Mobile Loads as Price Responsive Demand

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Price Responsive Demand

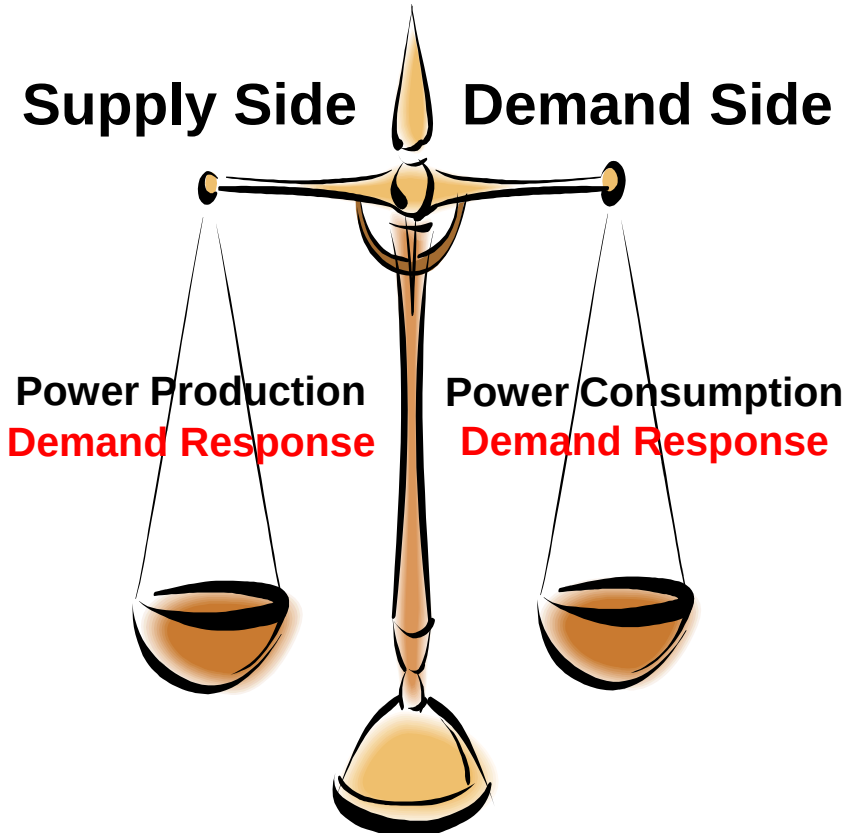
- There are two types of Price Responsive Demand (PRD)

- Demand-side
  - Customers change or shift the timing of electricity consumption in response to price
  - Response (i.e. changing consumption pattern) is voluntary
  - Receive bill savings

- Supply-side
  - Customers reduce load from normal levels and is a resource in the wholesale market
  - Helps balance supply and demand
  - Customers have an obligation to reduce load and receive a payment when they meet this obligation in addition to bill savings

PRD: a Tool for Operators and Consumers

- When consumers change consumption levels in response to changes in prices
  - Use less when prices are high
  - Use more when prices are low
- Helps power system operators maintain a balance between supply and demand



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Benefits of Demand-Side PRD

- Encourages energy storage and energy shifting
  - Takes full advantage of peak and off-peak price differences
- Helps reduce customers energy bills
  - Reduces payment of “risk premiums” for fixed-rate service
  - Encourages more efficient usage, which reduces energy bills
- More efficient usage benefits all consumers
  - Improves capacity utilization of the power system
  - Improves supply chain investment; generation, transmission and distribution
- Avoids supply-side issues
  - No need for estimation of consumer baselines
  - Customers treated as customers, not as suppliers with obligations

