Guidehouse

Memorandum

To: Massachusetts Electric Program Administrations and EEAC EM&V Consultants

From: Guidehouse Inc.

Date: October 7, 2022

Re: Integrating Demand Reduction and Energy Efficiency Offerings - Final Memo (MA22-DR01-E)

1 Introduction

The aim of the Integrating Demand Reduction (DR) and Energy Efficiency (EE) Offerings study (MA22-DR01-E) is to learn about how program administrators (PAs) in jurisdictions outside of Massachusetts are approaching the integration of DR and EE from both implementation and cost-effectiveness perspectives. The study covers electric DR and EE integration, with incidental observations about integration of gas-related programs. The learnings from this study will inform whether and how the Massachusetts Program Administrators (PAs) adjust their approach for the integration of DR and EE offerings in Massachusetts.

This memorandum describes the results of the study summarized through case studies, including findings from the literature reviews and interviews conducted across PAs in four jurisdictions with some level of integrated DR + EE offerings.[1] The four jurisdictions were selected based upon an initial literature review and discussion with the Massachusetts PAs and EEAC EM&V consultants.

The four PAs detailed in case studies within this memo are:

- Pacific Gas & Electric (PG&E) – California
- Hawaiian Electric (HECO) / Hawaii Energy – Hawaii
- EmPOWER Maryland, focusing on Baltimore Gas and Electric (BGE) – Maryland
- Consolidated Edison (ConEd) – New York

Throughout this study, Guidehouse reviewed a variety of materials from each PA including, but not limited to, demand-side management (DSM) filings, rate cases, annual or triennial EE plans, potential studies, benefit-cost analysis (BCA) files, customer-facing PA websites / materials.

Based on the materials reviewed and interviews, it appears that where the resource need is greatest, and perhaps most well defined (Con Ed NPA/NWA, Hawaii), the PAs have been more effective at integration of DR + EE. This appears to occur either because of regulatory enablement or because

[1] For the purposes of brevity, we will refer to “Integrated DR + EE” throughout this memo, recognizing that most offerings are at different levels of integration and are not fully integrated.

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the DR and EE organizations have realized the practical benefits of working together. Throughout the interviews, it was also notable that sometimes the regulator makes it difficult to achieve integration, even where they are leaning towards promoting DR + EE integration (CA). Cost-effectiveness was not presented as a driver or barrier for integration across DR and EE. Instead, the PAs interviewed reviewed cost-effectiveness as program changes were made and, also, adjusted the benefit/cost allocations between programs based on the framework in place. Guidehouse observes that the Massachusetts Program Administrators have adopted practices that contribute to high levels of integration and offers several considerations related to implementation and budgeting that may contribute to even higher levels of DR + EE integration.

This memo contains the following sections:

- Study Approach (**Section 2**)
- Comparing PAs' Integration Status (**Section 3**)
- Case Studies (**Section 4**)
- Findings & Considerations (**Section 4.5**)
- Appendices (**Appendix A,** In-Depth Program Descriptions, and **Appendix B,** Interview Guide**)**

2 Study Approach

2.1 Initial Literature Review

Guidehouse first identified jurisdictions with integrated DR and EE programs by reviewing the ACEEE 2019 study, "Integrated Energy Efficiency and Demand Response Programs"[2] And completing additional information gathering. The ACEEE paper outlined 20 jurisdictions with some form of DR + EE integration and 2 jurisdictions with non-wires alternatives leveraging some aspects of DR + EE. In addition, Guidehouse identified 6 additional PAs (Appalachian Power, Salt River Project, Consumers Energy, Hawaiian Electric, Oklahoma Gas and Electric, and Public Service Electric & Gas) that have the potential to claim integration between DR and EE.[3]

For each of the PAs, Guidehouse completed a cursory review of website, evaluation materials, regulatory filings (e.g., annual or triennial energy efficiency plans, benefit-cost materials, and potential studies) that could be useful in an in-depth literature review.

As a result of this initial review and a discussion with the MA PAs, four jurisdictions were identified for further investigation as these jurisdictions combined a relatively high level of DR + EE integration, sufficient scale, and had some characteristics similar to Massachusetts.

Table 1. PAs Identified for In-Depth Literature Review

PA	Case for Inclusion in In-Depth Review
Pacific Gas & Electric (PG&E) – California	PG&E's Smart Thermostat program has been well-documented over its years of existence. The program serves as an example of an integrated DR + EE approach without being a completely combined program. It could be of interest to see what levels of integration may best fit the needs of Massachusetts.

[2] ACEEE, "Integrated Energy Efficiency and Demand Response Programs", September 2019 https://www.aceee.org/sites/default/files/publications/researchreports/u1906.pdf

[3] The identified programs that include non-wires alternatives leverage C&I and residential auction-based DR or serve as a pilot study for Gas DR. These programs are less comparable to the Massachusetts landscape, so they have been omitted from this review.

PA	Case for Inclusion in In-Depth Review
Hawaiian Electric (HECO) / Hawaii Energy – Hawaii	Hawaiian Electric and Hawaii Energy work together to provide DR and EE responsibilities to their customers. The relationship between Hawaiian Electric and Hawaii Energy is described within the Case Studies of this report. Hawaiian Electric's robust program offers a multitude of measures, including behavioral DR, and innovative approaches to integrated DR + EE. As an island, Hawaii is energy constrained, so is at the forefront of approaches to DER integration. Additionally, Hawaiian Electric's DR + EE offerings include EVs, which is a measure of interest.
EmPOWER Maryland, focusing on Baltimore Gas and Electric (BGE) – Maryland	EmPOWER has a similar structure to Mass Save with multiple Program Administrators focused on promoting energy savings. Their smart thermostat follows a BYOT model, where customers can enroll their current thermostat or purchase a new one through the Marketplace.
Consolidated Edison (ConEd) – New York	The ConEd BYOT* program will showcase regional similarities for the Massachusetts PAs. The BYOT model is a popular framework and is continuing to gain traction in many states as both a C&I and residential offering. Additionally, ConEd's Winter DR offerings (as a part of their Gas DR) will be of interest.

*BYOT = Bring Your Own Thermostat
Source: Guidehouse Analysis

2.2 Key Findings from Initial Literature Review

In addition to identifying the four PAs for further research, Guidehouse found that most of the integrated DR + EE programs listed in the 2019 ACEEE report have continued to operate into 2022 – except for AEP Ohio's "It's Your Power" program. Additionally, smart thermostats are playing a key role in integrated DR + EE programs. C&I DR + EE programs are often technology-agnostic, whereas residential DR + EE programs identified specific technologies. The role of technologies will be discussed further in the Case Studies of this report.

2.3 In-Depth Literature Review

Guidehouse then conducted an in-depth literature review for the four identified PAs – Pacific Gas & Electric (PG&E) – California, Hawaiian Electric (HECO) / Hawaii Energy – Hawaii, EmPOWER Maryland, focusing on Baltimore Gas and Electric (BGE) – Maryland, and Consolidated Edison (ConEd) – New York. During the in-depth literature review, Guidehouse reviewed a variety of materials from each PA including, but not limited to, demand-side management (DSM) filings, rate cases, annual or triennial EE plans, potential studies, benefit-cost analysis (BCA) files, customer-facing PA websites / materials to answer the following topics and questions:

- Regulatory Environment
    - What is the regulatory environment supporting DR + EE integration?
    - How has the regulatory environment influenced the integrated DR + EE offerings within the jurisdictions?

- Integrated DR + EE Structures
    - What is the PA's current integration status based on program material?
    - What does integrated DR + EE program implementation look like, including incentive structure, where available and applicable?
    - What attributes are included within the integrated DR + EE programs in the four identified jurisdictions (i.e., program size, measures included, etc.)?

- Cost-Effectiveness Approach
    - How is cost-effectiveness calculated and tested for each PA, specifically for their DR + EE offering(s)?
    - How are the benefits treated for the purposes of cost-effectiveness within DR and EE program? Are they additive?

While conducting the in-depth literature review, Guidehouse identified a variety of areas where further clarification was needed.

2.4 Interviews

Topics from the in-depth literature review were discussed during interviews with each of the PAs. An interview guide was developed to use across interviews. The topics included program planning, implementation, cost-effectiveness testing, regulatory guidance, integrated demand side management (IDSM), and measures of success. The general interview guide is provided as **Appendix B**. Subject-specific questions were added based on the research conducted up to that time. Guidehouse interviewed 17 individuals across 9 interviews of 8 organizations as seen in Table 2. In addition to conversations with program administrators, Guidehouse also spoke with one vendor (EnergyHub) and one state efficiency agency (Maryland Energy Administration). EnergyHub was interviewed because they were identified as a vendor for several integrated DR + EE offerings involving smart thermostats. MEA was interviewed to add perspective on how the EmPOWER structure impacts DR + EE programs. Guidehouse also interviewed National Grid to confirm our understanding of DR + EE efforts in Massachusetts.

