# Update from PAs on Demand Savings Group

MA EEAC Meeting

June 21, 2016

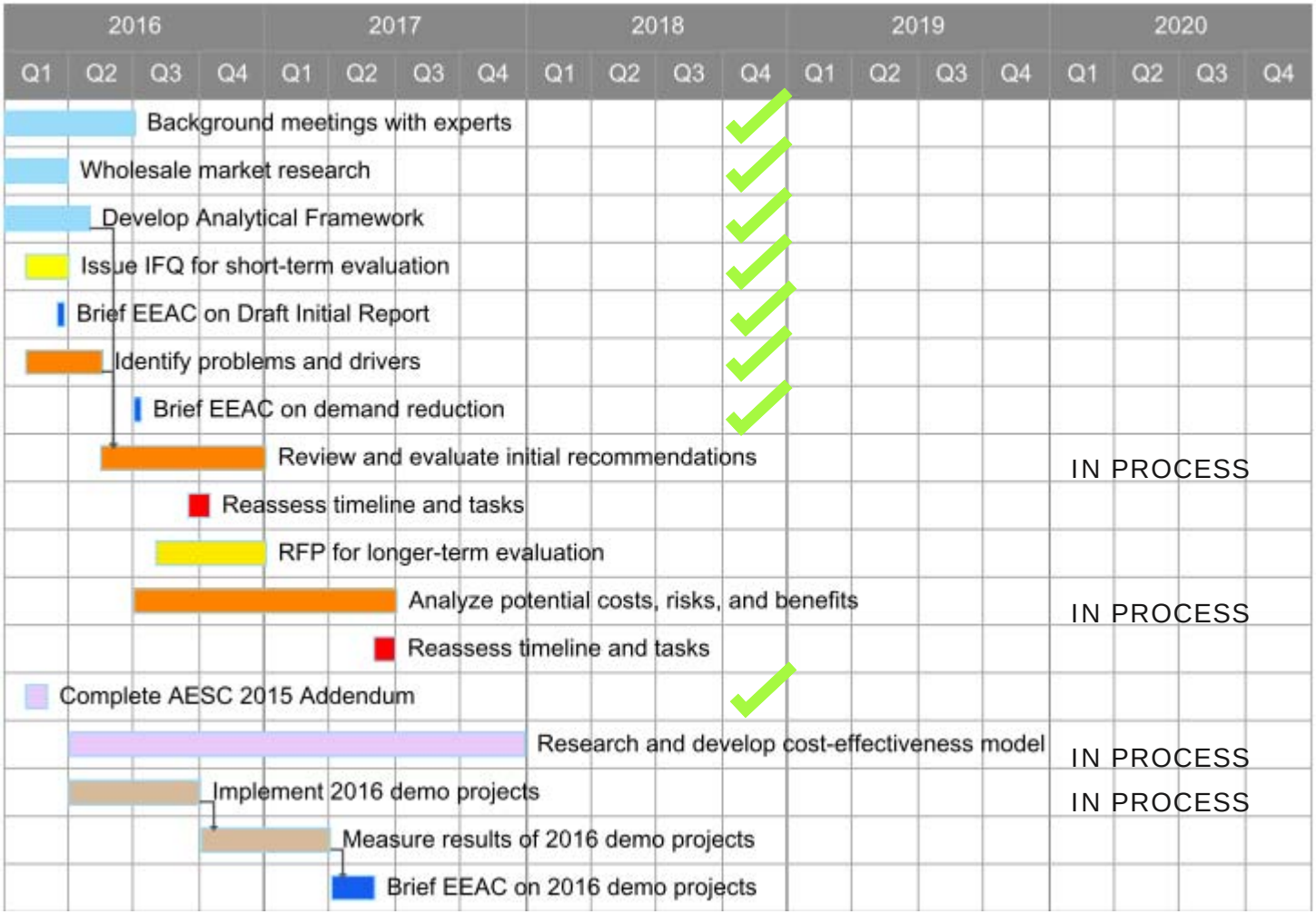
# What are the PAs trying to accomplish through the DSG?

- Meet the Goals identified in Initial Report.
  - Determine a number of residential, low-income and C&I behind the meter technologies that could potentially actively save/shift demand.
  - Develop a cost-effectiveness screening model that is in line with DPU guidelines and is appropriate for MA.
  - Identify a technology or technologies that could be appropriately included in the next three year plan and adopted as appropriate by individual PAs based on ability to save/shift demand, scalability, and incentives that will move the market with a consideration for bill impacts.
  - Even if there are no technologies or approaches that are cost-effective, are not accepted by the market, and/or not scalable, the effort being conducted to make that determination would be time/resources well spent, therefore, a success.

# How are the PAs going to get there?

- PAs developed an Analytical Framework with questions to guide overall analysis
- Focus on achieving objectives outlined in Initial Report
- Use learnings from other jurisdictions, consult with experts, and deploy appropriate demonstration projects when necessary

# Progress to Date




## Highlights:

- Met with ISO-NE, system planning engineers, DR vendors
- Released IFQ for EM&V vendor, made selection, completed contracting
- Multiple cost-effectiveness meetings with industry experts
- Completed AESC four-hour peak addendum
- Demonstration projects ramping up

# Progress on Analytical Framework

## Identify the Problems

- ISO Level
  - Amount of capacity
  - Cost of capacity
- Distribution Level
  - System constraints, planning horizons
- Customer Level

## Evaluate Solutions

- Review potential solutions
- 2016 Demonstrations - Enrolling Now

## Analyze costs, risks, and benefits

- Cost effectiveness screening

## Steps Taken:

- Conducted meetings with:
  - ISO-NE
  - System planning engineers
  - PA customers
- Reviewed available documents

- Worked with Fraunhofer to model measures
- Talked with PAs in other jurisdictions
- Met with vendors
- Leveraging existing program pathways
- Using learnings from others both in-state and in other jurisdictions

- Talked to outside vendors about models for DERs in other jurisdictions
- Revisited whether existing avoided costs are appropriate and are "optimized"
- Developed draft screening models

## Lessons Learned:

- Changes in ISO market rules present opportunities and challenges
  - Capacity v. Energy only
- Opportunity for programs to impact ISO forecasts without bidding into market but potential cost effectiveness issues
- System planners need to know reliability of reductions within 5 year planning horizon
  - May be able to impact planning indirectly by lowering peak demand
- Large customers are concerned about ICAP tags and demand charges

- Dispatchable assets have highest peak coincidence reduction values
- Some customers want choice, control and predictability
- Residential customers with Wifi Tstats connected to central AC have a high potential for load reductions within the sector
- Tstat manufacturers have customer experiences that they want to maintain even with BYOD approach