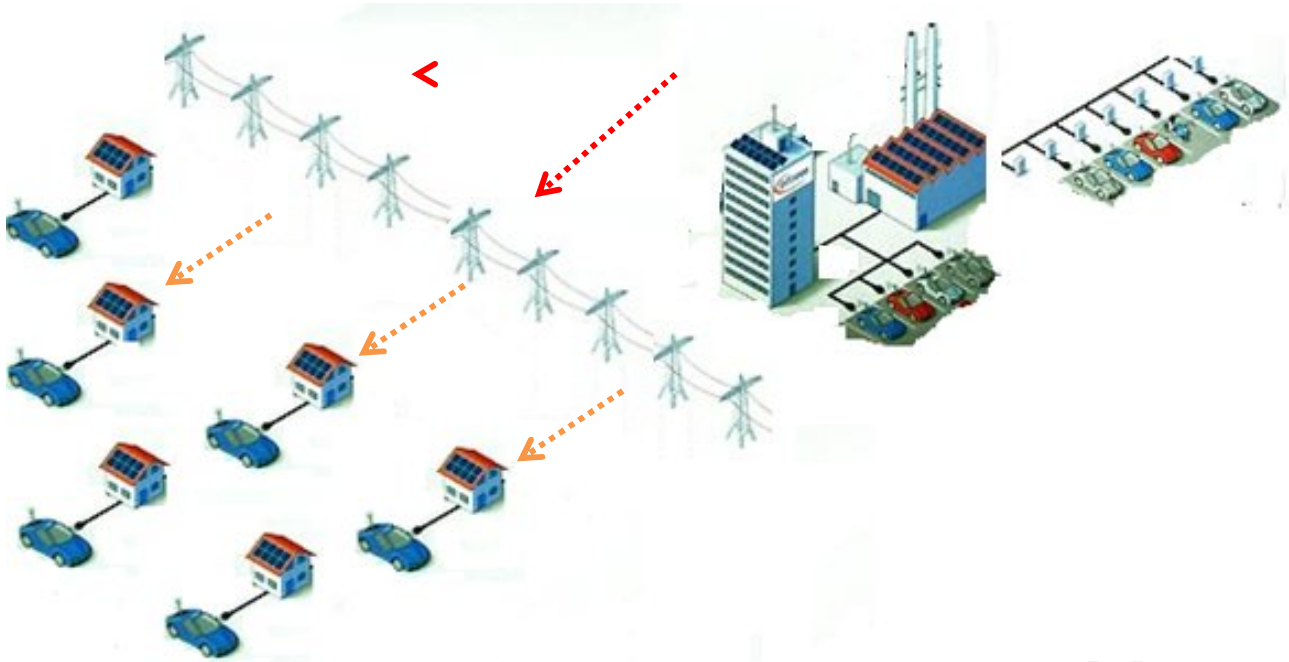
Challenges to Demand-Side PRD in New England

- Most consumers in region still charged uniform retail rates
  - Consumers cannot benefit from changing their consumption levels in response to changing real-time wholesale energy prices
  - Smart Grid technology makes little sense under uniform retail rates
  - Some stakeholders are resistant to change and price volatility

- Region has limited, but growing, advanced metering infrastructure and tools to assist retail customers to respond to prices
  - Limits ability of suppliers to offer dynamic retail rates
  - Limits the ability of consumers to evaluate dynamic retail rate offers or the cost effectiveness of smart grid investment opportunities

Value of Plug-in Vehicles

- Non-Business Hours
  - Residential charging
  - Taking power from grid when demand and price are traditionally lowest
- Business Hours
  - Injecting power into the grid when demand and price are traditionally highest



Parking Garage: One Big Battery?

- Output from garage could participate in regulation and energy markets
- As grid operator, ISO will be able to view large metropolitan parking garage as a single large battery
- For ISO Operations, the parking garage would look similar to a generator

- Parking garage responsible for
  - Estimating expected garage use and participation
  - Expressing to ISO capability of garage output and bidding into markets accordingly
  - Ensuring that vehicles have appropriate charge level at designated time of departure

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Challenges

- Aggregation
  - Need to be sizable (participation large enough to be visible to grid operator)
  - Can have different aggregator for demand and supply side
- Metering
  - Advanced metering and communication is required
- Limitation on output – cars need to get home
- System Operations
  - Grid operation significantly more difficult with small dispersed resources
  - Need to have understanding of injection points and potential transmission constraints
  - Need to operate the system and create market incentives to encourage efficient charging and injecting of power to grid
  - Uncertainty and unpredictability of output

