



# Active Demand Reduction Cost-Effectiveness Considerations

PA Presentation for EEAC

November 15, 2017



BLACKSTONE  
GAS COMPANY



Columbia Gas  
of Massachusetts  
A NiSource Company

EVERSOURCE



nationalgrid  
HERE WITH YOU. HERE FOR YOU.

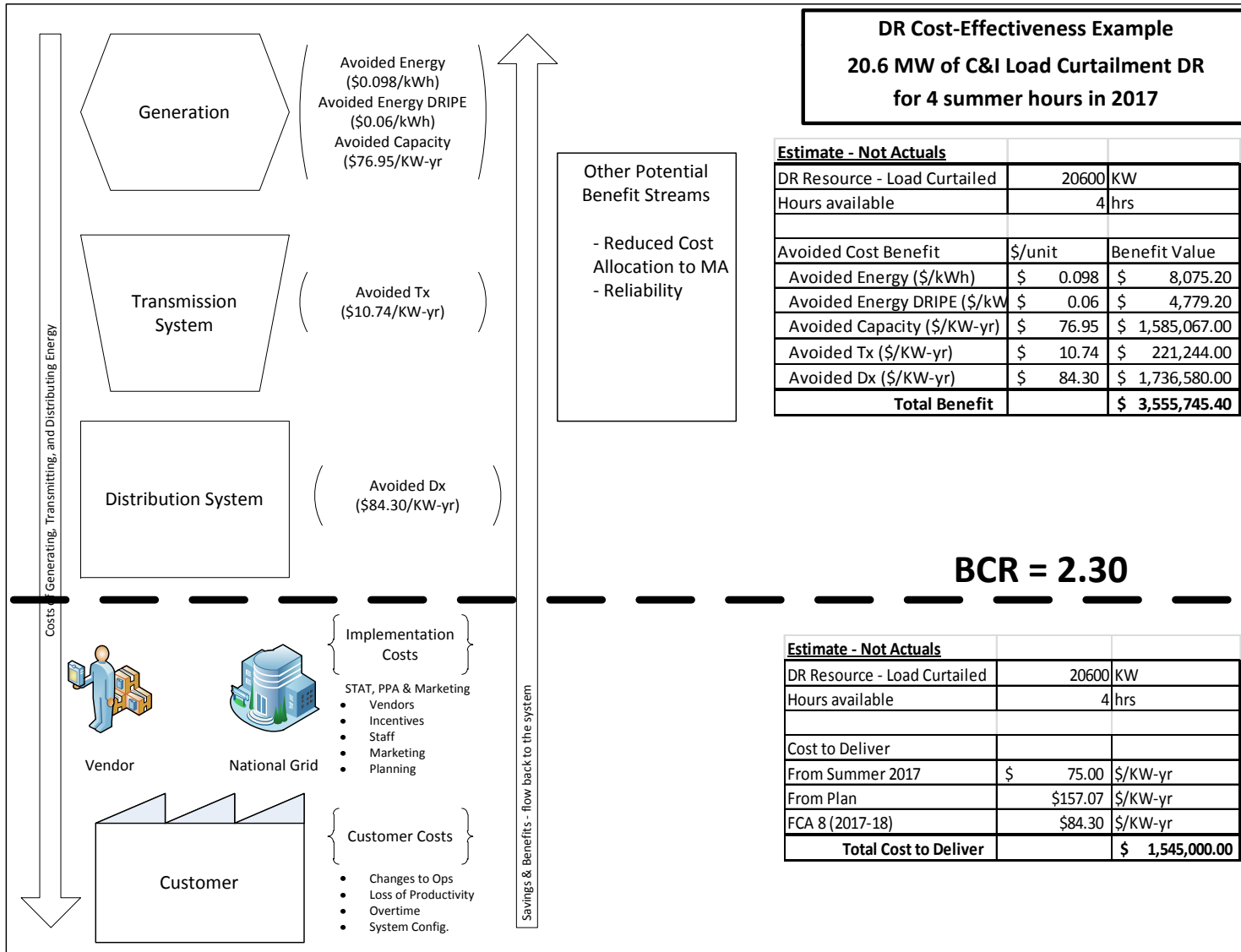


# On the hunt for benefits



- Current Benefits Claimed
  - 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
      - Energy DRIPE
      - Non-Electric Benefits
        - Resource Benefits
        - Non-Resource Benefits
- Investigated New Benefits to Claim for Demand-Focus Programs
  - Avoided Energy at 4-Hour Peak – Completed in AESC 2015 Addendum and Included in draft screening
  - Reduced ICR (Installed Capacity Requirement) – N/A - Already included in Avoided Capacity
- Additional Analyses to quantify additional benefits from active demand management
  - Reduce Cost Allocation for MA