- Discussed in detail later in presentation

# Initial Conclusions/Lessons Learned

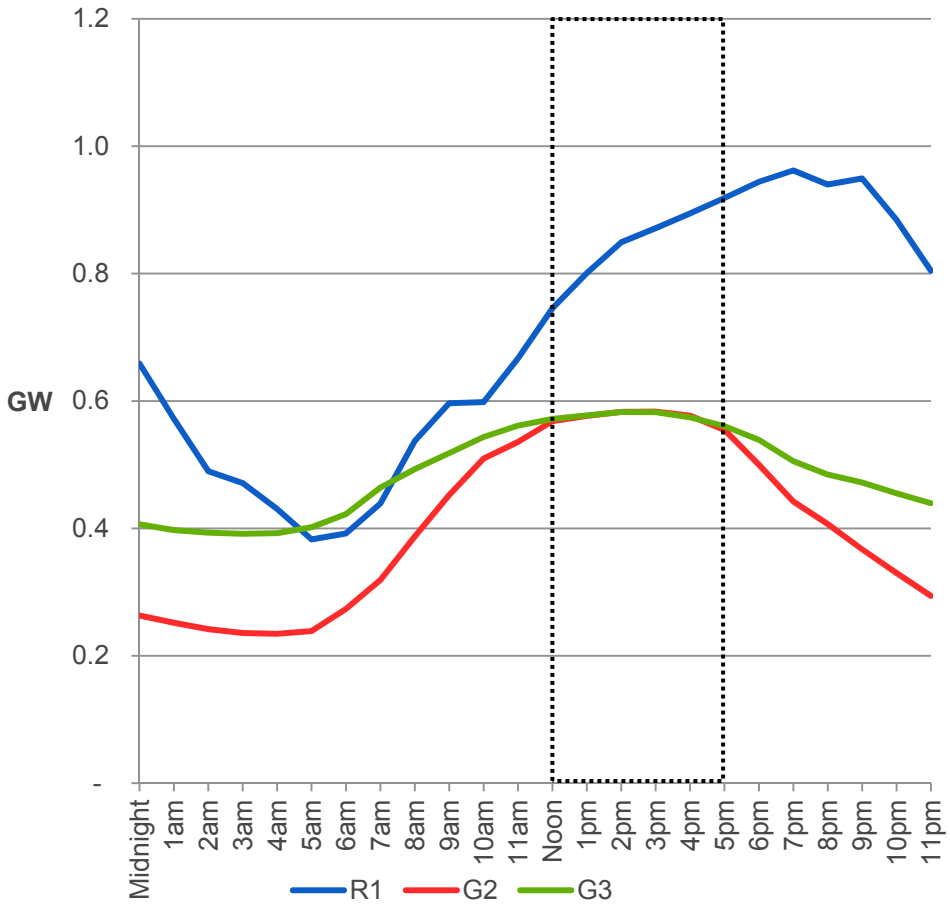
- There are multiple ways to impact system peak with differing costs, risks, and potential benefits.
  - Bidding demand response savings into capacity market includes strict telemetry requirements, a must offer requirement in the energy markets, and pay-for-performance standards which entail penalties. There is inherent risk in this option but could deliver significant benefits.
- Program models in other jurisdictions have been successful at lowering demand but have faced challenges in doing so, especially related to peak demand.
  - Some jurisdictions have seen increased opt-outs/overrides during extreme heat waves (when peak demand reduction is needed most)
  - Other ISOs have different market rules, influencing other PAs willingness to participate in wholesale markets.
- Need to address cost-effectiveness questions.
  - Current B/C model used for EE captures most costs and benefits – moderate refinements needed to address granular temporal nature of active demand reduction.
    - Avoided Capacity and Avoided Distribution benefits are the greatest currently understood proportion of active demand reduction benefits.
  - Other jurisdiction models and assumptions are based on their particular energy markets & rules, utility structure, PUC requirements which are different from Massachusetts.
    - E.g., California does not have a capacity market. The avoided cost of capacity is set by the California PUC and it is above the market capacity rate.
    - The presently used cost-effectiveness model may require hourly values for energy.
    - Additional benefit streams will need to be built into the model when identified and quantified.

# Eversource Specific Projects Update

# Energy Efficiency in the Information Age:
## Leveraging Real Time Information for Demand Management

**Reviewed Customer Classes**

- Analysis of load shapes by rate class led to focus on C&I



# Energy Efficiency in the Information Age:
## Leveraging Real Time Information for Demand Management

Reviewed Customer Classes → Reviewed Specific Customers

- Many customers have already optimized “peak” savings; but others still have opportunity
- Developed personas for promising customer types
- Potential for scale across C&I sector

Personas:

| | |
|---|---|
| | Small Retail/Restaurant |
| | Commercial |
| | Office |
| | University/Laboratory |
| | Manufacturing |

# Energy Efficiency in the Information Age:
## Leveraging Real Time Information for Demand Management

Reviewed Customer Classes → Reviewed Specific Customers → **Developed Hypotheses**

- Found many existing tools, technologies and vendors to reduce peak demand, but limited deployment
- Identified potential barriers preventing widespread demand reduction
- Engaging customers to test hypotheses and potential solutions

Barriers:

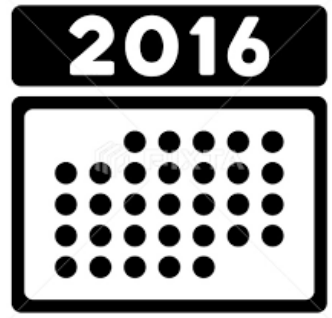
Lack of Awareness
Lack of Actionable Information
Insufficient Incentives

Example Solutions

Energy Management System
Sub-metering
Storage

# Energy Efficiency in the Information Age:
## Leveraging Real Time Information for Demand Management

Reviewed Customer Classes → Reviewed Specific Customers → Developed Hypotheses → **Field Deployment and Testing**




In the field starting summer 2016

Initial evaluation and scale up starting 2017

# Demonstration Project Set 1: Small Retail Customers

- Hypothesis: Small businesses who lack information and incentives to reduce coincident demand will have opportunities to reduce demand by bettering aligning energy usage with business profile
- Approach: Install EMS software and lighting controls to provide real-time information, with an initial focus on retail chains that can scale
- Question to be Answered:
  - Are information and equipment enough to reduce demand peaks, without specific financial incentives e.g., demand charges?
- Timeframe:
  - Enrolling franchisees for audits (now)
  - Installing equipment (through the summer)
  - Evaluation (end of the year)
  - Starting with one customer/brand, planning to roll out to similar customers/brands in 2017 timeframe

# Demonstration Project Set 2: Mid to Large Sized Customers

- Hypothesis: Lack of awareness of the demand issue, as well as lack of facility-specific information, is preventing demand optimization
- Approach: Develop on-site training for facility managers and/or sub-metering/EMS to raise awareness and develop specific opportunities for demand reduction
- Questions to be Answered:
  - Is training/information sufficient to cause operational change to appreciably reduce demand peaks?
  - What types of customers/facilities respond best to this training/information (i.e. is there a customer sweet spot?)
- Timeframe:
  - Reviewing responses to training RFP currently; will implement training in 2016-2018
  - Conducting on-sites for manufacturers and laboratories
  - Will work with customers to develop actionable demand reduction strategies based on sub-metering results in 2017