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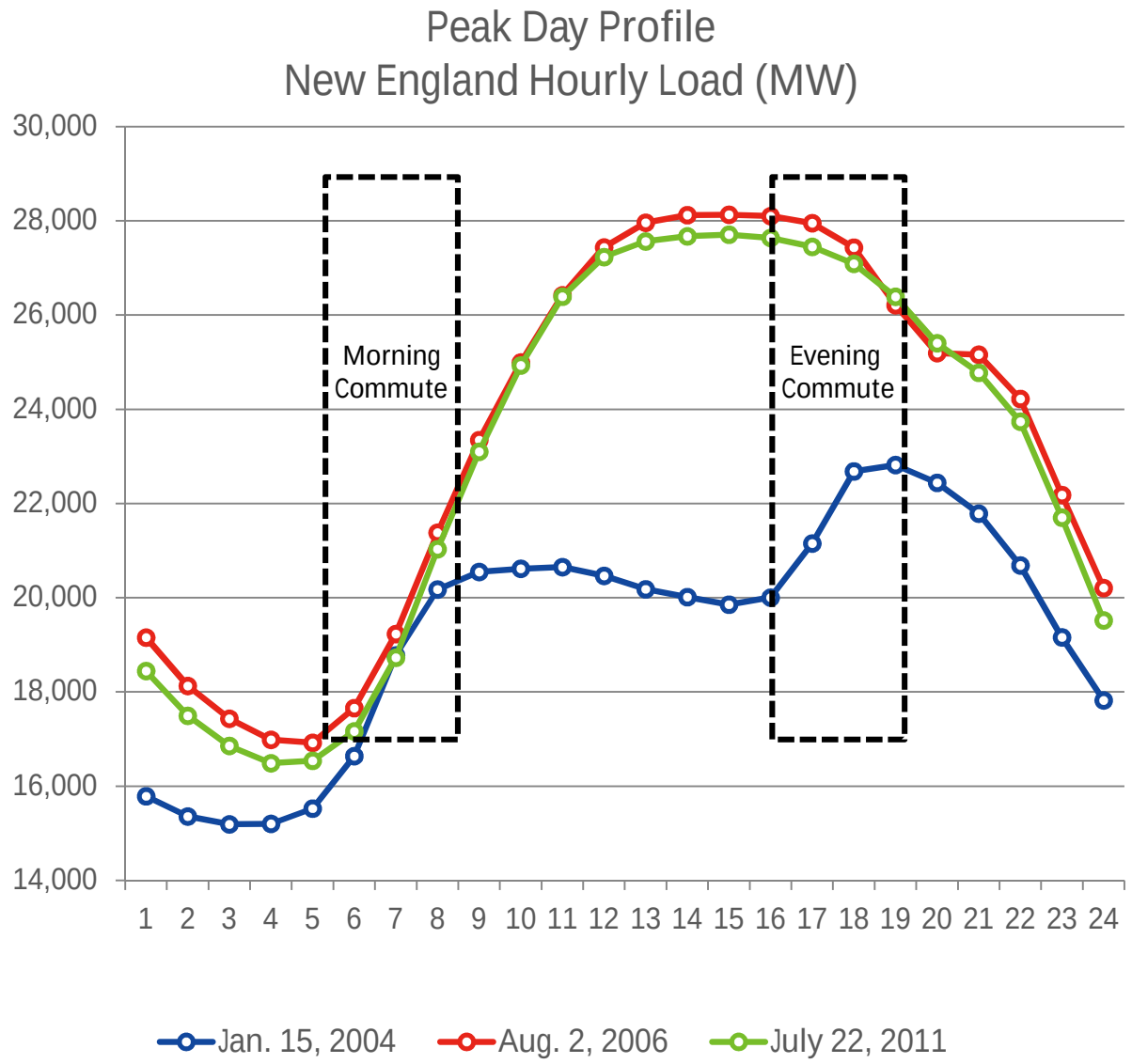
Potential Timing Issues

- From system operations perspective – these resources may be unavailable when needed most
  - During morning and winter evening ramp periods



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