  - Reliability – Grid Mod uses the LBNL Interruption Cost Estimate Calculator ([icecalculator.com](http://icecalculator.com))
    - Using Grid Mod Methodology Resi = ~\$5/peak kW and C&I= ~ \$36/peak kW
  - From Recent Demonstration Orders – DPU requires the PAs to examine the targeted distribution system benefits of demand program. Too early to understand the impact of this requirement.

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



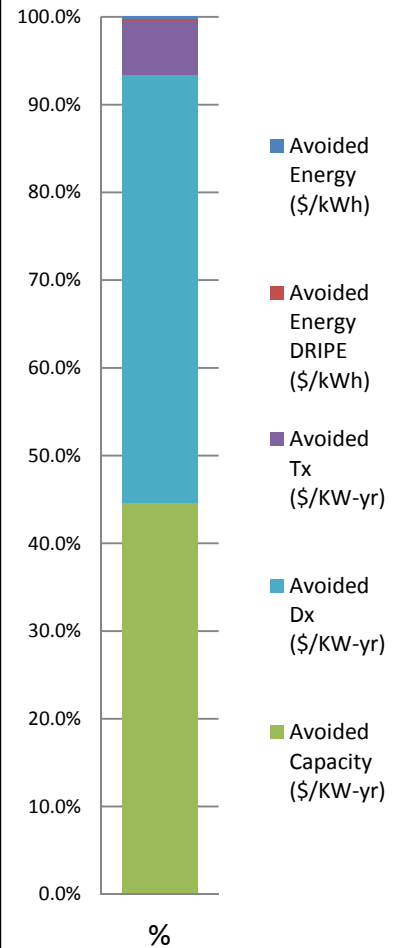
**DR Cost-Effectiveness Example**  
**20.6 MW of C&I Load Curtailment DR**  
**for 4 summer hours in 2017**

Estimate - Not Actuals		
DR Resource - Load Curtailed	20600	KW
Hours available	4	hrs
Avoided Cost Benefit	\$/unit	Benefit Value
Avoided Energy (\$/kWh)	\$ 0.098	\$ 8,075.20
Avoided Energy DRIPE (\$/kWh)	\$ 0.06	\$ 4,779.20
Avoided Capacity (\$/KW-yr)	\$ 76.95	\$ 1,585,067.00
Avoided Tx (\$/KW-yr)	\$ 10.74	\$ 221,244.00
Avoided Dx (\$/KW-yr)	\$ 84.30	\$ 1,736,580.00
<b>Total Benefit</b>		<b>\$ 3,555,745.40</b>