# National Grid Specific Projects Update

# National Grid Vision

## Why

60% of customers are interested in connected home solutions

**Convenience**

**Control**

**Savings**

## What

Integrated platform for connected devices

### Future

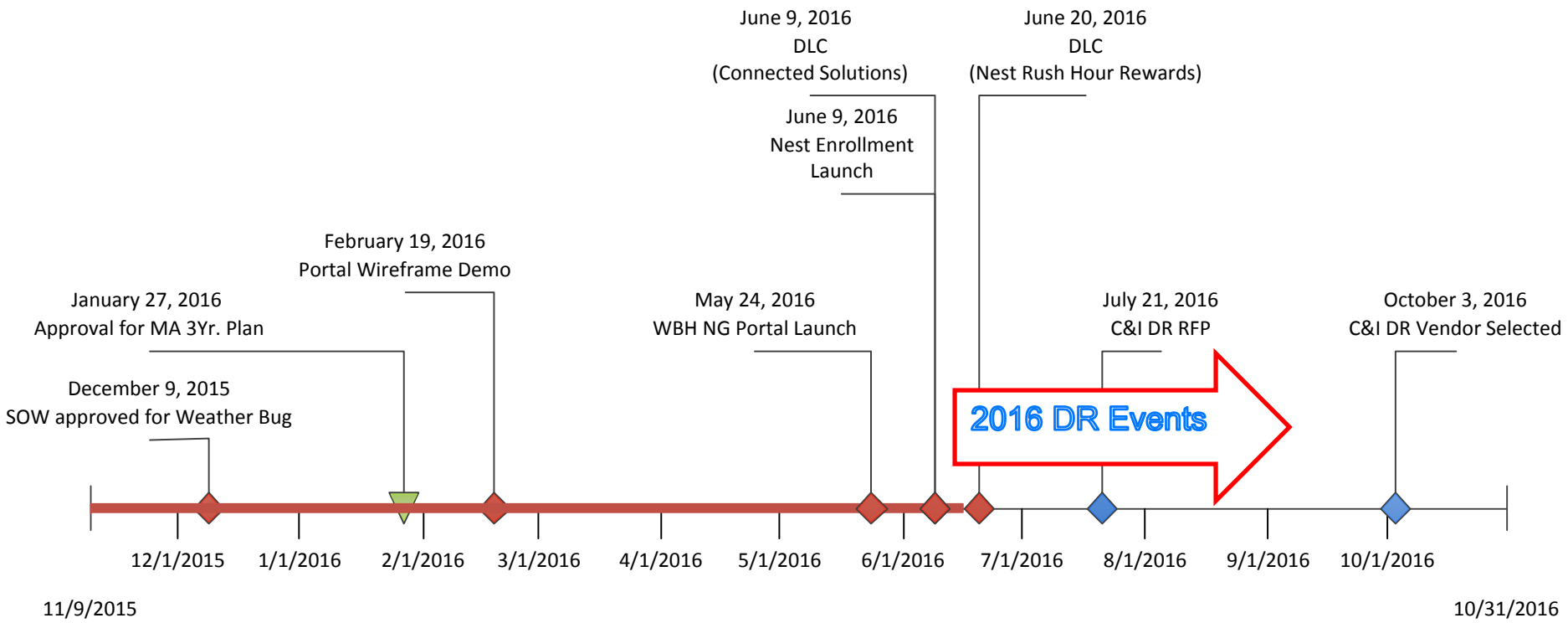
## How

Partnerships

BYOD

Integration with EE and Smart Grid

# Timeline - 2016

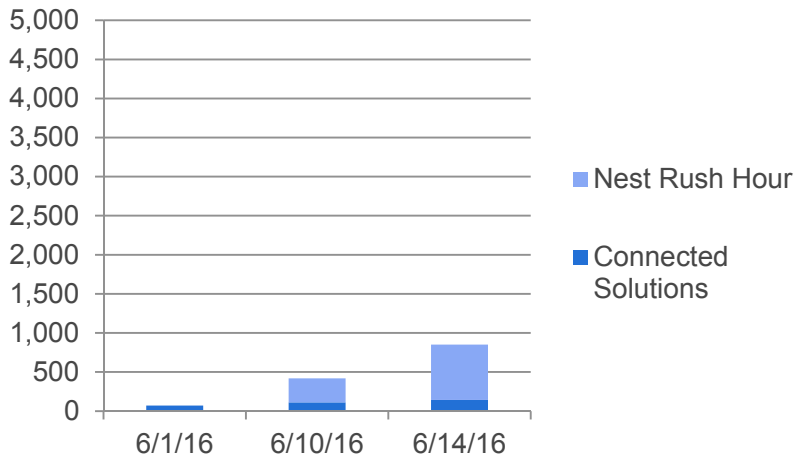


# Direct Load Control Demonstration Project

- **Goal:** To leverage seeded and new EE technological enablers to scale amount of demand controlled using findings from Smart Energy Solutions Pilot
- **Participant Groups:**
  - Existing Wifi Tstats installed through EE programs
  - New Wifi Tstats installed through EE programs
  - With central air conditioning

## Enrollment Targets

| Year | Wi Tstats Enrolled |
|---|---|
| 2016 | 6,000 |
| 2017 | 15,000 |
| 2018 | 40,000* |




* Dependent on Wifi Tstat sales continuing

# Incentive & Event Structure

- Incentive Structure
  - Connected Solutions – Launched 5/24
    - $25 for enrollment
    - $25 for participation
    - www.Ngrid.com/ma-connectedsolutions
  - Nest Rush Hour Rewards – Launched 6/9
    - $40 for enrollment & participation
    - www.nest.com/energy-partners/national-grid/
- Events Structure
  - Connected Solutions
    - Using a territory specific WA DA LMP* of $49 ~ 126 hours of events
  - Nest Rush Hour Rewards
    - Using a territory specific WA DA LMP* of $62 ~64 hours of events
  - Event Rules
    - One event per day, maximum length 4 hours
    - In a day where the price is over the trigger price for more than 4 hours, the event will be structured around the highest price hour.
    - Trigger price needs to persist over 1 hour to call an event ( Minimum length of event is 2 hours)
    - June 1st and Sept 31st 10 am and 8 pm, on weekdays and non-holidays
  - Revisit the trigger price on July 15th to assess



* WA DA LMP – National Grid territory specific weighted average of the day ahead Locational Marginal Price

# Marketing & Outreach Pathways

- Making use of HES, Residential Heating & Cooling Equip., and Small Business pathways
- Marketing for Connected Solutions is through multiple channels:
  - When a National Grid Electric customers get an HES audit, and if they have central AC, they get information and can sign up to get a no-cost Wi-Fi thermostat and a no-cost install and the installer will help them enroll in the program  the day of the thermostat install.
  - National Grid Electric customers who already have Wi-Fi thermostats with Honeywell, Ecobee, and Nest have and are being sent emails to join the program by provider
  - Honeywell will be doing in-store campaigns, this summer, for Wi-Fi thermostats and will advertise Connected Solutions and the associated incentives
- National Grid will be targeting potential central AC customers, with a marketing campaign about Connected Solutions in June

# Cape Light Compact Specific Projects Update

# Demonstration Offering Overview

- **Demonstration Offering Goal: Learn how to engage residential customers in demand response**
  - Use experience to inform development of future DR programs
- Participant groups: built on current Behavior Initiative
  - Opt-in monitoring only group (180 Enrolled)
  - Opt-in monitoring + Wi-Fi thermostat group (Enrolling now)
  - Opt-out monitoring + Wi-Fi thermostat group (Enrolling now)
    - Goal: enroll 40+ total Wi-Fi thermostat participants
- Events: 7-10 events in July – September 2016
  - Will target Cape/Vineyard-specific peak and system-wide peak
  - Will be 4 hours long
  - Participants will be notified of upcoming events
    - via email and app

# Demonstration Offering Overview

- Incentives
  - All participants will be paid per kWh reduced relative to baseline
  - Wi-Fi Thermostat participants will receive $20 for enrolling, plus thermostat and monitoring device
  - Opportunity to win prizes based on participation
- Data:
  - 5-minute interval usage data through monitoring device
  - Thermostat data during events
- Analysis:
  - kW/kWh reduced during events
  - Opt-In vs. Opt-Out participation and reduction rates
  - Customer sensitivity to thermostat adjustments

# Timeline and Next Steps

- July – September 2016
  - Continue enrolling WiFi thermostat participants
  - Hold 7-10 DR events
  - On a per-event basis, review results and adjust as necessary
- October 2016 – May 2017:
  - Continue enrolling customers
  - Review results from Summer 2016 to inform and implement necessary changes
  - Explore and implement additional DR technologies that will enable expansion of program for Summer 2017
- Also exploring small behind-the-meter storage demo

