MA ENERGY EFFICIENCY ADVISORY COUNCIL

→ CONSULTANT TEAM

DEMAND RESOURCES, DEMAND REDUCTIONS, AND DEMAND RESPONSE

INTRODUCTORY INFORMAL SESSION

EEAC Consultants

June 21, 2016

TODAY AND PREVIOUSLY

- Today's discussions on demand issues:
  - Informal session (now)
  - Eric Winkler, ISO-NE presentation
  - PA presentation and panel providing an update on the Demand Savings group, demonstrations, and PA analysis

- Prior discussions, documents, and reviews:
  - Update on the Demand Savings Group at the March EEAC meeting
  - Initial report on the Demand Savings Group by the PAs (March 31, 2016) and glossary in that report
  - Demand Savings Group meetings
  - Demand Reduction Subcommittee meetings (Feb. & June)
  - EEAC review of National Grid and Cape Light Compact proposed demonstrations (in the 2016-2018 Plan)

OUTLINE FOR INFORMAL SESSION

- Definitions, terminology, and classification
- Focus of discussions in Demand Savings Group
- Why pay attention to demand and peak demand?
- System-level (regional system, ISO) and state-level opportunities; ISO market resource (bid into the markets) vs. a state resource or utility resource
- Demand resources and demand reductions focused on multiple objectives, to provide multiple benefits -- not just focused on one objective or one benefit
- New opportunities and considerations, due in part to advanced technology and automation (this is not your parent's demand response)
- Many new opportunities can be leveraged by or layered on top of EE efforts – especially with advanced technology and automation.

DEFINITIONS

- **Demand Resource (ISO-NE)**: A source of capacity whereby a customer reduces the demand for electricity from the bulk power system, such as by using energy-efficient equipment, shutting off equipment, and using electricity generated on site.
  - **Active Demand Resource**: Real-Time Demand Response and Real-Time Emergency Generation
  - **Passive Demand Resource**: Energy Efficiency
- **Demand Response Programs (EIA):** Demand response programs encourage electric power customers to temporarily reduce their demand for power at certain times in exchange for a reduction in their electricity bills. Some demand response programs allow electric power system operators to directly reduce load, while in others, customers retain control. Customer-controlled reductions in demand may involve actions such as curtailing load, operating onsite generation, or shifting electricity use to another time period.

DEMAND RESOURCE STRATEGIES

Demand Resource Policies and Strategies
• Demand reductions from EE programs
• Demand response to reduce peak demand (actively) in specific time periods (ISO regional market, state efforts)
• Demand management, direct load control, and load shifting, through strategies using controls, analytics, energy management systems, connected technologies
• *Integrated* approaches to the above (e.g., integrated EE and demand response using controls and thermostats)
• Pricing and rate design (time-varying rates, demand charges)