Table 2. Interviews Conducted

Organization	Interviewee(s)
Consolidated Edison (ConEd)	• Damei Jack (Section Manager – Non-Pipes Solutions, EE & Demand Management)
	• Marlon Argueta (EE Program Manager, DR) • Gerrianna Cohen (Specialist, DR)
Baltimore Gas and Electric (BGE)	• Chris Walls (Manager, Mass Market Conservation Programs) • Eric Riopko (Manager, EE Programs)
Maryland Energy Administration (MEA)	• Babatunde Idrisu (Energy Policy Manager)
Hawaiian Electric (HECO)	• Yoh Kawanami (Director, Customer Energy Resources, Operations) • Angie Eide (Manager, Customer Energy Resources, Operations)
Hawaii Energy	• Caroline Carl (Executive Director) • Eileen Lacaden Stewart (Business Solutions Manager)
Pacific Gas & Electric	• Wendy Brummer (Program Manager, Expert – DR) • Albert Chiu (Expert Product Manager – IDSM)

Organization	Interviewee(s)
EnergyHub	• Erika Diamond (SVP, Head of Customer Solutions) • Brady Klein (Sr. Manager, Market Development)
National Grid	• Paul Wassink (Lead Engineer – DR) • David Roman Ubeda (Senior Program Manager – DR) • Antonio (Tony) Larson (Lead Analyst, Policy & Evaluation)

3 Comparing PAs' Integration Status

Table 3 offers a high-level of comparison of DR + EE integration across various program dimensions for the PAs identified in this study, including Massachusetts. We note that Massachusetts received a "yes" in more of these integration categories than any of the other identified PAs. Section 4 contains detailed case studies that outline various attributes of integration among DR + EE programs.

Table 3. Comparing PAs (High-Level) DR + EE Integration

PA	Is the program dimension integrated?					
	Measures Beyond Smart T-Stats	Program Delivery	Program Planning	Cost-Effectiveness	Funding/ Budgeting	Energy Savings from DR
Pacific Gas & Electric (PG&E) – California	Yes	Yes	Partial	No	No	No
Hawaiian Electric (HECO) / Hawaii Energy – Hawaii	Yes	Yes*	Yes*	No	Yes*	No
EmPOWER Maryland, focusing on Baltimore Gas and Electric (BGE) – Maryland	No	Yes	Yes	No	No	No
Consolidated Edison (ConEd) – New York	No**	Yes	No	No	No	No
Massachusetts PAs	Yes	Yes	Yes	No	Yes	No

Source: Guidehouse Analysis
* Hawaii Energy shows integration in these program attribute(s), but HECO is solely responsible for DR and does not qualify as integrated in its approach to DR + EE.
** Outside of BYOT, ConEd employs a technology-agnostic approach to DR for C&I, which could include EE.

4 Case Studies

This section provides case studies for integrated DR + EE programs across the four outlined jurisdictions and PAs. For more detailed program descriptions, please see the Error! Reference source not found.. The case studies are in alphabetical order, by state, apart from Massachusetts which is listed last for comparison purposes.

4.1 Pacific Gas & Electric (PG&E) – California

Background

PG&E is both the United States' and California's largest electric provider. Due to supply constraints, the utility has received recent regulatory pressure to focus on distributed energy resources (DER), and specifically DR solutions. Even though some of the pressure is recent, California was an early advocate for integrated DR + EE. The framework for integration originally began as Integrated Demand Side Management (IDSM) but has more recently transitioned to Integrated Distributed Energy Resources (IDER).[4] IDER is similar to IDSM but instead of a specific DSM focus, it also encourages the procurement of resources beyond traditional DSM measures, like solar and battery storage. Overall, the framework serves to help utilities plan for load reduction and procure DERs. Though the IDER order began as a way to encourage utilities to pursue energy efficiency and demand response options prior to investing in infrastructure, in practice, according to interview subjects, IDER has become a constraint to promoting the integration of DR + EE.

Integration of DR and EE Programs

PG&E has integrated its DR and EE related marketing, outreach, and implementation primarily for its Automated DR program. Customers do not enroll in DR at the same time that they participate in an EE program, but the processes between EE and DR are linked to recruit the same customers for applicable measures.

PG&E incorporates IDER into their portfolio in a variety of ways, with Automated DR (ADR) serving as the primary initiative for integrating DR and EE. The ADR offering began as a way to incentivize large C&I customers to install and program automatic controls for DR events. The ADR offering is not a program itself, but instead layers on top of existing DR and time of use (TOU) rate participation. Previously, the utility also offered an integrated DR + EE subprogram to hard-to-reach multifamily customers[5] up until the program was sunset in 2020, as it was not cost-effective. Currently, residential customers can only participate in ADR through smart thermostats. Customers are eligible for three separate incentives related to smart thermostats: EE, DR, and ADR (funded through the IDER budget). Customers may purchase a pre-enrolled smart thermostat through the PG&E Marketplace, but it is not required. Residential ADR is often advertised as "save up to $120 on your smart thermostat purchase," which includes both the EE ($50) and ADR ($70) incentives. The DR incentive that the customer receives is related to the specific program that they enroll in.

C&I customers may also participate in ADR. For these C&I customers, ADR is a more technology-agnostic DR offering and, while it does not guarantee the integration of DR + EE, it has the capability to encourage EE through incentivizing EMS and controls.

Different program managers administer DR and EE but, in the ADR program, there is frequent communication and collaboration between program managers. There is also coordination on marketing and outreach. In California, there is a separate program manager for IDER, and they also coordinate with the DR and EE program managers.

How DR and EE are Treated in Cost Effectiveness

California has a number of cost tests, but it is currently exploring using the Societal Cost Test (SCT) for all DER cost-effectiveness, including EE. According to interviewees, IDER programs are not required to go through a cost-effectiveness test but must still receive budgetary approval from the CPUC. However, it can be difficult for a utility to qualify a program as IDER. The difficulties in

[4] ACEEE, "Integrated Energy Efficiency and Demand Response Programs", September 2019 https://www.aceee.org/sites/default/files/publications/researchreports/u1906.pdf

[5] This program was called the Enhanced Time Delay Relay Subprogram.

program justification can be seen through the limited contractor participation. Though utilities are required to collect $10 million to implement IDER (in total for Residential and Non-Residential IDER), only about half of contractors include IDER in their contracts, thus signaling that there are likely challenges in the process. Additional conversations with contractors are required to uncover the specific challenges associated with the process. Yet, a clear framework for IDER cost-effectiveness could encourage more integrated program offerings, where various requirements have caused confusion among contractors and program managers. The ADR program at PG&E uses funding from EE, DR, and IDER budgets. All costs and benefits are reported on an incremental basis to their respective budgets, for example an EE incentive is an EE cost. Costs that are shared may be allocated to the IDER budget. Components associated with EE and DR are individually screened for cost-effectiveness.

4.2 Hawaiian Electric (HECO) / Hawaii Energy – Hawaii

Background

HECO delivers electricity services for 95% of Hawaii residents, making it Hawaii's largest electric utility.[6] Due to geographic constraints, Hawaii does not have any natural gas reserves, nor does it produce natural gas. The state, however, produces syngas (synthetic natural gas).). Most of the syngas is consumed by the commercial sector.[7] It is also used as the primary heating source in about 1 in 20 homes, only 5% of homes.

The integration of DR and EE in Hawaii is complicated by the fact that separate entities are responsible for DR/DERs (HECO) and EE (Hawaii Energy). HECO is an investor-owned utility , whereas Hawaii Energy is a ratepayer funded organization. Hawaii Energy is administered by Leidos Engineering, LLC, through a contract with the Hawaii PUC. Prior to 2012, HECO was responsible for both DR and EE. The PUC then ordered for EE to be administered by Hawaii Energy. Initially, there were some delays in overall collaboration between the two organizations. However, the Hawaii PUC is now actively encouraging HECO and Hawaii Energy to work together, and they reported that they have improved collaboration in recent years.

HECO and Hawaii Energy indicated that they plan to improve coordination in the future, with hopes of full integration of DR and EE offerings across applicable technologies. The Hawaii Energy 2019 – 2021 Triennial plan (the 2022 – 2024 Triennial plan is expected in 2023) states, "The Hawaiian Electric Companies are in the process of rolling out new demand response (DR) programs. As these programs are initiated, Hawaii Energy will work with the Hawaiian Electric Companies (HECO) to integrate the delivery of our energy efficiency (EE) program into the delivery of the DR programs."

Integration of DR and EE Programs
HECO's DR programs are not directly integrated with EE activities since they are not under the same organization. However, Hawaii Energy has integrated EE programs with HECO's DR programs through partnerships with aggregators. This has created an integrated approach to implementation, outreach, and marketing at Hawaii Energy.

Hawaii has two main programs that currently incorporate both DR and EE, and is developing a third, but the approach to integration is unlike any of the other PAs that Guidehouse reviewed. The programs are integrated through either EE program administration or DR program administration.

