Energy Efficiency in Wholesale Capacity Markets

Alberta Energy Efficiency Conference

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Synapse Energy Economics

- Founded in 1996 by CEO Bruce Biewald
- Leader for public interest and government clients in providing rigorous analysis of the electric power sector
- Staff of 30 includes experts in energy and environmental economics and environmental compliance
- Represent NEPOOL participants in the Alternative Resources and End User sectors

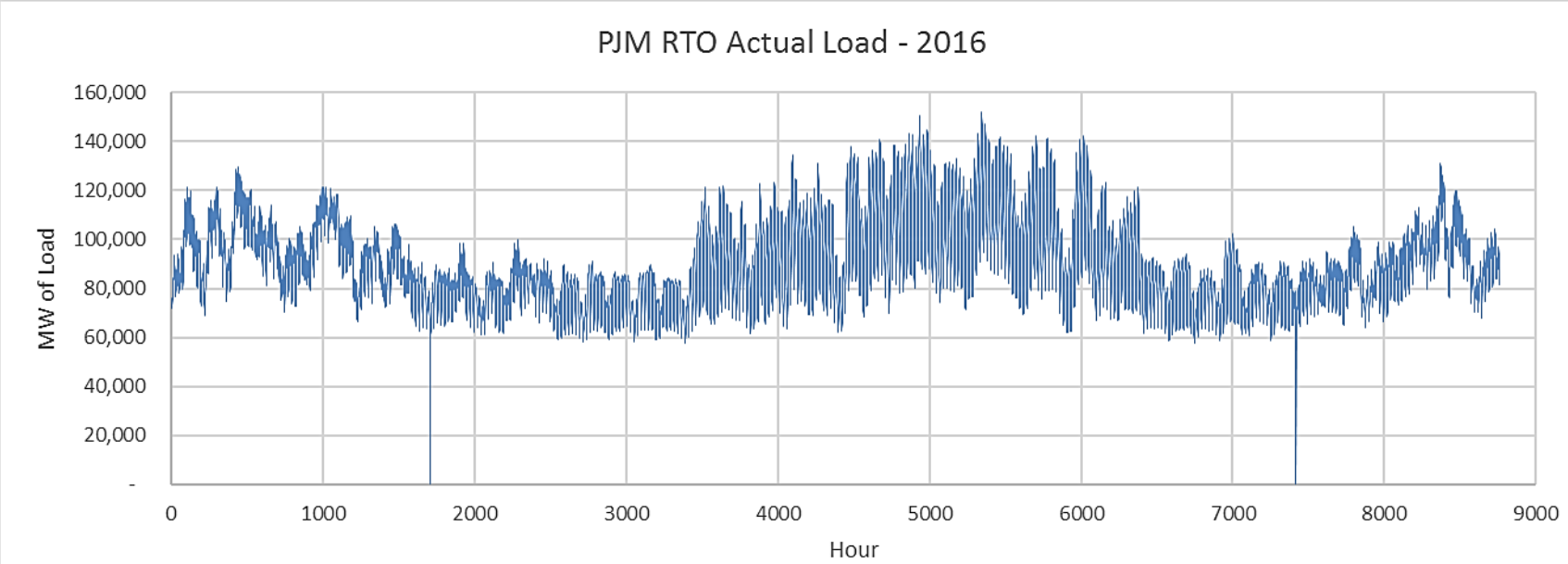
Doug Hurley

- Participating in stakeholder discussions around wholesale market design since 2004 in New England, PJM, MISO, NYISO, ERCOT, and California
- Led NEPOOL's Alternative Resource sector from 2010 - 2015
- Provides ongoing advice on daily participation of more than 300 MW of EE, CHP, and solar PV resources in the New England capacity market since 2006. Key clients include:
  - *The Cape Light Compact (Cape Cod)*
  - *Efficiency Maine*
  - *CLEAResult (formerly Conservation Services Group)*
  - *Efficiency Vermont*

Agenda for Today

- What is a Capacity Market?
- EE has succeeded in Capacity Markets
- How it all works
  - Timeline of qualification and delivery
  - M&V
- Debate Prep