FOCUS OF DISCUSSIONS IN DEMAND SAVINGS GROUP AND SUBCOMMITTEE

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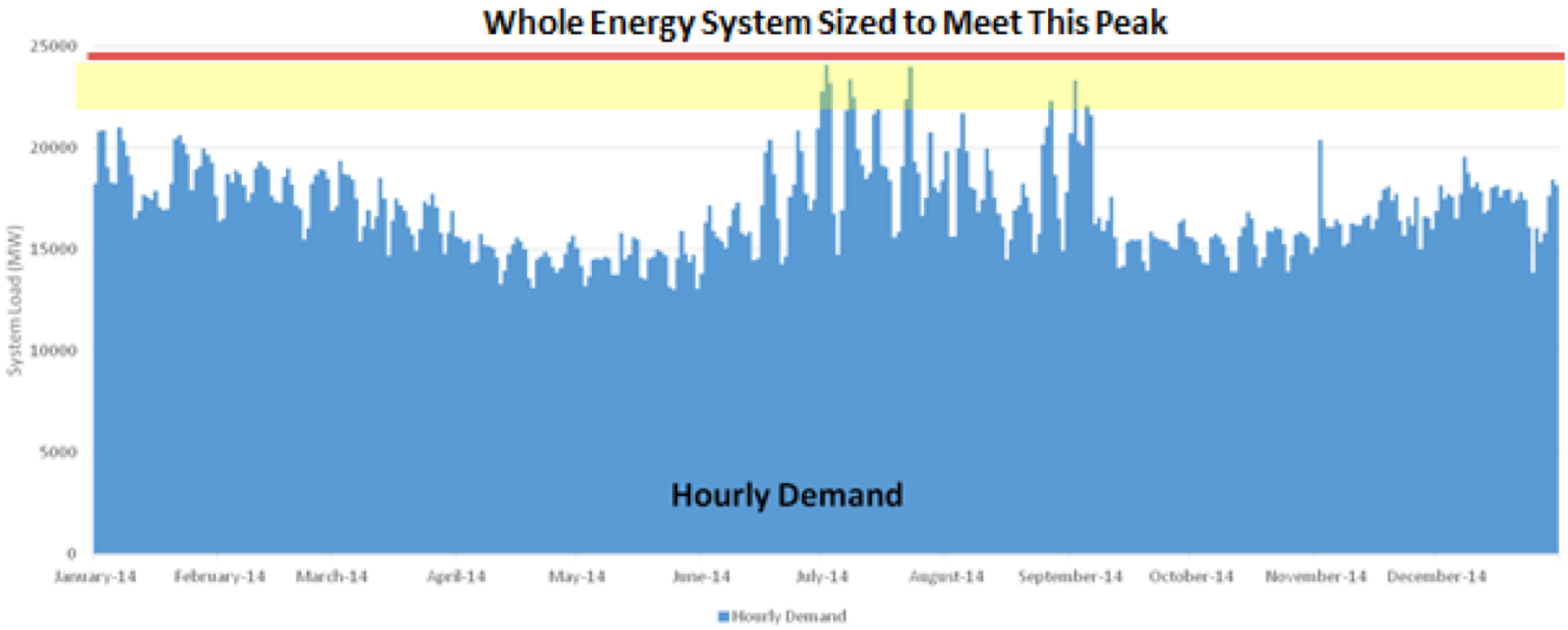
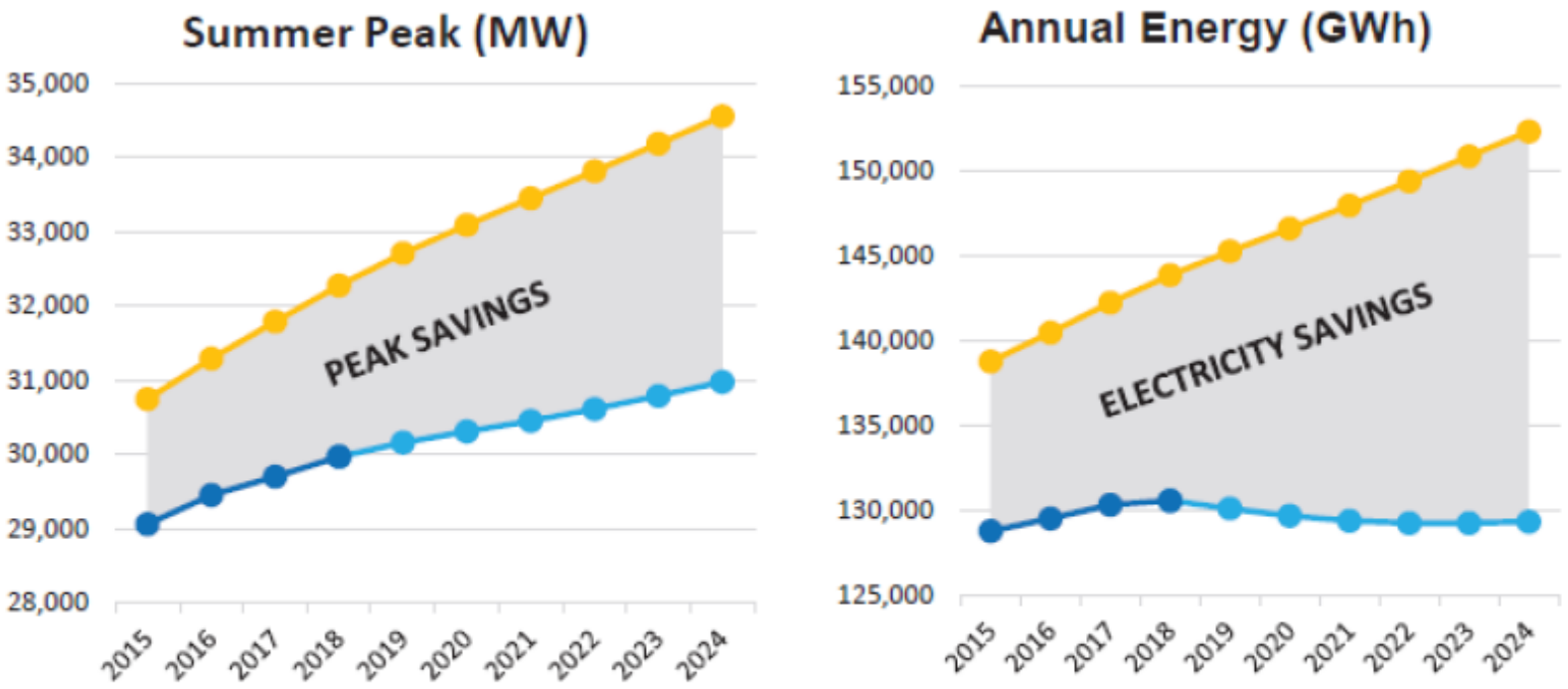
WHY PAY ATTENTION TO PEAK DEMAND? RELIABILITY AND COST