HECO maintains a large C&I DR (Fast DR) direct load control (DLC) offering that likely creates EE savings, though it has not been marketed or evaluated as an DR + EE solution. The program is

[6] Hawaiian Energy, Power Facts, December 31, 2021, https://www.hawaiianelectric.com/about-us/power-facts
[7] United State Energy Information Administration (EIA), State Profile and Energy Estimates – Hawaii, February 17, 2022, https://www.eia.gov/state/analysis.php?sid=HI

targeted toward commercial customers with Energy Management Systems (EMS), or who have the type of facility that would benefit from an EMS. HECO coordinates the EMS program for its customers, instead of relying on aggregators as they do for many of their residential programs.

For residential programs, HECO relies on aggregators to recruit and enable DR participants. For example, Hawaii Energy partnered with one of HECO's aggregators, Shifted Energy, to roll-out a low-income smart heat pump water heater program in indigenous communities. The program combines DR and EE by providing all customers with a new heat pump water heater with a Shifted Energy water heater controller. Yet the program steps around enabling DR through HECO with its partnership with Shifted Energy, which makes it a unique approach. The program is marketed directly to O'ahu residents who have enrolled in the "Nalo VPP" Program.

Hawaii has issued multiple decisions and orders approving a performance-based regulatory framework (PBR framework). The PBR framework creates a series of scorecards that incentivize a variety of end-goals, like increasing EE options for low-income customers, integration of battery storage, etc. While there is not specifically a scorecard for integrated DR + EE, the PUC strongly implies a need for collaboration across HECO and Hawaii Energy by including EE in the PBR framework. Since HECO's responsibilities do not include EE, through the PBR scorecard, the PUC intends for them to collaborate with Hawaii Energy. The HECO and Hawaii Energy interviewees also expressed that this has been abundantly clear in conversations with the Hawaii PUC. The Hawaii PUC sees the PBR framework as an opportunity to encourage integration through a variety of avenues – for example through customer experience, program implementation, and customer equity. The scorecards encourage the combination of program net benefits.

How DR and EE are Treated in Cost Effectiveness
HECO is required to address all compliance and safety mandated efforts through a Lowest Reasonable Cost (LRC)[8] method. This route focuses on the grid's current capabilities and risk incurred to implement the new technology. Per PUC instruction, if the proposed measure falls outside of compliance and safety mandates, it is evaluated through an extended version of the TRC test.

Hawaii Energy is only required to be cost-effective at the portfolio level, thus allowing significant flexibility among programs. Within the 2020 Annual PUC Report, it is noted that DR benefits are difficult to capture, so they have been omitted from the cost breakdown while costs are documented. Some DR investments have been captured through direct install EE programs, whereas others fall into Grid-Service Ready investments. The Grid-Service Ready investments are reflective of the programs mentioned in Section 3.1 that are "teeing up" future DR capabilities.

4.3 EmPOWER Maryland, focusing on Baltimore Gas and Electric (BGE) – Maryland

Background

EmPOWER serves as a coordinating body for Maryland utilities and energy cooperatives to encourage energy savings.[9] Since 2016, EmPOWER has set an annual goal to save 2% of gross electric energy consumption across the state. Though all PAs are coordinating to work towards EmPOWER's goals, each PA has a different approach to DR and EE. BGE is the largest utility and its offering seems to be the most integrated for DR + EE in Maryland.

[8] Lowest Reasonable Cost method mandates the utility to source thorough and representative bids and choose the lowest cost option that meets the requirements of the project.
[9] EmPOWER Maryland includes 7 utilities and co-ops: Baltimore Gas and Electric (BGE), Choptank Electric Cooperative, Delmarva Power, Easton Utilities, First Energy, Potomac Electric Power Company (Pepco), and Southern Maryland Electric Cooperative, Inc. (SMECO)

In the next 3-year program cycle (PY 2024 – PY 2026), EmPOWER will shift its goals from kWh/kW savings to greenhouse gas (GHG) abatement. Since this transition is still in the initial stages, the Maryland PSC and stakeholders are currently having conversations on how the shift to GHG abatement-based goals will impact cost-effectiveness, riders, and program incentives. Currently, the Maryland Energy Administration foresees that most utilities will maintain their current programs despite this proposed shift. The interviewee explained that some program aspects are driven by the PSC, whereas others are driven by the utilities themselves; therefore, the impact on DR + EE integration is unknown, but may not be affected in a significant way.

Integration of DR and EE Programs
BGE's smart thermostat program is its only integrated DR + EE offering. It is integrated in its implementation, marketing, and outreach.

The program advertised on the BGE website as a DR program that uses a smart thermostat. That webpage implies that customers are required to enroll their smart thermostat to receive the incentives. Like in Massachusetts, when enrolling through the Marketplace, customers are given the option to "opt-in" to DR through a check-box. This check-box is not required or automatically checked, so customers do have the option to receive a rebated smart thermostat without enrolling in the DR program. In both Maryland and Massachusetts, the "opt-in" box does not directly enroll customers into the DR program, as some customers may not be eligible even though they are purchasing a smart thermostat (i.e., customers without cooling).

At BGE, the program managers for DR and EE are different individuals, but they communicate frequently and brainstorm ways that they can collaborate. Overall, the goal is to create the most value for the customer, which will likely mean finding additional opportunities for integrated DR + EE in the future. BGE has seen some constraints on the regulatory side, as they must file cost recovery for DR and EE separately.

How DR and EE are Treated in Cost Effectiveness
Currently, cost-effectiveness reporting on the sector-level has only accounted for EE programs, but BGE will report separately on DR and EE cost-effectiveness. The state of Maryland and EmPOWER require all utility portfolios (segmented only by commercial versus residential sectors) to be cost-effective through the TRC test. To calculate this, utilities provide sector-level granularity. DR cost-effectiveness has not been reported yet and an EM&V plan is currently being created. Reported DR cost-effectiveness is expected in 2023. The statewide evaluator advised that, "The Plans should employ methods and assumptions used for energy efficiency evaluations and cost effectiveness analyses where applicable."

BGE reports EE benefits and costs for smart thermostat installation and optimization through its EE report. Any shared costs, such as marketing and outreach, are financed by the program whose primary vendor is awarded the contract.

4.4 Consolidated Edison (ConEd) – New York

Background

Energy demand in New York continues to increase while infrastructure investments can be expensive and difficult to permit. To accommodate the growing need for electricity in certain geographies ConEd has employed innovative approaches through EE programs, DR programs, and Non-Wires Solutions (NWS). As explored through the following section, only one DR and EE program is integrated, whereas others are delivered independently. NWS are often an integrated demand management approach for specific geographic areas to defer or displace infrastructure investments. Many lessons on DR and EE integration can be gained from these situations. Yet, ConEd prefers to position DR and EE as separate solutions.

Integration of DR and EE Programs
As noted, ConEd prefers to steer away from integrating DR and EE programs, but logistics have led to integrating the BYOT program through marketing, outreach, and implementation. Though much of the material on the ConEd BYOT program is integrated, the Marketplace does not include the option to enroll in DR during checkout.

ConEd includes DR and EE offerings in both its electric and gas portfolios.[10] However, ConEd considers its most integrated offering to be its BYOT programs. Aside from BYOT programs, commercial and residential customers are eligible to participate in its DR + EE offerings, but typically residential customers will participate under a third-party aggregator, while C&I customers will participate directly through ConEd. ConEd intends to continue using the aggregator model for residential customers and, in so doing, shift towards having a more technology-agnostic approach to DR. This will likely reduce overall intentional integration of DR and EE.

Outside of implementing DR with aggregators, ConEd facilitates a BYOT program for residential customers. This program has also been leveraged as DR and EE in NWS demand management efforts. Customers can purchase their smart thermostat directly through ConEd or from an outside vendor. Eligible thermostats can be enrolled in the BYOT program for an additional incentive (on top of their EE rebate).

When an NWS is planned in a geographic area, the NWS team will first identify all of the applicable DR and EE offerings, including BYOT. The NWS team attempts to increase enrollment outside of the normal program through enhanced incentives, targeted marketing, etc. Both the EE program and the Non-Wires (and Non-Pipes) programs count all cost and benefits within their BCAs. The programs are not concerned with "who receives credit" for deferred usage, as they have different goals overall.

The BYOT program is part of ConEd's residential EE portfolio instead of its DR portfolio. This structure was not intentional, but instead it was logistically easier to "add-on" the BYOT program to the existing Smart Thermostats program that was conducted through the Residential EE portfolio. Currently, the EE portfolio's Marketplace and the DR enrollment are integrated, but the teams do not foresee additional Marketplace measures becoming integrated through a similar pathway.[11]
Though this study focuses on electric DR + EE integration, some lessons can be learned from ConEd's gas DR + EE integration. Many customers who participated in the ConEd's Winter Gas DR Pilot were Summer Electric DR BYOT program participants. These customers reduced gas consumption the most in the program and ConEd did not incentivize an additional thermostat.

