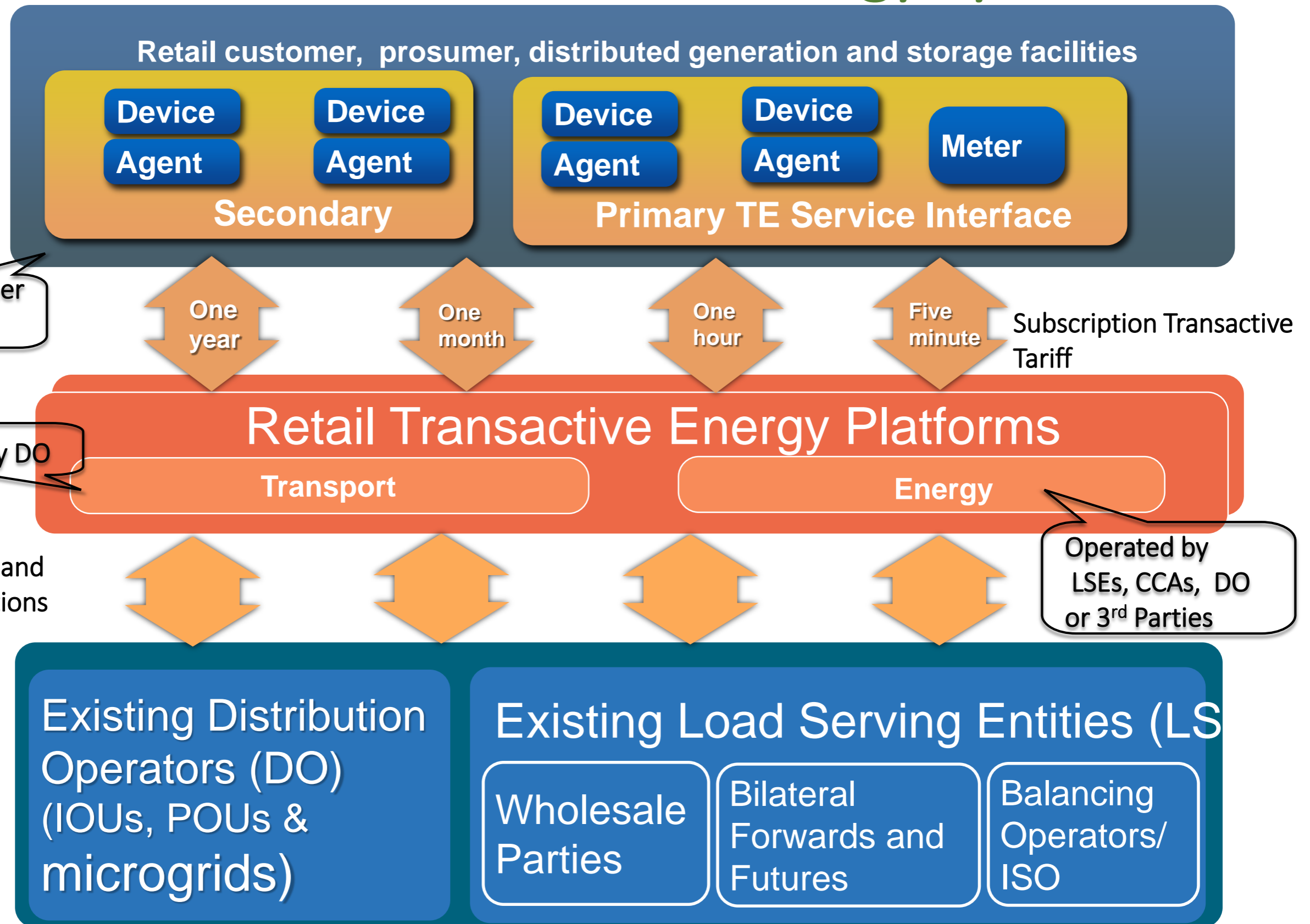
6 kW Residential Charger

Initial Charge
50% at 6:30 pm

Requested Charge
75% at 7:30 am



End-to-End Transactive Energy System



Deployment of RATES

Focus on medium and larger retail customers with flexible technology:

- electric heat pumps, electric water heating, pumps, battery storage, solar, electric vehicles & commercial refrigeration.
- California's 100 percent clean energy and electrification goals will result in many customers with these technologies.

Load serving entities (incl. CCAs) and distribution operators implement:

- automated interfaces to RATES, and
- the Subscription Transactive Tariff on an opt-in basis by the customers with flexible technologies.

Tailor to each customer's situation:

- 5-, 15-minute or hourly metering,
- with or without HAN interface to the facility meter, and
- with or without automated energy management systems and forward transactions.

Benefits of RATES

Highly dynamic tariff prices enable more flexibility for renewables than static TOU tariffs

Simple, granular tariff; No demand charges, DR events, capacity payments or DER baselines

No need for DER to bid into wholesale markets and be dispatched

Forward tenders support optimization of storage, EVs, HVAC, electric water heaters, and pumps

Subscriptions support low income policies and can retain net metering solar benefits

Lower IT, settlement and program costs