Electric Grid is Sized for Highest Hour of Demand



Top 1% of Hours accounts for 8% of Massachusetts Spend on Electricity
Top 10% of Hours accounts for 40% of Electricity Spend

ENERGY USE IS FLAT OR DECLINING, BUT PEAK CONTINUES TO GROW



Source: ISO-NE State of the Grid- 2016

The gross forecast of peak demand and energy use

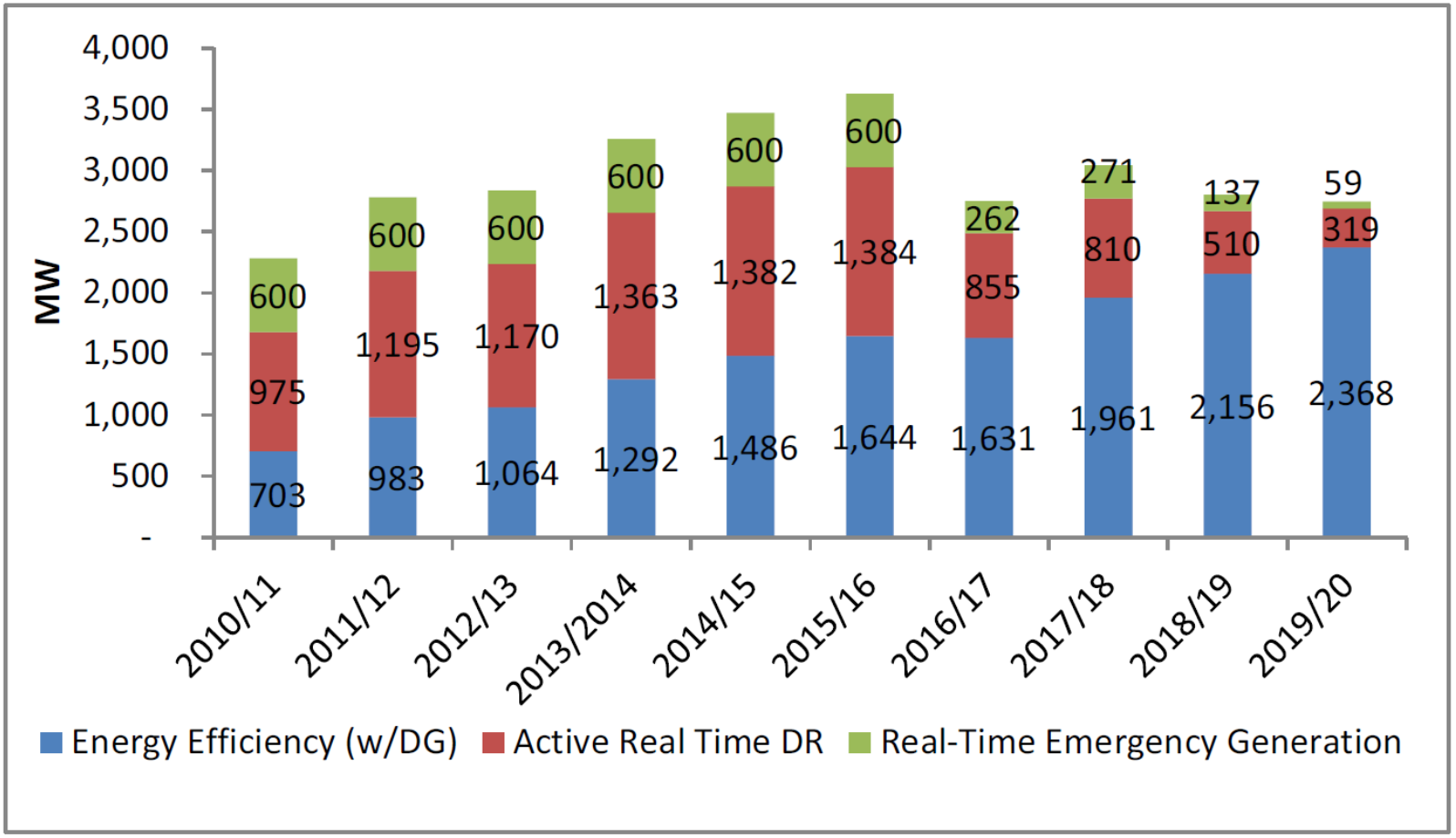
The forecast minus the impact of EE participating in the Forward Capacity Market (FCM) to date