How DR and EE are Treated in Cost Effectiveness
DR and EE cost-effectiveness are reported separately. Currently, the ConEd BYOT initiative is evaluated as a DR program instead of as an integrated program. Program administration and marketing costs are allocated to DR, however, the EE incentive is allocated to EE. Overall, New York has attempted to coordinate the BCA approach across all of its utilities through a general regulatory

[10] 2020 ConEdison Demand Response Forum, February 18, 2020, https://www.coned.com/-/media/files/coned/documents/save-energy-money/rebates-incentives-tax-credits/smart-usage-rewards/demand-response-forum.pdf
[11] Con Edison Interview

framework.[12] ConEd has developed a BCA Handbook based on the state's guiding principles, which it applies to DR and EE programs.[13] The leading ideas in ConEd's BCA framework are as follows:[14]

1) be based on transparent assumptions and methodologies; list all benefits and costs including those that are localized and more granular;
2) avoid combining or conflating different benefits and costs;
3) assess portfolios rather than individual measures or investments (allowing for consideration of potential synergies and economies among measures);
4) address the full lifetime of the investment while reflecting sensitivities on key assumptions; and
5) compare benefits and costs to traditional alternatives instead of valuing them in isolation.

The BCA handbook uses the societal cost test (SCT) for all BCAs. NWS also utilize the methodology outlined in the handbook. In the case where an NWS is recruiting participants under an EE program, both the EE program and NWS will count all costs and benefits.

4.5 National Grid – Massachusetts

Background
Massachusetts is a leader in energy efficiency programs across the United States. With limited energy production capabilities and a strong focus on greenhouse gas reduction, Massachusetts is consistently looking for ways to maximize efficiency. Massachusetts has several PAs, with Eversource and National Grid being the largest electric and gas EE providers. The interview and reporting concerning National Grid is presented as an example of the state of EE and DR program integration in Massachusetts.

Integration of DR and EE Programs
DR is part of the EE program structure at National Grid. The program manager for DR reports to the EE lead and communication across program teams is highly encouraged.

Rather than developing specific DR + EE offerings, National Grid's program manager communicates regularly with the EE program managers to see where collaboration is possible. For example, when the MassSave Marketplace rolled out a smart thermostat incentive, National Grid co-promoted its residential demand response program through an "opt-in" checkbox at the time of purchase. The "opt-in" checkbox does not directly enroll any of these customers into the DR program but allows customers to confirm eligibility and the website ultimately directs them to the appropriate enrollment route. The DR team also coordinates with thermostat manufacturers to send emails directly to individuals that have purchased smart thermostats to encourage enrollment, if they passed the opportunity during purchase.

For commercial DR + EE, customers tend to hear about DR opportunities through either a sales representative from National Grid or a Curtailment Service Provider participating in National Grid's programs. These outreach professionals are trained to talk with customers about which EE program(s) fits their needs best, including DR programs.

[12] NYPSC, "Order Establishing the Benefit Cost Analysis Framework," January 21, 2016. https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={F8C835E1-EDB5-47FF-BD78-73EB5B3B177A}
[13] ConEdison, "Report on Program Performance and Cost Effectiveness of Demand Response Programs - 2020", 2020 http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BEBA3679E-ADF5-4633-B46E-B96126E6D10F%7D
[14] Enefirst, "Assessing the Value of Demand Side Resources", https://enefirst.eu/wp-content/uploads/11_ASSESSING-THE-VALUE-OF-DEMAND-SIDE-RESOURCES.pdf

National Grid emphasizes the importance of cross promotion across technologies that enable both EE and DR, however this tends to happen after the program is developed rather than proactively.

How DR and EE are Treated in Cost Effectiveness
DR is accounted for in the overall Electric BCA table as another line-item, similar to how any other EE program's BCA would be approached, such as a standard EE program like Residential New Homes & Renovations. According to interviewees, costs are broken out on an incremental basis for things like cross-promotion, marketing, implementation, etc. through coordinated administration, however this level of granularity is not reflected in the BC Models.

5 Findings & Considerations

Each of the programs evaluated within this memo has a unique approach to integrating DR + EE. Though each approach is individualized to the PA, the Guidehouse team noted several key findings.

5.1 Key Findings

Overall, where the resource need is greatest, and perhaps most well defined (Con Ed NPA/NWA, Hawaii), the PAs have been more effective at integration of DR + EE. This appears to occur either because of regulatory enablement or because the DR and EE organizations have realized the practical benefits of working together. Yet, this has not always happened instantaneously. For example, HECO and Hawaii Energy were slow to work together until the regulator began incentivizing their collaboration through scorecard performance metrics. Throughout the interviews, it was also notable that sometimes the regulator makes it too difficult to comply, even where they are leaning towards promoting DR + EE integration (CA). Cost-effectiveness was not presented as a driver or barrier for integration across DR and EE. Instead, the PAs interviewed reviewed cost-effectiveness as program changes were made and, also, adjusted the benefit/cost allocations between programs based on the framework in place. Further detailed findings are presented below for each of the three research topic areas: integrated DR + EE structures, regulatory environment, and cost effectiveness approaches.

<u>Key Findings</u>

Integrated DR + EE Structures

Alignment of internal program objectives is important. Integration can be achieved when DR and EE objectives are aligned as best as possible (or at least do not interfere with each other) and where frameworks support it. The highest amount of integration observed, in Hawaii, is the result of a long process of building trust and communication between the two program administrators with a common objective, aided by regulatory encouragement. In Maryland, DR and EE groups have been focused on creating customer value. Conversely, at Con Edison, disparate objectives lead to limited opportunities for integration. Each jurisdiction's objective was different (e.g., grid management, customer value, resource needs, GHG abatement) and each responds to their respective objective.

It is important to note that integration for its own sake was not identified as an objective. While there are similarities between DR and EE stemming from both being demand side resources, there are differences regarding program administration responsibilities, delivery channels, funding streams, regulatory guidance, and even implementation timing that often pose challenges to the highest amount of integration. Because of this, no jurisdiction mentioned that the ultimate goal of integration efforts is full integration of all offerings.

Integration is aided by ease of customer processes. The most successful integration efforts involve minimizing the amount of effort a customer has to undertake to acquire the EE device and enroll in a DR program. EnergyHub stressed that complex systems and multiple portals are a barrier to integration. Hawaii Energy discussed how HECO's DERMS complexity was a challenge to integration. Some of this is unavoidable, especially with the grid-stability focus of DR. However, the case studies identified steps that facilitate customer participation. Automatic enrollment in a DR program helps a customer understand at one time the full financial offer to them from DR and EE. Where automatic enrollment is not feasible because of timing or regulatory structure, offering EE measures that are DR-enabled (such as smart thermostats, EMS, HPWH, and pool pumps) also facilitates participation. Across the C&I sector, technology-agnostic approaches seem to be becoming more popular for integrating DR + EE. This is likely due to the ease in enabling an EMS for these types of customers. In all cases, the integration of messaging to customers about the complementary benefits of DR and EE will reduce confusion and may enhance participation.

Collaboration by internal PA teams leads to greater success. The most successful integration occurs when DR and EE teams work together from the outset, sharing ideas and investigating new technologies. We observed that effective collaboration can occur independently of whether the teams are in the same department or different departments. The BGE EE and DR teams stressed brainstorming and communicating from the outset of program planning to optimize integration. Even when regulatory pathways ultimately take programs in different directions, this approach yields the best results. There could be volatility in programs, especially in early-stage programs, that affects integration efforts; these challenges could be worked through over time, especially if teams are communicating with each other.

Flexibility about DR technology is increasing. While thermostats dominate DR + EE integration, other technologies are used as well. A technology focus in DR is even viewed by some, such as in New York, as limiting in achieving resource targets. In these jurisdictions, technology-agnostic market solicitations are more commonly being used, particularly for the C&I sector. Another dimension of technology flexibility is the promotion of grid-enabled devices through EE programs. This is considered to be a preliminary step to greater integration. In Hawaii, the strategy is to use rebates for grid-enabled devices as a way to open the door to measure adoption with a longer-term goal of enrolling customers in DR. Massachusetts follows a similar, technology-agnostic approach for its interruptible DR program.

Regulatory Environment

Regulatory frameworks are enabling for integration but are not a key driver. Con Edison, MEA, and the Hawaii PAs all described how regulators encourage integration through discussions with the PAs. Though California has prioritized IDSM / IDER for many years, according to interview subjects, the regulator has produced a framework that is considered to hinder integration since it is difficult to justify a program as IDER and there is not a way to account for cost-effectiveness. The difficulties in program justification can be seen through the limited contractor participation. Though utilities are required to collect $10 million to implement IDER (in total for Residential and Non-Residential IDER), only about half of contractors include IDER in their contracts, thus signaling that there are likely challenges in the process. The most effective regulatory tool reported has been in Hawaii where HECO has a portion of its performance incentive tied to support by the utility (which focuses on grid management) for EE programs, particularly low-to moderate income programs. Having a single budget and regulatory framework for DR and EE is very supportive. According to the interviewees, generally, regulators have not pressed for more integration across DR and EE. MEA does not attempt to steer utilities towards specific programs, but instead encourages utilities to pursue cost-effective and equitable opportunities for customers. It will be interesting to see whether DR + EE integration is impacted as Maryland moves to a GHG abatement focus.

