Unitil Demand Savings/Shifting Demonstrations 2016 - 2018

Summary of Demonstration Projects

Considerations include demand reduction potential, customer acceptance, projected performance, reliability, cost-effectiveness, bill impacts, and the potential ability to bring concepts to scale in 2019-2021. All budgets and schedules are contingent on EEAC and DPU approval.

- Cost = $146,000
- Potential kW Reduction during ISO Summer Critical Peak = 400 kW to 600 kW for two hours
- Potential kW Reduction during ISO Summer Peak = 30 kW for two hours with two additional hours for Solar PV
- Potential kW Reduction during ISO Winter Peak = 30 kW for two hours

C&I ICAP and ISO Summer Critical Peak Demand Shifting via Operations Changes: Key Questions and Goals

- Number of Customers = up to 2, customers must make a substantial commitment
- Budget = $32,000
- Estimated Deployment Schedule = April 2017

(with 4 month DPU approval cycle)

- Assessment = January/February 2018
- Main Purpose =
  - ➢ test customers acceptance of the concept and value
  - ➢ performance (kW shifted during critical peak) and ability to reduce customers' ICAP charge
  - ➢ determine cost-effectiveness

C&I ICAP and ISO Summer Critical Peak Demand Shifting via Operations Changes

Vendor Driven Software Uses Interval Data Profile to Determine $ and kW Shifting Opportunities.

Can the Software Accurately Predict Economic Events on the Energy Grid?

- Capacity Tags – ISO NE System Peak Hour (ICAP).
  5 to 8 days/periods per year. Typically occur during Summer Critical Peak Hours but could be in the Winter.

- Potential Revenue from ISO-NE Demand Response program

Can the Results be Monetized?

- Competitive suppliers use blended kW-kWh rate. Needs to be split out.
- Demand Response Program

C&I ICAP and ISO Summer Critical Peak Demand Shifting via Operations Changes

Typical Actions Taken By Customers

- Change set-points in HVAC Systems
- Program Building Management Systems for reductions
  - Dim Lights
  - Cycle HVAC units
  - Pre-heat/pre-cool
- Delay batch manufacturing processes (Recycling, injection molding, etc.)
- Shut down time insensitive processing (pumping, etc.)