The forecast minus anticipated EE growth beyond FCM years

Sources: ISO-NE, MA DOER slide

ACTIVE DEMAND RESPONSE RESOURCES HAVE DECLINED IN NEW ENGLAND

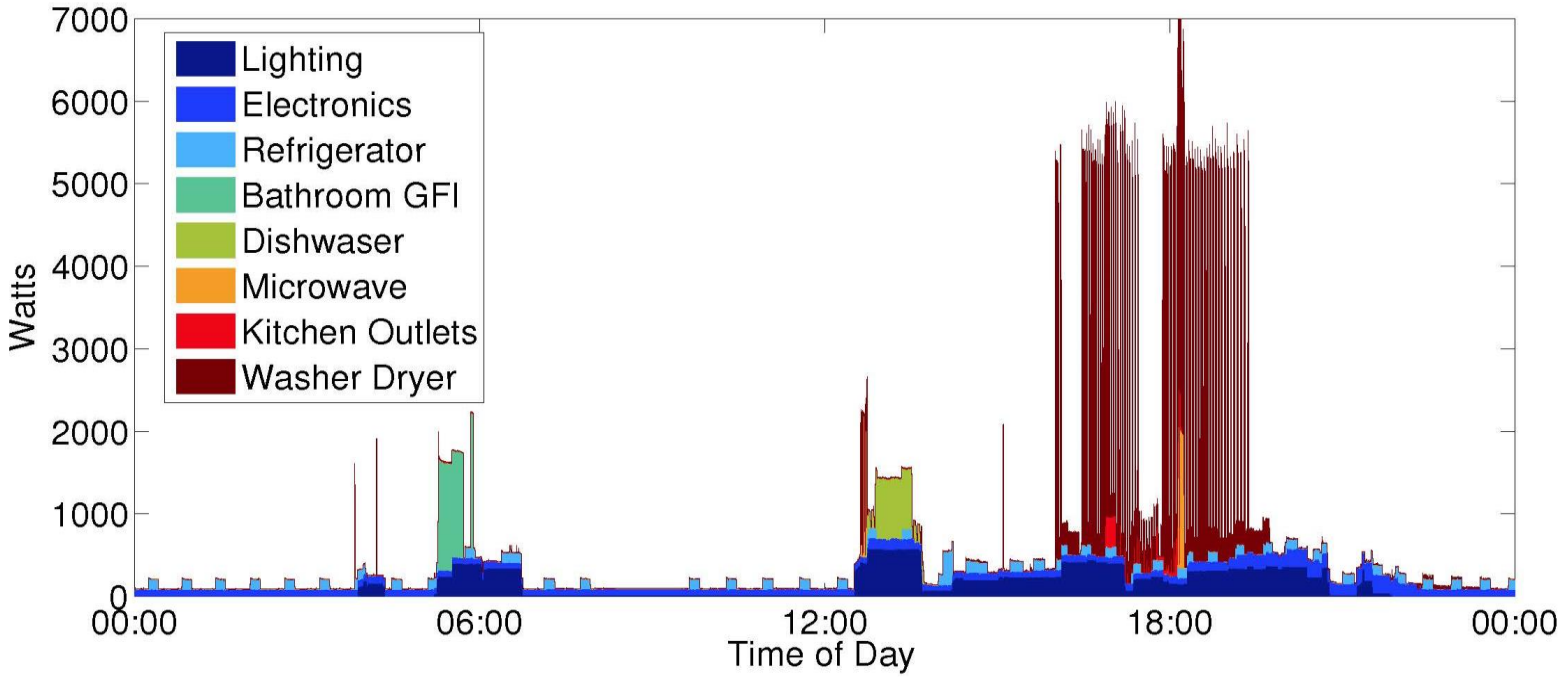
Capacity Supply Obligations taken by demand side resources in the primary auction of FCM starting in 2010/2011 through 2019/2020.



Source: Initial Report of Demand Savings Group, 3/31/16

WINTER AND SUMMER PEAK

- End use disaggregation to better understand the actual composition of load (Retroficiency, First Fuel, Nest, others)
- Example of an electric winter load shape:



Source: PA slides, February 2016

SOME OPTIONS TO RECEIVE VALUE FROM DEMAND REDUCTIONS

- Both system-level (regional system, ISO) and state-level opportunities
- ISO market resource (bid into the markets) vs. a state resource or utility resource
- Some options:
  1. Forward Capacity Market (FCM): bid into the FCM, receive FCM revenues (to fund programs), and put downward pressure as part of FCA auctions
  2. Installed Capacity Requirement (ICR) and forecast: reduce the ICR, then states would need to buy less capacity (but demand resources are reconstituted if bid in)
  3. ICAP Tag and cost allocation: reduce demand in peak hour, thereby reducing the share of capacity costs to the load serving entity and some larger customers (the total system cost doesn't decrease but system share paid by MA would)
  4. Reduce customer costs by reducing demand charges