Regulatory structures for budgeting and cost recovery are necessary but some structures seem to negatively influence integration. Availability of funding for program designs and pilots plays a role in the ease of development for new integrated DR + EE offerings. The more the regulatory body can assist in making funding options for integrated programs available through set asides or other types of earmarks, the more programs are able to get off the ground. Within the jurisdictions evaluated, regulators tend to lean towards issuing orders to set program parameters prior to establishing funding. However, there can be drawbacks with this methodology, as seen with CA which created a structure for IDSM but it is difficult to navigate and is therefore viewed as a barrier to effective growth of integrated programs. BGE has seen some constraints on the regulatory side, as they must file cost recovery for DR and EE separately. And in New York, the requirements for cost recovery for introducing new DR technologies is perceived as limiting and has contributed to the choice of using technology-agnostic market solicitations for DR.

Massachusetts' regulatory structure offers a high amount of flexibility for integration compared to other states. Funding requests for DR and EE in Massachusetts are itemized but are currently included in one comprehensive EE filing.

Cost-Effectiveness Approach

We encountered separate regulatory requirements for EE and DR programs regarding treatment of cost effectiveness or attribution of savings. In most jurisdictions, DR and EE programs have different objectives and therefore there is less concern about which programs count respective savings. This is most apparent in New York, where the EE program and the Non-Pipes/Non-Wires programs both count all cost and benefits within their BCAs. The programs are not concerned with "who receives credit" for deferred usage, as they have different goals overall. Hawaiian Electric Co. doesn't even take credit for the EE savings associated with its DR deployment. Currently, HECO and Hawaii Energy both count savings from shared programs, but this will be addressed as collaboration continues. In California, there are separate regulatory requirements for EE, DR, and IDER. In the context of integrated DR + EE, IDER is crosscutting and may serve as an additional budget for PAs to tap into. IDER does not have cost effectiveness requirements, where EE and DR do and BCRs are calculated individually.

Integrated DR + EE is rarely evaluated for cost-effectiveness by PAs as a single stand-alone program (e.g., where a BYOT program may be evaluated as part of a residential electric portfolio). Absent regulatory guidance, program administrators assess cost-effectiveness of DR and EE separately. While benefit and cost categories are similar, there are some differences. For example, Hawaii Energy – the EE program administrator – counts energy savings benefits for EE but not for DR.[15] For some programs, Hawaii Energy considers DR to be cost item without benefits. Nevertheless, the EE benefits are often accumulated across a program that includes non-DR direct install EE or other types of measures that provide enough benefits to balance the initial DR investment within the cost-effectiveness analysis even though Hawaii Energy is not required to have a cost-effective program. Additionally, the greater the aggregation level for cost effectiveness testing (i.e., at the portfolio vs measure level), the greater opportunities exist for integration. In Maryland, where customer value is the objective, it is measured through qualitative means, not based on inputs into cost effectiveness modeling.

PAs have not felt the need to create a framework for allocating costs across DR + EE Offerings. Using smart thermostats as an example, it was found that incentive costs were allocated logically (EE incentives to EE and DR incentives to DR), program administration cost allocation was clear as all PAs had separate program managers/teams for DR and EE, but the allocation of marketing costs was consistently more ambiguous. However, the PAs did not voice concerns on their

[15] Because energy savings from DR are so small, this treatment would have a negligible impact on cost-effectiveness.

allocation methods for costs associated with integrated offerings. Furthermore, at their current states of integration, the PAs did not see cost allocation within their BC frameworks as a barrier to increased integration. Yet, the Guidehouse team suspects that cost allocation across all spending categories – including incentives – may become a larger conversation point as additional technologies become available for DR + EE integration and/or programs become more seamlessly integrated in their offerings.

5.2 Considerations

Based on the literature review and interviews, and with a foundation in the current state of integration in Massachusetts, the Guidehouse team offers the following considerations to Massachusetts program administrators to promote further integration of DR and EE.

Where applicable and allowed, promote automatic enrollment of EE measures in DR programs, with an opt-out option. Automatic enrollment is the easiest way to achieve integration. To support this, incentives to customers should be structured to reward full integration and to minimize customers opting out. For all Massachusetts residential and income-eligible customers, where the Department of Public Utilities ruled against automatic enrollment in the most recent Three Year Plan Order[16] because of health and safety concerns for vulnerable segments of the population associated with temporary adjustment of climate conditioning by an auto-enrolled DR program, the home energy assessment and marketing material for DR measures should include a strong educational component regarding demand response to enhance the likelihood of customer enrollment. Enrollment itself should be as easy as possible and if, automatic enrollment is not feasible, Massachusetts should continue its current practice to highlight enrollment options through marketplace purchases.

Continue to promote solutions that are easy for customers to enroll in, participate, recognize value stacks and track their performance. A single point of sign-up at the retail level should be featured for increased enrollment and customer ease of use and to gain additional analytics on potential customers to help serve them through DR + EE, as Massachusetts does with its smart thermostat program. Customers should not have to log-in to their utility account to reach the Marketplace to purchase DR-enabled devices and then have to do another login for DR program enrollment. Even in technology-agnostic offerings or where the PAs rely on smart devices themselves to promote DR enrollment, the PAs should take an active role in promoting integration of DR and EE with their partners. Facilitate seamless communication between the utility and EE program administrator, along with overall accessibility and transparency for the customer throughout their experience with DR.

Promote future integration through DR-enabled EE measures and market solicitations. In cases where the programs have an option to incentivize DR-enabled measures and non-DR enabled measures, preference should be given to the DR-enabled measures to facilitate future DR + EE integration. Interviews with Hawaii and EnergyHub suggested that the best opportunity for DR-enablement may be associated with the introduction of new technologies into a DR program; in Massachusetts this could be relevant to heat pumps which are an important area of focus of electrification efforts in Massachusetts. In market technology-agnostic solution solicitations, such as those used by Con Edison in New York, the solicitations should provide guidance in terms of targets, definition of and level of integration, outreach and marketing, and allow maximum flexibility within that guidance.

[16] The Commonwealth of Massachusetts, Department of Public Utilities Order in D.P.U. 21-120 through D.P.U. 21-129, accessed at https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/14509751

In addition to these considerations for actions to promote integration, we offer two considerations confirming the status of Massachusetts integration efforts.

No regulatory changes to support DR + EE integration in Massachusetts related to funding, performance incentives, or cost-effectiveness are currently needed. Massachusetts' regulatory framework has supported the development of a currently high level of integration of DR + EE. Massachusetts had a DR component of its performance incentive through 2021, similar to Hawaii, and this was removed in the 2022-24 Plan as the implementation effort of DR matured. There is no compelling need to re-introduce it to advance integration. Funding for DR and EE in Massachusetts is blended at the program level (e.g., Residential Existing Buildings) which sidesteps some of the challenges observed with separate funding streams in other states and allows for great flexibility in spending across subprograms and initiatives. Finally, Massachusetts' BC model already includes both DR and EE. While benefits in it are counted separately, the presence of both in the same model is more integrated than what was observed in most other jurisdictions. Each peer jurisdiction's cost-effectiveness guidelines are so unique as to make it difficult to translate their cost-effectiveness practices to Massachusetts. However, we did not identify any benefits that other jurisdictions count that are not considered in Massachusetts.

Many takeaways and considerations are applicable to Gas DR. The Guidehouse team did not focus on Gas DR in the literature review or interviews for this study. The interview with the Con Edison lead for NPA, who had prior experience with electric NWA, indicated that, aside from differences in technology, implementation of gas DR + EE could be similar to electric DR + EE integration. Because gas DR is in early stages in most places, PAs would have the opportunity to design gas DR programs to be as integrated as possible with gas EE, through a focus on objectives, budgeting, enrollment, and communication. The value of gas DR in Massachusetts would first need to be established through the regional avoided cost study to enable cost-effectiveness analysis of gas DR and EE and a method for determining reliable estimates of peak gas demand reduction would need to be established.

Appendix A – In-Depth Program Descriptions & Additional Context

Pacific Gas & Electric (PG&E) – California

Program Description – Automated DR (ADR) Program
Customers with an ENERGY STAR residential smart thermostats can enroll in an eligible DR program and ADR offering. These participants may receive up to $70 in incentives for enrolling their smart thermostat in the ADR offering and TOU rate, in addition to the $50 rebate for the smart thermostat. The ADR incentive does not include an annual incentive, though that is seen as a potential area for improvement by the program administrators.[17] Many of the eligible DR programs have annual incentives, however. Customers receive DR and EE information at the same website but are not required to pursue DR to receive an EE incentive for the smart thermostat itself. The ADR incentive only applies if the thermostat is then enrolled in a DR program/ TOU rate and the customer applies for an ADR incentive. Currently, smart thermostats are the only eligible residential measure for the ADR program.

