NORTH CAROLINA
PUBLIC STAFF
UTILITIES COMMISSION

January 26, 2024

Ms. A. Shonta Dunston, Chief Clerk
North Carolina Utilities Commission
4325 Mail Service Center
Raleigh, North Carolina 27699-4300

Re: Docket Nos. E-2, Sub 931; E-7, Sub 1032; and E-100, Sub 179
The Public Staff's Comments

Dear Ms. Dunston:

Attached for filing on behalf of the Public Staff in the above-referenced dockets are the Public Staff's Comments for the 2023 Mechanism Review and four appendices.

By copy of this letter, we are forwarding a copy to all parties of record by electronic delivery.

Sincerely,

Electronically submitted,
/s/ Anne M. Keyworth
Staff Attorney
anne.keyworth@psncuc.nc.gov

cc: Parties of Record

Executive Director (919) 733-2435 | Accounting (919) 733-4279 | Consumer Services (919) 733-9277 | Economic Research (919) 733-2267
Energy (919) 733-2267 | Legal (919) 733-6110 | Transportation (919) 733-7766 | Water/Telephone (919) 733-5610

4326 Mail Service Center • Raleigh, North Carolina 27699-4300 • Fax (919) 733-9565
An Equal Opportunity / Affirmative Action Employer

STATE OF NORTH CAROLINA
UTILITIES COMMISSION
RALEIGH

DOCKET NO. E-2, SUB 931
DOCKET NO. E-7, SUB 1032
DOCKET NO. E-100, SUB 179

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, SUB 931	)	
	)	
In the Matter of	)	
Application by Carolina Power & Light	)	
Company, d/b/a Progress Energy	)	
Carolinas, Inc., for Approval of Demand-	)	
Side Management and Energy Efficiency	)	
Cost Recovery Rider Pursuant to G.S.	)	
62-133.9 and Commission Rule R8-69	)	
	)	
DOCKET NO. E-7, SUB 1032	)	
	)	
In the Matter of	)	
Application of Duke Energy Carolinas,	)	**PUBLIC STAFF'S**
LLC, for Approval of New Cost Recovery	)	**COMMENTS**
Mechanism and Portfolio of Demand-	)	
Side Management and Energy Efficiency	)	
Programs	)	
	)	
DOCKET NO. E-100, SUB 179	)	
	)	
In the Matter of	)	
Duke Energy Progress, LLC, and Duke	)	
Energy Carolinas, LLC, 2022 Biennial	)	
Integrated Resource Plans and Carbon	)	
Plan	)	
	)	

INDEX

NOW COMES THE PUBLIC STAFF – North Carolina Utilities Commission (Public Staff), by and through its Executive Director, Christopher J. Ayers, and respectfully requests that the Commission consider the following comments.

I. BACKGROUND

On October 20, 2020, in its Order Approving Revisions to Demand-Side Management and Energy Efficiency Cost Recovery Mechanisms (2020 Mechanism Order), the Commission approved the current versions of the demand-side management (DSM) and energy efficiency (EE) cost recovery mechanisms of Duke Energy Carolinas, LLC, and Duke Energy Progress, LLC (together, Duke or the Companies), in Docket Nos. E-2, Sub 931, and E-7, Sub 1032 (Mechanism(s)). In its 2020 Mechanism Order, the Commission directed that, in the next Mechanism review, certain issues should be evaluated and reported on as follows:

a. Ordering Paragraph 3 required that "the DSM/EE Collaborative shall study ways to implement a step approach to the incentive/penalty structure adopted by the Joint Parties to potentially achieve even greater annual energy savings and in the next Mechanism review the Public Staff shall include in its initial filing a report on the discussions and conclusions reached by the Collaborative on this matter";

b. Ordering Paragraph 4 required that "the DSM/EE Collaborative shall study the concept of a low-risk discount rate in assessing the cost effectiveness of the electric public utilities' DSM/EE programs, and in the next Mechanism review the Public Staff shall include in its initial filing a report on the discussions and conclusions reached by the Collaborative on this matter";

c. Ordering Paragraph 6 required that "[t]he Public Staff's review should specifically address whether the incentives in the Commission-approved Mechanisms are producing significant DSM and EE results; whether the customer rate impacts from the DSM/EE rider are reasonable and appropriate; whether overall portfolio performance targets should be

adopted or revised; and any other relevant issues that may be identified during the review process"; and

d. Paragraph 56 of the approved DEP Mechanism required that "the parties shall consider whether or not to allow the minimum three-year amortization period designated in Paragraph 54 . . . to be further reduced, taking into consideration the impact upon customer rates, as well as other relevant factors."

On May 16, 2022, Duke filed its proposed Carbon Plan in Docket No. E-100, Sub 179, which included, in relevant part, a request that the Commission adopt four enablers that would allow the Companies to maximize their energy savings from EE and DSM and to attain annual energy savings of one percent of eligible retail sales. These proposed enablers included: (1) updating the inputs underlying the cost benefit test in the Companies' Mechanisms; (2) using an as-found baseline for EE measures; (3) broadening the definition of low-income customer; and (4) developing guidelines for expedited regulatory approval of DSM/EE programs (collectively, the Proposed Enablers).

After receiving testimony on the Proposed Enablers at the Carbon Plan expert witness hearing, the Commission stated in its Order Adopting Initial Carbon Plan and Providing Direction for Future Planning issued on December 30, 2022, in Docket No. E-100 Sub 179 (Initial Carbon Plan Order) that it was "persuaded by the Public Staff that all enablers related to the DSM/EE mechanism should be discussed within the context of a full DSM/EE mechanism review" and that it was "persuaded by the Public Staff's assertion that any modifications to individual components of the Mechanisms must take place in the context of a full, formal review of the entire Mechanisms, so that any impacts of other components of the

Mechanisms can be analyzed at the same time.'" Initial Carbon Plan Order at 109-10. As a result, the Commission stated that, "[w]ith one exception, the Commission determines that it is not reasonable to make any determination on the specific enablers in this proceeding but directs Duke to initiate a review of DEC's and DEP's DSM/EE Mechanisms within 120 days of the issuance of this Order." *Id.* at 110. The Commission ordered that "Duke shall initiate a docket to review the DEC and DEP DSM/EE cost recovery mechanisms to consider the enablers Duke proposes." *Id.* at 134.

On April 27, 2023, Duke filed a letter to commence the Commission-directed review of the Mechanisms in compliance with the Initial Carbon Plan Order. In its letter, Duke stated that "this targeted review will focus upon how [the Companies'] DSM/EE cost recovery mechanisms . . . should be revised to incorporate [the Proposed Enablers]."

On May 11, 2023, the Public Staff filed a letter stating its position that the Initial Carbon Plan Order did not direct implementation of the Proposed Enablers in the Mechanisms; rather, it ordered that the Proposed Enablers should be considered in the context of a full, formal review of the Mechanisms. Further, the Public Staff noted that the Initial Carbon Plan Order requires a "full, formal review of the entire Mechanisms" rather than a "targeted review."

On June 29, 2023, Duke hosted the first stakeholder meeting concerning the Proposed Enablers and Mechanism review, in which Duke set forth the targeted changes it wished to make to the existing Mechanisms related to the

Proposed Enablers. Other stakeholders, including the Public Staff, indicated their interest in a more comprehensive review of the Mechanisms, including, but not limited to, consideration of the Proposed Enablers.

On September 7, 2023, in advance of the second planned stakeholder meeting, the Public Staff filed a Motion for Procedural Relief (Motion). In the Motion, the Public Staff expressed that, after extensive discussion with intervenors and with Duke, and in light of the complexity inherent in a full Mechanism review (which encompasses the Proposed Enablers) and the demands of other ongoing proceedings, the Public Staff did not believe that the timeframe Duke proposed for recommendations, stakeholder engagement, and comments provides sufficient time for intervenors to fully investigate, research, and analyze the Proposed Enablers, much less to conduct a full review of the Mechanisms. Accordingly, the Public Staff requested that the Commission issue a scheduling order in the existing Mechanism dockets calling for parties, including Duke, to file initial comments concerning the Proposed Enablers and the full Mechanism review on or before January 26, 2024, with reply comments to be due by March 29, 2024. The Public Staff noted that the Proposed Enablers are only one aspect of a full Mechanism review, and the Proposed Enablers should not be analyzed separately from the other issues in a Mechanism review.

The Public Staff further requested that, in initial comments, parties address – at a minimum – the following issues in addition to any other issues of interest to parties or regarding which the Commission requests comment:

a. The appropriateness of continuing to allow the Companies to collect net lost revenues in light of House Bill 951 and the Carbon Plan Order;

b. What actions, if any, justify a utility incentive, as well as whether there should be limits imposed upon utility incentives, whether there should be a required savings threshold that must be met before incentives are earned, what metrics should be utilized in awarding incentives, whether the Mechanisms should contain both incentives and penalties like Performance Incentive Mechanisms, and the efficacy of incentive mechanisms in other jurisdictions;

c. How savings and benefits should be calculated and valued, including whether non-energy benefits should be included in particular cost-effectiveness tests, whether carbon reduction benefits should be separately accounted for, and the extent to which differential value to the system should be reflected, if at all, when quantifying anticipated costs and benefits of EE/DSM measures, among other issues;

d. Definitional changes, including how to define “low income” customers, different program types, cost effectiveness, and measure baselines;

e. Whether the same cost-effectiveness measures should be applied to all programs;

f. Financial reporting requirements;

g. How to most effectively encourage industrial and commercial participation in EE/DSM programs, given that the right of industrial and large commercial customers to opt-out of ratepayer-funded EE/DSM measures is codified at G.S. 62-133.9(f) and whether to change the threshold for a “large commercial customer” under Rule R8-69 that can opt-out;

h. Current Evaluation, Measurement, and Verification practices;

i. Cost recovery issues such as the splitting of vintage years, whether vintage years should be considered complete after a certain period of time for purposes of cost recovery, amortization, deferral, allocations, and recovery of indirect costs (e.g., administrative, marketing, and education);

j. Composition and role of the Stakeholder Collaborative;

k. Identify mechanism changes that would prioritize persistent, cumulative savings measures and reduce reliance on the achievement of short-lived behavioral measures; and

l. Any other relevant issues.