NOT YOUR PARENT'S DEMAND RESPONSE

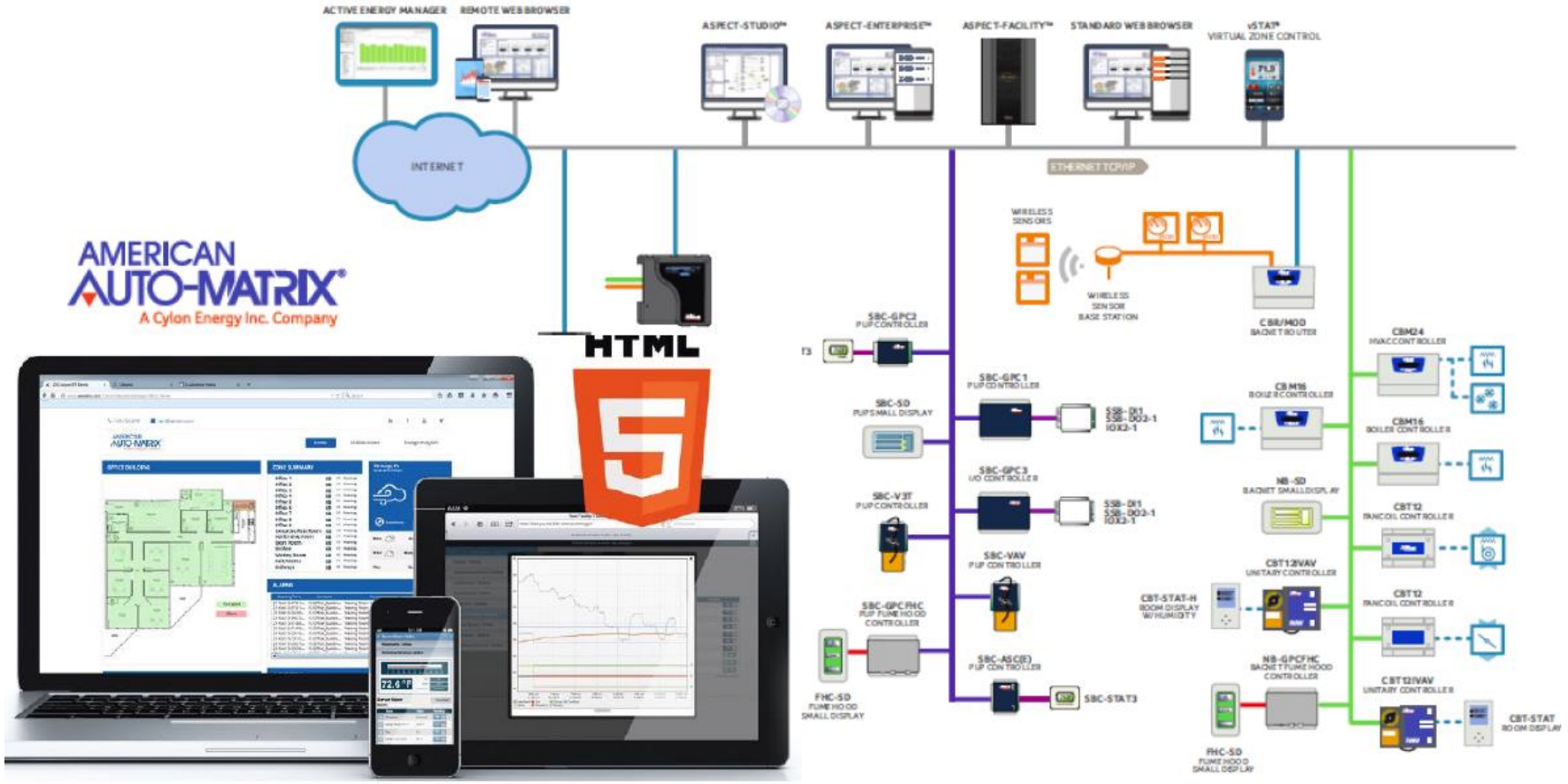
- Not just:
  - Large customers
  - "Curtailment"
  - Events

- Future opportunities
  - All sectors
  - New opportunities and considerations, due in large part to advanced technology and automation
  - Demand resources and demand reductions focused on multiple objectives, to provide multiple benefits -- not just focused on one objective or one benefit or one market

