Moving the Target—Evolving Portfolio Metrics from EE to GHG

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ABSTRACT

Climate change and technological advancements require new approaches for efficiency programs to deliver impact. As more program administrators seek to align efficiency portfolios with state climate and clean energy policies, they can learn from the experience of program administrators who are "early adopters" in evolving performance metrics from energy savings to greenhouse gas (GHG) reduction.

This paper details the evolution of two energy efficiency portfolios over the past decade in two very different markets: Vermont and Washington, DC. Like most energy efficiency portfolios, both programs historically measured performance based on energy savings for specific fuels: electricity (MWh), natural gas (therms), and unregulated fuels (MMBtu). As of their most recent performance periods, both programs have incorporated performance metrics and incentives for GHG reduction.

This paper explores the policy advancement and programmatic activities that led to the historic changes in energy efficiency portfolio metrics for Efficiency Vermont and the DC Sustainable Energy Utility (DCSEU). Key strategies included launching early research and pilot projects, proactive engagement of stakeholders and regulators, and adapting the methods and tools used to track savings impacts. The DCSEU and Efficiency Vermont experience will be particularly relevant to program administrators in states and cities where climate and clean energy goals are prompting a reexamination of efficiency program metrics and frameworks.

Introduction

As states set increasingly ambitious climate and clean energy goals, energy efficiency programs must evolve to better support policy goals and an increasingly renewable electric grid. This paper describes how two well-established energy efficiency programs, the DC Sustainable Energy Utility (DCSEU) and Efficiency Vermont, shifted their performance metrics to prioritize GHG emissions reductions. While both of these programs operate in jurisdictions with strong climate and clean energy goals and policies, and both are run by third-party administrators rather than utilities, they are subject to regulatory and evaluation processes similar to utility-administered energy efficiency programs. Therefore, the evolution of these programs highlights practical lessons about GHG regulation, goal-setting, and accounting, as well as program design and planning considerations, which can inform the evolution of other energy efficiency portfolios. The DCSEU and Efficiency Vermont experience will be particularly relevant to program administrators located in states and cities where climate and clean energy goals are prompting a reexamination of energy efficiency program metrics and frameworks.

Energy Efficiency Context Prior to Program Evolution

The DC Sustainable Energy Utility

The DCSEU was created by the Council of the District of Columbia when it enacted the Clean and Affordable Energy Act of 2008 (CAEA), which also established a Renewable Energy Portfolio Standard (REPS). The Act aimed to improve the city's energy infrastructure, reduce total energy consumption, spur economic development, and generate green collar jobs (Council of DC 2008). The CAEA established the DCSEU as the District's main implementer for energy efficiency programs, replacing the electric and gas utility efficiency programs, and the DCSEU is funded by ratepayer surcharges through the Sustainable Energy Trust Fund (SETF). The CAEA gives the Mayor authority, through the District Department of Energy and Environment (DOEE), to contract with a private entity to operate the DCSEU. VEIC is the contractor currently operating the DCSEU programs, while the Sustainable Energy Utility Advisory Board (SEUAB) provides advice and monitors the DCSEU's performance.

Since its inception, the DCSEU has offered energy efficiency and solar programs for residential and commercial customers. The DCSEU operates through a performance-based, five-year contract with mandatory benchmarks to ensure that it meets specific performance targets. Prior to the most recent contract period, the DCSEU's performance benchmarks focused on electric and natural gas savings, along with other District priorities. As shown in Table 1, the DCSEU's contract for fiscal years (FY) 2017-2021 specified six performance benchmarks. In addition to these benchmarks, the DCSEU was mandated to fully expend its annual allocation from the SETF, use Certified Business Enterprises for at least 35 percent of dollars that are spent using Implementation Contractors, and spend on electric and natural gas efficiency programming in proportion to the revenues from each of those utility ratepayer sources (DOEE 2017).