All non-residential customers are also encouraged to participate in ADR, including agriculture, retail, and water treatment accounts.[18] Within this program, participants can receive incentives and technical assistance to improve energy management and lighting controls. Though ADR ultimately focuses on DR, it can also improve EE. Non-residential customers are routed through the same application to pursue Retrocommissioning (RCx), Custom Retrofit (CR), Commercial Whole Building (CWB), and Automated DR and they can coordinate their DR and EE efforts. If the participant is not seeking an incentive for RCx, CR, or CWB, PG&E highly encourages ADR participants to pursue EE incentives outside of ADR, while offering some energy efficient devices that enable DR.[19] Customers who wish to participate in the ADR program must commit to participating for 3 years. Participants can receive up to $200 per kW of load shed and up to 75% of implementation costs. For 2018 – 2022, the ADR program had a budget of $8,000,000, yet there is still $5,352,600 remaining in incentives (as of January 2022).[20]

Past Program Description – Enhanced Time Delay Relay Subprogram

The Pacific Gas & Electric (PG&E) Smart Thermostat integrated DR + EE offering was implemented by a third-party, Proctor Engineering. The Enhanced Time Delay Relay Subprogram began as an initiative to help hard-to-reach multifamily customers participate in EE programs through direct EE installs.[21] In 2019, the program added smart thermostats to its EE device options that were directly installed during the home energy assessment. This then enabled multifamily customers to participate in DR. Customers received the option to enroll in DR and install EE through the same contact point.[22] The Enhanced Time Delay Relay Subprogram was closed at the end of 2020, as it was not cost-effective.

[17] PG&E Interview
[18] PG&E Auto Demand Response Program, https://pge-adr.com/
[19] PG&E Demand Response, https://www.pgecorp.com/corp_responsibility/reports/2020/cu03_demand_response.html
[20] Calculated Incentives for Energy Efficiency and Automated Demand Response Program Project Application, https://www.pge.com/pge_global/common/pdfs/save-energy-money/business-solutions-and-rebates/product-rebates/CustomApplication.pdf
[21] PGE&E, "2019 Energy Efficiency Annual Report", 2019, https://files.cpuc.ca.gov/energy/EEfficiencyRpts/PGE/PGE.AnnualNarrative.2019.2.pdf
[22] Ibid.

Regulatory Environment

In 2010, California PUC asked utilities to begin piloting integrated approaches to projects and shifting siloed budgets into more coordinated efforts. The California PUC later adopted a pilot to defer some of the investments that would have gone towards infrastructure to promoting integrated technologies. California utilities have emphasized the necessity of funding for testing integration and have continued to pursue new integration methods.[23] In a 2018 study, Sacramento Municipal Utility District explained, "The primary driver for IDSM is to increase EE savings. The regulatory mandates for EE in California are very aggressive and while the goals are increasing, the EE potential is decreasing. IDSM programs offer an opportunity to get more efficient measures in the field, alongside other program measures, such as time-based-rates and EV chargers."[24]

California PUC requires utilities to pay into an IDSM budget (primarily sourced from their DR budgets, but partially supported by EE budgets) and all IDSM-designated projects are funded from this budget. This can both encourage and discourage projects, as it provides additional guidelines and resources for integration, but utilities are less incentivized to integrate programs that are not officially categorized as IDSM and funded through that budget.[25] The PG&E program described above was influenced by the regulatory frameworks and environment, particularly within the way incentives are budgeted, as indicated by the interviewees at PG&E.

PG&E has been pursuing IDSM opportunities for many years. However, though the legislation is seemingly progressive in California, it has made it increasingly difficult for the utilities to truly integrate DR + EE. California requires that DR and EE are funded separately, while IDER has its own pool of funding. In turn, this has created a set-up at PG&E where they have an EE group, a DR group, and an IDER group. The nuance between if a technology can receive IDSM funding can be difficult to navigate. California requires that EE RFP (Requests for Proposals) include IDER language, however, it is not required that vendors follow it. PG&E estimates that, out of 35 contractors, 10 will include IDER opportunities.

Currently, the CPUC and utilities of CA are discussing the framework in its evolution of integrating DERs. This revised framework will focus on enabling the grid to support a large number of DERs. In addition to a dedicated IDER working group within the PUC that aims to drive forward integration and find funding for utilities, the PUC is publishing preliminary frameworks accepting stakeholder comments, with goals of finalizing a decision in 2024.[26]

Hawaiian Electric (HECO) / Hawaii Energy – Hawaii

Program Description – Shifted Energy

In March 2022, Hawaii Energy, announced a partnership with Shifted Energy to roll out a new integrated residential DR + EE offering for indigenous communities in Hawaii centered on water heater control.[27] The source article announced that HECO is involved in this partnership, however HECO shared that Hawaii Energy is solely leading this initiative with Shifted Energy. Since Hawaii

[23] Ibid.
[24] Lawrence Berkeley National Laboratory and Hawaii Natural Energy Institute, "Barriers and Opportunities to Broader Adoption of Integrated Demand Side Management at Electric Utilities", February 2018, https://ipu.msu.edu/wp-content/uploads/2018/03/LBL-Barriers-and-Opps-for-Integrated-DSM-2018.pdf
[25] Ibid.
[26] California Public Utility Commission, Distribution Planning, https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/distribution-planning
[27] Shifted Energy, "Energy Efficiency + Grid Services: Hawai'i Energy Partners with Shifted Energy to Launch a Virtual Power Plant of Heat Pump Water Heaters", March 18, 2022 https://shiftedenergy.com/shifted-energy-leads-demand-response-energy-efficiency-program-with-heat-pump-water-heaters/

Energy is not a grid operator, they work with Shifted Energy to recruit and aggregate customers, and eventually lean on HECO's customer energy resource (aggregator), OATI.

This program, through Hawaii Energy, will be called the Waimānalo VPP Program. Shifted Energy produces a CTA-2045 smart water heater controller, the Grid Maestro, that can be attached to any water heater to enable it to connect to the grid. HECO has been partnering with Shifted Energy for many years to enable DR but, under this offering, it is integrating EE and Distributed Energy Resources (DERs). Customers must simultaneously install EE and enroll in demand response (thus making it a fully established single program), yet it does not involve the grid operator directly. For participating households, Shifted Energy will replace their existing electric water heater or gas water heater (even if it is not at the end of its life) with a new heat pump water heater. The program, rather than the customer, is responsible for all installation and maintenance costs. In exchange, participants are directly enrolled in a variety of connected solutions for Hawaii Energy through Shifted Energy. The water heater's grid integration includes solar sponging (the process of using more energy when solar electricity production is high and reduce usage when solar electricity production is low), peak load reduction, and DR.[28] Though the program has not been evaluated yet, Shifted Energy claims that it will be a cost-effective approach to integrating EE and DR.

Program Description – Fast DR

HECO's Fast DR program is its longest-standing DR offering with potential EE savings, though it has not been marketed or evaluated as an DR + EE solution. The program is targeted toward commercial customers, though the program materials outline that residential and small business customers are also eligible. The Fast DR offering includes options for semi-automatic DR and automatic DR controllers (ADR).[29] The ADR option is controlled via the Building Management Systems within the building. The Fast DR offering is authorized to have a capacity up to 7 MW, but as of 2021, its curtailment capabilities were at 4.34 MW. HECO intends to add additional users to reach 7 MW.[30]

When enrolling in the program, the customer participates in a preliminary assessment and/or technical audit where they are offered some EE-related improvements that are focused on DR enablement. These improvements may include updates to their Building Management System software, efficient monitoring equipment upgrades, and minor infrastructure enhancements. These improvements are funded by HECO and offered to customers free of charge if they participate in the Fast DR program. In addition to the equipment enhancements, the customer receives an incentive for participating in Fast DR. All commercial customers are required to commit at least 50 kW for load curtailment. Then, the customer may choose if they would like to participate in 40 or 80 events for the year. If a customer participates in the 40-event-plan, they are awarded $5/kW of load shed commitment. If the customer participates in the 80-event-plan, they are incentivized at $10/kW of load shed commitment.[31] Customers are guaranteed an annual payment of at least $3,000 or $6,000, depending on which event-plan they participate in. If a customer is able to commit more than 50kW, they are paid an additional $5/kW or $10/kW based upon the event-plan. HECO does not claim any realized or potential EE savings with this program.

[28] Ibid.
[29] Hawaiian Electric Company, Fast Demand Response, https://www.hawaiianelectric.com/products-and-services/demand-response/fast-demand-response
[30] Utility Dive, "Hawaii OKs emergency demand response to avoid energy shortfalls following AES coal plant closure", June 10, 2021, https://www.utilitydive.com/news/hawaii-emergency-demand-energy-shortfalls-aes-coal/601573/
[31] Hawaiian Electric Company, Fast Demand Response, https://www.hawaiianelectric.com/products-and-services/demand-response/fast-demand-response

Regulatory Environment

For the past 10 years, the Hawaii PUC has required utilities such as HECO to file an annual integrated resource plan that addresses interaction between programs, but third-party Hawaii Energy files a more collaborative triennial plan with the Hawaii PUC. The Hawaii PUC specifically asks that utilities highlight how DERs will be integrated into the future Hawaiian energy landscape. Hawaii defines DER broadly as "distributed generation, energy efficiency, demand response, electric vehicles, and distributed energy storage."[32] HECO's plans focus on battery storage and DR, while Hawaii Energy's plans focus primarily on energy efficiency, with a secondary focus on supporting HECO and other Hawaiian utilities. The different timetables for filings create a small barrier to integration. HECO & Hawaii Energy highlighted PV + storage as a current and future interest, but this fell outside of the focus of this study

Cost-Effectiveness Approach

The state of Hawaii defines DER broadly as, "'DER includes distributed generation, EE, DR, electric vehicles, and distributed energy storage."[33] Cost-effectiveness for DR + EE offerings is calculated based on which organization (HECO or Hawaii Energy) is leading the program. For example, the Fast DR program only claims DR-related benefits, even though it may have some EE impacts and costs. The separation of EE versus DR responsibilities creates challenges for integrated cost-effectiveness testing.