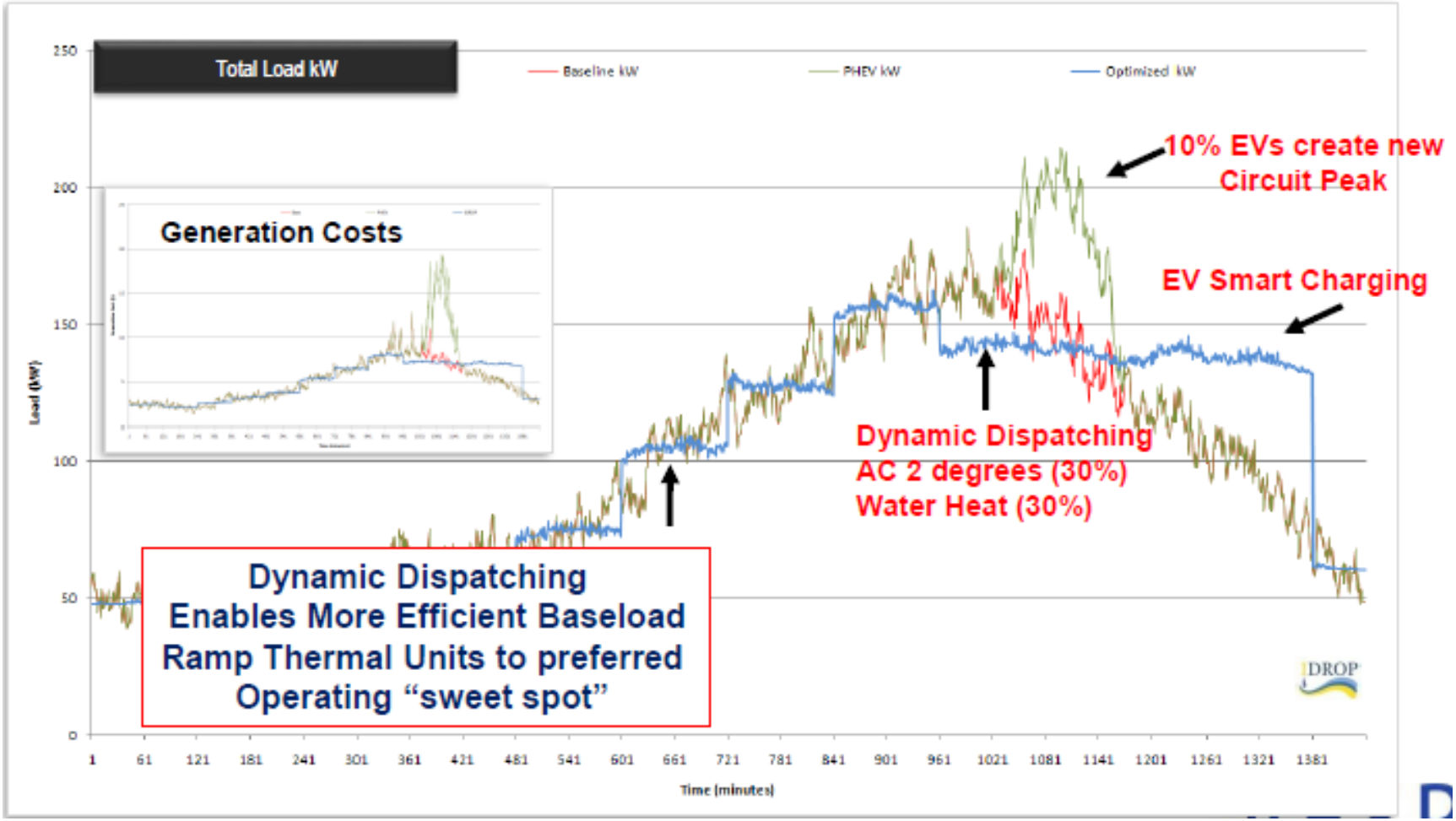
- More about *demand management* than about direct *control* or customer *response* to a noticed event