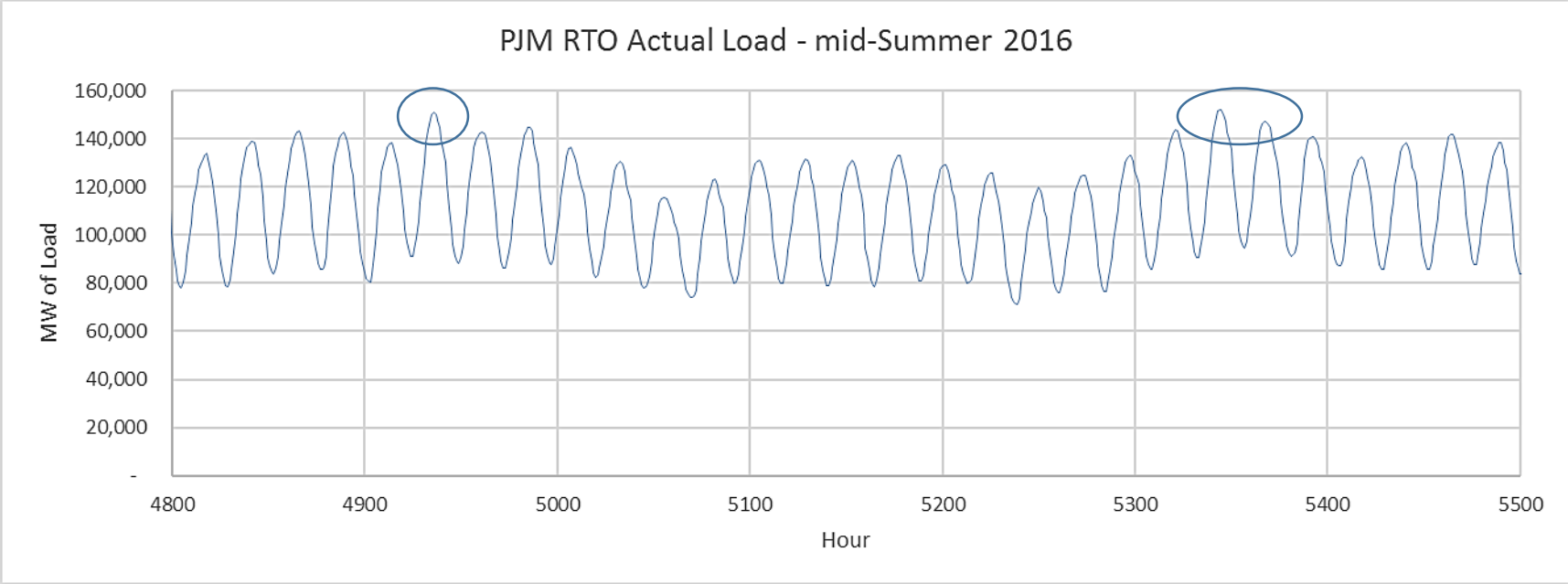
Energy and Ancillary Services Markets



- Grid operator must dispatch supply to match load on a minute-by-minute basis, all day, every day.
- Generally, lowest-cost units dispatched first. First ~60 GW will run all year. Plenty of energy revenues and possibly some ancillary services (AS).
- Mid-merit units (60 GW – 140 GW) cycle each day. Revenue in energy and reserves, plus other AS (Frequency Regulation, voltage support, etc.).

Why a Capacity Market?

- System needs peaking units, but they will run very rarely for energy.
- Capacity market reduces risk to develop a new peaking unit. Theoretical intention is to cover the cost to build a new peaking unit.
- Cost of New Entry (CONE) = Total Costs minus expected Energy and AS revenues