On September 14, 2023, Duke filed a response to the Public Staff's Motion, in which Duke requested that the Commission approve the Motion in addition to further relief requested by Duke. Specifically, Duke requested that the Commission: (1) approve a one-time, non-precedent setting reconciliation of Vintage Year 2025 to reflect all Commission-approved modifications to the Mechanisms resulting from the Mechanism review; and (2) issue its order on the proposed modifications to the Mechanism resulting from the Mechanism review by the end of the second quarter of 2024.

On September 15, 2023, the Carolina Industrial Group for Fair Utility Rates II and III (CIGFUR) filed a response to the Public Staff's Motion, in which CIGFUR requested that the Commission approve the Motion in addition to further relief requested by CIGFUR. Specifically, CIGFUR requested that the Commission: (1) undertake an expedited review of issues pertaining to non-residential demand response programs, including consideration of new programs and/or modifications to existing programs, such that any such new programs or modifications aimed at decreasing opt-outs could be implemented without delay to take effect in the soonest possible vintage year; (2) open, and consolidate with the above-captioned dockets, a new docket specific to Dominion Energy North Carolina (Dominion) on the basis that the comprehensive Mechanism review contemplated in the Motion may result in proposed amendments to Commission Rules governing DSM/EE programs administered by all electric public utilities in North Carolina, including

Dominion; and (3) order that attorneys shall be allowed to participate in the DSM/EE Collaborative.

On September 20, 2023, Duke filed a supplemental response to the Public Staff's Motion, in which Duke indicated changes in certain parties' stated positions on the additional relief requested by Duke and added clarity concerning the implications of not allowing the requested one-time reconciliation of Vintage Year 2025.

On September 26, 2023, the Public Staff filed a letter in response to Duke's response and supplemental response to the Motion. In its letter, the Public Staff explained that, although it is not against the true-up *per se*, the Public Staff does not consider it in the public interest to agree in advance to impacts that are wholly unknown at this time. Instead, the Public Staff suggested that this issue be part of the comprehensive Mechanism review, in which the potential true-up can be considered item by item with a full understanding of the implications thereof. Until more is known about potential changes to the Mechanism, the Public Staff stated that it is impossible to anticipate the impact of a one-time true-up on ratepayers. Therefore, the Public Staff requested that the Commission deny Duke's request for a one-time true-up at this time but require the comprehensive Mechanism review to include consideration of whether any of the parties' proposed changes to the Mechanism should be applied retroactively or only prospectively, as well as the impact to rates and Duke's ability to attain its Carbon Plan DSM/EE goals.

On October 30, 2023, the Commission issued an order granting the Public Staff's motion for procedural relief and requiring that initial comments addressing the issues identified in the Public Staff's Motion be filed by January 26, 2024, and that reply comments be filed by March 29, 2024 (Scheduling Order). In addition, the Commission: (1) added to the list of issues for consideration in initial comments the Proposed Enablers, Duke's request for a one-time true-up of changes to the Mechanism resulting from the Mechanism review for Vintage Year 2025, and CIGFUR's request that attorneys be allowed to participate in the DSM/EE Collaborative; (2) declined to grant CIGFUR's requests that non-residential programs be considered on a more accelerated schedule or to open a new docket specific to Dominion; (3) declined to commit itself to issuing an order in a particular timeframe, although it noted the parties' desire for an order to be issued by the end of the second quarter of 2024; and (4) scheduled a technical conference for December 18, 2023, on the existing Mechanisms and a summary of the work of the DSM/EE Mechanism review stakeholder process (Technical Conference).

On December 12, 2023, a summary of the stakeholder proceedings to date and an overview of the existing Mechanisms were jointly pre-filed (Pre-Filing) by Duke, the Attorney General's Office (AGO), CIGFUR, the Carolina Utility Customers Association (CUCA), the North Carolina Sustainable Energy Association (NCSEA), the Southern Environmental Law Center (SELC), Walmart, Inc., and the Public Staff (together, the Active Parties). This Pre-Filing detailed the many stakeholder meetings and topical discussions that the parties had engaged

in to date and set forth certain uncontroverted information concerning the existing Mechanisms.

On December 18, 2023, the Commission held the Technical Conference at which the Active Parties each presented their unique perspectives on the existing Mechanisms and their objectives for this Mechanism review proceeding.

II. STAKEHOLDER ENGAGEMENT

In total, stakeholders met formally on over a dozen occasions, and met a number of other times in preparation for the Technical Conference. Significant efforts were made by all parties to find consensus on issues, and the Active Parties were ultimately able to come to agreement on a number of issues as described in more detail in Section III, below.[1] The Public Staff appreciates the efforts of all parties and the progress made toward consensus and looks forward to continued engagement with the Active Parties on the items that remain in dispute.

III. ANALYSIS

It is important to begin by establishing the context in which this Mechanism review arose. In 2007, the North Carolina General Assembly passed Session Law 2007-397 (Senate Bill 3), requiring electric power suppliers in North Carolina to implement DSM/EE and supply-side resources to establish the least-cost mix of demand reduction and generation measures that meet the electricity needs of its

[1] The Public Staff's representation of the Active Parties' positions throughout these comments is based on the Public Staff's information and belief. Any misrepresentations are inadvertent.

customers. *See* N.C.G.S. § 62-133.9. Senate Bill 3 provided for the recovery of all reasonable and prudent costs incurred in implementing DSM/EE and allowed the Commission to use its discretion to approve incentives for utilities adopting and implementing new DSM/EE. *See* N.C.G.S. § 62-133.9. Commission Rules make clear that utility incentives, including net lost revenues (NLRs), are to be awarded at the Commission's discretion, if appropriate. *See* Commission Rule R8-69(a)(2).

In 2021, the North Carolina General Assembly passed Session Law 2021-165 (House Bill 951), which was codified in relevant part as N.C.G.S. § 62-110.9 (Section 110.9) and N.C.G.S. § 62-133.16 (Section 133.16). Specifically, Section 110.9 imposes certain requirements concerning reductions in emissions of carbon dioxide from electric public utilities, and Section 133.16 authorizes performance-based regulation for electric public utilities. These two new sections significantly influence both the DSM/EE rider and the Mechanisms.

Section 110.9 requires the Commission to "take all reasonable steps" to ensure that statewide carbon dioxide emissions from electric generating facilities owned and operated by utilities serving at least 150,000 North Carolina retail jurisdictional customers (presently, only Duke) are reduced by 70% from 2005 levels by 2030, and to achieve carbon neutrality by 2050. Specifically, Section 110.9 states that the Commission shall:

> Develop a plan, no later than December 31, 2022, with the electric public utilities, including stakeholder input, for the utilities to achieve the authorized reduction goals, which may, at a minimum, consider power generation, transmission and distribution, grid modernization, storage, energy efficiency measures,

> demand-side management, and the latest technological breakthroughs to achieve the least cost path consistent with this section to achieve compliance with the authorized carbon reduction goals (the "Carbon Plan"). The Carbon Plan shall be reviewed every two years and may be adjusted as necessary in the determination of the Commission and the electric public utilities.

It is now, therefore, a statutory requirement that the Companies reduce their carbon emissions in order to comply with the targets and deadlines set forth in Section 110.9, and that they do so in a least-cost manner. Further, the statute explicitly lists EE measures and DSM as resources that may be used to achieve the required emission reductions.

Duke itself has highlighted EE and DSM as tools for compliance with House Bill 951 and Section 110.9, categorizing them as “Grid Edge” resources that are, for modeling purposes, used to reduce future load before new resources are selected. In its first Carbon Plan proposal, filed on May 16, 2022, the Companies emphasized their Grid Edge programs as essential to compliance with House Bill 951:[2]

> At the forefront of achieving the energy transition and developing comprehensive decarbonization plans to achieve the targets of [House Bill 951] in a least-cost manner is the need to impact load at the edge of the grid through programs, enabling investments and offers that allow for the reduction and management of load, such as energy efficiency (“EE”), demand-side management (“DSM”), customer self-generation, voltage management and other distributed energy resources (“DER”). [Duke] will ensure the prioritization of these valuable resources by considering them prior

[2] Proposed Carbon Plan, Docket No. E-100, Sub 179, Appendix G at 1 (May 16, 2022).

> to evaluating the supply-side resources required to reliably meet the system loads in Duke Energy's resource evaluation in the Carolinas Carbon Plan ("Carbon Plan" or "Plan").

In addition, Duke noted in its direct testimony that the "first pillar of energy transition and the Carbon Plan process is to 'shrink the challenge' by reducing energy requirements and modifying load patterns through Grid Edge customer programs, allowing more tools to respond to fluctuating energy supply and demand."[3] Specifically, "for purposes of Carbon Plan modeling for energy transition," Duke explained that it "assumed an annual reduction of 1% of eligible load from energy efficiency programs."[4] Throughout the 2022 Carbon Plan proceeding, Duke consistently characterized this modeling assumption as "aggressive but achievable" and "reasonable and prudent."[5] According to Duke, "the Companies' adoption of an annual energy efficiency forecast of 1% reduction of eligible load strikes the appropriate balance between reaching beyond the reasonable assumptions in the approved 2020 [Integrated Resource Plan] to ensure the Companies are aggressively pursuing energy efficiency and demand-side measures to benefit customers and assuming an unattainable target."[6]

In its Initial Carbon Plan Order, the Commission stated that it was "persuaded that Duke's assumption that it can achieve a 1% reduction in eligible

[3] Direct Testimony of Timothy J. Duff and Jonathan L. Byrd, Docket No. E-100, Sub 190, at 5 (Sept. 1, 2023).

[4] *Id*. at 6.