HECO is required to address all compliance and safety mandated efforts through a Lowest Reasonable Cost (LRC) method. This route focuses on the grid's current capabilities and risk incurred to implement the new technology. Per PUC instruction, if the proposed measure falls outside of compliance and safety mandates, it is evaluated through an extended version of the TRC test.

Hawaii Energy is only required to be cost-effective at the portfolio level, thus allowing significant flexibility among programs. Within the 2020 Annual PUC Report, it is noted that DR benefits are difficult to capture (as HECO is the grid operator), so they have been omitted from the cost breakdown while costs are documented. Some DR investments have been captured through direct install EE programs, whereas others fall into Grid-Service Ready investments. The Grid-Service Ready investments are reflective of the programs mentioned in Section 3.1 that are "teeing up" future DR capabilities.

When calculating cost-effectiveness, Hawaii Energy considers similar benefits to HECO, including energy savings, demand savings, peak savings, load shifting, carbon offsets, and job creation. Hawaii Energy does not count T&D costs, avoided T&D benefits, or transmission losses/capacity, though HECO does. Table 4 outlines the benefits and costs that are accounted for during HECO's cost-benefit analysis (CBA).[34]

[32] Hawaii's Energy Office Facts and Figures 2020, Hawaii State Energy Office, https://energy.hawaii.gov/wp-content/uploads/2020/11/HSEO_FactsAndFigures-2020.pdf
[33] Hawaii's Energy Office Facts and Figures 2020, Hawaii State Energy Office, https://energy.hawaii.gov/wp-content/uploads/2020/11/HSEO_FactsAndFigures-2020.pdf
[34] This table and similar tables in the Appendix are included to show the range of benefits; no attempt was made to compare definitions of benefit categories across jurisdictions.

Table *4*. HECO TRC Benefits & Costs

Benefits	Costs
Avoided Generation Capacity	Incremental T&D Costs and/or DER-Provided Distribution Grid Services
Avoided Energy	Incremental Program and Admin Costs
Avoided Transmission Capacity	Increased Ancillary Service Costs
Reduced Transmission Losses	
Avoided Ancillary Services	
Avoided Subtransmission Capacity	
Avoided Distribution Capacity	
Reduced O&M	
Reduced Distribution Losses	
Avoided Restoration Costs	
Reduced Revenue Cycle Service Costs	
Reduced Restoration and Staging Costs	
Increased Customer Choice	
Avoided Emissions	

Source: HECO 2020 Annual PUC Report

Generally, in Hawaii Energy's plans, DR is listed as a budgetary line item under costs, and energy efficiency accrues program benefits. All programs are ultimately viewed through an EE lens since Hawaii Energy is organized to support EE.

EmPOWER, Maryland, focusing on Baltimore Gas and Electric (BGE) – Maryland

Program Description – Connected Rewards

Through its PeakRewards program, BGE incentivizes customers to install smart thermostats for DR. BGE is a part of the state EE promoter, EmPOWER, yet their program operates mostly on its own. EmPOWER oversees 7 utilities and co-ops, some of which have smart thermostat DR programs. The BGE program began as a way to condense customer time commitments and cross promote EE measures and DR. While a field technician was on-site, they would install a smart thermostat in addition to any direct install EE measures, such as LED lighting. The program has since changed names to "ConnectedRewards," and "PeakRewards" now refers to the legacy program of installing air conditioner DR switches (though BGE is not currently installing new switches).[32] If customers have a smart thermostat, they can enroll it directly through ConnectedRewards; otherwise, the customer is sent to the BGE marketplace, where they can purchase a smart thermostat and/or a variety of other energy efficient products. Customers receive $50 for each thermostat enrolled, and $50 for each year of DR program participation.

Regulatory Environment

Maryland's regulatory environment has only recently begun to emphasize the importance of DR + EE integration. In 2019, the Maryland Public Service Commission (Maryland PSC) requested proposals from all of Maryland's electric utilities with the stated purpose of "identify[ing] pilot programs to shape customer load profiles through load shifting, peak shaving, and EE." BGE responded with its BYOT program outlined above. The Maryland Energy Administration is another state agency that supports the state's energy savings goals and assists utilities in their program delivery and development. The Maryland Energy Administration does not attempt to steer utilities towards specific programs, but instead encourages utilities to pursue cost-effective and equitable opportunities for customers.

Maryland is a state that relies on the PJM Interconnection (PJM) regional transmission organization to operate the regional power market. In Maryland, all PJM benefits flow directly back to ratepayers. PJM operates a variety of programs from which customers can benefit and it has rules guiding the qualification and participation of demand-side resources in those programs. The rules impact participation; however, they do not appear to influence the structure of integrated DR + EE in Maryland or its cost-effectiveness requirements. With many DR programs, PJM can directly call emergency events that cannot be overridden by customers. However, these events also provide an additional payment to customers for their curtailed load. As of BGE's 2019 evaluation submitted to EmPOWER, PJM had not called any events through BGE. Traditionally, EmPOWER utilities bid DR capacities into the PJM market, however they did not in the 2021/2022 Program Year as their resources did not meet newly renewed Capacity Performance requirements.

Cost-Effectiveness Approach
Though BGE combines the DR and EE smart thermostat programs on an administrative level, it ultimately breaks out costs and energy savings by EE versus DR due to separate cost recovery riders as customers are not automatically enrolled into the DR program upon purchasing a smart thermostat. Ultimately, programs are required to be cost-effective at the program level through the TRC test. BGE uses the same BCA calculations for DR and EE offerings since cost-effectiveness is evaluated on a residential program level. The included benefits are present value of electric avoided energy and capacity costs, demand reduction induced price effects, secondary fuel savings, and water savings, as indicated in **Error! Reference source not found.**.

Table 5. BGE Costs & Benefits - EE

TRC Benefits	TRC Costs
Avoided Energy*	Program Administrative Costs
Avoided Capacity*	
Energy and Capacity DRIPE	Incremental Measure Costs
Fuel Savings	
Residential Lamp Replacement Cost Savings	
O&M Savings	Increased Fuel Use
Water Savings	
Home Comfort for HPwES, HEIP & HVAC	

*The present value of electric avoided energy and capacity costs includes avoided line losses occurring from reductions in customer electric use. Capacity costs include avoided transmission and distribution benefits.
Source: Guidehouse Evaluation

Consolidated Edison (ConEd) – New York

Program Description – Bring Your Own Thermostat (BYOT) – Electric
Residential and commercial customers have the opportunity to enroll in the BYOT program to help curtail peak loads with Nest, Honeywell, or Emerson Sensi thermostats they have purchased. If the customer does not already have a smart thermostat, they are directed to the manufacturer's website, where ConEd facilitates a $50 EE rebate for the smart thermostats. The marketing (website) associated with the program implies that enrolling is the "next step," and encourages that, but ultimately it is up to the customer to follow through. A residential customer can receive an additional $85 incentive (per thermostat) and a commercial customer can receive an additional $115 incentive (per thermostat) if they then enroll the smart thermostat in the DR program. Customers are offered an

additional $20 to participate in the Winter Gas DR pilot. All offers are coordinated through the same webpage.[35]

Program Description – Gas DR Pilot

ConEd conducted its Gas DR Pilot (part of its Smart Solutions Program) for the past 3 winters. Within this initiative, ConEd engaged residential, multifamily, and C&I customers to gain a better understanding of the opportunities associated with Winter Gas DR.[36] Though the pilot allowed all customers with access to firm gas to participate, it ultimately prioritized multifamily and C&I accounts. To source its participants, ConEd reached out to those already participating in the electric BYOT program and offered gas DR. The customers had already received a smart thermostat rebate from ConEd, thus reducing the cost of implementation. In the 2019/2020 program year, ConEd saw opt-out rates of less than 20%.[37] Different incentive rates were awarded to participants depending on their regional zone. The zone that ConEd deemed as having the highest reduction value was awarded the highest incentive rate.

Regulatory Environment

New York has been working on some form of DR + EE integration since the early 2000s with New York State Energy Research and Development Authority (NYSERDA) developing and offering programs focused on DR and EE for C&I customers.[38]

Reforming the Energy Vision initiative (REV) was adopted by the New Yok Public Service Commission in 2015.[39] This framework serves to promote the integration and incorporation of DERs (defined in Case 14-M-0101, as “a wide variety of distributed energy resources, including end-use energy efficiency, demand response, distributed storage, and distributed generation”). According to ACEEE,[40] after the order was released, utilities began combining marketing materials for DR and EE programs.