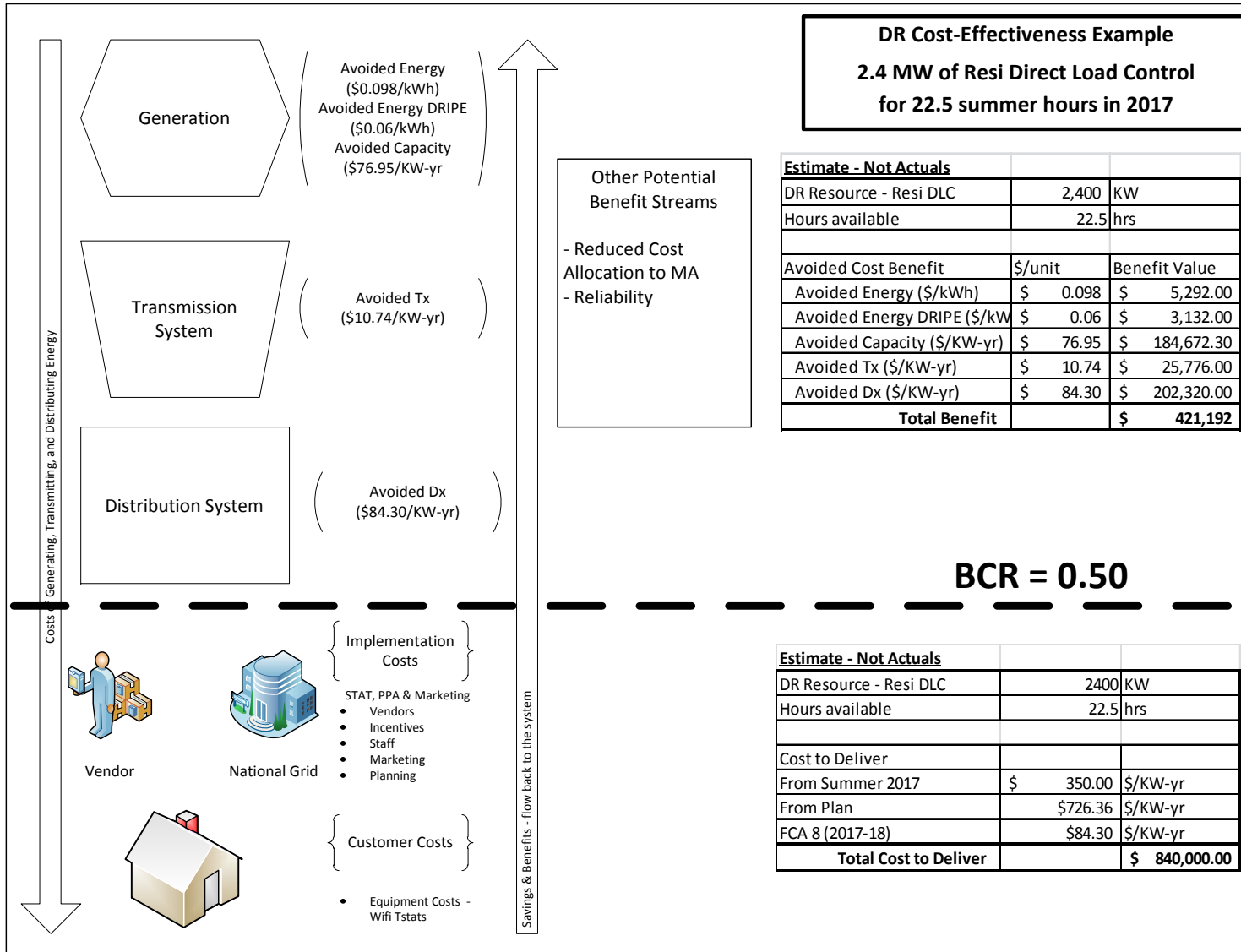
**BCR = 2.30**

Estimate - Not Actuals		
DR Resource - Load Curtailed	20600	KW
Hours available	4	hrs
Cost to Deliver		
From Summer 2017	\$ 75.00	\$/KW-yr
From Plan	\$157.07	\$/KW-yr
FCA 8 (2017-18)	\$84.30	\$/KW-yr
<b>Total Cost to Deliver</b>		<b>\$ 1,545,000.00</b>