[5] *Id*. at 6-7.

[6] *Id*. at 30.

retail load through [utility energy efficiency] programs is an 'obtainable modeling assumption' as Duke characterize[d] the goal" and directed Duke to seek an aspirational goal of 1.5%."[7] In addition, the Commission stated that "Duke's proposal to reduce load through Grid Edge programs, including demand-side management, EE, customer self-generation, and voltage management, is a reasonable step towards achieving reductions in carbon dioxide emissions as required by N.C.G.S. § 62-110.9."[8] The Commission further ordered that Duke "utilize the Grid Edge programs to the greatest extent possible."[9]

Duke reiterated the essential role of energy efficiency and demand-side management in meeting its statutory obligations in its 2023 Carbon Plan and Integrated Resource Plan (CPIRP) filing. In their direct testimony, filed September 1, 2023, Duke witnesses Timothy J. Duff and Jonathan L. Byrd stated that "the Companies' approach to an orderly and least-cost transition toward a clean energy future continues to rely on 'shrinking the challenge,'" in other words, reducing and shifting load using Grid Edge and customer programs.[10]

Further, each portfolio and pathway contained in the Companies' 2023 CPIRP "aggressively leverages demand-side and grid edge resources to shrink the challenge."[11] In their Verified Petition for Approval of the 2023 CPIRP, the

[7] Initial Carbon Plan Order at 104-05.

[8] *Id*. at 106.

[9] *Id.*

[10] Direct Testimony of Timothy J. Duff and Jonathan L. Byrd, Docket No. E-100, Sub 190, at 11 (Sept. 1, 2023).

[11] Verified Petition for Approval, Docket No. E-100, Sub 190, at 12 (Aug. 17, 2023).

Companies reiterated the CPIRP's role of "serv[ing] the Companies' dual-state systems and [achieving] the State's carbon reduction goals established in N.C.G.S. § 62-110.9 in a balanced and reasonable manner and [ensuring] reliable electric service for all of the Companies' customers at affordable rates over the short and long term."[12] In accordance with those obligations, Duke requested that the Commission, among other things, "[a]pprove the Companies' plans to continue advancing Grid Edge and customer programs."[13]

It is uncontroverted that the Companies have a statutory requirement to reduce their carbon emissions in compliance with the targets and deadlines set forth in Section 110.9, and that EE and DSM are available resources for achieving those targets and deadlines. Furthermore, and most importantly, as Duke has emphasized itself in both the 2022 Carbon Plan proceeding and the 2023 CPIRP proceeding, EE and DSM have vital roles to play in achieving compliance with Section 110.9. Based on Duke's characterization of DSM/EE as a vital and achievable component of House Bill 951 compliance, the Commission required that Duke seek an aspirational goal of 1.5% and ordered that Duke utilize the Grid Edge programs to the greatest extent possible. As such, Duke is required by statute and by the Commission's Initial Carbon Plan Order to pursue EE and DSM as part of the least-cost plan to comply with Section 110.9.

[12] *Id.* at 26.

[13] *Id.* at 29.

As detailed above, while Senate Bill 3 required the Companies to achieve as much DSM/EE as necessary to achieve the least-cost mix of demand reduction and generation measures that meet the electricity needs of its customers, House Bill 951 added an additional layer to this charge, requiring the Companies now to substantially reduce carbon emissions by utilizing the least-cost mix. Duke itself refers to DSM/EE as the "first pillar" of the energy transition and has committed to reducing load by 1% of eligible retail sales, and the Commission accepted this 1% commitment as a modeling target and ordered Duke to aim higher and pursue its 1.5% aspirational goal, as well as to utilize DSM/EE to the greatest extent possible.

It is with this statutory and regulatory context in mind that the Public Staff offers the following recommendations, listed in the order set forth in the Commission's Scheduling Order.[14] For all items on which Duke and the Public Staff (and, in most instances, other intervenors) are in agreement, the Public Staff recommends that the Commission allow the red-lined revisions to such items as proposed by Duke. For all other items, the Public Staff's proposed, red-lined revisions are attached hereto as **Appendix A (DEC)** and **Appendix B (DEP)**. An

[14] The lettering contained in the Scheduling Order's list of issues for parties to address is slightly different than the lettering contained in the Public Staff's Motion as listed in Section I, above, due to the fact that the Commission added certain issues (the Proposed Enablers and Duke's request for a one-time reconciliation) to the final list. In addition, the Commission's list expands upon one issue in the Public Staff's Motion (the inclusion of attorneys in the Collaborative) at CIGFUR's request that this issue be considered.

overview of the Public Staff's positions (and where to find those positions) is contained in **Appendix C**.[15]

a) ***The Proposed Enablers***

i. Updating the inputs underlying the cost benefit tests in the Companies' Mechanisms

The first step in developing a DSM/EE program or determining whether the program should continue is to calculate the program's cost effectiveness, i.e., a ratio of the costs to the benefits of the program. Central to this calculation is determining the appropriate valuation of costs and benefits. It is critical that the benefits used in the cost-effectiveness calculation, which are based on system avoided costs, be accurate representations of how the grid values particular assets. Over the course of the Mechanism's history, the method for derivation of avoided costs used in DSM/EE has changed several times to ensure that the most appropriate avoided costs for DSM/EE were being used.

The determination of the avoided cost (capacity and energy) inputs that underly the cost benefit test calculations is a critical issue that directly influences the scale and scope of DSM/EE offerings by Duke. All else equal, use of a higher avoided cost to calculate the benefits of a program will improve the results of the cost-effectiveness tests (benefits/costs), which may lead to more DSM/EE program offerings and increased participation, as system benefits ascribed a

[15] To reduce confusion, on issues for which the Public Staff proposes separate revisions, the Public Staff has not attempted to renumber paragraphs. Where the Public Staff supports the revisions proposed by Duke (which in many instances are supported by other parties), these comments will reference Duke's proposed new paragraph number and not the existing paragraph number (see **Appendix C** for the existing paragraph number).

higher value may allow the Companies to increase customer incentives. In stakeholder meetings and the 2022 Carbon Plan, Duke emphasized the need to change the calculation methodology of the avoided costs used to estimate DSM/EE program benefits in a way that would increase the value of both the avoided capacity and avoided energy, in order to recognize their unique role in reducing carbon emissions and meet the Companies' Grid Edge goals to "shrink the challenge." In the 2022 Carbon Plan proceeding, the Commission did not rule on the Companies' request to update the underlying determination of system benefits in its Initial Carbon Plan Order, instead directing Duke to initiate a review of the DSM/EE Mechanism that is the subject of the instant dockets.

The current DSM/EE Mechanisms require that the program-specific avoided capacity and energy benefits be derived from the underlying resource plan, production cost model, and cost inputs that generated the avoided capacity and energy rates in the most recently approved Biennial Determination of Avoided Cost Rates for Qualified Facilities (QFs) selling power to the Utilities under the Public Utilities Regulatory Policy Act (PURPA) (Avoided Cost Proceeding) as of December 31 of the year immediately preceding the annual DSM/EE rider filing date. The calculation of avoided costs for DSM/EE has historically relied on the QF rates, with the following changes: (1) DSM/EE utilizes a projected EE hourly shape, while QFs utilize a 100 MW block of capacity in each hour; and (2) EE capacity benefits are increased by the Reserve Margin Adjustment Factor, net of the Performance Adjustment Factor, which recognizes that EE serves as a load reduction rather than a supply-side resource.

The Public Staff's position on the appropriate avoided cost inputs for DSM/EE is that the inputs should reflect, as closely as possible, the Companies' actual avoided costs, and that the inputs and calculation methodology should be aligned with avoided costs determined in the most recently approved Avoided Cost Proceedings unless there are specific factors that merit differentiation. The Public Staff recognizes that cost-effective DSM/EE measures must be part of the least-cost CPIRP, as they have the potential to avoid the need for some new generation, and that encouraging the maximum amount of incremental cost-effective DSM/EE savings is consistent with the Initial Carbon Plan Order. To that end, since the conclusion of the 2022 Carbon Plan proceeding, the Public Staff has discussed this issue with the Active Parties and agrees that utilizing system benefit inputs derived from the most recently adopted CPIRP as of December 31 prior to the filing of the rider applications, as opposed to the most recently approved Avoided Cost Proceeding, is appropriate. The Public Staff presents the following additional recommendations for ensuring that the avoided costs are accurately derived.

First, as to avoided capacity, the Public Staff notes that the Commission has historically utilized an F-frame combustion turbine (CT) as the peaking resource. However, it is evident that the Companies are moving away from F-frame CTs as a capacity resource, instead utilizing advanced class CTs, which are more efficient and can provide more flexibility to integrate renewable energy.[16] For

[16] This appears to be somewhat of an industry trend due to higher efficiencies associated with advanced class turbines, environmental regulations, and the need for energy and capacity. *See* Power Engineering's 2015 article "The Fall of the F-Class Turbine," accessible at: https://www.power-eng.com/emissions/policy-regulations/the-fall-of-the-f-class-turbine/.

example, Duke's proposed 2023 CPIRP does not include an F-frame CT as a selectable resource in any of the modeling portfolios, and DEC plans to construct multiple advanced class CTs at the Marshall Steam Station site.[17] Given these changes to the capacity resources available to Duke, and the Commission's openness to evaluate the avoided cost methodology in the future in light of the evolving landscape,[18] the Public Staff believes that the use of an advanced class CT may be appropriate for calculating avoided capacity benefits. However, as an advanced class CT is more efficient and typically has a higher capacity factor than an F-frame CT, there may be energy benefits that accompany the use of an advanced class CT that should be considered and potentially deducted from the avoided capacity,[19] if the energy value is significant as determined by the annual capacity factor.[20] In addition, the net capacity credits should be based on the annual capacity costs over the operational life approved in the most recent CPIRP,[21] include costs associated with estimated operations and maintenance

[17] *See* Docket No. E-7, Sub 1297.