Table 1. DCSEU FY2017- FY2021 performance benchmarks

Reduce electricity consumption
Reduce natural gas consumption
Increase renewable energy generating capacity
Increase the number of green-collar jobs
Improve the energy efficiency and renewable energy generating capacity of low-income housing, shelters, clinics, or other buildings serving low-income residents
Leverage external funds to support energy efficiency and renewable energy projects

Source: DOEE (2017, 37)

Efficiency Vermont

Efficiency Vermont was created by the Vermont Public Utility Commission (PUC) and the Vermont Legislature in 2000 as a statewide, third-party, objective resource to meet the need for energy services through the development and implementation of energy efficiency programs for residential, commercial, and industrial customers. Since its inception, Efficiency Vermont has been administered by VEIC, which currently holds an appointment from the Commission to

administer Efficiency Vermont as a regulated Energy Efficiency Utility (EEU) through the end of 2026 (VEIC 2021). Efficiency Vermont operates in three-year performance periods with compensation linked to specific performance goals.

Since the 1980s, Vermont's state energy policy has aimed to create a "sustainable," and "environmentally sound" energy system (Vermont General Assembly 2020, 24). In support of these broad goals, 30 V.S.A. § 218 (c) requires regulated electric and gas companies to account for environmental costs and include energy efficiency programs when they prepare mandatory least-cost integrated plans,[1] and these objectives and policies are present in many other jurisdictions. Vermont statute 30 V.S.A. § 209 allows the PUC to appoint an independent EEU to implement energy efficiency programs, including development, implementation, and monitoring of thermal energy and process fuel (TEPF) efficiency.[2] These statutes create an energy policy context that facilitates consideration of broad environmental concerns, as well as ratepayer costs.

From 2000-2020, Efficiency Vermont's Quantitative Performance Indicators (QPIs) focused mainly on electric and thermal savings. An Energy Efficiency Charge (EEC) is collected from electric ratepayers and funds the electric efficiency programs. The State added TEPF programs in 2008, dedicating revenues it receives for participating in the ISO New England Forward Capacity Market (FCM) and Regional Greenhouse Gas Initiative (RGGI) to energy efficiency programs for customers that heat with unregulated fuels. The disparate funding sources for electric energy efficiency and thermal efficiency resulted in separate sets of goals focused on the annual incremental unit reduction of energy, along with some supporting goals to ensure a balanced portfolio. Tables 2 and 3 show Efficiency Vermont's QPIs for the 2018-2020 performance period.

Table 2. Efficiency Vermont 2018-2020 electric efficiency performance indicators

QPI#	Title	Performance indicator/milestone	100% target
1	Total resource benefits	Present worth of lifetime electric, fossil, and water benefits	$318,107,900
2	Annual electricity savings	Annual incremental net megawatt-hour (MWh) savings	357,400
3	Statewide summer peak demand savings	Cumulative net summer peak demand kilowatt (kW) savings	45,900
4	Statewide winter peak demand savings	Cumulative net winter net peak demand kW savings	62,400
5	Lifetime electricity savings	Lifetime incremental net MWh savings	3,582,000

Source: VEIC (2017, 39). These targets were subsequently revised by the PUC. See (PUC 2021).

[1] A least-cost integrated plan is a plan for meeting the public's need for energy services, after safety concerns are addressed, at the lowest present value life cycle cost, including environmental and economic costs.

[2] Natural gas is only available in a small part of the state, and Vermont Gas Systems is responsible for providing energy efficiency programs for natural gas customers. Efficiency Vermont's TEPF programs serve customers that heat with unregulated fuels such as oil, propane, and wood.

Table 3. Efficiency Vermont 2018-2020 TEPF performance indicators

QPI#	Title	Performance indicator/milestone	100% target
1	Thermal and mechanical energy efficiency savings	Annual incremental net million British thermal unit (MMBtu) savings	388,700
2	Residential single-family comprehensiveness	Average air leakage reduction per project	34%
		Percentage of projects with square feet of insulation added equivalent to at least 50% of the home's finished square feet of floor area	44%
		Percentage of households (premises) that implement shell measures, and also have a heating system measure installed within three years of shell measure	16%
		Number of comprehensive projects completed	2,286

Source: VEIC (2017, 40).

Historical Approaches to GHG Accounting

Prior to the most recent performance periods, both the DCSEU and Efficiency Vermont tracked and reported on the GHG emissions impacts of programs, but these impacts did not drive program design or planning. Programs were instead designed to acquire fuel-specific electric (MWh), natural gas (therms), or TEPF (MMBtu) savings. This has often *correlated* with GHG emissions reductions, but these reductions were not the principal objective of the programs.