**C&I Avoided Cost Benefit Proportions**



# Diagram of Benefits & Costs – Residential DLC

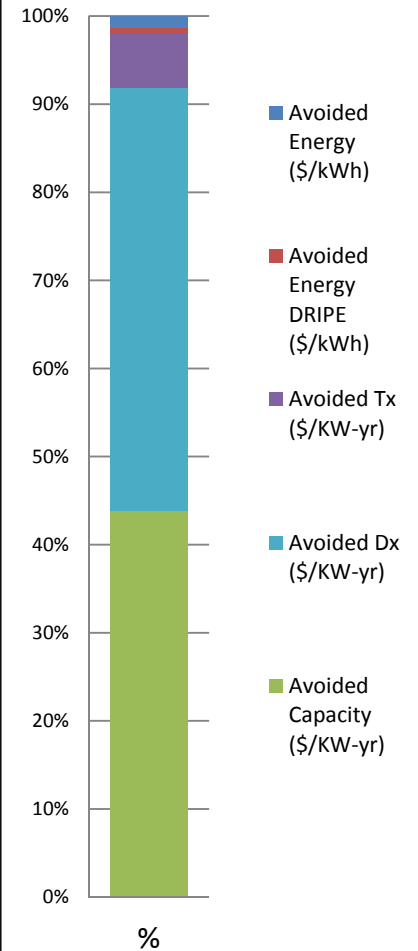


## DR Cost-Effectiveness Example 2.4 MW of Resi Direct Load Control for 22.5 summer hours in 2017

Estimate - Not Actuals		
DR Resource - Resi DLC	2,400	KW
Hours available	22.5	hrs
Avoided Cost Benefit	\$/unit	Benefit Value
Avoided Energy (\$/kWh)	\$ 0.098	\$ 5,292.00
Avoided Energy DRIPE (\$/kWh)	\$ 0.06	\$ 3,132.00
Avoided Capacity (\$/KW-yr)	\$ 76.95	\$ 184,672.30
Avoided Tx (\$/KW-yr)	\$ 10.74	\$ 25,776.00
Avoided Dx (\$/KW-yr)	\$ 84.30	\$ 202,320.00
<b>Total Benefit</b>		<b>\$ 421,192</b>

Estimate - Not Actuals		
DR Resource - Resi DLC	2400	KW
Hours available	22.5	hrs
Cost to Deliver		
From Summer 2017	\$ 350.00	\$/KW-yr
From Plan	\$726.36	\$/KW-yr
FCA 8 (2017-18)	\$84.30	\$/KW-yr
<b>Total Cost to Deliver</b>		<b>\$ 840,000.00</b>

## Residential Avoided Cost Benefit Proportions



# Pathways to Cost-Effectiveness



- Reduce costs
  - Use benefits as upper bound for cost targets
  - Hone Residential offering in light of this understanding
    - Understand the cost/kW-year of various technologies/strategies and enabling administration costs and use a focused logical investment criteria approach
- Find more benefits
  - AESC 2018 Investigating specific demand benefit values
    - If Avoided Capacity increases by any percent or decreases 10-20%, a C&I incentive type program likely will be OK, Resi still a challenge
    - If Capacity DRIPE >0 then everyone jumps for joy but it may mean Avoided Capacity value reduction
    - Avoided Energy – 4 hour peak or other incarnation is not expected to drive cost-effectiveness due to the relatively few number of hours used
- Integrate into cost-effective EE Programs – one among many measures within the same program (e.g., software and controls (EMS), wireless thermostats)
  - Passive Demand and Energy Savings + Incremental Control Demand Reduction = 2 measures with different savings and life but joined cost
  - TRC & Measure Life/Program Life need to be considered