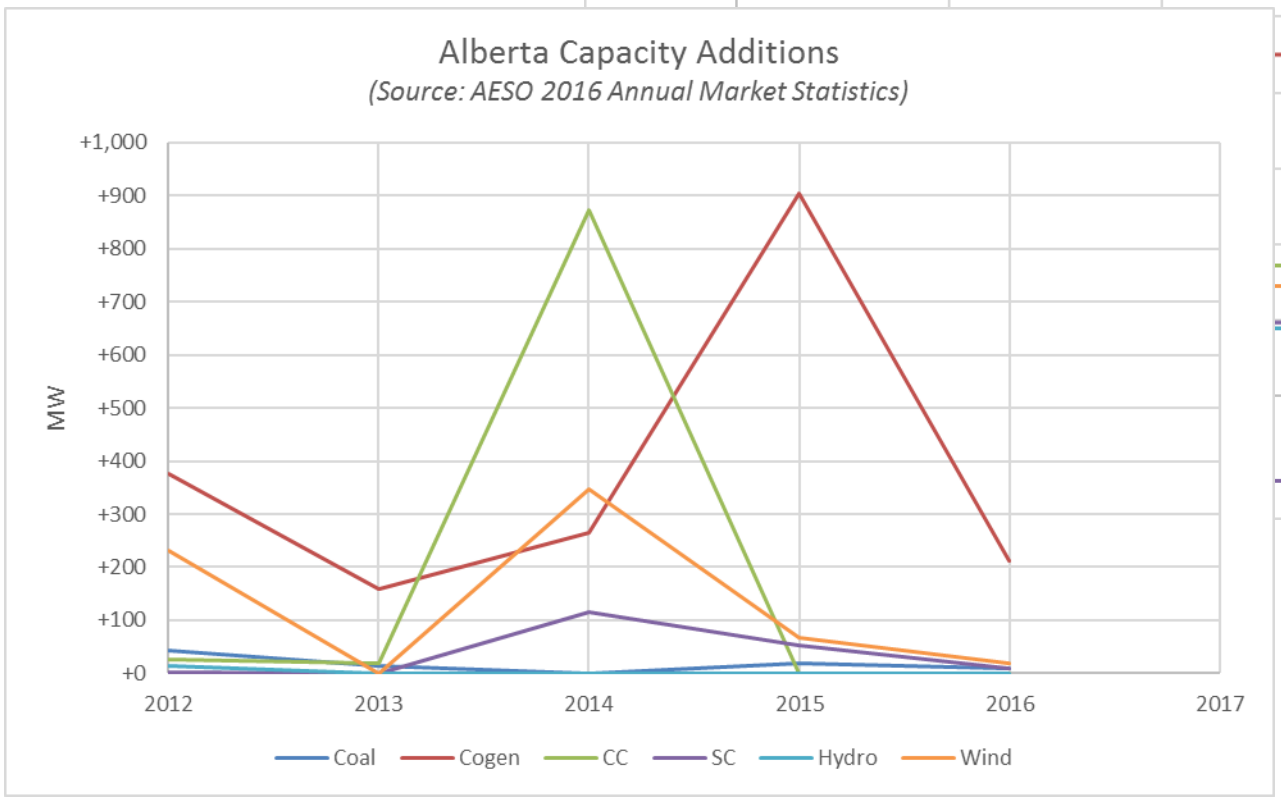


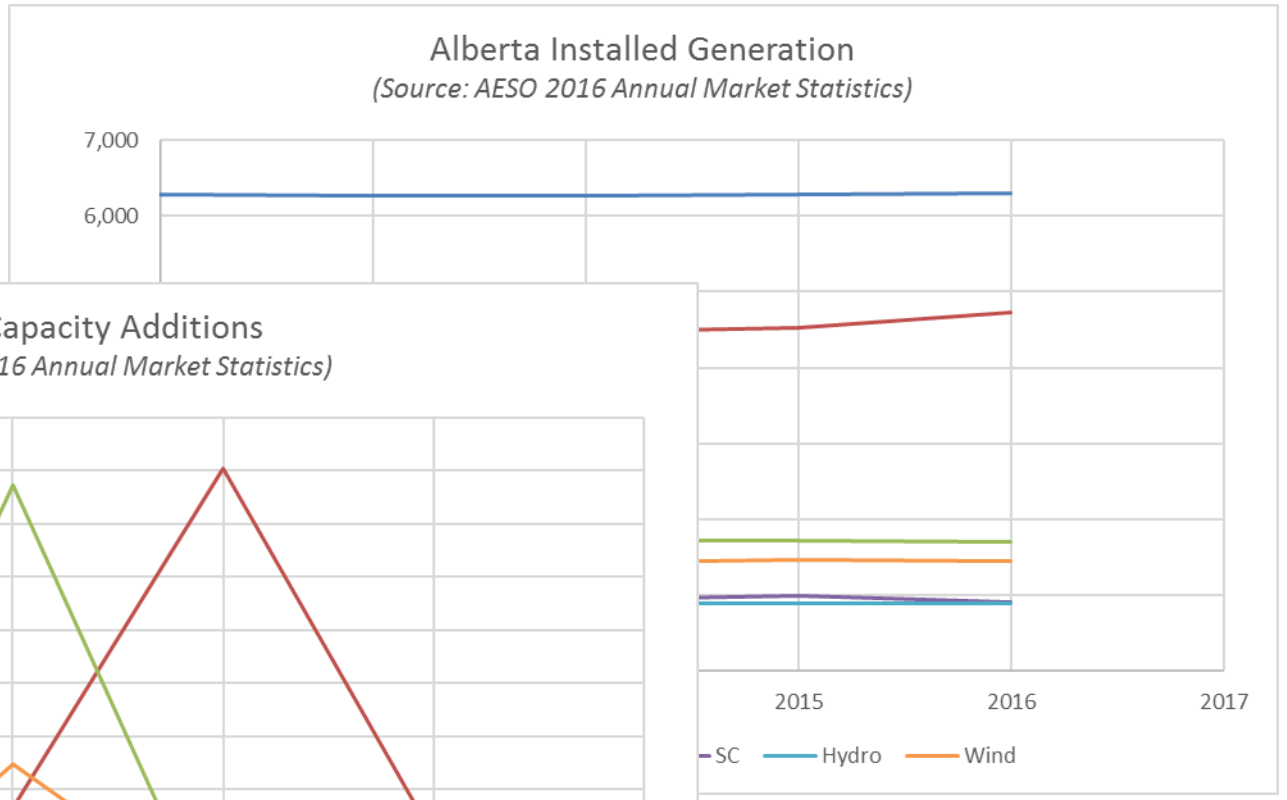
EE in a Capacity Market

- If you will have a capacity market, EE should be one of the eligible resources
- Low-cost, emission-free resource that relieves transmission issues rather than complicating them
- Can be targeted to peak hours, and can be measured for delivery during certain hours
- Is an investment made in balancing load and supply on the grid, similar to investments in power plants, demand response, or storage. Deserves to have the opportunity to recover the cost of the investment from a wholesale capacity market (if one exists)
- Several clear advantages to the market and to customers when EE is eligible

EE in Alberta (from AESO)

Public reports of capacity do not typically include EE (yet).