ENERGY MANAGEMENT SYSTEMS, CONTROLS, AND AUTOMATION

Building Automation and Energy Management



DEMAND MANAGEMENT, ANALYTICS, AND CONTROLS

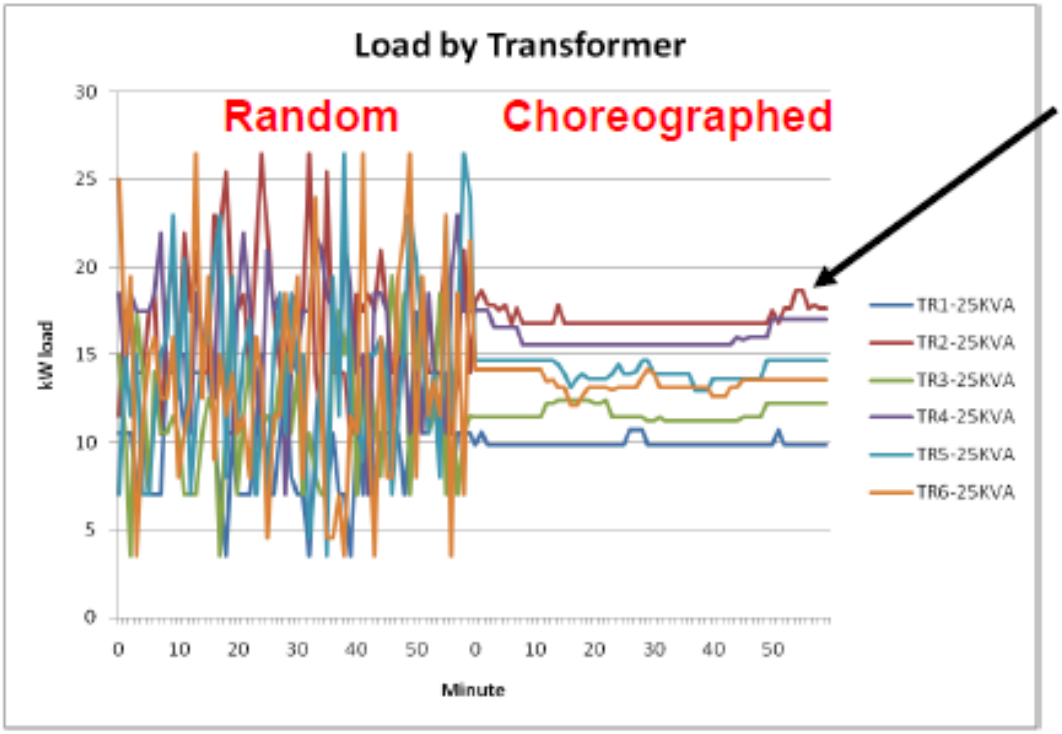


Source: PA slides for DSG. Example from Integral Analytics.

SOFTWARE/ANALYTICS VENDORS: LOAD FLATTENING STRATEGIES

Voltage Improves, Asset Protected

IA only needs 25%-40% customer participation to levelize load, which saves utility money and does not force customers to participate.



Bumps intentional to limit the extent that AC units are started/stopped, and to optimize on customer marginal costs, not just on load alone.

Loads are flat enough to observe improved voltages and protects the service transformer

Six transformers, 30 homes, displaying normal volatility in load prior to IA vs. after optimizations are operational.

Source: PA slides for DSG. Example from Integral Analytics.

KEY INFORMATION NEEDS

- Technology and automation – how well will it work, will it perform as expected (and as sold)?
- Customer interaction and acceptance – how will customers interact with new technology and automated systems, and what will be the nature and degree of customers allowing others to manage their load?
- Integration – what are the best opportunities to integrate energy efficiency with active demand management and demand response?

- *Demonstrations over next 1-2 years are crucial to addressing these key information needs and answering the research questions*

INTEGRATION OF EE AND DEMAND MANAGEMENT/DR

- Many new opportunities can be leveraged by or layered on top of EE efforts – especially with advanced technology and automation.
- Not siloed into EE vs DR
- Examples:
  - Energy management systems, controls, and automation to manage lighting, HVAC, and process loads
  - Lighting controls in commercial facilities
  - Process automation
  - Wifi thermostats to reduce energy use and manage peak demand (summer and winter opportunities)
  - Smart systems and smart controls and smart equipment

SCHEDULE

- Logical sequence of analysis, initial explorations, demonstrations, and “offerings” (larger-scale efforts)
  - Analyzing and developing
  - Doing and implementing
  - Evaluating and learning
  - Growing actual demand reductions
- What do you need to do in each of 2016, 2017, and 2018?
- What do you need to do to achieve objectives and provide value during this three-year period?
- What do you need to do in time for the 2019-2021 Plan?
  - Draft plan in April 2018
  - Full implementation in time for winter of 2018-2019
  - Full implementation in early 2019