Additionally, Efficiency Vermont and the DCSEU had long accounted for the GHG emissions avoided from efficiency measures and programs in their societal cost-effectiveness screening tests by using environmental externality adjustors. Programs used the marginal emissions rate of the regional transmission operator (ISO New England for Efficiency Vermont and PJM for the DCSEU) to account for emissions avoided by incremental electric efficiency measures. This approach recognizes the impact of efficiency on the dispatch of generating resources within the regional grid as a result of reduced electricity consumption. Thus, emissions avoided by electric efficiency have historically been measured at the source, reflecting the emissions released or combusted during the production of electricity by the average regional marginal generator. By contrast, the emissions impacts of heating fuel measures – both natural gas and TEPF – were traditionally measured at the site level. The act of combusting the fuel at the physical site causes a known level of emissions per unit, and this was the point historically used to calculate emissions for heating fuels.

Setting the Stage for Evolution to GHG Metrics

Because of the complicated regulatory and energy policy landscapes in which energy efficiency programs operate, change often comes slowly. It is possible, however, to help catalyze change in a particular direction. This section describes how DC and Vermont set the stage to evolve efficiency program metrics through a combination of policy advancement and pilots that demonstrated GHG reduction strategies.

It is worth noting that, as in other jurisdictions, most of the funding for programs in Vermont and DC comes from ratepayers. Although one is subject to oversight by utility regulators and the other is not, both jurisdictions are sensitive to the limits of what ratepayers should pay for. Policymakers' views are evolving at different speeds in different places regarding how or whether to internalize GHG reduction into costs borne by ratepayers.

Policy Advancement

The DCSEU. Since the initial legislation establishing the DCSEU, the District has developed increasingly ambitious climate and clean energy plans and goals. In 2010, the Mayor of DC committed to reducing GHG emissions 50 percent below 2006 levels by 2032 and 80 percent below 2006 levels by 2050 (DOEE 2010). In 2016, the Renewable Portfolio Standard Expansion Amendment Act increased the city's RPS requirement to 50 percent by 2032 and required the city's solar generation target to achieve 5 percent by 2032 (Council of DC 2016). In 2018, the Clean Energy DC Plan laid out a blueprint for building decarbonization to reduce GHG emissions. The details of the plan were codified in the Clean Energy Omnibus Amendment Act of 2018 (Council of DC 2018). The Omnibus Act increased the city's RPS requirement to 100 percent by 2032, making DC's renewable energy target the most aggressive in the county. The adoption of a 100 percent RPS put the District on a course that will ultimately sever the connection between electric energy efficiency savings and GHG reductions, creating an impetus to update efficiency program metrics. In addition to increasing the District's climate and energy targets, the Omnibus Act removed specified funding allocations for electric and natural gas efficiency, expanding program flexibility.

The Omnibus Act also established a Building Energy Performance Standard (BEPS) to address the city's building energy use, which accounts for 75 percent of the district's GHG gas emissions (Council of DC 2018). The standard requires a phased approach for specific building types and sizes including multifamily, commercial, and District-owned buildings to achieve minimum energy performance thresholds. To smooth adoption and feasibility of the standard, the legislation requires the DOEE to coordinate with the DCSEU and the DC Green Bank to offer incentives and technical assistance to help qualifying building owners and affordable housing providers meet BEPS requirements (Council of DC 2018).

To prioritize service for low-income and disadvantaged residents, the law created an "Affordable Housing Retrofit Accelerator" and provided annual funding for the DOEE and the DCSEU to enable providers of affordable housing or rent-controlled buildings to undertake energy efficiency upgrades that are subject to BEPS requirements (Council of DC 2018).[3] Providing programs for low-income and disadvantaged communities is crucial for the city to achieve its climate goals while addressing historical inequities. Additionally, the DCSEU's contract requires that at least 30 percent of program funding benefits low-income residents, and the contract advances local job creation by requiring the DCSEU to establish workforce development initiatives in energy efficiency-related fields (Council of DC 2018). The DCSEU's longstanding *Workforce Development* program aims to produce highly skilled permanent jobs in

[3] The District subsequently allocated additional funding from the American Rescue Plan Act (coronavirus relief) to the Affordable Housing Retrofit Accelerator, to further support BEPS compliance (DCSEU 2022).

the energy sector for the District's unemployed or underemployed residents. In 2021, the DCSEU created 87 permanent energy-focused jobs (DCSEU 2022a).