# Unitil Specific Projects Update

# Questions to be Answered and Timeframe

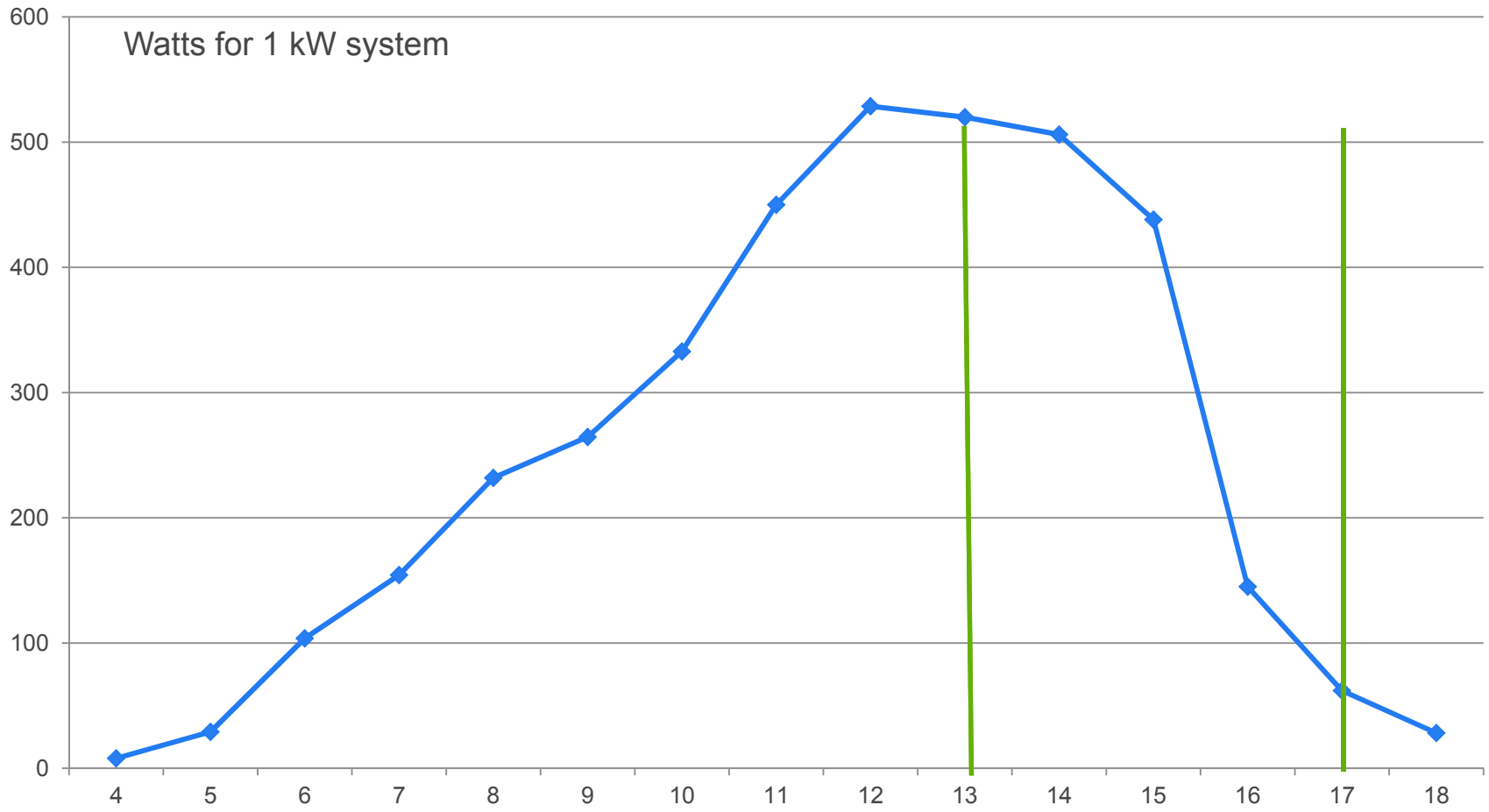
Questions to be Answered/Qualification of Technologies:

- Targeting ISO Peak, ISO 4-Hour Peak, Customer Peak*?
- Is there potential for a technology to have a significant impact?
- Cost-effectiveness?
- What incentives will be needed short-term (demonstration) and long-term?

Timeframe:

- Phase 1 ➡ Conduct Research on Technologies (2016 through November)
- Phase 2 ➡ Complete Planning (December 2016)
- Phase 3 ➡ Installation of Demonstration Projects if a technology/concept qualifies (January 2017 to June 2017)
- Phase 4 ➡ Project Analysis (July 2017 to June 2018)

# RESI Solar PV with Battery Storage



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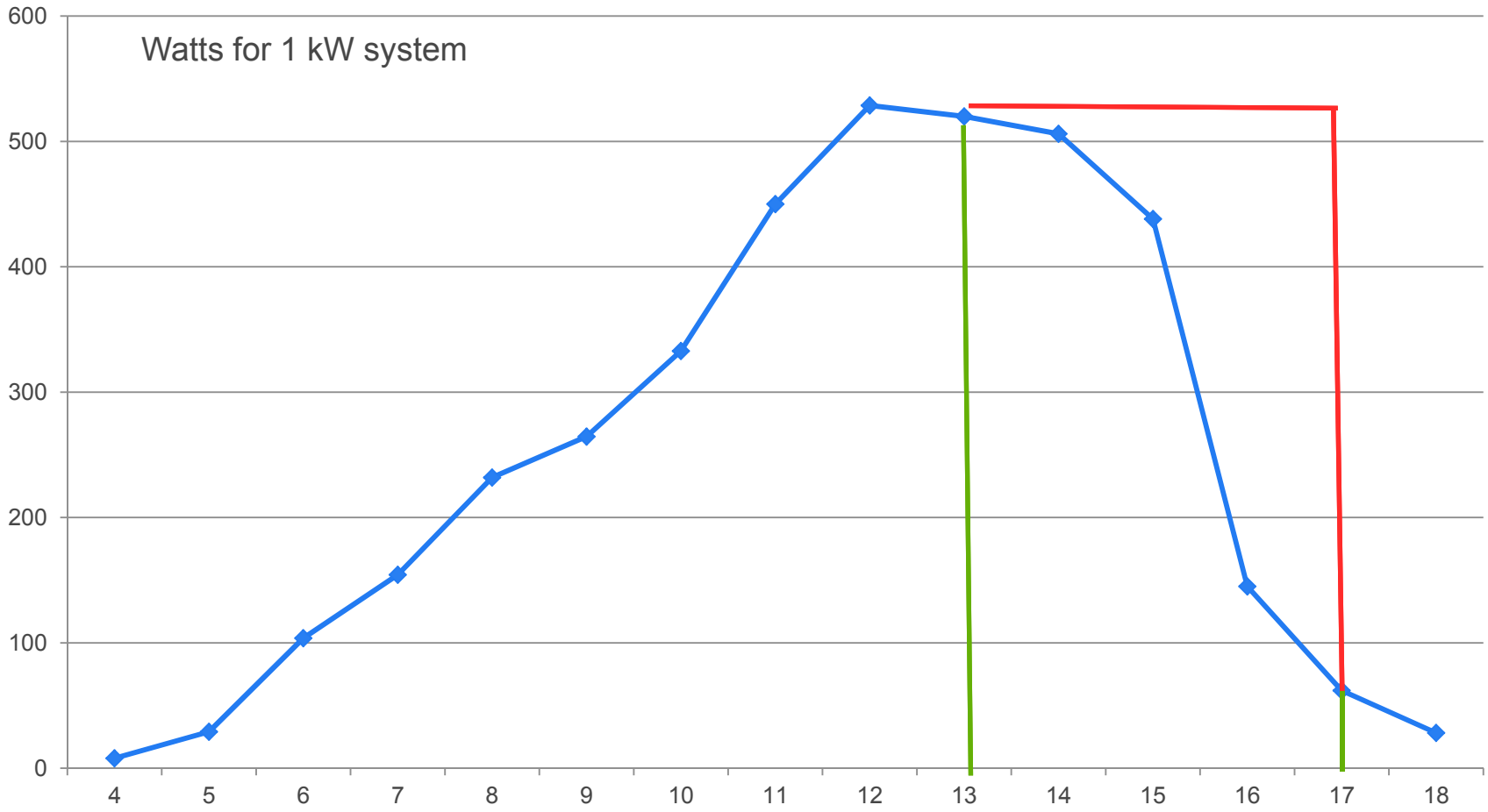


# RESI Solar PV with Battery Storage

- Determination of off-peak Grid Charging vs. Solar PV Charging percentages

- Determination of Battery kWh Needed per kW of Solar PV Installed

# Other Research Areas

- **WIFI Tstats for Small Commercial Buildings with Central AC/Heat Pumps**
  - Approach
  - Control Times*

- **Demand Logic Controls for C&I Refrigeration Compressors**
  - Controls to assure ½ the units are on/off at all times
  - Run 24/7*