ICAP and ISO Summer Critical Peak Demand Shifting via Operations Changes

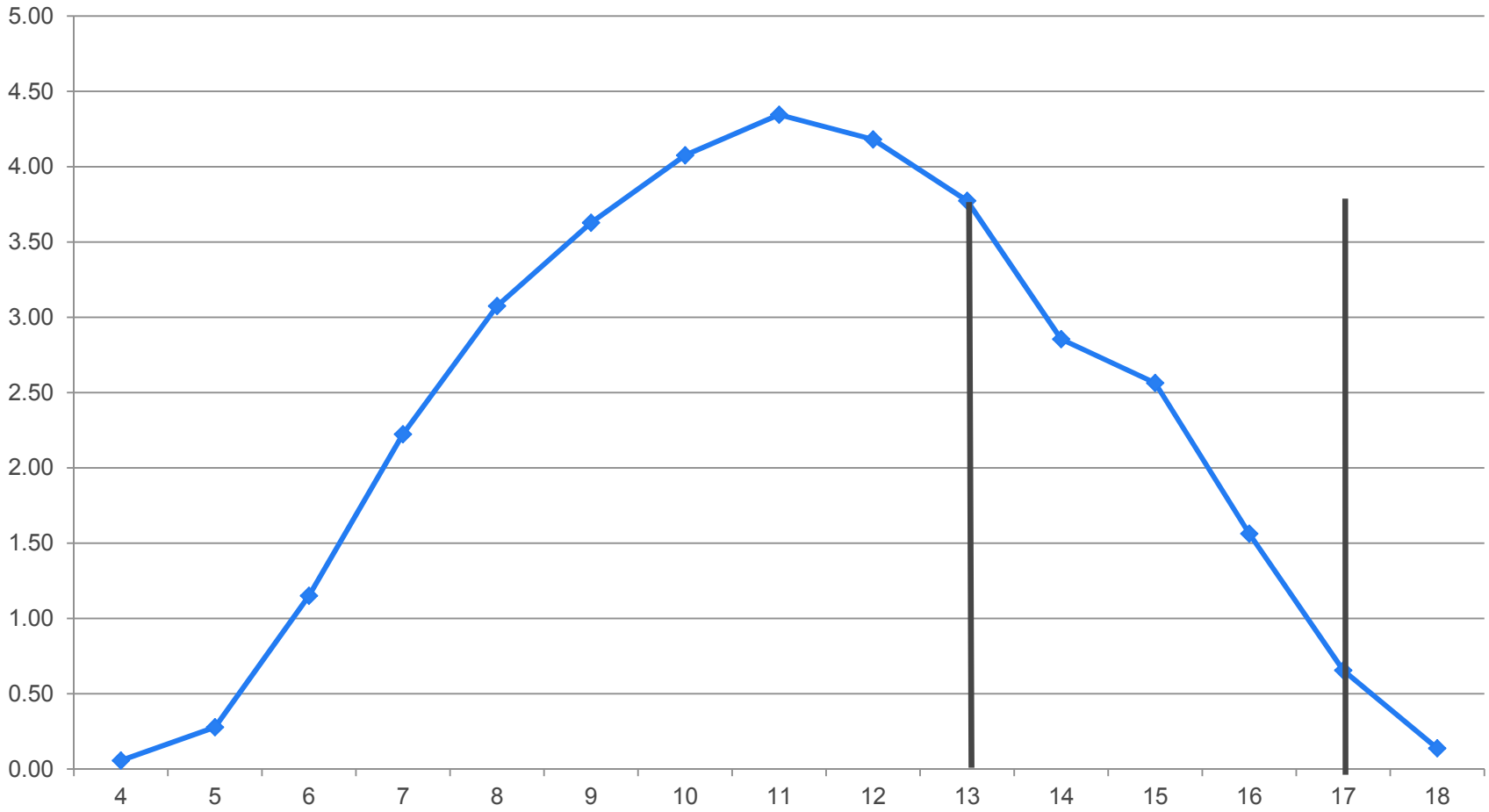
The Numbers and Schedule

- Number of Customers = 2 (estimated) of 28 large customers
  - Challenge to procure customers - requires active commitment on their part
  - Limited Number of Potential Customers – need the right load shape and ability to shift loads
- Vendor paid from $ savings
- Life = 3 to 4 years
- Cost = $32,000
- Projected Critical Peak Demand Shifted per Average Customer = 200 to 300 kW for 2 hours
- Start contacting customers in November 2016

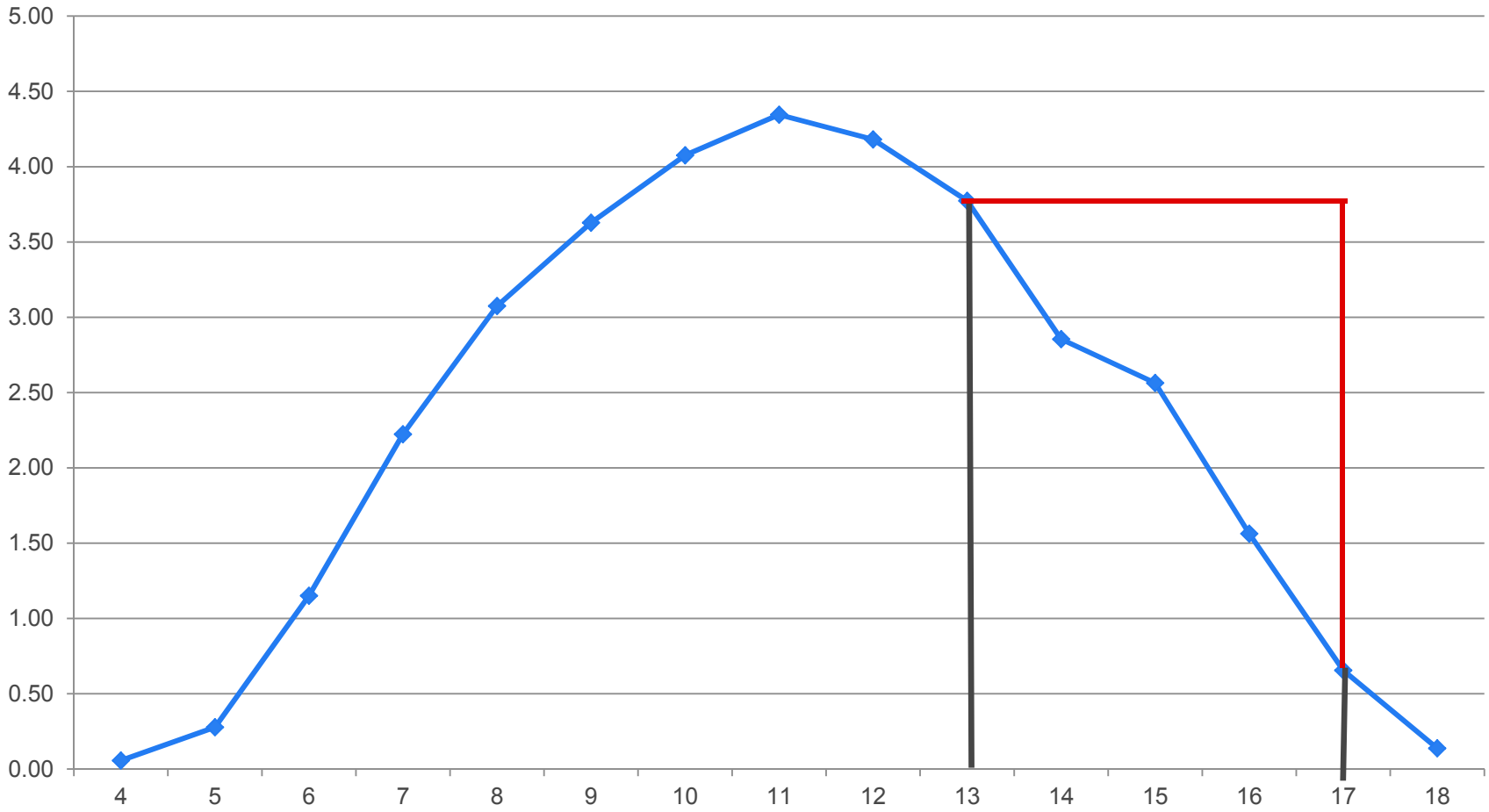
Residential Battery Storage with Solar PV: Key Questions and Goals