Efficiency Vermont. The statutes that underpin Vermont's electric and thermal efficiency programs identify GHG emissions reductions as a specific objective (Vermont General Assembly 2021) and include the State's progress in meeting its GHG reduction goals in assessment of economic costs. Since Efficiency Vermont was established, Vermont has taken other actions to advance climate and clean energy goals. In 2005, the Vermont General Assembly enshrined non-binding GHG reduction goals in state statute, signaling an awareness of the need to take action to address climate change and a growing willingness to do so (Vermont General Assembly 2020a). In 2015, the Vermont legislature passed a Renewable Energy Standard (RES) and expanded the scope of traditional renewable energy standards to include obligations for electric distribution utilities to reduce GHG emissions from fossil fuels (Vermont General Assembly 2015). In 2016, the state updated its Comprehensive Energy Plan (CEP), including an in-depth analysis of the Vermont's existing energy use and the GHG emissions associated with each sector of the state's economy. The CEP established GHG goals of 40 percent reduction below 1990 levels by 2030 and 80-95 percent reduction below 1990 levels by 2050 (DPS 2016). It also began to chart pathways to a less GHG-intensive energy system, calling for more efficient use of energy in Vermont's buildings, industry, and transportation sectors and highlighting the role that energy efficiency can play as a least-cost resource to reduce GHG emissions.

In response to the RES and the 2016 CEP, decarbonizing Vermont's energy sectors became a shared priority amongst Vermont's energy stakeholders, prompting Efficiency Vermont to engage with partners in novel ways to maximize the GHG reduction impact of efficiency programs. The importance of partnership to rapidly decrease GHG emissions was formally recognized in what became known as the Act 62 investigation (PUC 2019).[4] In this proceeding, Efficiency Vermont proposed that its role should shift from providing energy cost and MWh reduction to providing energy cost and GHG reduction and suggested that GHG targets could be added to efficiency program performance metrics. Over the course of the investigation, Efficiency Vermont and many stakeholders supported a shift in focus toward GHG reduction, which was reflected in the PUC's final report recommendation that GHG targets become a new component of EEU performance, in addition to historic electric efficiency and load management metrics (PUC 2021a).

Conversations supporting GHG performance metrics for Vermont EEUs took place in parallel with other legislative steps that also focused attention on the need for GHG accounting. In 2019, the State regulated refrigerants with high global warming potential (GWP) (Vermont General Assembly 2019). In 2020, the Vermont Global Warming Solutions Act (Act 153) codified some of the goals set forth in the 2016 Comprehensive Energy Plan. It requires Vermont to "reduce emissions of greenhouse gases… by 26 percent from 2005 greenhouse gas emissions by January 1, 2025; [and by] not less than 40 percent from 1990 greenhouse gas emissions by

[4] Recognizing the State's failure to achieve its legislated environmental goals, Act 62 directed the Commission to report on a variety of issues, including an all-fuels energy efficiency program and the expansion of the services an EEU may provide. In July 2019, the PUC opened Case 19-2956-INV to explore these issues.

January 1, 2030; [and by] not less than 80 percent from 1990 greenhouse gas emissions by January 1, 2050" (Vermont General Assembly 2020a, 3-4). During this same legislative session, Vermont lawmakers passed Act 151, "An act relating to energy efficiency entities and programs to reduce greenhouse gas emissions in the thermal energy and transportation sectors" (Vermont General Assembly 2020). This pivotal law allowed Efficiency Vermont to use a limited amount of its existing electric energy efficiency funding specifically for GHG reduction programs related to thermal (heating) and transportation. Taken together, these policies set the stage for Efficiency Vermont to shift to a GHG performance metric.

Pilot Projects to Test GHG Reduction Strategies

The DCSEU. As the District ramped up its building decarbonization efforts under the 2018 Omnibus Act, DOEE was interested in exploring beneficial electrification (BE) strategies for low-income District residents. The DCSEU worked with DOEE and other stakeholders to design and implement a Low-Income Decarbonization Pilot (LIDP) to determine costs, GHG reductions, lifecycle savings, benefits to the consumer, and roadblocks encountered when completing comprehensive BE retrofits of single-family homes occupied by low-income households (SEUAB 2021). At no cost to participants, the pilot installed efficiency upgrades (weatherization and smart thermostats), replaced fossil fuel-based heating, hot water, and cooking equipment with electric replacements (air-source heat pumps, heat pump water heaters, and electric stoves), and installed solar PV systems or enrolled households in community solar (Burdick 2020).