# Challenges and Considerations



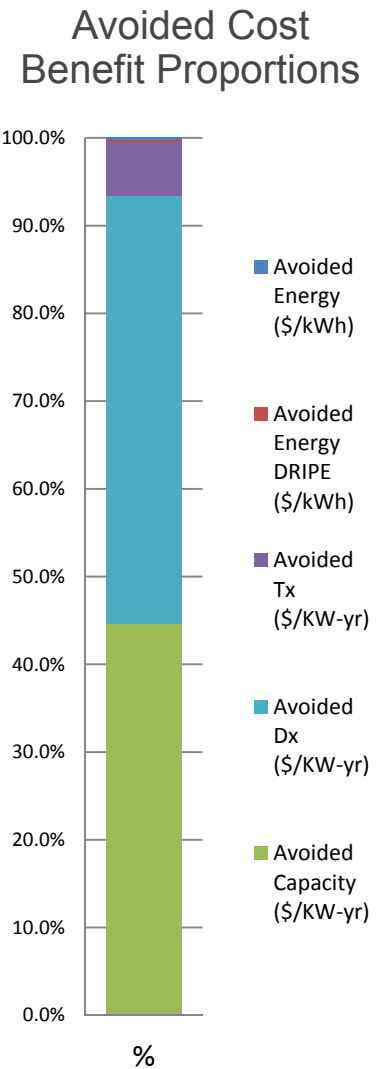
- Active Demand Management Program Cost-Effectiveness Considerations
  - Measure Life – Instead think about it like a Program Life
    - Assume 3 Year Program Life - unlike most of EE, which is set and forget, active demand management captures benefits only if the customer responds each subsequent year
  - Ex Ante – in the case of a cold summer, you would have called but conditions never got that bad, do you get credit?
    - Assuming 3 year program life likely smooth's this out but still plan Ex Ante while using Ex Post to inform future planning\*
  - Not every KW is valued equally – system peak vs distribution peak –
    - What if they are different? Do you get a fraction based on the coincidence of each?
    - Is it possible that there are mutually exclusive
- Treatment of Avoided Distribution Costs
  - Utility Grid Mod Filings did not include distribution benefits
    - Avoided distribution benefits account for ~50% of anticipated active demand management avoided benefits value
  - Utility Distribution Company planning perspective that it must have a 5 year track record in order to factor into planning and actually defer specific infrastructure investments. Therefore PAs look to keep statewide approach using distribution system value for distribution avoided costs.

\*Ex-post is the opposite of ex-ante, which means "before the event."

# To bid or not to bid?



- Avoided Capacity is a large portion of Avoided Benefits
- There is a difference between KW reduction bid into the FCM and KW reduction not bid into the FCM
  - If bid into FCM, revenues can offset ratepayer funding for program needs, however, there is no avoided capacity cost because load pays just like generation because active DR is reconstituted into ICR
  - If not bid into FCM all funding comes from ratepayers bill, however, there is avoided capacity benefit due to ICR reduction in three years based on regression
  - With FCM bid 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? – Assumption No



# Findings from others Jurisdictions



- CA DR Cost-Effectiveness Protocols
  - 2016 Protocols are an updated version of the DR Cost-Effectiveness Protocols approved in 2010
  - The time period for the cost-effectiveness evaluation should be limited to the length of the program cycle (usually three years).
  - LSEs may amortize capital costs over a longer period.
  - Protocols are intended for ex ante evaluations of demand response programs which provide long-term resource value
  
- NY REV DSIP BCA Handbook
  - Each DR program has unique requirements for notification time, length of demand reduction, number of calls, and frequency of calls. A DR resource is typically available only for limited hours in a year (e.g., <100 hrs.) and limited hours per call.
  - The major benefit from DR is ability to reduce peak demand. The particular use case or operational objective of the DR determines the value for its coincidence factors.
  - The coincidence factors can and will change based on when DR event is called, customer response (e.g., overrides), device availability, load availability, and other project and technology-specific factors.
  - The value of reduced energy use attributable to the DR asset can be calculated using the average LBMP of the top 50 hours of system peak..
  
- Similarities of Programs Reviewed
  - Separate dockets from EE
  - AMI in place so response is measureable for performance
  - Run in parallel to EE but generally different providers and implementation groups within utilities



# Appendix

## Further Reading



- A Framework for Evaluating the Cost-Effectiveness of Demand Response:  
[https://emp.lbl.gov/sites/all/files/napdr-cost-effectiveness\\_0.pdf](https://emp.lbl.gov/sites/all/files/napdr-cost-effectiveness_0.pdf)
- CA 2016 Demand Response Cost Effectiveness Protocols:  
<http://www.cpuc.ca.gov/General.aspx?id=7023>
- EPRI Quantifying the Impacts of Time-Based Rates, Enabling Technology, and Other Treatments in Consumer Behavior Studies: Protocols and Guidelines:  
<https://www.epri.com/#/pages/product/000000003002000282/>



**Thank You**