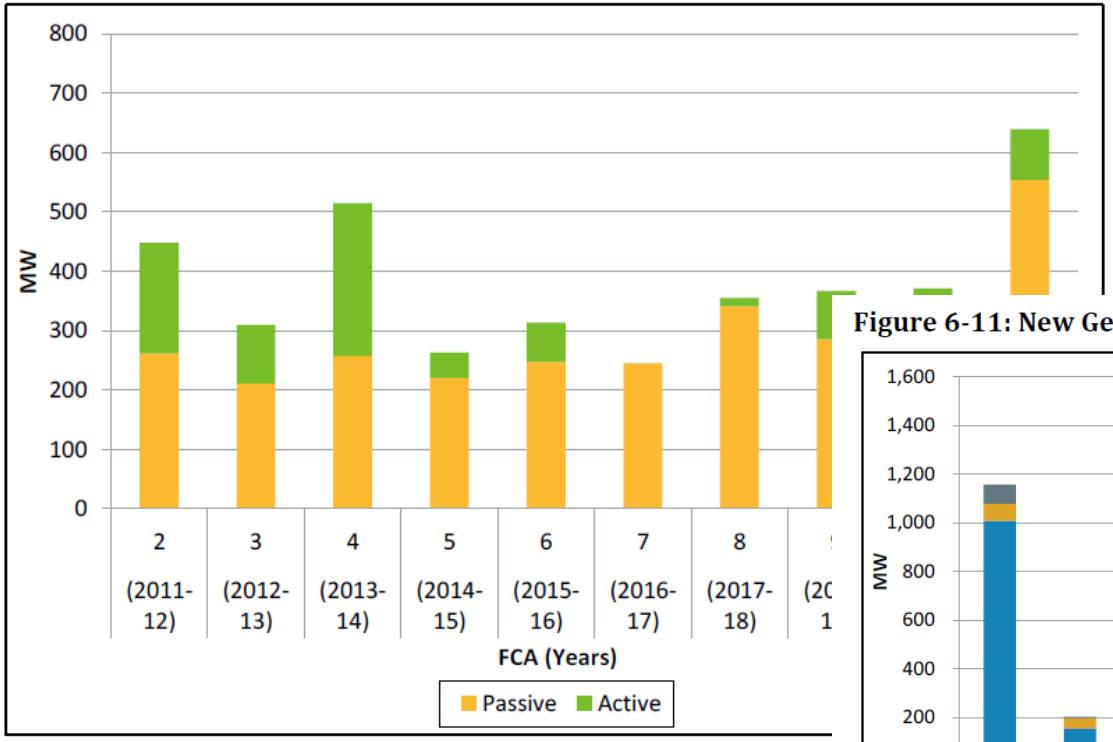




Source: AESO 2016 Annual Market Statistics data file

EE in New England

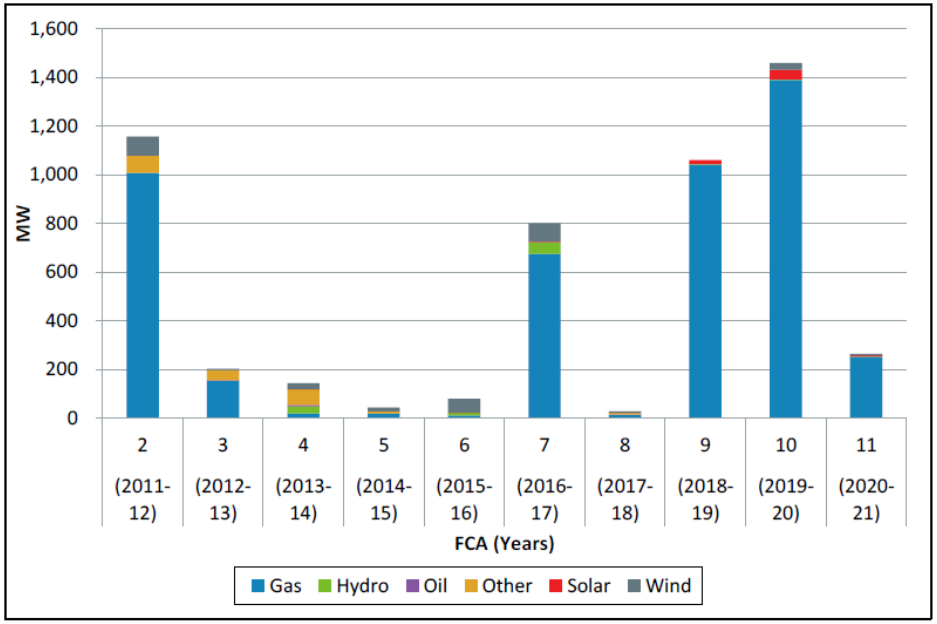
Figure 6-12: New Demand (Reduction) Resources with a CSO



Source: ISO New England 2016 Annual Markets Report

With EE recognized alongside generation in capacity market, data is easily accessible to all.