[18] *See* Order Establishing Standard Rates and Contract Terms for Qualifying Facilities in Docket No. E-100, Sub 175 (November 22, 2022), at 14.

[19] The energy benefit from an advanced class CT should be deducted from the avoided capacity value to avoid double counting the benefit. During the calculation of avoided energy, advanced class CTs that are included in the expansion plan will provide energy benefits that are included in the avoided energy rate, as energy from the CT displaces energy from less efficient units. This represents the "net peaker method" proposed by Dominion and rejected by the Commission in the 2014 Avoided Cost Proceeding. *See* Order Setting Avoided Cost Input Parameters in Docket No E-100, Sub 140 (December 31, 2014), at 24-27.

[20] For example, if the projected capacity factor from production cost modeling is less than 20%, this represents a negligible energy value from the CT, and an energy adjustment may not be warranted. However, as the projected capacity factor approaches 30% or 40%, it becomes clear that this unit will be providing significant energy values that should be accounted for.

[21] In the 2022 Carbon Plan, natural gas CTs had a 35-year operational life.

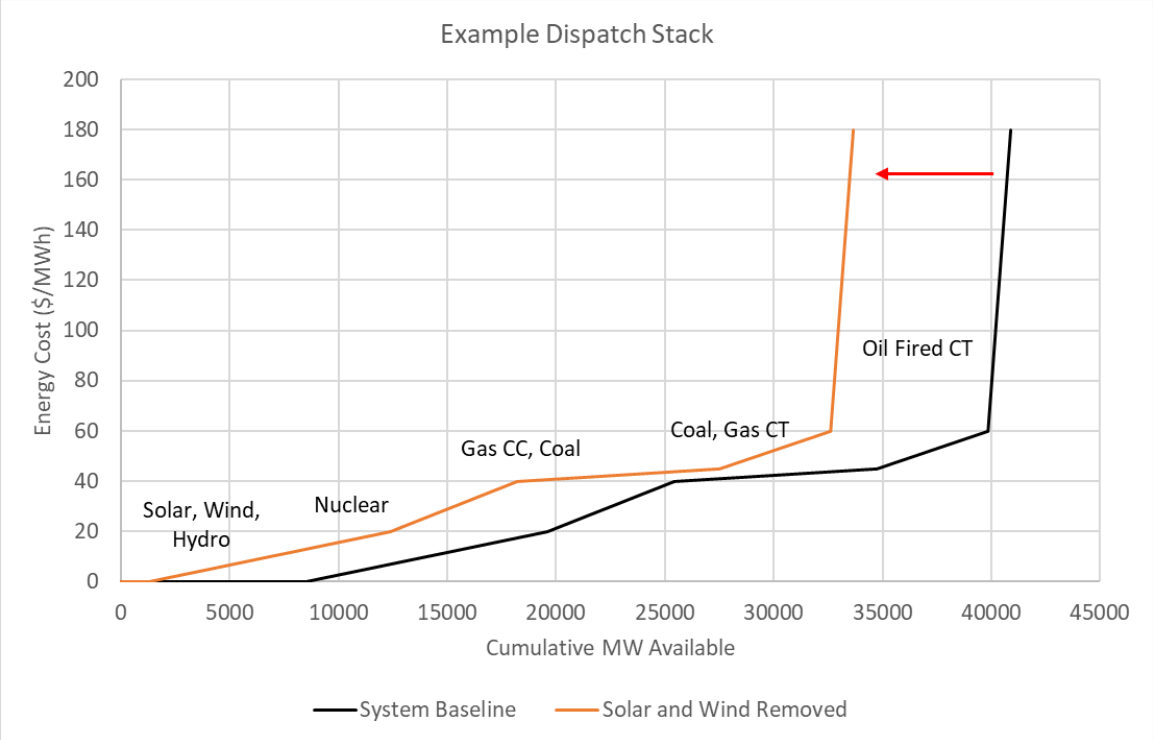
and intrastate transport costs, and be allocated to summer and winter seasons based on the loss of load hours from the most recent Resource Adequacy study.[22]

As to avoided energy, the Public Staff first recognizes that there is a fundamental difference between a DSM/EE program and a new renewable energy generation facility. DSM/EE programs can be developed and deployed relatively quickly and have the potential to reduce the need for new generation resources in the future. The methodology for calculating avoided energy is based on the results from production cost models based on an approved expansion plan and comparing the costs with EE (base case) and without EE (change case). This is reasonable for a QF, which provides energy from new non-utility-owned generation resources that are added alongside other new utility-owned resources. However, DSM/EE does not require permitting and construction and generally can be deployed before new generation would go on-line; therefore, it may be appropriate to value the energy benefits from these DSM/EE measures as if they began providing energy savings prior to the addition of some amount of new generation in Duke's expansion plans.

One way to value DSM/EE as if it were being added before new renewables would be to remove from the production cost model some amount of new renewable capacity in each model year. The Public Staff recommends that the amount of annual EE savings (in MWh) be converted to renewable capacity, thus ensuring that the amount of renewable energy removed is theoretically capable of

[22] *See* Attachment I to the Companies' CPIRP filing.

being displaced by future EE measures. Removing renewable generation that has zero-cost energy would result in shifting the dispatch stack[23] to the left, as shown in the figure below. When the dispatch stack is shifted in this way, a higher marginal cost unit would be dispatched to serve the same amount of load. Because the slope of the dispatch curve increases as load increases, an increase in load in the change case (i.e., removing EE measures) will result in a larger system cost increase when renewables have been removed. The end result is an avoided energy rate that reflects the value of a future EE/DSM measure, calculated as though it displaced the need for new renewable generation.



[23] The "dispatch stack" refers to a graph displaying the resources available to the utility arranged in economic order, sometimes referred to as merit dispatch, with cumulative capacity (in MW) on the x-axis and marginal price (in $/MWh) on the y-axis. A given load level is associated with a given marginal cost unit needed to serve that load.

However, given the magnitude of the renewable resources necessary to achieve House Bill 951 compliance, the Public Staff does not believe that any DSM/EE portfolio, no matter how ambitious, can displace *all* of the new incremental renewable resources that must be added over the 15-year planning horizon. The Public Staff supports the removal of some renewable resources in the calculation of avoided energy as described above but recommends limiting the removed capacity to an amount that could have produced the forecasted EE savings in any given year. For example, Portfolio 3 from the CPIRP (Duke's preferred portfolio at the time of its initial CPIRP filing) shows that in 2035, Duke expects approximately 6.2 million MWh in energy savings from EE measures. This amount of load reduction is equivalent to the amount of energy that could be produced by approximately 2,300 MW of solar capacity and 175 MW of wind capacity. Removing that quantity of solar and wind from both the change case and the base case models would be a reasonable method of estimating the avoided energy benefit of DSM/EE measures.

The Public Staff's proposed revisions on this issue to existing Paragraphs 20, 20A, 25, and 27 (DEC), and 20, 20A, 24A, and 83 (DEP), are encompassed in **Appendices A and B**. In addition, the Public Staff supports Duke's proposed changes to revised Paragraphs 21B (DEC and DEP).

ii. Using an As-Found baseline for EE measures

In 2022, Duke sought to utilize an As-Found savings baseline in the program design of the Companies' Residential Smart Saver Early Replacement

and Retrofit programs, which were approved by the Commission on August 23, 2023, in Docket Nos. E-2, Sub 1308, and E-7, Sub 1278. These programs are designed to encourage the early replacement of measures that are costly to operate, most notably HVAC systems, as opposed to allowing the inefficient equipment to remain active until failure. Explicit permission to use an As-Found baseline as opposed to the more generally accepted baseline of the minimum efficiency and performance requirements set by the federal or state level codes and standards had not been brought up in prior program offerings and was a topic of significant debate among parties. Ultimately, the Commission allowed for the application of an As-Found savings baseline to be used for determining these programs' savings.

The Active Parties agreed[24] to add language in the program approval section of the Mechanism to require the Companies to clearly identify when they are requesting permission to use an As-Found savings baseline in a program application or modification and the extent to which the Companies intend to claim the savings associated with the difference between the baseline efficiency measure and the measure that is being replaced. The Public Staff supports Duke's proposed changes to revised Paragraphs 23 (DEC) and 24 (DEP).

The Public Staff acknowledges that there are energy efficiency gains to be made by encouraging the early replacement of inefficient equipment, and therefore

[24] On this issue, the Active Parties either supported the revision, did not oppose the revision, or did not take a position.

supports the ability for the Companies to pursue such program offerings on a case-by-case basis. However, the Companies should not be permitted to earn an incentive on the incremental gain from utilizing an As-Found savings baseline, unless it can be limited to the lesser of the savings calculated using the remaining life of the less efficient, replaced equipment or that would be produced over five years. This approach balances the early replacement savings achieved by the programs utilizing the As-Found baseline with appropriate incentives for the Companies. If such limitations are not set, incremental savings would wrongly be attributed to Duke beyond the life of the replaced equipment, which would have been replaced by equipment at least at the standard baseline, thereby oversizing Duke's incentive.

iii. Broadening the definition of low-income customers

With respect to low-income customers and program offerings, the Public Staff supports Duke's proposed changes to revised Paragraphs 3 (DEC) and 4 (DEP), which allow for alignment with state and federal funding opportunities. If the Commission-approved threshold for the Companies' low-income programs of 200% of the Federal Poverty Guidelines (FPG) is used, the Companies would, to some extent, be precluded from utilizing state and federal funding opportunities (for example, through the Inflation Reduction Act) that target low-income customers at different thresholds. Specifically, it could be difficult for Duke to determine which participants would qualify for both opportunities – Duke-sponsored low-income DSM/EE programs and state or federal funding. The proposed language would allow the Companies to develop new or modify current

low-income programs to allow for increased opportunities for outside funding, thus increasing the potential for participation from low-income customers and making the programs more cost effective.