- Number of Customers = up to 6
- Budget = $112,000
- Estimated Deployment Schedule = May 2017 (with 4 month DPU approval cycle)
- Assessment = January/February 2018
- Main Purpose/Questions to be Answered:
  - Can the combination of solar PV and battery storage flatten out the solar curve such that there is a consistent production of kWs across the summer and winter peak periods?
  - What will the production of kWs be if the ISO-NE summer peak shifted from 1-5 PM weekdays to a later time such as 3-7 PM weekdays?
  - Are there significant differences in production and in flattening the solar curve when comparing south facing, west facing, and tracking solar PV systems?
- Other Questions to be Answered: customers acceptance of the technology and value, performance, cost-effectiveness

Solar PV Curve



Solar PV Curve – with Battery Storage



Residential Battery Storage with Solar PV

Performance

- Batteries will be run during Summer and Winter peak periods
- Type of Battery = Lithium Ion or Other Available
- Output demand (kW) shifted by battery, solar PV, and combined
- Installed cost per kW
- Issues encountered
- Durability of the battery
- Reliability

Residential Battery Storage with Solar PV

Reasons to Support Battery Storage Projects with Solar PV

- Battery prices are trending lower.
- Sizeable Pool of Potential Customers.
- Solar PV front loads its kW production at the beginning of the Summer peak period – a partial demand resource
- The concept is scalable to larger systems (C&I) or residential programmatic role outs that have economies of scale.
- Opportunity to learn how battery/solar PV systems and controls work.
  - Learnings can be shared with Grid Mod. Team.
  - Learnings can inform 2019-2021 EE planning.

Residential Battery Storage with Solar PV

The Numbers

- Cost = $112,000
- Life = 12 – 20 years, depends on days/year (cycles)
- Projected Summer Demand Shifted per Average Customer = 5 kW for 2 hours in addition to 5 kW for solar PV for 2 hours
- Projected Winter Demand Shifted per Average Customer = 5 kW over 2 hours
- Sizeable pool of customers
- Start contacting customers in November 2016

Why Demand Shifting Demonstrations?

"Is a demonstration necessary - why not simply use existing research/experience from other jurisdictions?"

- There are cost-effectiveness concerns with each of these efforts—the demonstrations will provide in the field data that can be potentially used to enhance cost-effectiveness and to potentially propose adjustments to current Massachusetts-specific cost-effectiveness screening approaches.

- MA has different load profiles, rate structures, avoided costs, market costs, and climate than other jurisdictions.

- In MA, when we roll out new concepts, the standard approach is to start with demonstration projects. This is similar to the "MTAC/Innovation" approach described by the CIMC at the EEAC meeting in September. This allows in the field/hands on experience with real customers that provides essential learnings to PA staff implementing the programs, which cannot be gleaned from research.

Thank you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