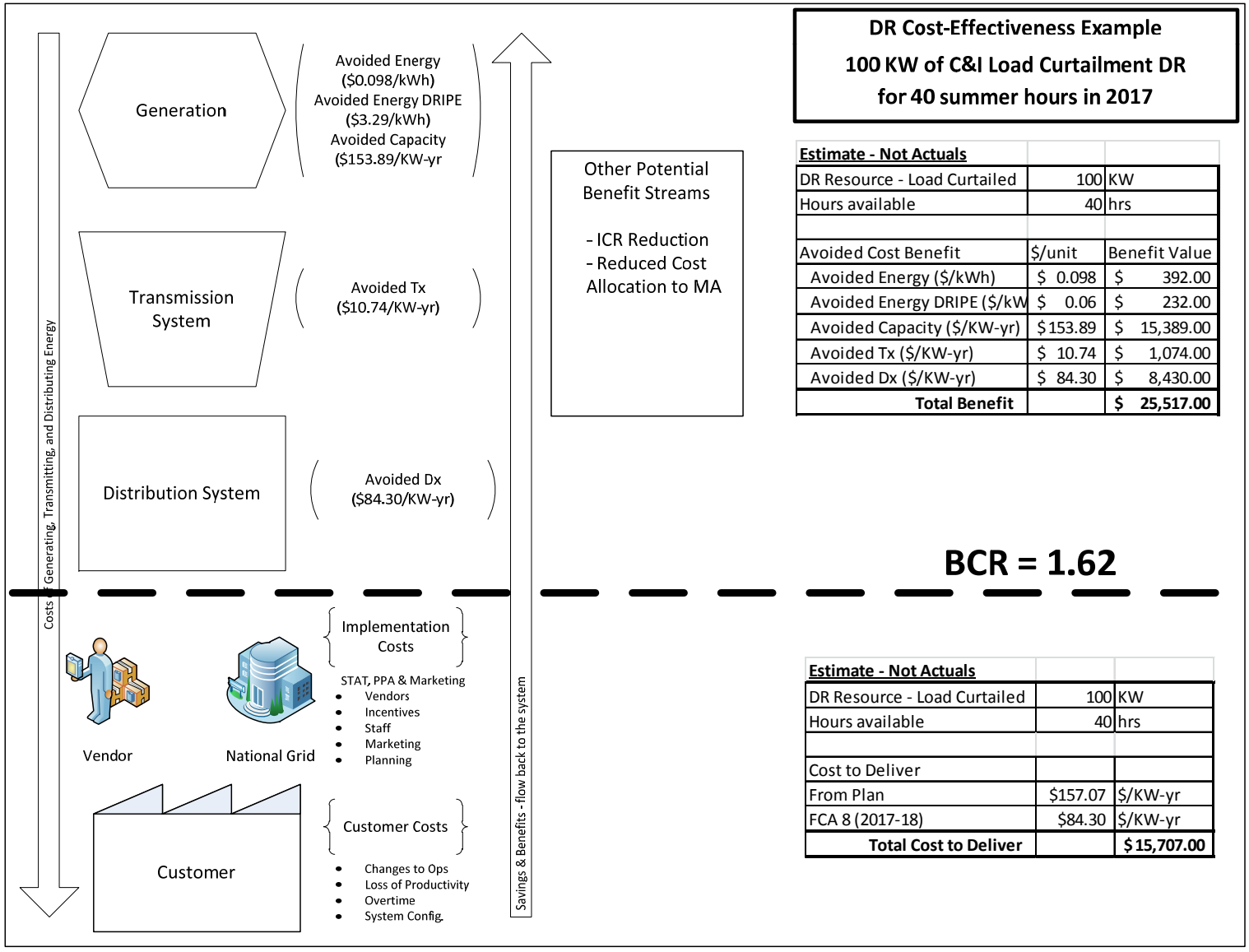
- **Residential AC Compressor Turn Down Controller**
  - Reduces Compressor Power Output by 50%
  - Controlled by Utility*

# Active Demand Reduction Cost-Effectiveness Considerations

# Precedent

- DPU 11-120-A, Phase II – January 31, 2013
  - 3.4.3.3 Program Benefits
    - Avoided Capacity – summer-period & winter-period
    - Avoided Energy – summer-period peak/off=peak & winter-period peak/off-peak
    - Avoided Transmission
    - Avoided Distribution
    - Capacity DRIPE (Demand Reduction Induced Price Effects)
    - Energy DRIPE
    - Non-Electric Benefits
      - Resource Benefits
      - Non-Resource Benefits
- Additional Analyses to capture additional benefits for demand reduction
    - Avoided Energy at four-hour peak periods – Complete and Included in draft screening
    - Reduced ICR (Installed Capacity Requirement) – Already included in Avoided Capacity
    - Reduce Cost Allocation for MA - >2 years from program start
    - Reliability – Applicable to only certain types of active demand reduction

# Diagram of Benefits & Costs – Large C&I Load Curtailment




**DR Cost-Effectiveness Example**

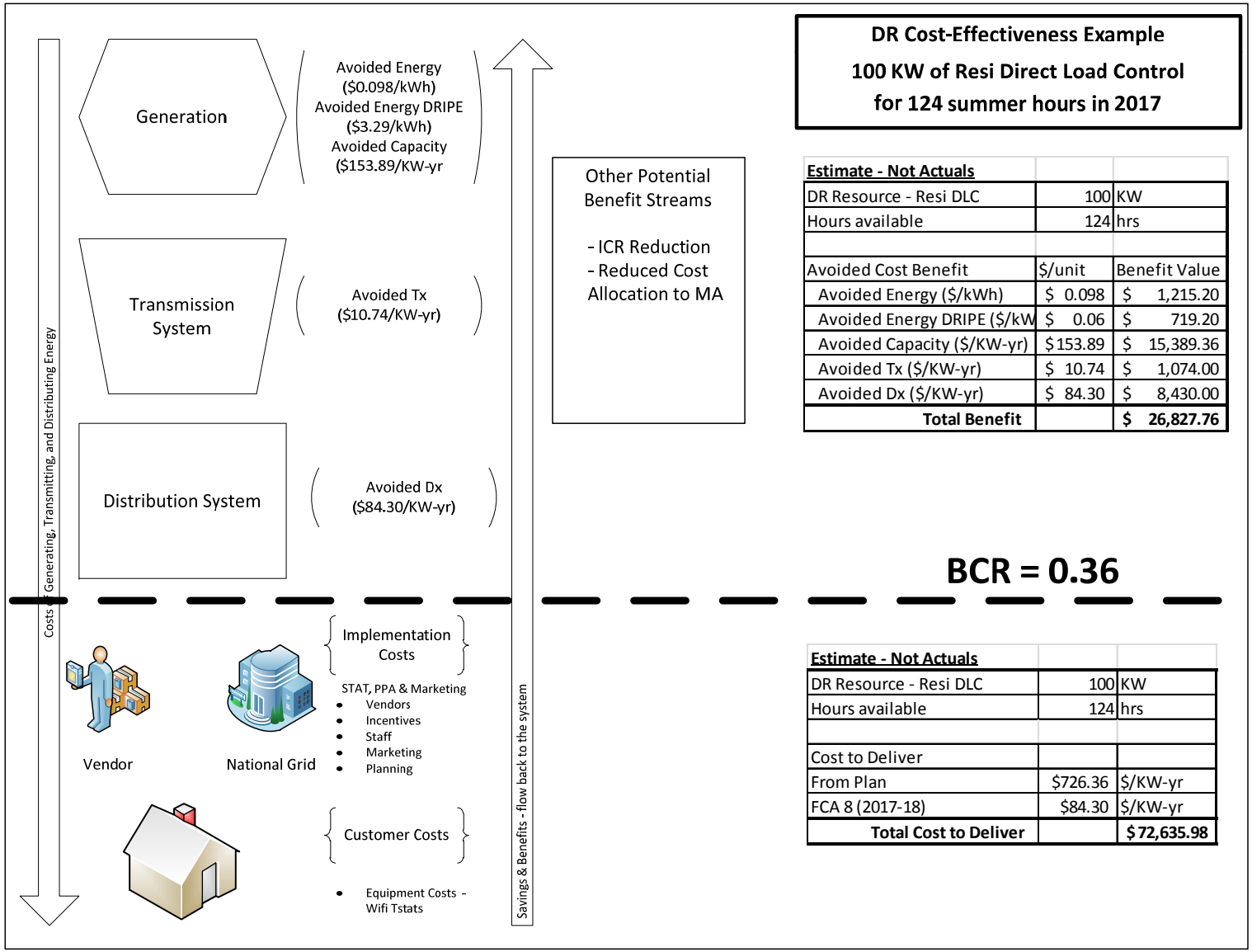
**100 KW of C&I Load Curtailment DR for 40 summer hours in 2017**