While the Public Staff believes that the language proposed by the Companies is appropriate for reasons stated above, the Public Staff is concerned that having an unbound definition for low income may introduce unintended consequences – namely, using the limited resources allocated to low-income programs to serve people who are not in the lowest income brackets. For example, the agreed-upon language allows for potential use of Area Median Income (AMI) at the zip code level as a metric to define low-income eligibility so that the Companies can pursue program offerings on a community basis where appropriate. However, use of this definition could allow participation in a low-income program by a customer of greater means than a low-income customer as traditionally defined. The Inflation Reduction Act authorizes rebates for efficient appliances for households making up to 150% of the AMI. To determine a household's AMI, the IRA utilizes the United States Department of Housing and Urban Development's (HUD) published income limit information.[25] According to HUD's published income limit information, a household of one in Wake County with an income of up to $119,063 in 2023 (150% of the AMI) would qualify for rebates for efficient appliances. When there are so many eligible low-income customer households making far below $100,000, it would not be appropriate to utilize

[25] Available at: https://www.huduser.gov/portal/datasets/il/il2023/select_Geography.odn.

ratepayer funds to incentivize households in some communities by utilizing the IRA criteria of 150% AMI as eligibility criteria through Duke's low-income DSM/EE program offerings. As such, the Public Staff will be carefully reviewing program filings to ensure that low-income offerings are truly targeting low-income customers or communities.

Additionally, as state and federal definitions change over time, this shift could result in a considerable portion of the Companies' customers being classified as low-income customers who would be eligible to participate in low-income programs, which are not required to be cost effective. The Low-Income Affordability Collaborative's Final Report revealed that, for the March 1, 2019 through February 29, 2020 timeframe, approximately 29% of the Companies' customer base is at or below 200% FPG.[26] However, the Companies' December 9, 2022 *Low and Moderate Income Penetration Study*[27] demonstrates that only approximately 0.92% of Duke's low and moderate income households participated in Duke's low-income EE programs between 2013 and 2021. Although there are many reasons for the low participation as set forth in the study, the Public Staff is concerned that the Companies' current low-income offerings are not reaching the target customer base effectively. If low-income eligibility is broadened for future programs and program modifications so that the percentage of the Companies' eligible customers increases beyond an appropriate level, then it would be

[26] *See* the Low Income Affordability Collaborative's Final Report, Docket Nos. E-7, Subs 1213, 1214, and 1187, and E-2, Subs 1219 and 1193 (August 12, 2022), at 9.

[27] This study was filed in Docket No. E-7, Sub 1285 (March 7, 2023).

appropriate for the Commission to consider whether those programs should be required to achieve cost-effectiveness results greater than 1.0. As such, it is critical that the Companies clearly show the impact of this broadened definition in their program approval requests, rider applications, and the next Mechanism review proceeding to ensure that Duke's low-income program offerings are appropriately targeting those customers needing the most assistance.

iv. Developing guidelines for expedited regulatory approval of DSM/EE programs

The Public Staff supports Duke's proposed revised Paragraphs 31 and 51 (DEC and DEP) which establish the proposed Efficiency Innovation Program (EIP). The EIP is designed to provide the Companies with the ability to rapidly prototype, test, and evaluate new energy efficiency technologies, equipment, and program designs. The EIP framework is similar to that proposed in Docket Nos. E-2, Sub 1330, and E-7, Sub 1296, for non-DSM/EE programs, except that the proposed budget for the EIP is much lower at $1 million per company. Notably, savings attributable to the EIP would not be eligible for recovery of utility incentives in the form of a portfolio performance incentive (PPI), program return incentive (PRI), or NLRs. The Public Staff is satisfied that the EIP, as proposed, has the potential to allow for the development and collection of data on DSM/EE technologies, equipment, and program designs. However, similar to the framework proposed in the non-DSM/EE rapid prototyping dockets, the Public Staff believes that this program should be reviewed again no later than the next DSM/EE Mechanism review to assess whether or not it is appropriate to continue offering this program.

b) <u>The appropriateness of continuing to allow the Companies to collect net lost revenues in light of House Bill 951 and the Carbon Plan Order</u>

The recovery of NLRs as a utility incentive has always been an item within the Commission's discretion. Specifically, Commission Rule R8-69(a)(2) defines the DSM/EE rider as:

> [A] charge or rate established by the Commission annually pursuant to G.S. 62-133.9(d) to allow the electric public utility to recover all reasonable and prudent costs incurred in adopting and implementing new demand-side management and energy efficiency measures after August 20, 2007, *as well as, if appropriate, utility incentives, including net lost revenues* (emphasis added).

Historically, the Companies' requests to recover NLRs that resulted from DSM and EE measures have been addressed in the DSM/EE riders to offset revenue lost as a result of the implementation of those DSM and EE measures. As described in the currently approved Mechanism, the recovery of estimated NLRs has been allowed for a period of 36 months after a measure is installed. For example, if a measure with a life of 10 years is installed in January 2020, then the Company may be allowed to recover estimated NLRs for that measure through December 2022, or when rates become effective as approved in a general rate case, whichever occurs first. Duke may only request estimated NLRs for the vintage year under review in the respective rider proceeding (i.e., the upcoming rate period) and cannot request estimated NLRs for future vintage years.[28]

[28] *See* Fields Exhibit 2 for both DEC and DEP's most recent DSM/EE rider proceedings, Docket Nos. E-2, Sub 1322, and E-7, Sub 1285.

However, with the enactment of House Bill 951, Section 133.16 introduced a new pathway for the treatment of estimated NLRs that had not been available prior to this Mechanism review. Specifically, Section 133.16 created a requirement that, as part of a performance-based ratemaking (PBR) proceeding, the Companies shall include a revenue decoupling mechanism (RDM) for its residential customers to align the Companies' target revenues with their actual revenues on an annual basis, as well as an earnings sharing mechanism (ESM) for the purpose of sharing surplus earnings between the Companies and customers. Notably, Section 113.16 explicitly states that Duke may exclude electric vehicle (EV) revenues from the RDM to preserve the Companies' incentive to encourage EV adoption.

As part of the Companies' most recent PBR proceedings,[29] Duke proposed that any estimated NLRs collected through the Companies' DSM/EE riders would be subtracted from the RDM balance, which would reflect actual NLRs from all sources (weather, DSM/EE, storm, etc.) or excess revenues in the event actual kWhs exceed the target, so as not to double count the DSM/EE NLRs, and making a corresponding adjustment to earnings for DSM/EE incentives in the ESM, in addition to EV sales and other items.[30] Although the Commission concluded in its final orders in both rate cases that the RDM and ESM proposed by the Companies were consistent with the PBR statute and with Commission Rules, the Commission

[29] *See* Docket Nos. E-2, Sub 1300, and E-7, Sub 1276.

[30] *See* Direct Testimony of Laura A. Bateman and Phillip O. Stillman, filed in Docket No. E-2, Sub 1300 (October 6, 2022), at 10; and Direct Testimony of Laura A. Bateman and Phillip O. Stillman, filed in Docket No. E-7, Sub 1276 (January 19, 2023), at 10-11.

did not explicitly accept or approve the Companies' proposal in its entirety other than with regard to the handling of EV sales.[31] Indeed, the approved RDM tariff language merely states that the RDM rider rate "will be adjusted annually to true-up the difference between actual revenue collected from residential customers and the Commission authorized revenue," and that each company shall "file its proposed adjustment to the Rider within 60 days of the end of each Rate Year."[32] As such, nothing in the Commission's PBR rate case order for either company requires adoption of the Companies' proposal that any estimated NLRs collected through the DSM/EE riders be subtracted from the actual RDM balance, nor do the orders preclude changes to the process proposed by Duke. The determination of the inputs for the RDM and ESM should be handled within the respective rider proceedings.

Although Duke's proposal for handling DSM/EE estimated NLRs in the RDM attempts to avoid a double counting of the NLRs, it is not the most appropriate method for several reasons. First, previous RDM rider periods cannot be modified in future proceedings should the amount of NLRs used to calculate a past RDM be trued-up in a subsequent DSM/EE rider proceeding. Second, the RDM accounts

[31] *See* the Commission's Order Accepting Stipulations, Granting Partial Rate Increase, and Requiring Public Notice in Docket No. E-2, Sub 1300 (August 18, 2023), at 232; and the Commission's Order Accepting Stipulations, Granting Partial Rate Increase, Requiring Public Notice, and Modifying Lincoln CT CPCN Conditions in Docket No. E-7, Sub 1276 (December 15, 2023), at 264.

[32] DEP's approved RDM tariff is available at: https://www.duke-energy.com/-/media/pdfs/for-your-home/rates/dep-nc/leaf-no-608-rider-rdm-ry1.pdf?rev=e9e4592b3000410fba62f31ce051204e. DEC's approved RDM tariff is available at: https://www.duke-energy.com/-/media/pdfs/for-your-home/rates/electric-nc/nc-rider-rdm.pdf?rev=0afede14b2b14f84bc66231b30369759.

for actual NLRs from all sources. The NLRs calculated in the confines of the DSM/EE rider do not represent actuals, but rather the best estimates of the programs eligible for recovery of NLRs, as provided for by the Companies' EM&V. As actual data is available annually for the RDM, it is reasonable to utilize the actuals to calculate the NLRs as stated in the approved RDM tariff language. Finally, there are inherent timing differences between the RDM and DSM/EE filing, which further exacerbate any reconciliation of the estimated NLRs that would be recovered from DSM/EE and excluded from RDM in the Companies' methodology.

Instead, the Public Staff proposes for periods when the Company has an RDM in effect, that the residential DSM/EE NLRs be deemed recovered through the RDM and not separately be eligible for recovery through the Companies' DSM/EE riders. During periods where there is not an RDM rider in effect, then Duke may request that residential DSM/EE estimated NLRs be recovered through the DSM/EE riders, in the same manner as recovered under the currently approved treatment for NLRs. This proposal allows for the Companies to recover the actual NLRs through the RDM when a PBR and RDM are in effect while streamlining the associated calculations and eliminating potential double counting. The Companies can still track the estimated NLRs associated with DSM/EE measures in the same manner the Companies' track total NLRs on an annual basis.