In 2017, REV Best Practices Working Group developed a best practice guide for energy efficiency.[41] One of the key recommendations was to prioritize a pay-for-performance plan for DR + EE. This allows funding for measures to be authorized on a singular basis by the PSC. Additionally, the PSC has generally supported utilities leveraging its marketing efforts for DR + EE offerings. The PSC has combined resources and information through presentations and discussions.

In a 2018 Berkeley Lab report[42] sponsored by the U.S. Department of Energy, ConEd indicated that REV was critical in the development of its IDSM (Integrated Demand Side Management) portfolio. REV required all utilities to file pilot and demonstration projects related to IDSM. NYSERDA offered

[35] Con Edison, BYOT Program, https://www.coned.com/en/save-money/rebates-incentives-tax-credits/rebates-incentives-tax-credits-for-residential-customers/bring-your-thermostat-and-get-$85
[36] Con Edison Performance-Based Gas Demand Response Pilot Guidelines, August 2021, https://www.coned.com/-/media/files/coned/documents/save-energy-money/rebates-incentives-tax-credits/smart-usage-rewards/gas-demand-response-pilot-guidelines.pdf
[37] Ibid.
[38] ACEEE, “Integrated Energy Efficiency and Demand Response Programs”, September 2019 https://www.aceee.org/sites/default/files/publications/researchreports/u1906.pdf
[39] New York Public Service Commission, Case 14-M-0101 – Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b0B599D87-445B-4197-9815-24C27623A6A0%7d
[40] ACEEE, “Integrated Energy Efficiency and Demand Response Programs”, September 2019 https://www.aceee.org/sites/default/files/publications/researchreports/u1906.pdf
[41] REV Best Practices Working Group, “REV Energy Efficiency Best Practices Guide”, February 17, 2021, https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={738AE607-658B-44CB-BB51-8898FE513533}
[42] Lawrence Berkeley National Laboratory and Hawaii Natural Energy Institute, “Barriers and Opportunities to Broader Adoption of Integrated Demand Side Management at Electric Utilities”, February 2018, https://ipu.msu.edu/wp-content/uploads/2018/03/LBL-Barriers-and-Opps-for-Integrated-DSM-2018.pdf

funding options for these pilots and demonstrations. It was within this development period that ConEd invested in its notable Brooklyn-Queens Demand Management (BQDM) Non-Wires Solution projects that emphasized the integration of DR + EE through multiple technologies.[43]

However, now, the New York PAs are receiving less new guidance when it comes to DR + EE integration. If a utility would like to add a new DR offering, the NY PSC requires the utility to provide significant research to support a pilot, conduct the pilot, and eventually submit a tariff to support this new offering (assuming the pilot has been successful). This is done to protect ratepayers, but at the same time it is an extended process and leading ConEd to prefer a technology-agnostic solution.[44]

Approach to Cost-Effectiveness

In ConEd's approach to cost-effectiveness, many DR and EE benefits and costs are allocated to both DR and EE, as seen in the following **Error! Reference source not found.**. Since BYOT is often an "add-on" to the EE smart thermostat program, any EE-related costs, like the smart thermostat itself, is considered in EE program cost-effectiveness. In the case where an NWS is recruiting participants under an EE program, both the EE program and NWS will count all costs and benefits.

[43] Ibid.
[44] Con Ed Interview

Table 6. ConEd Benefits and Costs

#	Benefit/Cost	PV	CHP	DR	EE
	Benefits				
1	Avoided Generation Capacity Costs	●	●	●	●
2	Avoided LBMP	●	●	●	●
3	Avoided Transmission Capacity Infrastructure	◒	◒	◒	◒
4	Avoided Transmission Losses	○	○	○	○
5	Avoided Ancillary Services	○	○	○	○
6	Wholesale Market Price Impacts	○	○	○	○
7	Avoided Distribution Capacity Infrastructure	◒	◒	◒	◒
8	Avoided O&M	○	○	○	○
9	Avoided Distribution Losses	○	○	○	○
10	Net Avoided Restoration Costs	○	○	○	○
11	Net Avoided Outage Costs	○	◒	○	○
12	Net Avoided CO_2	●	●	●	●
13	Net Avoided SO_2 and NO_x	●	●	●	●
14	Avoided Water Impacts	○	○	○	○
15	Avoided Land Impacts	○	○	○	○
16	Net Non-Energy Benefits	○	○	○	○
	Costs				
17	Program Administration Costs	●	●	●	●
18	Added Ancillary Service Costs	○	○	○	○
19	Incremental T&D and DSP Costs	◒	◒	◒	○
20	Participant DER Cost	●	●	●	●
21	Lost Utility Revenue	●	●	●	●
22	Shareholder Incentives	●	●	●	●
23	Net Non-Energy Costs	○	○	○	○

Note: This is general applicability and project-specific applications may vary.

● Generally applicable ◒ May be applicable ○ Limited or no applicability

Source: ConEd BCA Handbook 2018
LBMP = Location Based Marginal Pricing

Appendix B - Interview Guide

1.1 Background / Introduction

Thank you for talking with me today about [PA]'s integrated DR + EE offerings. Guidehouse is conducting a study for the Massachusetts Program Administrators to understand the current environment of integrated DR + EE programs across PAs, and where certain practices may be applicable to Massachusetts. Within this discussion, we hope to cover a variety of topics, generally including: 'What are best practices for integrating DR + EE,' 'How has your PA been successful in its integration efforts?,' 'What are future goals for integration?,' and 'What are ways that programs can be integrated on the back-end as well as on the customer-facing end?'

For additional context, I would like to define what we mean when referencing "integrated" programs. For this study, we have used the framework from a 2019 ACEEE study on integrated DR + EE. Ultimately, the study outlined four program integration levels for integrated DR + EE. The levels are as follows:

ACEEE Levels of Integration for Integrated DR + EE Programs

Level	Description	Criteria (May include one or more)
Level 1	Stated recognition of latent energy (kWh) or demand (kW) reduction capabilities	• Program stated intention to reduce energy usage through DR + EE • Programs do not actively strategize integration
Level 2	Cross promotion	• Programs use the same marketing and outreach channels, utility contact person, etc.
Level 3	Administrative coordination	• Single point of enrollment for multiple programs • Coordinated internal management
Level 4	Single program	• Simultaneous enrollment in DR and EE elements • Coordinated evaluations of program (including, but not limited to cost-effectiveness and EM&V)

Source: ACEEE 2019, "Integrated EE and DR Programs"

1. With regards to EE and/or DR programs, what is your role, and how long have you been in the role?

2. Please describe your organization's role in facilitating EE and/or DR programs.

1.2 Coordination of Program Administration Teams for Programs

3. Describe the coordination of DR and EE program planning and implementation at your utility.
    a. *Probe:*
        - Planning groups
        - Filings
        - Marketing
        - Implementation
        - Confirm technologies (current and future?)

4. How are decisions regarding whether and how DR and EE programs will be integrated generally made? Are those decisions made at the beginning of a program, or as they unfold?

5. Is there a specific implementation vendor (either EE or DR) staff person that you recommend that we speak with about their experience with DR + EE integration? If so, whom would that be?

1.3 Impact of Regulatory Guidance

6. To what extent does regulatory guidance about integration generally aid or hinder integration advancements? What about cost-effectiveness specifically? Please explain your answer.

7. What regulatory guidance or directive, if any, has been especially useful in promoting the integration of DR and EE?

8. Is there funding dedicated to integrated programs? If so, how beneficial is dedicated funding integration efforts?

9. What are the drivers to your utility's integration of DR + EE? *(probe: regulatory guidance, reserved funding, internal load management objectives, or something else)*

10. [Optional] Is there someone else that you recommend that we speak with about regulatory guidance for DR + EE integration? If so, whom would that be?

1.4 Cost-Effectiveness for Integrated DR + EE

11. Are DR + EE programs coordinated on calculating cost-effectiveness? What form does that coordination take (e.g., models, assumptions or inputs)? Do benefits and costs vary by EE versus DR?

12. Are you willing to share most recent cost-effectiveness calculation workbooks for EE, DR, and DR + EE?

13. [If not calculated in one model] How are savings claimed for DR and EE in an integrated program?

14. [If time] How do each of the following impact cost-effectiveness approaches specifically as they relate to the integration of DR and EE:
    a. State policies
    b. Regulatory guidance and precedence about cost-effectiveness of EE, DR, and DR + EE
    c. Other theories about how costs and benefits of DR and EE programs should be examined
    d. Program administration components (implementation pathways, vendors, timing)
    e. Something else?

1.5 Determining Success for Integrated DR + EE

15. What is the objective of your DR programs? Of integrated DR + EE?

16. How do you (or would you like to) evaluate the effectiveness of an integrated DR + EE program? What metrics would you use to determine that the integrated program has been successful?

17. Do you see an end goal for the integration of DR + EE across a demand side management portfolio? Will all programs look similar as a fully integrated DR + EE offering? Is it possible to use an integrated approach for all programs? Why/why not?

18. Do you have any additional thoughts around best practices to integrate DR + EE efforts?