| Estimate - Not Actuals | | |
|---|---|---|
| DR Resource - Load Curtailed | 100 | KW |
| Hours available | 40 | hrs |
| | | |
| Avoided Cost Benefit | $/unit | Benefit Value |
| Avoided Energy ($/kWh) | $ 0.098 | $ 392.00 |
| Avoided Energy DRIPE ($/kW | $ 0.06 | $ 232.00 |
| Avoided Capacity ($/KW-yr) | $153.89 | $ 15,389.00 |
| Avoided Tx ($/KW-yr) | $ 10.74 | $ 1,074.00 |
| Avoided Dx ($/KW-yr) | $ 84.30 | $ 8,430.00 |
| **Total Benefit** | | **$ 25,517.00** |

**BCR = 1.62**

| Estimate - Not Actuals | | |
|---|---|---|
| DR Resource - Load Curtailed | 100 | KW |
| Hours available | 40 | hrs |
| | | |
| Cost to Deliver | | |
| From Plan | $157.07 | $/KW-yr |
| FCA 8 (2017-18) | $84.30 | $/KW-yr |
| **Total Cost to Deliver** | | **$15,707.00** |

# Diagram of Benefits & Costs – Residential DLC




**DR Cost-Effectiveness Example**

**100 KW of Resi Direct Load Control for 124 summer hours in 2017**

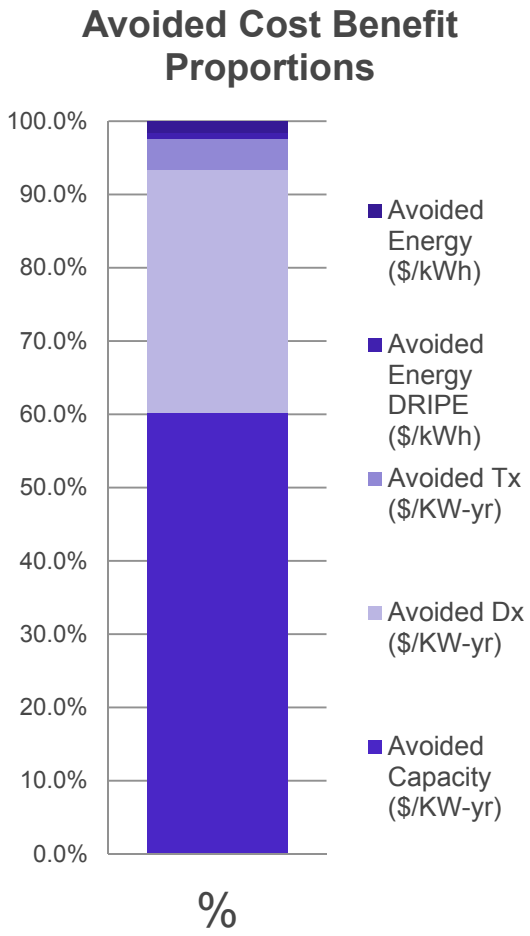
| Estimate - Not Actuals | | |
|---|---|---|
| DR Resource - Resi DLC | 100 | KW |
| Hours available | 124 | hrs |
| | | |
| Avoided Cost Benefit | $/unit | Benefit Value |
| Avoided Energy ($/kWh) | $ 0.098 | $ 1,215.20 |
| Avoided Energy DRIPE ($/kW | $ 0.06 | $ 719.20 |
| Avoided Capacity ($/KW-yr) | $ 153.89 | $ 15,389.36 |
| Avoided Tx ($/KW-yr) | $ 10.74 | $ 1,074.00 |
| Avoided Dx ($/KW-yr) | $ 84.30 | $ 8,430.00 |
| **Total Benefit** | | **$ 26,827.76** |

**BCR = 0.36**

| Estimate - Not Actuals | | |
|---|---|---|
| DR Resource - Resi DLC | 100 | KW |
| Hours available | 124 | hrs |
| | | |
| Cost to Deliver | | |
| From Plan | $726.36 | $/KW-yr |
| FCA 8 (2017-18) | $84.30 | $/KW-yr |
| **Total Cost to Deliver** | | **$ 72,635.98** |

# Challenges

- Measure Life
  - Assume 1 Year Measure Life
    - Unlike most of EE in this way – Similar to the OPower Behavioral approach
- FCM Requirement
  - Need to bid into FCM in order to claim Avoided Capacity Benefit
    - Largest portion of Avoided Benefits (~60% in previous example)
    - With FCM comes complication, expense, and risk as well as some opportunities in the future
      - Can a PA claim capacity benefits if another entity holds the CSO?
- Treatment of Avoided Distribution Costs
  - Grid Mod did not include distribution benefits
    - ~33% in previous example
  - Planning perspective that it must have a 5 year track record in order to factor into planning and actual defer infrastructure
- How does the timing of ICR reductions and Cost Allocations applied back to the State effect what can be counted?
  - ICR reduction impact occurs in year 4 absent FCM participation and is already captured in the standard cost-effectiveness model used by the PAs for energy efficiency – will also be used for active demand reduction
  - Reallocate MA proportion of ICR – Shifts cost to other states but MA ratepayers benefit - TBD



# Findings from Others

- CA
  - Assumes 3 year measure life for possibly 1 year of commitment
  - Assumes avoided capacity price 3x of market CONE
  - Uses hourly avoided energy costs forecasted for 30 years
- BG&E
  - Assumes much greater DRIPE value than 2015 AESC
  - Used ARRA funds for metering
  - PJM allows year end reporting and different baselines
- Similarities of Programs Reviewed
  - Separate dockets
  - AMI in place
  - Run in parallel to EE but generally different providers

# Next Steps

# What's Next?

- PAs will continue to work collaboratively to answer the questions set forth in the Analytical Framework.
  - For example: continue to work with experts and stakeholders to synthesize lessons learned in order to prioritize the areas of focus
    - Summer peak
    - Winter peak pricing
    - Distribution
- Continue to review current cost-effectiveness models and consider alternative models
  - Do the models work appropriately for dispatchable demand reduction type assets (including BTM storage)?
  - What is the appropriate measure life?
  - How should upfront costs be accounted for?
  - Are avoided capacity, transmission, and distribution costs appropriately accounted for?
- Implement and evaluate demonstration projects; determine whether modifications are needed
- Work on developing appropriate funding approaches

# Thank you

BERKSHIRE
GAS

BLACKSTONE
GAS COMPANY

Cape Light
Compact

Columbia Gas
of Massachusetts
A NiSource Company

EVERSOURCE

Liberty Utilities

nationalgrid
HERE WITH YOU. HERE FOR YOU.