The current approved Mechanism allows for this shift in treatment of NLRs. Paragraph 60 (DEC) and Paragraph 66 (DEP) in the Mechanisms each state that:

> Notwithstanding the allowance of 36 months' Net Lost Revenues associated with eligible kWh sales reductions, the kWh sales

> reductions that result from measurement units installed shall cease being eligible for use in calculating Net Lost Revenues as of the effective date of (a) a Commission-approved alternative recovery mechanism that accounts for the eligible Net Lost Revenues associated with eligible kWh sales reductions, or (b) the implementation of new rates approved by the Commission in a general rate case or comparable proceeding *to the extent the rates set in the general rate case or comparable proceeding are set to explicitly or implicitly recover the Net Lost Revenues associated with those kWh sales reductions*. (Emphasis added.)

In short, the Public Staff's method is more accurate than the method proposed by the Companies in that it would both ensure that the NLRs awarded to the Companies are based on a holistic view of actual sales, and not estimates; and streamline the calculation as NLRs would be handled on a 12-month basis in the RDM with no need for later true-ups. The Public Staff's proposed revisions on this issue to existing Paragraphs 56, 57, 59, and 60 (DEC), and 62, 63, 65, 66 (DEP), are encompassed in **Appendices A and B**.

Since the RDM is specific to the residential class, the Public Staff does not propose any changes to the treatment of nonresidential NLRs.

c) What actions, if any, justify a utility incentive, as well as whether there should be limits imposed upon utility incentives, whether there should be a required savings threshold that must be met before incentives are earned, what metrics should be utilized in awarding incentives, whether the Mechanisms should contain both incentives and penalties like Performance Incentive Mechanisms, and the efficacy of incentive mechanisms in other jurisdictions

In the 2020 Mechanism Order, interested parties were tasked with studying ways to implement a step approach to the incentive/penalty structure as a means to achieve greater savings, as well as whether overall portfolio performance targets

should be adopted or revised.[33] Currently, the utility incentive is calculated by applying a fixed percentage to the net benefit regardless of the savings achieved. For example, with the current PPI percentage of 10.6%, if a program produces a net benefit of $100 (meaning that the benefits outweighed the cost by $100), then the Companies would be able to recover $10.60 as the PPI for that program. The PPI is included in the DSM/EE rider's revenue requirement, along with program costs and NLRs.

As discussed *supra*, since the conclusion of the last DSM/EE Mechanism review, the regulatory ratemaking framework in North Carolina has changed. Among other things, House Bill 951 introduced performance-based regulation, which allows the Companies to earn financial rewards or penalties based on their actual performance through the establishment of performance incentive mechanisms (PIMs). *See* N.C.G.S. § 62-133.16.

Introducing the concept of a PIM structure into the DSM/EE framework is a logical next step toward encouraging an increased level of cost-effective DSM and EE achievement that contributes toward the State's carbon reduction requirements. Moving forward, cost-effective energy reductions should be incentivized by establishing a performance-based, tiered PPI structure. The report titled *Cost Recovery Mechanism Review: A Survey of Current Performance Incentive Mechanism Structures in the U.S.*, prepared by GDS Associates, Inc. (GDS), for the Public Staff and filed in the above-captions dockets on December

[33] 2020 Mechanism Order, Ordering Paragraphs 3 and 6.

18, 2023, demonstrates that other states are moving toward a tiered approach for their DSM/EE PIMs. For example, Connecticut uses a tiered structure for its multifactor PIM,[34] which begins rewarding the utility when it reaches 75% of its goal and increases the incentive until it reaches 115% of its goal.[35] Likewise, an Indiana electric utility uses a tiered incentive structure for its energy-savings-based PIM[36] that begins rewarding the utility when it achieves 80% of its target and increases the incentive until it reaches 110% of its target.[37] New Jersey, Arkansas, and Texas also use tiered DSM/EE performance incentives, with utilities in New Jersey earning no reward until achieving 110% of their target.[38] Notably, the report stated that GDS "did not find any states that used a goals-oriented PIM, at least in part, which did not include a tiered or sliding-scale incentive structure."[39]

In its Initial Carbon Plan Order, the Commission found that a 1% reduction in load from prior year eligible retail sales through energy efficiency was a reasonable planning target.[40] Additionally, the Commission directed Duke to seek an aspirational goal of a 1.5% reduction in load from prior year eligible retail sales. For the purposes of this Mechanism review, the Public Staff views these two

[34] Multifactor incentives are those by which utilities earn a reward for meeting savings goals based on multiple metrics. *Id.* at 2.

[35] *Id*. at 4.

[36]Energy-savings-based incentives are those by which utilities earn a reward for meeting savings goals. *Id.* at 2.

[37] *Id.* at 5.

[38] *Id.* at 4-5.

[39] *Id.* at 5.

[40] Eligible retail sales are defined as the total retail sales minus the sales associated with customers that have opted out of the Company's DSM/EE rider.

thresholds as reasonable performance targets for determining the level of PPI awarded to the Companies.

Under the tiered approach proposed by the Public Staff, the level of PPI to be awarded would fall into three distinct overall portfolio performance thresholds: savings (1) below 1% of prior year eligible retail sales; (2) between 1% and 1.5% of prior year eligible retail sales; and (3) above 1.5% of prior year eligible retail sales.

With regard to the first tier, the Public Staff believes that no PPI should be awarded to net savings below 1% of the prior year's eligible retail sales for any given vintage year. The Companies have characterized 1% of prior year eligible retail sales as an aggressive but achievable goal, and the Commission found it to be a reasonable planning target. Additionally, as discussed in greater detail *supra*, the Companies have emphasized that DSM/EE plays a vital role in achieving their statutory requirement to reduce carbon emissions in compliance with Section 110.9. Specifically, the Company's CPIRP modeling sets the floor for savings from energy reductions of DSM/EE activities at 1.0% of prior year's retail sales. Thus, offering an incentive for energy reductions that are already incorporated into the Companies' CPIRP—a minimum reduction of 1% of prior year eligible retail sales—would reward subminimum performance.

With regard to the second tier, upon achievement of the Company's target of 1% prior year eligible retail sales, the PPI percentage applied to the incremental net savings between 1% and 1.5% of eligible retail sales should be the Companies'

weighted average cost of capital (WACC) approved in each company's most recent general rate case. This is appropriate for several reasons. To begin with, the PPI percentage has been a heavily debated component of every DSM/EE mechanism review, particularly because the PPI percentage or rate has not been based on any other approved component, but instead has been the product of negotiation among various parties. While the PPI is not directly comparable to a rate of return on investment, tying the PPI percentage to the WACC provides reasonable guiderails and would be updated even in the absence of frequent mechanism reviews. Notably, WACC has been approved by the Commission as the rate of return on deferrals and in calculating storm securitization as appropriate, which are both historically expense items with minimal, if any, capital costs included. Similarly, DSM/EE costs (with the exception of Distribution System Demand Response) are generally expense items recovered annually as opposed to capital costs. In addition, utilities generally do not finance individual projects with specifically earmarked debt or equity, but rather use a blend of debt and equity. Once debt or equity capital has been obtained and spent by the utility, it loses its "debt" or "equity" designation and is simply money used to provide service to customers, including DSM/EE programs. Utility revenue requirements established in general rate cases are calculated using a weighted cost of capital to reflect this reality. As such, the use of WACC is used in a variety of contexts to determine the return for the Companies, and is a reasonable metric to apply for purposes of incentivizing DSM/EE in a regulatory framework where the Companies have been

directed to pursue their Grid Edge programs "to the greatest extent possible" and to strive to achieve their 1.5% aspirational savings goal.

With regard to the third tier, the PPI percentage applied to the incremental net savings of prior year eligible retail sales greater than 1.5% should be the Companies' WACC plus 25 basis points. This stretch goal aligns with the spirit of N.C.G.S. § 62-133.16(c)(5)[41] by providing a performance incentive above the Company's weighted cost of capital by 25 basis points. This third tier should provide the Companies with sufficient incentive to produce savings beyond the baseline Duke proposed in the 2022 Carbon Plan. Table 1 below shows the PPI performance tiers as proposed by the Public Staff.

Table 1: Performance Thresholds for PPI Percentage

	Achievement of load reduction based on prior year eligible retail sales	**PPI percentage to be applied to incremental savings above prior tier**
Tier 1	< 1%	None
Tier 2	1% - 1.5%	WACC
Tier 3	> 1.5%	WACC + 25 basis points

[41] Subject to the limitations set out in subdivision (4) of this subsection, any PIMs proposed by an electric public utility shall include one or more of the following:

a. Rewards based on the sharing of savings achieved by meeting or exceeding a specific policy goal.

b. Rewards or penalties based on differentiated authorized rates of return on common equity to encourage utility investments or operational changes to meet a specific policy goal, which shall not be greater than 25 basis points.

c. Fixed financial rewards to encourage achievement of specific policy goals, or fixed financial penalties for failure to achieve policy goals.

In consideration of the fact that the success of the Companies' DSM/EE efforts is not fully within their control, the Public Staff proposes inclusion of a Force Majeure-type provision that would allow the Companies to seek a one-time modification to these thresholds should extraordinary circumstances arise that are outside of the Companies' control and significantly impact the Companies' DSM/EE efforts, such as the Companies' inability to enter homes to install EE measures during the COVID-19 pandemic.

Additionally, for consistency between the PPI and PRI, the Public Staff recommends that the incentive applied to the PRI be equal to the respective company's WACC. However, unlike for the PPI, the Public Staff does not propose the PRI to operate on a tiered–structure. This approach aligns the two utility incentives while continuing to encourage low-income programs that are historically not cost effective.

The Public Staff's proposed revisions on these issues to Paragraphs 71 and 76 (DEC), and 77 and 82 (DEP) are encompassed in **Appendices A and B**.