Figure 6-11: New Generation Capacity by Fuel Type from FCA 2 to FCA 11



Note: "Other" category includes landfill gas, methane, refuse, solar, steam, and wood.

New Resources in New England

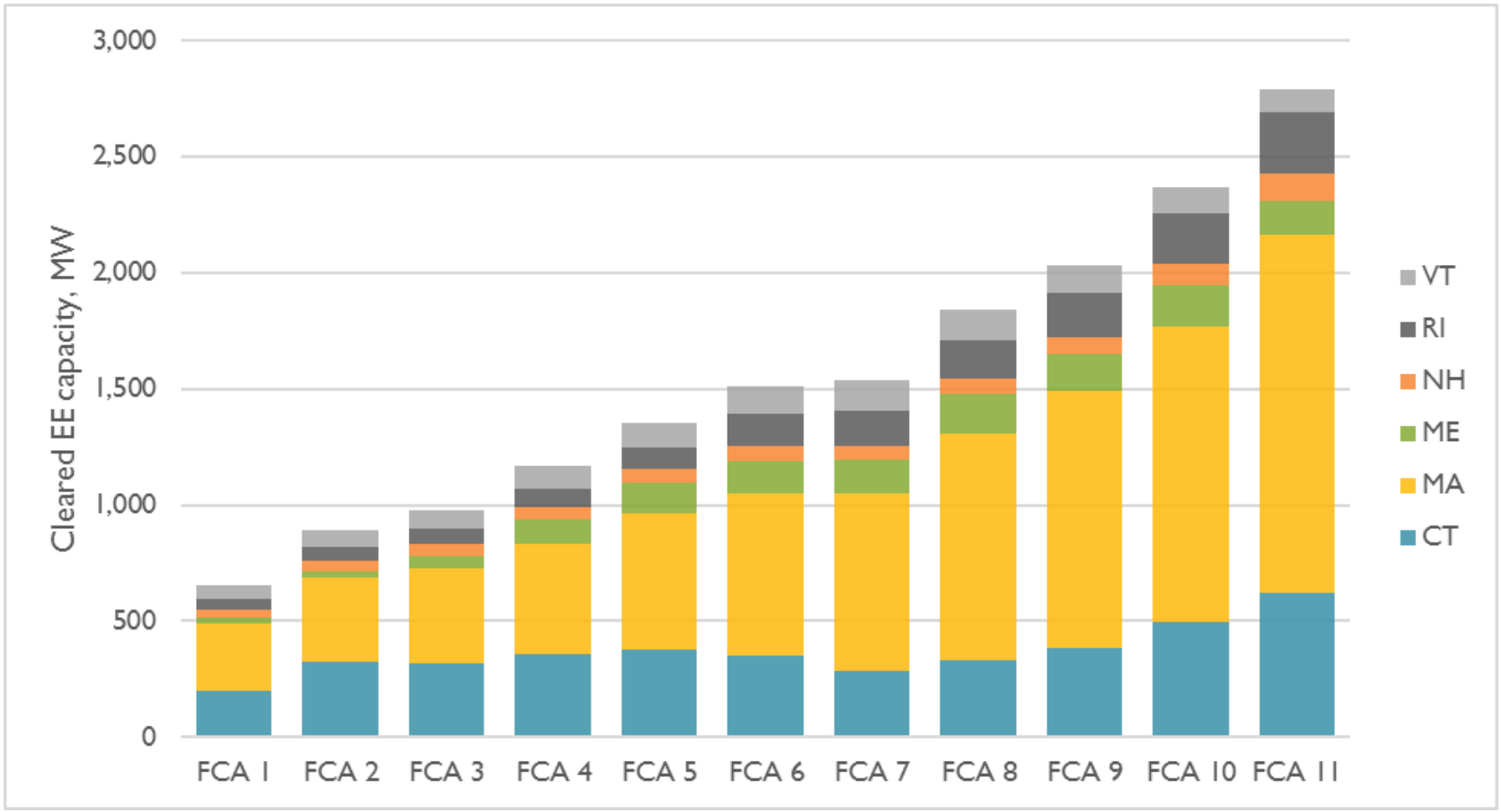
Table 4-5
Capacity Supply Obligation for New Capacity
Procured during the Forward Capacity Auctions (MW)[a]