The pilot identified opportunities and barriers associated with BE for low-income residents. Some residents hesitated to participate because they did not understand the benefits and/or were skeptical of the technologies; contractors needed to clearly explain the benefits of BE upgrades and offer continual assurances about the durability and reliability of retrofits to alleviate these concerns. Many of the District's single-family homes and rowhomes date from the early and mid-1900s and, as a result, all the pilot homes required basic electrical upgrades to accommodate the added electric load of the BE retrofits. In addition, the age of the selected homes required preemptive weatherization to ensure the upgrades performed as intended. Both barriers added to total costs and extended the length of the pilot. Supply chain disruptions due to Covid-19 made it difficult to procure equipment and temporarily delayed progress on some retrofits (P. Boyd, director, DCSEU, pers. comm., March 21, 2022).

Despite these challenges, the LIDP successfully retrofitted ten single-family homes with BE upgrades that lowered energy use and GHG emissions. The pilot also generated valuable lessons learned to inform future building electrification strategies in the District.

Efficiency Vermont. Every year, Efficiency Vermont invests a modest "non-resource acquisition" budget (less than 2 percent of the total annual budget) to explore promising program concepts and ideas through research and demonstration (R&D) projects. Smart thermostats, cold-

climate heat pumps, and load management initiatives all began as small-scale research projects and now comprise robust programs within Efficiency Vermont's portfolio.

In late 2018, Efficiency Vermont began to incorporate GHG impacts as a new screening criterion for assessing the potential of new R&D projects. Projects selected because of their potential GHG impact have explored the feasibility of natural refrigerants and refrigerant management, compared the emissions impacts of different heating fuel options in Vermont, and evaluated the embodied carbon impact of residential and commercial new construction materials (Efficiency Vermont 2021a). These projects familiarized Efficiency Vermont staff with GHG tracking in a much deeper and more comprehensive way by enabling staff to research and assess the GHG impacts of new dimensions of energy efficiency measure lifecycles, such as refrigerant leakage at customer sites and the lifecycle GHG impacts of different heating and insulation options.

The regulatory framework that allows Efficiency Vermont to explore new concepts though R&D projects was a critical element in the transition to GHG metrics. It allowed staff to collect data, develop confidence in the direction of the work, and generate proof of concept as the 2021-2023 program planning period approached.

New GHG Performance Metrics

Having set the stage for efficiency program evolution through policy advancement and pilot projects, the DCSEU and Efficiency Vermont were ready to work with stakeholders and regulators to include GHG targets in their performance frameworks for the latest performance periods. This section describes the specific efforts that supported inclusion of GHG metrics in goal setting and contract negotiation, including stakeholder and regulator engagement and modeling and forecasting.

DCSEU Contract Extension for Fiscal Year 2022-2026

Following the establishment of BEPS and the 100 percent renewable energy requirement under the 2018 Omnibus Act, District stakeholders and the city government accelerated efforts to align the DCSEU's performance framework with these policies. Stakeholders recognized that the District's commitment to 100 percent renewable electricity would eventually eliminate the connection between MWh savings and GHG emissions. At the same time, achieving the District's GHG targets will require massive reductions in direct building emissions from natural gas. The City, the Sustainable Energy Utility Advisory Board (SEUAB), clean energy advocates, and other stakeholders were interested in updating the DCSEU's performance framework to better support these new priorities.

From 2019-2021, the DCSEU, DOEE, and the SEUAB worked closely to identify opportunities to strengthen the role of the DCSEU's performance benchmarks in implementing the District's GHG emission reduction goals (SEUAB 2021). In FY20, the DCSEU contract was modified to remove the "fuel-switching penalty," so that electrification measures that increased electricity consumption and reduced natural gas consumption did not count against the DCSEU's achievement of the electricity savings performance benchmark. In 2019, the SEUAB formed a subcommittee that worked with the DCSEU and DOEE to explore whether the DCSEU contract

should contain a GHG reduction target. Following the subcommittee's report, the SEUAB finalized detailed recommendations for changes to the DCSEU contract. Specifically, the SEUAB voted to recommend:

1. Inclusion of a GHG performance benchmark;
2. Adoption of a fuel neutral energy savings benchmark in addition to the GHG benchmark;
3. Use of 2006 as the base year against which DCSEU GHG reduction targets and achievements would be measured; and
4. Use of marginal rather than average emissions in determining amounts of avoided CO2 equivalent emissions able to be claimed by the DCSEU. (SEUAB 2021, 5)

The recommendations elevated GHG emissions reduction to a key goal, while retaining an energy consumption goal as the primary means to reduce energy costs for District homes and businesses. However, the recommendations set the DCSEU on a path to move away from fuel-specific energy efficiency by setting the energy savings benchmark in fuel-neutral units (MMBtus). The SEUAB also voted to require prior approval by DOEE for the DCSEU to reimburse expenditures on "new or existing natural gas or fuel oil appliances and equipment" and added criteria to inform whether these expenditures align with District policy goals, including equity and decarbonization (SEUAB 2021).

The SEUAB recommendations formed the basis for the performance benchmarks included in the DCSEU's contract extension with DOEE (Table 4), which extended the contract for an additional five years. The contract also phases out incentives for natural gas equipment starting in FY22 (DCSEU 2022a).

Table 4. DCSEU FY2022- FY2026 performance benchmarks

Performance benchmark	Metrics / performance indicators
Reduce energy consumption	MMBtu source
Reduce GHG emissions	MtCO2e
Increase renewable energy generating capacity	kW/kWe
Increase the number of green-collar jobs	Full-time equivalent (FTEs)
Improve the energy efficiency and renewable energy generating capacity of low-income housing, shelters, clinics, or other buildings serving low-income residents	Minimum percentage of program spending
Complete deep energy retrofits	Reduction of 30% or more of annual energy used on-site (MMBtu)

Source: DOEE (2021,8)

In addition to new performance benchmarks, the DCSEU's new contract addresses GHG and energy accounting and the boundaries for evaluating impacts. From FY17 to FY21, the DCSEU had separate performance benchmarks for electric and natural gas energy savings. The new fuel-neutral energy savings goal is measured in combined energy savings from both electricity and gas, measured at the source level (DCSEU 2022a). In addition to marginal

emissions from electricity generation, the District is also applying an emissions factor to account for avoided upstream methane emissions.

Efficiency Vermont Demand Resources Plan Proceeding for 2021-2023

Every three years, Vermont's regulators convene a proceeding to develop the Demand Resources Plan (DRP) which establishes Efficiency Vermont's triennial budgets, performance metrics, and compensation. As a regulated energy efficiency utility, Efficiency Vermont is compensated based on the results it produces for Vermonters, as measured by performance metrics set in its DRP. The proceeding involves a wide range of stakeholders including State agencies, utilities, and other interested parties.

In the 2021-2023 DRP proceeding, Efficiency Vermont proposed to add GHG reduction as a metric for its electric and thermal portfolios. Notably, Efficiency Vermont proposed to count GHG emissions reductions from both traditional efficiency measures that lower energy usage and new measures that reduce emissions from non-energy related activities, such as reducing fugitive refrigerant emissions or using natural or lower-GWP refrigeration systems. Efficiency Vermont proposed to tie 5 percent of its eligible performance award compensation to the achievement of GHG metrics, providing a financial incentive to meet or exceed its emissions targets.

In order to gain support for the proposed GHG performance metric, Efficiency Vermont had to demonstrate for regulators the value of a GHG metric for Vermonters. Critical elements in that process included: preparing findings from recent R&D projects to use in the proceeding and engaging with local stakeholders who shared Efficiency Vermont's GHG emissions aspirations.

A critical element of Efficiency Vermont's DRP testimony was a "Refrigerant Management Work Paper" outlining its recent experience monitoring and measuring the value of GHG emissions reductions through R&D projects (Efficiency Vermont 2020). Some energy efficiency measures, such as commercial refrigeration leak repair, deliver both direct energy efficiency benefits and non-energy related emissions benefits when the refrigerant itself is kept from escaping into the atmosphere. Because of the high GWP of gases used in refrigeration equipment and the direct energy savings of refrigerant management, this was a strategic starting point for Efficiency Vermont's GHG conversation with its regulators. The regulators in Vermont acknowledged that the incremental effort for efficiency programs to capture these "non-energy" emissions benefits was small—and a worthwhile pursuit for the energy efficiency program. Moreover, the practice of counting emissions avoided at the measure level (e.g., customer site) had been done for many years with heating efficiency measures. This precedent was used to explain how refrigerant management measure impacts should be counted—both when the direct emission of refrigerants is avoided on-site (e.g., "non-energy GHG") and when more traditional GHG benefits accrue from avoiding the incremental kWh on the regional grid.