While the Public Staff's PPI proposal in this Mechanism review focuses specifically on the achievement of cost-effective energy reductions, the development of a tiered performance-based PPI structure based on the cost-effective achievement of either energy reductions or capacity reductions, or both, could be considered in future mechanism reviews. Specifically, similar to the energy reductions PPI structure proposed above, thresholds for actual capacity

reductions at peak through DSM activations could be an incentivized metric considered in future Mechanism reviews.

d) How savings and benefits should be calculated and valued, including whether non-energy benefits should be included in particular cost-effectiveness tests, whether carbon reduction benefits should be separately accounted for, and the extent to which differential value to the system should be reflected, if at all, when quantifying anticipated costs and benefits of EE/DSM measures, among other issues[42]

The inclusion of Commission-approved non-energy benefits (NEBs) in the total resource cost (TRC) test has been discussed between the Active Parties. Notably, since the conclusion of the last Mechanism review, the Companies contracted Skumatz Economic Research Associates, Inc., to perform a study on the impacts of NEBs on selected programs within both DEC and DEP's portfolios (NEBs Study).[43] The NEBs Study reviewed the impacts of a number of NEBs, including utility NEBs (e.g., reduced shutoffs, reduced reconnections, reduced customer calls, lower bad debt written off, and reduced carrying cost on arrearages), participant NEBS (e.g., improved comfort, fewer sick days from work or school, fewer asthma incidences, reduction in allergies or cold symptoms, household safety, improved equipment features or performance, marketability for property managers, reduced tenant complaints to property managers, and avoided

[42] The Public Staff's comments concerning the avoided cost derivation and its impact on savings and benefits are discussed in subsection (a) concerning the Proposed Enablers, above, and are not further discussed in this subsection.

[43] *See* "Non-Energy Benefits/Non-Energy Impacts (NEBS/NEIS) for Selected Programs in the Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) Portfolios – Final Report," prepared by Skumatz Economic Research Associates, Inc. (April 25, 2023). This report is included herein as **Appendix D**.

moves or other household impacts), and societal NEBs (e.g., emission impacts on public illnesses).[44]

The Active Parties agreed[45] that the NEBs Study should be utilized as the source document for determining the level of impact that NEBs will have toward the TRC test until the next NEBs analysis is ordered by the Commission. Additionally, to simplify the process, the Public Staff agrees with the Companies' proposal to apply, if ultimately approved by the Commission, a weighted average utility system NEBs multiplier to the value of energy savings rather than different values for specific NEBs, with a higher weighted average multiplier being applied to the low-income program portfolio. The Public Staff supports Duke's proposed changes on this issue to revised Paragraphs 10 and 15 (DEC), and 11 and 16 (DEP).

With respect to carbon reduction benefits and whether they should be separately accounted for, the Public Staff believes that these benefits are reflected in the generation expansion plans that are subject to an annual carbon dioxide emission limit, which generally include lower carbon emitting resources that tend to have lower marginal costs and higher capital costs per kW. Thus, the increasing role of renewable generation tends to depress avoided energy costs without a commensurate increase to avoided capacity costs as currently calculated with the peaker methodology. A possible solution that would allow for the continued use of

[44] *Id*. at 3-4.

[45] The Active Parties either supported this revision or did not oppose this revision.

the peaker method is the inclusion of a carbon reduction benefits adder in the cost-effectiveness tests for DSM/EE. The Commission could approve a carbon reduction benefit of $0 in this proceeding as a placeholder for future determination in the Avoided Cost proceedings. The Commission could then direct parties to propose a calculation methodology in the next biennial avoided cost proceeding or the Companies' next biannual CPIRP proceedings, where this issue can be investigated with other considerations related to the valuation of avoided costs and included in future DSM/EE program evaluations. At this time, the Public Staff does not have any proposed language for the Mechanisms to reflect this potential approach to valuing carbon reduction benefits.

e) Definitional changes, including how to define "low-income" customers, different program types, cost effectiveness, and measure baselines[46]

With the exception of the new definitions and modifications to existing definitions discussed *supra*, there is no need to define or redefine any additional terms.

f) Whether the same cost-effectiveness measures should be applied to all programs

Since the signing of Senate Bill 3 and the promulgation of Commission Rule R8-68, cost-effectiveness tests have been used to evaluate the performance of the Companies' DSM and EE programs. These tests are the Utility Cost (UC) test, the

[46] The Public Staff's comments concerning the proposed changes to low-income customers and measure baselines are discussed in subsection (a) concerning the Proposed Enablers, above, and are not further discussed in this subsection.

TRC test, the Participant test, and the Ratepayer Impact Measure (RIM) test. Each test takes into account a different perspective that can be used to compare the program benefits to the costs. These four tests have served the Active Parties and the Commission well over the last decade and should continue to be used to determine whether a new program proposal should be approved or denied. R8-68(c)(2)(v) states that the electric public utility should include at a minimum the four tests mentioned above. As described in the currently approved Mechanism, and as advocated for in this Mechanism review, the UC test is, and should continue to be, the prevailing test for determining the cost effectiveness of a program proposed for inclusion in the Companies' portfolio of DSM and EE programs.

While R8-68(c)(2)(v) allows for the introduction of new tests, the four approved tests are sufficient for assessing the potential and actual performance of the DSM/EE portfolio.

g) Financial reporting requirements

The Public Staff has worked with Duke to ensure that the two Companies are reporting earnings in the same manner. The Public Staff sought review of this issue on the basis that DEP and DEC reported their earnings on the E.S. 1 reports differently. More specifically, the Commission's 2020 Mechanism Order required that each company calculate and present its primary North Carolina retail jurisdictional earnings by including all actual EE and DSM program revenues, including PPI and NLR incentives, and costs. In viewing the two companies' E.S. 1 reports, however, it is apparent that DEP includes NLRs in its earnings reporting

in compliance with the 2020 Mechanism Order, while DEC subtracts NLRs from its operating income, giving the impression that DEP's DSM/EE programs are considerably more profitable than DEC's. While the existing Mechanism language provides for the inclusion of NLRs on both companies' E.S. 1 reports such that no changes are necessary,[47] the Public Staff will work with DEC to make the necessary updates to its reporting practices in compliance with the Commission's 2020 Mechanism Order, thereby ensuring synchrony in the two companies' earnings reporting.

h) How to most effectively encourage industrial and commercial participation in EE/DSM programs, given that the right of industrial and large commercial customers to opt-out of ratepayer-funded EE/DSM measures is codified at G.S. 62-133.9(f) and whether to change the threshold for a "large commercial customer" under Rule R8-69 that can opt-out

At the Technical Conference, CUCA noted that the current DSM/EE incentives in place do not work well for large industrial customers because the incentives do not allow these customers to recover the cost of participation in the rider and that, for most manufacturer customers, it is unsustainable to be opted into the riders for long periods of time. Wal-Mart observed that its choice to participate in the riders is dependent both on whether doing so is economic for the stores as well as whether the stores can physically respond to DSM call events, noting that building controls often do not provide stores with the flexibility to respond to events that are longer than a few hours. Wal-Mart suggested that Duke be enabled to offer creative solutions such as offering programs to aggregated

[47] *See* existing Paragraphs 90 (DEC) and 96 (DEP) of the Mechanisms.

groups of large customers that can meet the requirements of a DSM call event collectively but not individually. CIGFUR suggested the following DSM ideas to entice industrial customers with flexible load to opt into the riders: (1) increasing bill credits to offset expenditures for customers to install and utilize emergency on-site generation assets, which CIGFUR asserts would avoid ratepayer critical expenditures for incremental capacity and reliability in times of grid strain; (2) a tiered approach with differential value of bill credits based upon varying response times and amount of load able to be shed, among other differentials, which CIGFUR asserts would avoid ratepayer capital expenditures for incremental capacity; and (3) separate emergency and non-emergency (economic) programs and modifications to incentivize Duke to maximize participation, which CIGFUR asserts would result in economic savings for ratepayers and reliability in times of grid strain.

Generally, the Public Staff supports exploration of these ideas for program offerings provided that the participants must opt into the Companies' DSM/EE riders and to the extent the offerings are cost effective. The Public Staff does not support program modifications that would decrease the cost effectiveness of large customer offerings, programs that are not cost effective, or offerings that do not require participation in the DSM/EE riders.

i) Current Evaluation, Measurement, and Verification practices

The Companies' current practice of EM&V has served their customers well over the years. It has provided a means of periodically updating the savings

estimated for the measures being offered through the Companies' DSM and EE programs to more realistic assumptions of the kilowatt-hours (kWh) and kilowatt (kW) savings. These updates to measurement unit savings assumptions not only result in updates to the PPI, PRI, and NLRs, but also improve the Companies' CPIRP load forecast modeling. Two enhancements to the current EM&V process are warranted and should be codified in this Mechanism review to limit potential disagreements regarding EM&V procedures and results.

First, the Active Parties agree[48] to Duke's proposed changes to revised Paragraphs 37, 38, and 46 (DEC), and 29, 34, and 36 (DEP), which require the Companies to provide updates on the development of new EM&V plans both in the Collaborative and in their annual rider testimony. The Companies will provide the new EM&V plans to the Public Staff and will also provide such plans to any other stakeholder upon request. Finally, before making any material modifications to existing EM&V plans, the Companies will share the modifications with the Public Staff and with other parties by request. These changes ensure that all parties have the opportunity to review EM&V plans and provide feedback before the plans are implemented, and that parties are made aware when the Companies intend to depart from what was initially set forth in a plan.

Second, commercial and industrial customers that have opted out of DSM/EE programs should not be included in the EM&V process. Traditionally, the Companies' third-party evaluator has collected data from customers to determine

[48] The Active Parties either supported, did not oppose, or took no position on these revisions.

the kWh and kW reductions from each measure and program during a specific time frame. Recently the Public Staff became aware that the third-party evaluator was including the savings from customers that had opted out of the DSM/EE riders.[49] Pursuant to Commission Rule R8-69(d), any industrial or large commercial customer that has notified its electric power supplier that it will implement alternative DSM or EE measures and elects not to participate (i.e., opt-out) in DSM or EE measures is exempt from any annual DSM/EE cost recovery rider.