Unitil
energy for life

# Appendix

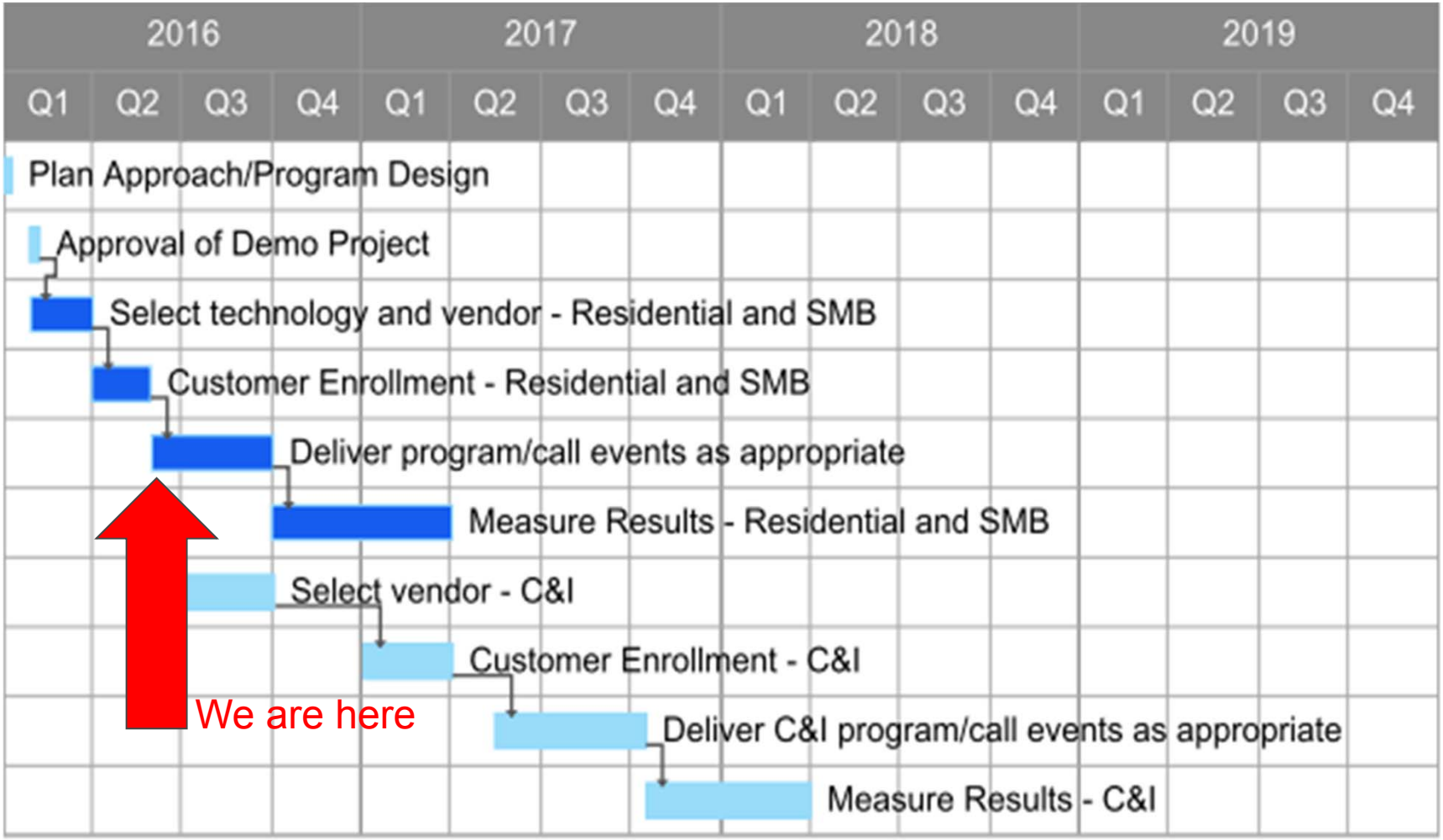
# Goals of the Demand Savings Group

- Lower overall costs to all Massachusetts customers.
- Develop programs/projects that are compatible with efforts to improve the long-term reliability and efficiency of the electric and gas transmission and distribution systems.
- Continue support of the Global Warming Solutions Act goals.
- Consistent with the Green Communities Act, develop cost-effective demand reduction programs/projects that provide customers maximum value.
- Deploy cost-effective demand reduction initiatives that provide customers maximum value, and balance customer bill impacts to maintain rate stability and affordability, and protect low-income and other vulnerable customers.

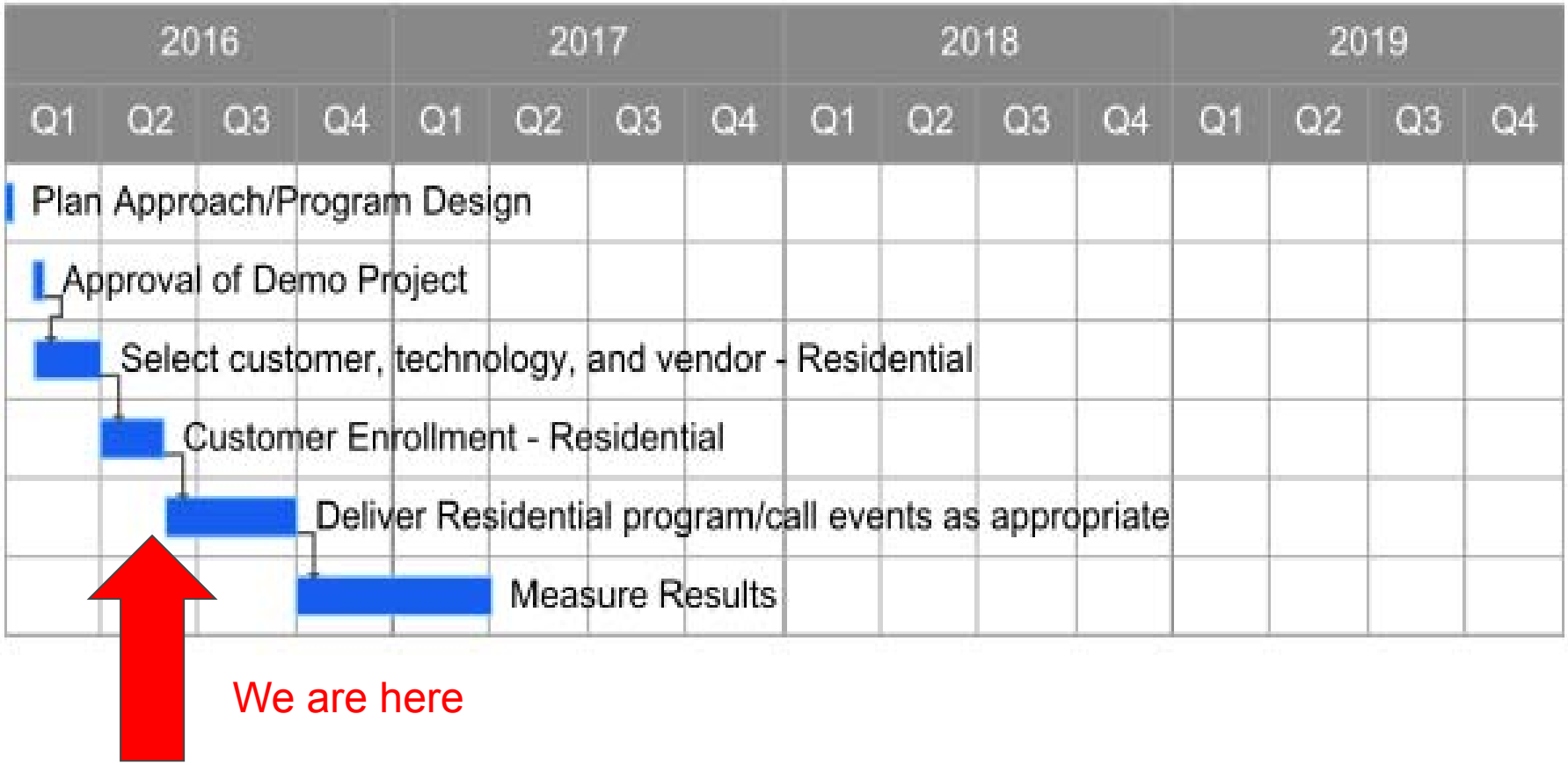
# Objectives of the Demand Savings Group

1. Identify opportunities to manage demand more efficiently and increase system reliability; evaluate/develop programs to take advantage of those opportunities.
2. Assess direct and indirect impacts of demand reduction programs on customer classes and the energy system, including the effect on emissions associated with generation.
3. Identify a suite of demand reduction opportunities that may provide appropriate incentive/signal to customers to ensure the long-term success of demand reduction programs and provides benefits for various customer classes, including low-income and other vulnerable customers, for each service territory.
4. Develop a cost-effectiveness screening model with a multi-year and program-specific perspective in order to appropriately account for costs and benefits.
5. Analyze and develop cost-recovery mechanisms that appropriately allocate costs, and provide reasonable performance incentives to the PAs if challenging but achievable goals are met.
6. Develop evaluation protocols and an assessment structure that provides on-going feedback and useful, actionable results.
7. Develop and continuously evaluate short-term and long-term strategies.
8. Identify customer-focused methods to deploy potential programs/projects that have a beneficial impact and provide customer value.
9. Assess opportunities to leverage existing technologies and customer engagement approaches in the energy efficiency portfolio that can also be used to facilitate demand reduction offerings such as Wi-Fi thermostats and lighting controls.