Another critical element of the DRP testimony was a work paper describing Efficiency Vermont's plans to build programs in adherence to Act 151 (Efficiency Vermont 2021). This paper described two key elements of Efficiency Vermont's foray into transportation electrification program design: electric vehicle supply chain support and electric vehicle consumer outreach and education. While this work does not tie to specific GHG targets in the

first performance period, the market transformation efforts are expected to have quantifiable impacts on market lift for electric vehicles, which reduce GHG emissions from transportation.

In addition to these work papers, Efficiency Vermont also gathered letters of support from key industry stakeholders as part of the proceeding. Three large supermarket chains documented the value of working with Efficiency Vermont on refrigeration management measures including energy and cost savings, reduction in GHGs, and increased compliance with refrigerant regulations. Amidst the hundreds of pages of documentation filed in this proceeding, these three letters conveyed the value of GHG reductions in a way that other testimony did not. They proved to be critically important in articulating for regulators the value of a GHG-based performance metric for Efficiency Vermont.

After months of testimony and regulatory processes, the PUC established Efficiency Vermont's Quantitative Performance Indicators for the 2021-2023 performance period. As Table 5 shows, the new QPIs included all five electric efficiency performance goals from the prior period, along with three new ones including Greenhouse Gas Reduction as QPI #6. Another notable new QPIs was an innovative metric for kW of flexible load, such as building energy management systems and heat pump water heaters with grid-interactive controls. This measure indirectly supports GHG reduction goals by encouraging Efficiency Vermont to promote customer adoption of efficiency measures that support grid flexibility and resilience, which is increasingly crucial given Vermont's high penetration of variable renewable energy.

Table 5: Efficiency Vermont 2021-2023 electric efficiency performance goals

QPI#	Title	Performance indicator
1	Total resource benefits	Present worth of lifetime electric, fossil, and water benefits
2	Annual electricity savings	Annual incremental net MWh savings
3	Statewide summer peak demand savings	Cumulative net summer peak demand kW savings
4	Statewide winter peak demand savings	Cumulative net winter peak demand kW savings
5	Lifetime electricity savings	Lifetime incremental net MWh savings
6	Greenhouse gas reduction	Electric energy and non-energy benefits (metric tons of CO_2e)
7	Flexible load	Annual kW of flexible load (controllable load)
8	Administrative efficiency	5% administrative cost reduction

Source: VEIC (2021, 61).

Organizational Changes and Challenges to Adapt to GHG Metrics

Once the new GHG performance metrics were in place, the work of adapting the organizations began. The following sections provide an overview of the ongoing work required to support the new GHG metrics.

DCSEU Adaptations to GHG Metrics

The DCSEU is developing new programs and services to support GHG reductions. For example, in FY22 it began offering rebates for electric and battery-powered leaf blowers, the first time it designed a rebate specifically to target GHG emissions from fuel switching (DCSEU 2022a). Rebates for electric lawn mowers and refrigeration management programs are under development, and the DCSEU is adjusting other programs in response to DOEE's decision to phase out incentives for natural gas equipment starting in FY22. After building relationships with key accounts in recent years to develop natural gas efficiency projects, account managers are adapting their approach to support these customers in their GHG reduction efforts. For these customers, the DCSEU continues to support energy efficiency measures that do not involve installation of long-lived equipment, such as building envelope upgrades, and operations and maintenance (O&M) measures such as boiler and furnace controls, steam traps, economizers, and combustion controls (P. Boyd, director, DCSEU, pers. comm., March 21, 2022).

Accurately accounting for the new GHG performance benchmarks also required updates to the DCSEU's cost-effectiveness screening and avoided cost test. Notably, the DCSEU had to work with stakeholders to agree on a cost of carbon. Among other things, these broad conversations resulted in the accounting of source emissions for natural gas (e.g., upstream methane from production and distribution in the gas system) in cost-effectiveness tests.