Capacity Resource	FCA #1	FCA #2	FCA #3	FCA #4	FCA #5	FCA #6	FCA #7	FCA #8	FCA #9
Generation resources	40	1,157	199	114	42	79	800	27	1,060[b]
Demand-resource total	860	447	309	515	263	313	245	355	367
Active demand resources	*576*	*185*	*98*	*257*	*42*	*66*	*<1*	*14*	*81*
Passive demand resources	*284*	*262*	*211*	*258*	*221*	*247*	*245*	*341*	*286*
Import resources	0	1,529	817	831	871	1,648	1,718	1,154	1,360

Source: ISO New England 2015 Regional System Plan

Note: In New England, most Imports are considered New Resources every year.

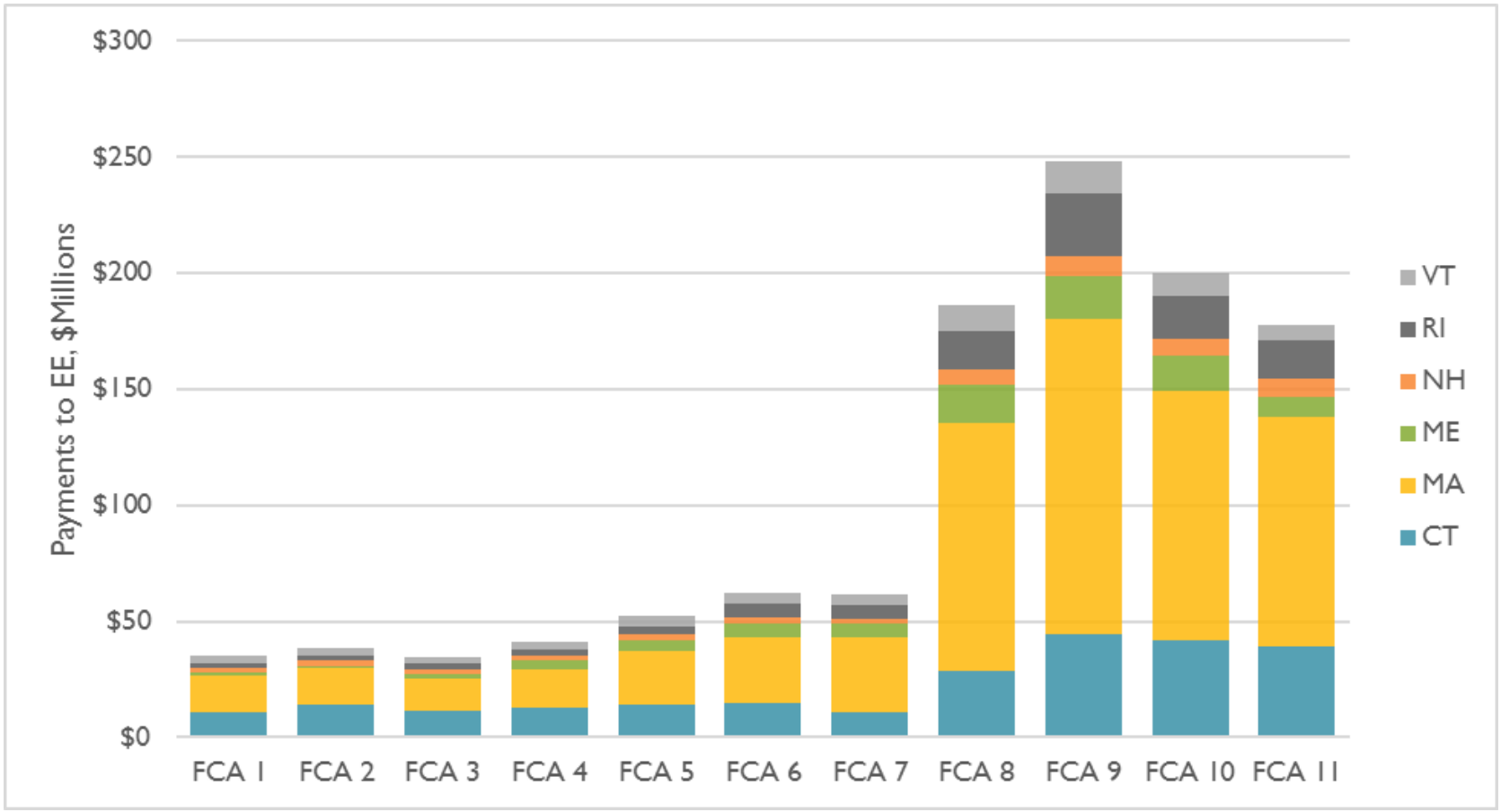
EE* in New England by State



Steady annual growth, mostly by state-funded providers…

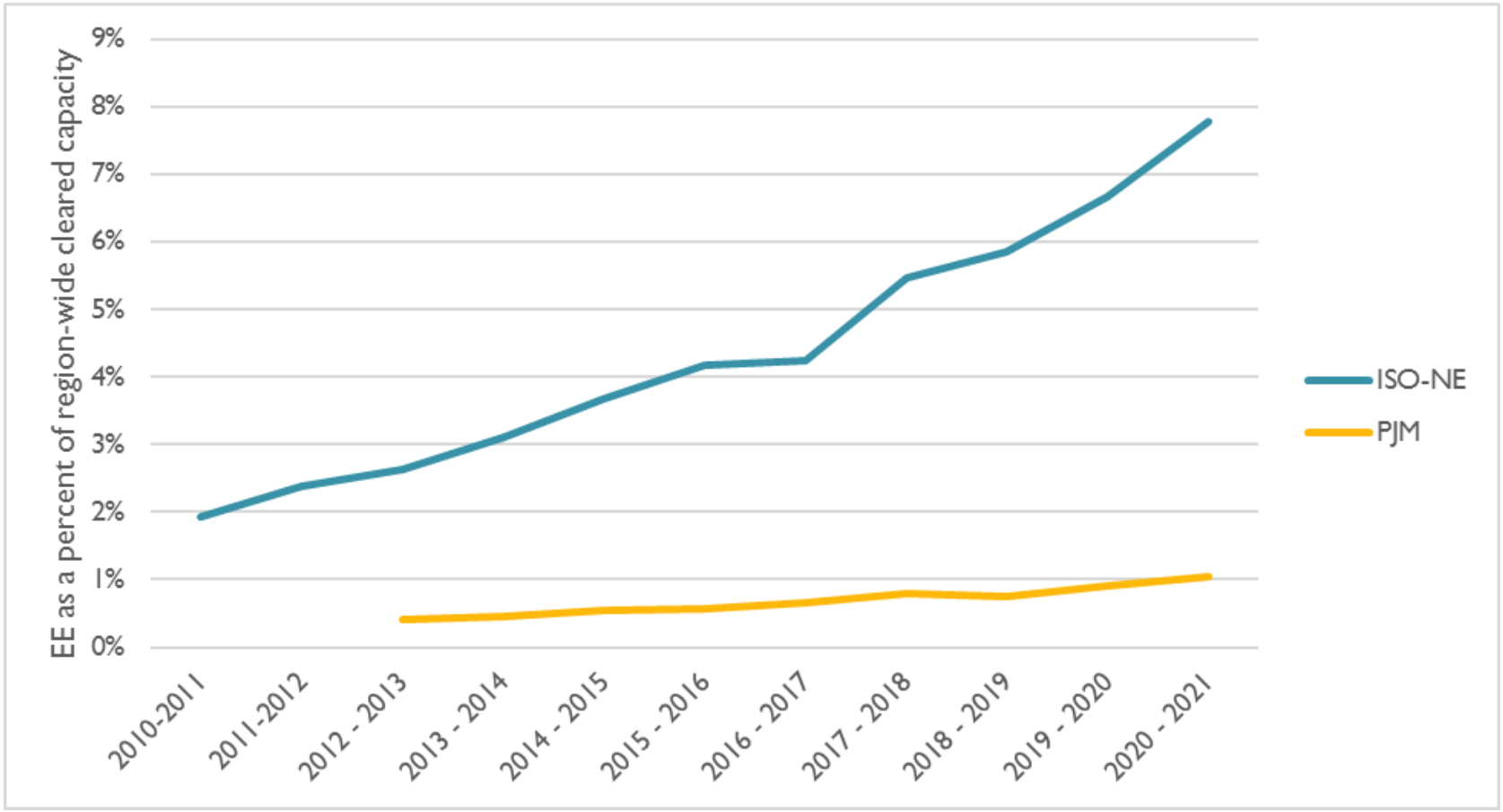
** Sum of On Peak and Seasonal Peak resources, which includes some distributed generation at customer sites (e.g., 180 MW of DG in FCA-11).*

FCM Payments to EE



… but capacity revenues can vary widely based upon market conditions.