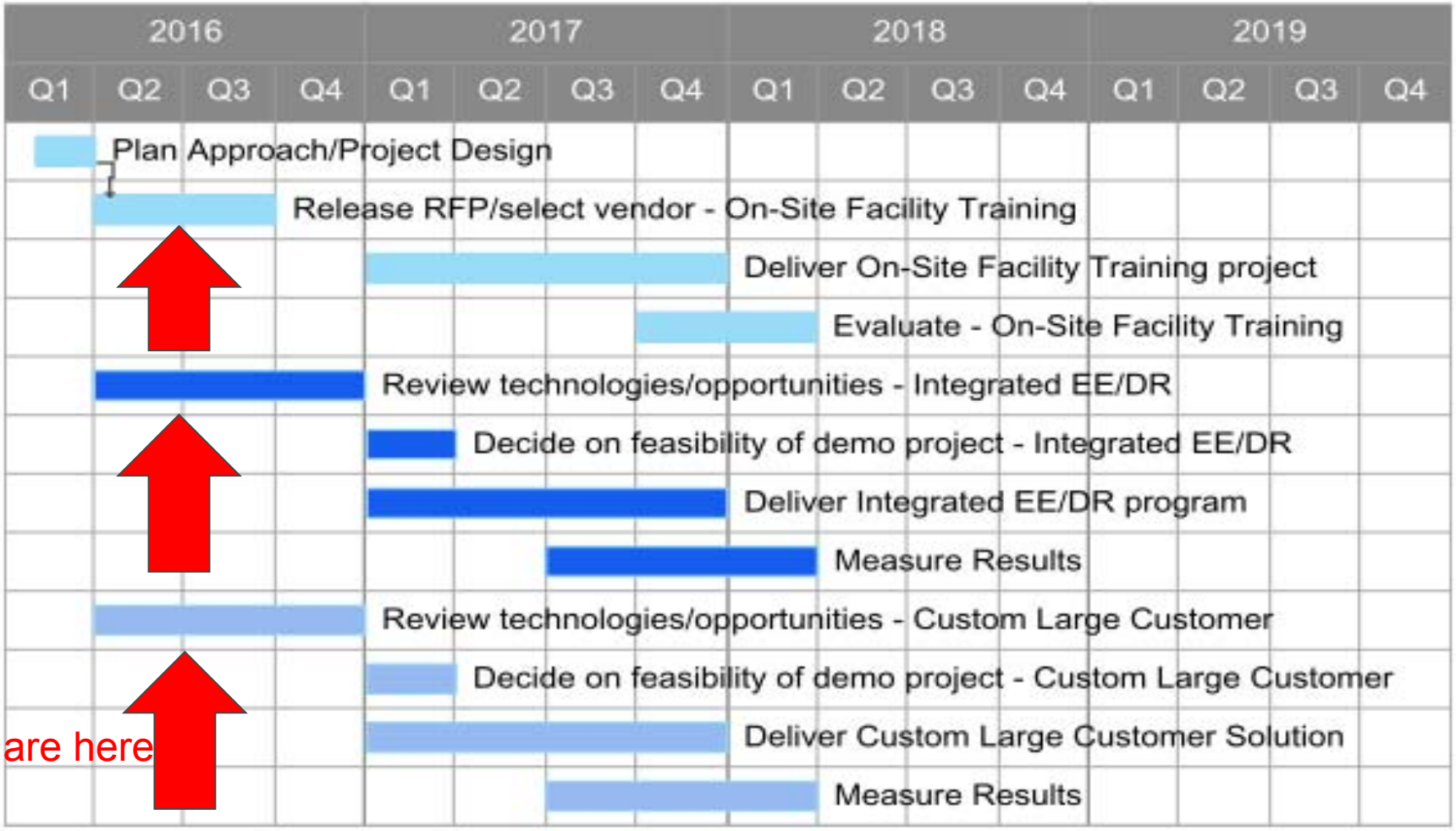
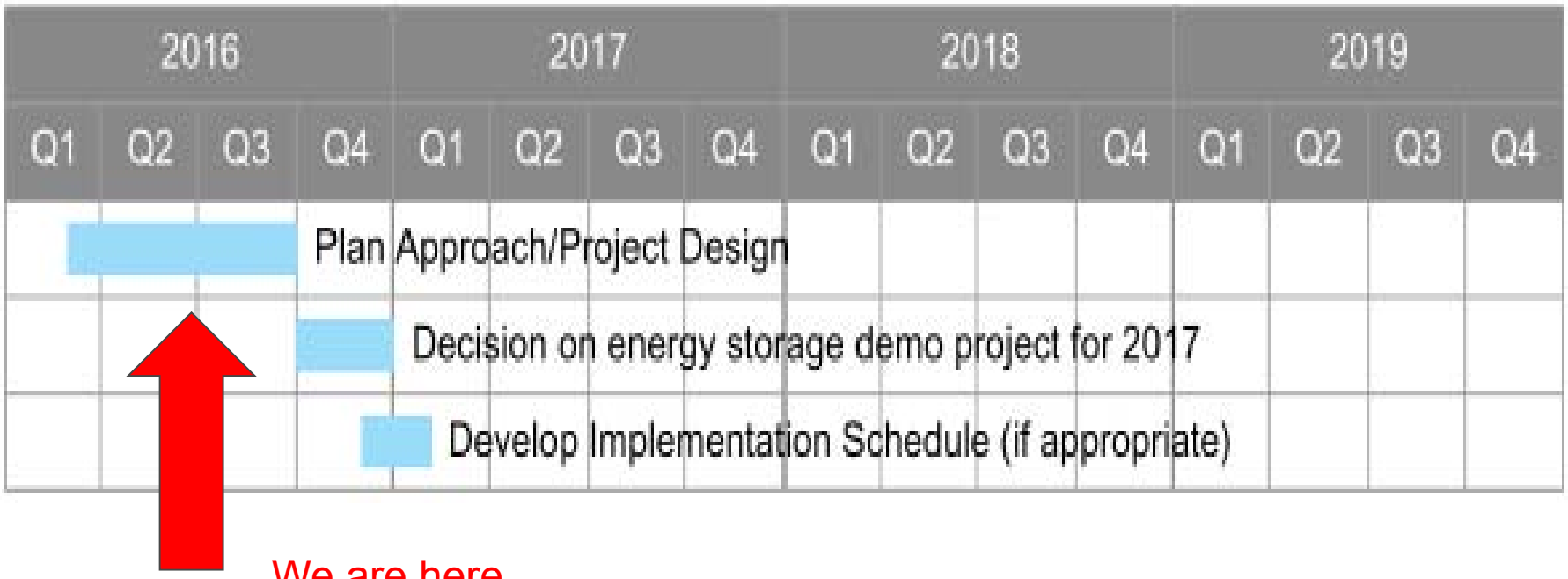
# National Grid Specific Project Timeline



# The Compact Specific Project Timeline



# Eversource Specific Project Timeline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