Efficiency Vermont Adaptations to GHG metric

To support this new body of work, Efficiency Vermont developed a Program Implementation Procedure (PIP), which is standard practice for new programs in the portfolio (Eaton, Marin, and Pilliod 2021). Efficiency Vermont shared this document with the ratepayer advocates to ensure transparency in the methodologies and approaches to claiming non-energy GHG savings associated with refrigeration projects. Outlining these details early in the first few months of the performance period allowed program implementation staff to proceed confidently with program planning.

Since the beginning of the performance period, Efficiency Vermont account managers and energy consultants have approached customer project opportunities differently, especially with regard to refrigeration technologies. Refrigeration has become a core measure category within the traditional energy efficiency portfolio, offering significant GHG reductions to commercial and industrial customers. Customer-facing staff also now engage with the trades and upstream supply chain to help bring GHG savings to refrigeration projects across Vermont. Contractors, distributors, and retailers have always been an essential part of Efficiency Vermont's success, and the partnership team has engaged these market actors to ensure that all parties are aware of the opportunities to help end-use customers decarbonize.

Capturing the non-energy GHG impacts of measures required database changes for Efficiency Vermont. As previously discussed, an emissions factor was historically applied to account for the GHG reductions from energy efficiency. The new GHG metric now requires Efficiency Vermont to also track the non-energy GHG savings for measures involving refrigerants, and database and process changes were required to accommodate this new tracking.

Efficiency Vermont account management team members have also engaged with an entirely new market in order to successfully roll out new programs for electric vehicle supply chain support. While the energy efficiency program has been in existence for many years, vehicle dealerships were unaccustomed to Efficiency Vermont supporting their work to promote the sales of electric vehicles, and there has been a learning curve for everyone involved.

In addition to the Demand Resources Plan proceeding, Efficiency Vermont participates in a biennial regulatory process called the Avoided Cost Proceeding, which aims to update the costs avoided by energy efficiency used in the state's cost-effectiveness screening tool. While Efficiency Vermont had already accounted for the avoided cost of carbon as an externality in its screening tool, there was no way to capture measure-level, "non-energy" GHG benefits in the tool, even though the quantification of such GHG savings had already been approved in the 2021-2023 DRP. In July 2022, the Vermont PUC released a Proposal for Decision, as part of the Avoided Cost Proceeding, and recommended a methodology by which Efficiency Vermont shall incorporate non-energy GHGs in the screening tool.

Additional Program Considerations

While there are industry best practices for some elements of GHG accounting, changes to measure characterizations, screening tools, and avoided costs will be needed to enable program administrators to accurately calculate the GHG impacts of efficiency measures and to design programs that target emissions reductions. For example, calculating GHG reductions based on annual averages and regional emissions factors will be less accurate than using more granular time periods based on measure loadshapes. This is especially true as more renewables come online, where certain times of the day and seasons have much higher GHG emissions.

Energy efficiency program administrators should consider tracking GHG impacts now to gain familiarity with common GHG accounting practices and to understand where current systems may have limitations. This pre-work could be helpful in providing a "baseline" understanding of the program administrator's capabilities well in advance of changing performance metrics. Program administrators that are ready to adopt GHG metrics should work closely with evaluation, measurement, and verification (EM&V) staff as well as external evaluators to have confidence that the methodologies employed will withstand regulatory scrutiny. EM&V staff should support development of new performance metrics on the front end and tracking and reporting on the back end, once the new metrics are adopted.

Conclusion

While strong clean energy policies were a key factor driving program evolution in both DC and Vermont, program administrators also made many strategic decisions to take advantage of the circumstances and propel the programs toward GHG metrics, all while being mindful of affordability impacts on ratepayers. From capitalizing on pivotal regulatory and legislative opportunities, to exploring GHG reduction strategies through pilot projects, to proposing new ideas via "work papers" in regulatory proceedings, program administrators worked proactively to support the adoption of GHG metrics.

As more program administrators seek to align efficiency portfolios with state climate and clean energy policies, they can learn from the experience of program administrators who are "early adopters" in evolving performance metrics from energy savings to GHG reduction. While the DCSEU and Efficiency Vermont experience will be particularly relevant to program administrators in states and cities where climate and clean energy goals are prompting a similar reexamination of efficiency program metrics and frameworks, all program administrators can take steps to begin tracking the GHG impacts of efficiency programs. Key steps include updating methods and tools to more accurately track GHG reductions and conducting research and pilots to test GHG reduction strategies.

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