EE as a Percent of Capacity

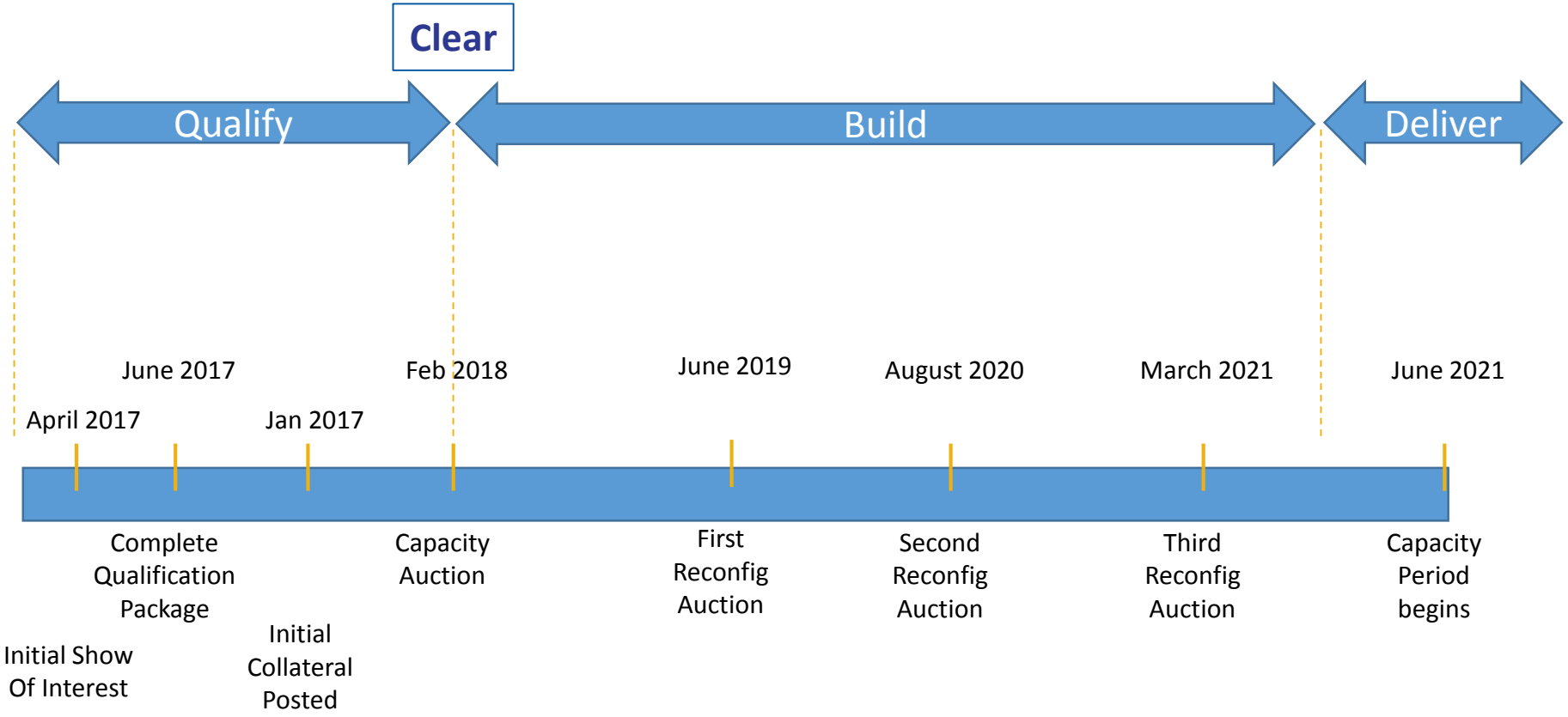


Regional and state policies matter in amount of success.
Every MW of EE is cheaper and cleaner than a MW of generation.

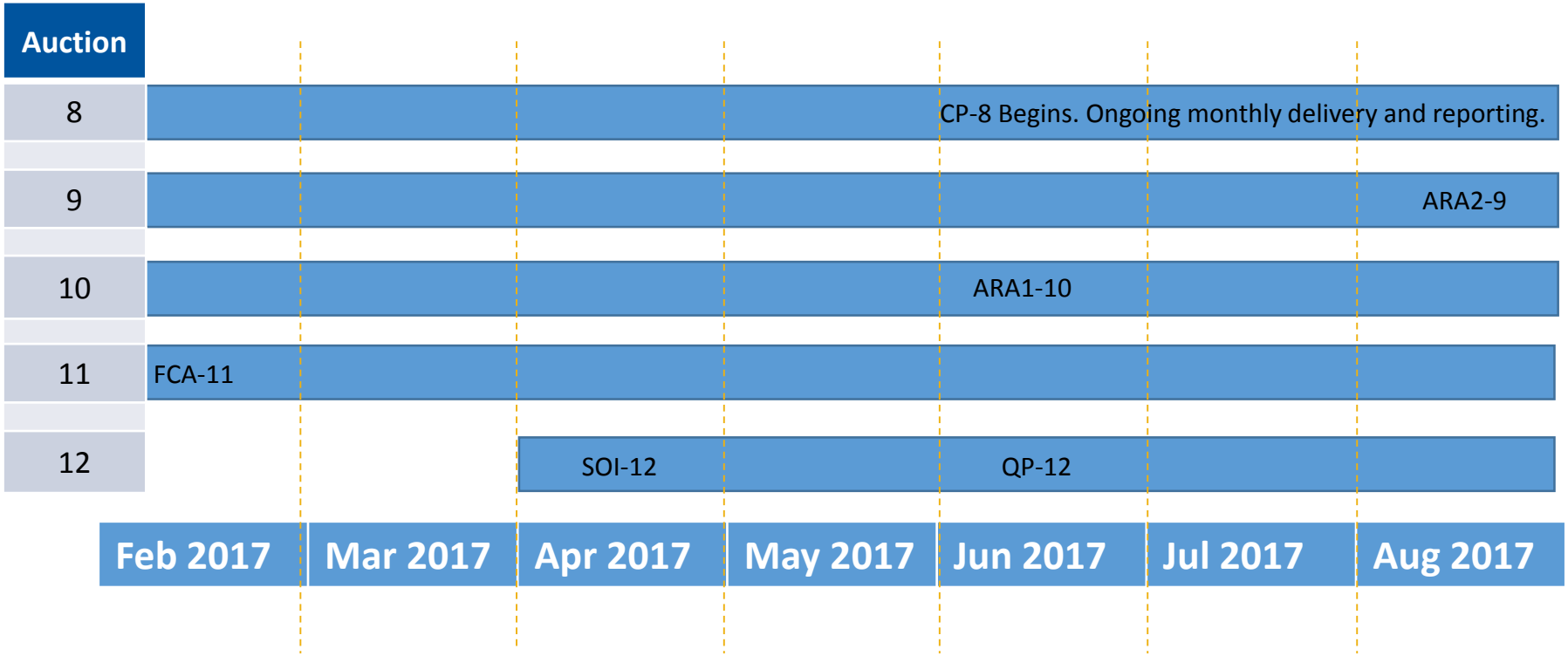
The Process

- Process of a Forward Auction involves distinct periods of time, for all parties involved.
  - Qualify for and Clear in the Forward Auction
  - Building and Reconfiguration
  - Delivery
- EE is typically installed every month, so several timelines overlap at any one moment in time.

Forward Auction Process



Overlap of Multiple Timelines

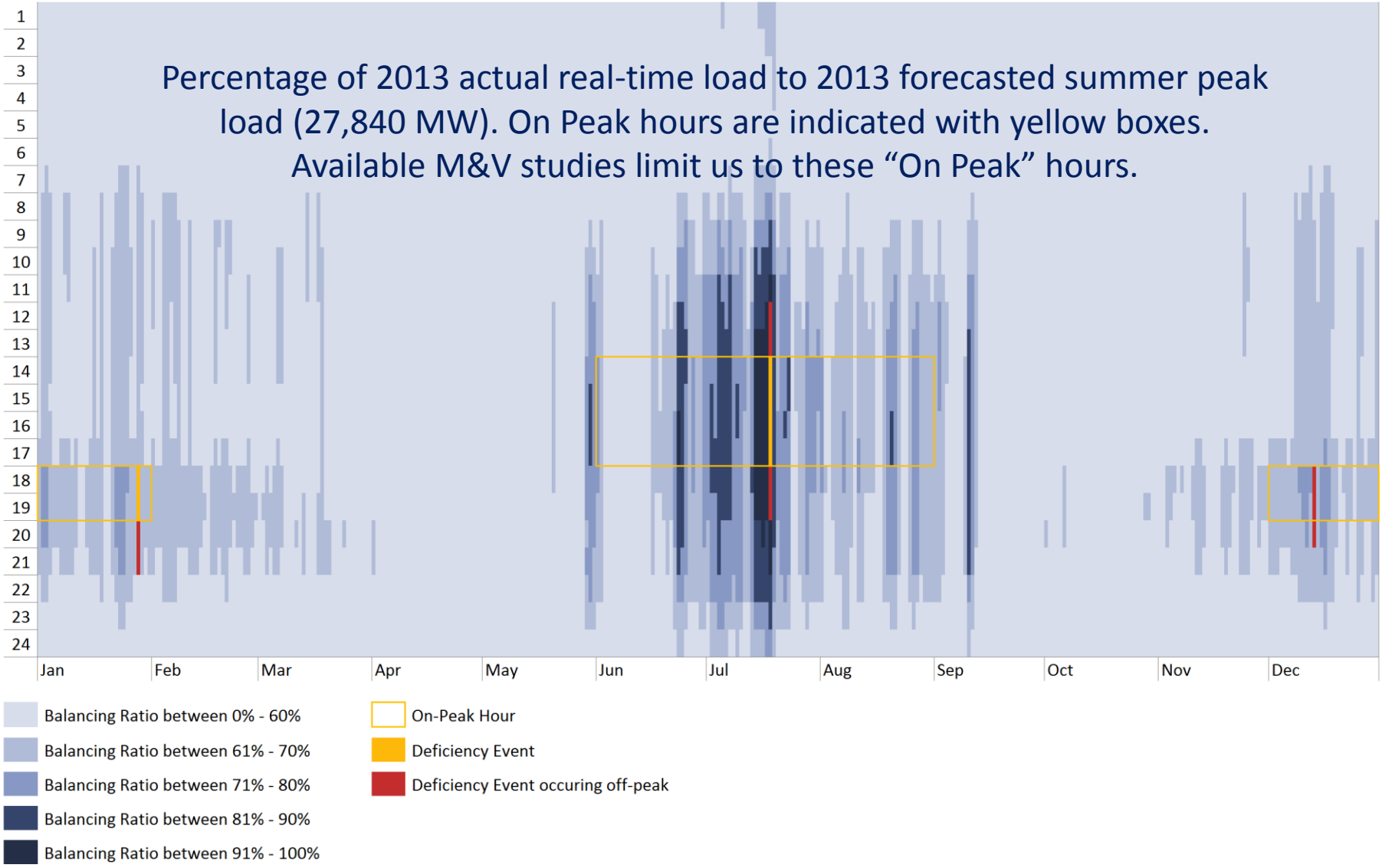


Annual process with routine deadlines understood by all parties.

Measurement & Verification

- Must demonstrate ability to perform M&V during qualification.
- Requirements for provincial plans and reports will probably focus on total energy savings and dollar amount of savings.
  - Key focus on Benefit-Cost Ratio. Province must ensure that customers are getting a good return on their investment in EE (BCRs are typically >3:1)
- For AESO capacity market, focus will be on MW of delivered savings during specific peak hours.
  - M&V studies must have the ability to estimate peak savings
  - New technology is making this easier and cheaper, with much more data
  - If possible, get data for all hours. If peak hours shift, can show savings in different hours easily

Shortage Conditions for EE in FCM PI



Debate Prep (1 of 3)

Argument You Will Hear	Responses
1. They get cost savings, so they don't need capacity revenue.	a. Lots of power plants get plenty of revenue from energy and ancillary services markets. They don't need capacity revenue either, but you're planning to pay them. b. A third-party entity is developing and managing this resource, with contribution from individual customers. This EE entity is a market participant that receives no cost savings.
2. We can't dispatch it.	a. Many power plants are not dispatchable either. And yet we know how to handle them and plan to pay them for capacity.

Key Theme: EE is essentially a baseload, self-scheduled power plant that was developed through an investment by provincial customers. It has no emissions and reduces transmission system cost. It deserves capacity revenue as much as any investment in reliable system capacity.

Debate Prep, continued (2 of 3)

Argument You Will Hear	Responses
3. We don't know how much we are getting.	a. The EE industry has decades of experience in reliable M&V studies. Each step is typically conservative, usually underestimating the true amount of savings. b. Power plants typically get a percentage bandwidth on power delivered.
4. We'll just reduce the load forecast.	a. It will take as many as 14 years for the full impact of the savings to impact load forecast. Why should customers have to wait 14 years to get the full return on their investment? b. Ignores investment of EE provider, who is developing reliable capacity
5. Double-counting	a. Yes, we need to include amount of EE that will be delivered in the capacity requirement, but this is really simple math. Addition and subtraction. Easy.

Debate Prep, continued (3 of 3)

Argument You Will Hear	Responses
6. They should participate on the demand side.	a. This forces the EE provider to become a wholesale load entity, which isn't their business. b. Why do we need to force EE providers through an extra hurdle of contracts with wholesale load if developers of power plants aren't similarly forced to fulfill those contracts in advance?
7. Just pay for 4 years, then load forecast.	a. This is the PJM approach, and their success has been limited for this and other reasons. Why should a power plant be paid for the entire useful life, but an EE provider must recover their investment in 4 years? This is an investment in reliable capacity and should be treated as such.

Questions?