It is inappropriate for savings attributable to opted-out customers to be counted in any way in the evaluation and surveying process since the results of the evaluation are used to estimate a program's final kWh and kW savings, which directly affect program cost recovery. These final program savings estimates should only reflect those savings associated with measures installed by the customers who pay the DSM/EE Rider (those who have not opted out or are ineligible to opt-out), and it is these savings which should be leveraged in the calculation of PPI, PRI, and NLRs in determining the DSM/EE riders. The Public Staff believes that any DSM or EE measures installed by customers leveraging this opt-out provision should not have any impact on the DSM/EE riders, regardless of whether the Companies' programs influenced those savings. The Public Staff's proposed revisions on this issue to existing Paragraphs 35 (DEC) and 32 (DEP) are encompassed in **Appendices A and B**.

[49] *See* Direct Testimony of Warren Hirons, filed in Docket No. E-2. Sub 1322 (August 29, 2023).

j) Cost recovery issues such as the splitting of vintage years, whether vintage years should be considered complete after a certain period of time for purposes of cost recovery, amortization, deferral, allocations, and recovery of indirect costs (e.g., administrative, marketing, and education)

i. Splitting and completion of vintage years

To streamline the rider calculation, the Public Staff suggests that true-ups of no more than five years from the current Vintage Year be permitted. In addition, when corrections are identified, the Public Staff suggests that any corrections should be made in the year the issue is identified, rather than splitting the corrections over multiple years. The Public Staff's proposed revisions on these items are encompassed in **Appendices A and B** as new paragraphs after existing paragraphs 52 (DEC) and 60 (DEP).

ii. Amortization (DEP only)

As required by Paragraph 56 of the DEP Mechanism, the Public Staff has carried out a preliminary analysis of the estimated rate impact for Vintage Year 2025 if the amortization of Operations and Maintenance (O&M), Administrative, and General expenses were reduced from the current three-year amortization period to one year. However, as the ultimate changes to the Mechanisms are currently unknown, the Public Staff's analysis on this issue is preliminary and is largely based on information available from earlier rider filings and a similar analysis performed in the previous Mechanism review proceeding.

The current estimated Residential ratepayer's total monthly bill for the month of January 2024, assuming 1,000 kWh of consumption and the currently

approved rates, is approximately $156.47 pre-tax, which includes the current DSM/EE rider charge of $6.29. A comparison of the estimated monthly bill increase for both amortization scenarios (reducing the amortization period from three years to one and keeping the current three-year amortization period) based on the Public Staff's preliminary analysis is as follows:

Table 2: Estimated Monthly Increases with Different Amortization Periods

	Reduced from 3 years to 1 year				No Change			
	Rider Cost ($)	**% Increase**	**Total Bill ($)**	**% Increase**	**Rider Cost ($)**	**% Increase**	**Total Bill ($)**	**% Increase**
Current	$6.29		$156.47		$6.29		$156.47	
Year 1	$8.72	38.63%	$158.90	1.55%	$6.95	10.49%	$157.13	0.42%
Year 2	$7.86	24.96%	$158.04	1.00%	$7.39	17.49%	$157.57	0.70%
Year 3	$6.30	0.16%	$156.48	0.01%	$7.02	11.61%	$157.20	0.47%

Reducing the amortization period to one year would not only eliminate the year-over-year amortizations but would also reduce the carrying costs and income taxes on carrying costs associated with a longer amortization period, thereby not adding additional costs to the current year costs as this continuous cycle of amortizing costs comes to an end. While there will be increases in the initial two years due to the overlap of current program cost recovery and accelerated recovery of previous program costs, the Public Staff contends that it is in the best interest of ratepayers to reduce the amortization period from three years to one year sooner rather than later. This approach would ultimately save ratepayers money by eliminating the interest and associated taxes paid for carrying the costs

over the extended period. In addition, this approach would streamline rider proceedings in the future and would bring the utilities into alignment with one another on this issue, which will be beneficial should a merger occur. The Public Staff's proposed revisions on this issue to existing Paragraphs 54, 56, 58, and 58 are encompassed in **Appendix B**.[50]

iii. Deferral, allocations, and recovery of indirect costs (e.g., administrative, marketing, and education)

The Public Staff proposes no revisions to these items.

k) Composition and role of the Stakeholder Collaborative, including whether attorneys should be allowed to participate

The Active Parties agreed[51] to modifications to broaden the Stakeholder Collaborative to allow attorneys, who have not previously taken part in the bi-monthly meetings, the opportunity to join an informal working group within the collaborative. This agreed-upon process also provides that the agenda for each bi-monthly Stakeholder Collaborative meeting will be shared with all interested parties, including attorneys, before the meeting to allow all parties the opportunity to ensure their attendance at meetings covering topics pertinent to them. In addition, the agreed-upon language allows that, to the extent that a topic warrants

[50] The Public Staff notes that Revised Paragraph 58 (DEP) as set forth in Duke's filing includes that, upon a merger between DEC and DEP, DEP's three-year amortization period will be eliminated. The Public Staff supports this provision in the sense that, should the Commission disallow the Public Staff's request herein to reduce the amortization as a result of this proceeding, it agrees that amortization should be eliminated in the merger or another time prior to the merger. However, the Public Staff's ultimate recommendation on this issue remains that DEP's amortization period be eliminated now rather than upon a future merger.

[51] The Active Parties either supported this revision, did not oppose this revision, or took no position on this revision.

additional discussion inclusive of attorneys, an attorney may request, and the Companies will schedule, an informal working group meeting to discuss the relevant item. Based upon the general consensus reached by all Active Parties on this item, the issues raised by CIGFUR in its response to the Public Staff's Motion should be sufficiently addressed. The Public Staff supports Duke's proposed changes to revised Paragraphs 45 (DEC) and 28 (DEP).

l) Identify mechanism changes that would prioritize persistent, cumulative savings measures and reduce reliance on the achievement of short-lived behavioral measures

The Public Staff believes there is value in incentivizing the Companies to increase the percentage of savings attributable to long-lived measures that constitute the overall portfolio. To incentivize the Companies accordingly, a bonus incentive (potentially tiered) could be granted upon a specified and meaningful increase in the percentage of savings attributable to long-lived programs in the overall portfolio. Accordingly, the Public Staff intends to discuss this idea with the Active Parties and will provide its recommendation on this item, if any, in reply comments.

m) A one-time, non-precedential reconciliation procedure to allow Vintage 2025 projections to be filed in the 2025 DSM/EE rider proceedings and then trued-up to reflect actual costs and results during the 2026 annual DSM/EE cost recovery proceedings

In its response to the Public Staff's Motion, Duke requested that the Commission issue an order for this mechanism modification by no later than the second quarter of 2024 so that the Companies can apply the Commission-approved revisions to Vintage Year 2025 using a one-time reconciliation to true-

up Vintage Year 2025. Duke stated that each company will file its 2024 DSM/EE rider filing with Vintage Year 2025 projections (for recovery of program costs and utility incentives, etc.) using the existing mechanism and would then true-up Vintage Year 2025 actuals to the modifications that are ultimately approved in the 2026 DSM/EE rider filings.

The Commission should not grant Duke's request for this one-time reconciliation. Despite the fact that the nature of the request is exceptional and unprecedented in the various other mechanism review proceedings to date, the Companies have not provided any quantitative analysis or substantiated support to show a particular need for this reconciliation or the impact of such a one-time reconciliation. Currently, there are many unknown factors at play. First, it is unknown what inputs and provisions of the Mechanism will change as a result of this Mechanism review. Second, the avoided costs that would apply in this one-time reconciliation are currently under review by the Commission. Third, in the ongoing Avoided Cost Proceeding, Duke has proposed to use a new avoided cost rate methodology for DSM/EE savings and the ultimately approved avoided cost rates will not be known until later this year.

Without knowledge of what the avoided cost rates will be or what changes will be approved in the Mechanism review proceeding, it is impossible to determine the impact of the one-time reconciliation. Moreover, the CPIRP is also a critical component impacting this Mechanism review, and it is currently unknown how that proceeding will conclude or what changes would influence DSM/EE. It would not

be in ratepayers' interest to approve this request when so little is known about its impact, and Duke has made no showing that exceptional circumstances exist that would justify such a drastic departure from how mechanism changes have historically been implemented. The Commission should make this determination at a later date when more of the current unknowns are clarified.

n) <u>Any other relevant issues</u>

i. 2020 Mechanism Order items

In its 2020 Mechanism Order, the Commission directed the parties to study, in relevant part: (a) the concept of a low-risk discount rate in assessing the cost effectiveness of the electric public utilities' DSM/EE programs; and (b) whether the current utility incentives are producing significant DSM and EE results and whether rate impacts are reasonable.[52]

The Active Parties discussed the idea of a low-risk discount rate, but given the difficulties of determining a discount rate that reflects the risk of such programs in contrast to other utility investments, the Public Staff believes that the use of a low-risk discount rate would not be appropriate or in the public interest.

Concerning Duke's DSM/EE performance and the associated rate impacts to date, Duke has been a leader of DSM/EE in the Southeast and, in recent years, has performed above the national average.[53] Specifically, Duke presented at the

[52] 2020 Mechanism Order, Ordering Paragraphs 4 and 6.

[53] *See* the American Council for an Energy-Efficient Economy's (ACEEE) 2022 State Energy Efficient Scorecard, which shows that North Carolina was the highest ranked of the

Technical Conference that, between 2017 and 2022, the Companies saved approximately 3.37 million megawatt hours, or the equivalent of approximately 225 thousand homes' electricity use for a year.[54] The Public Staff considers these energy savings to be substantial, particularly when viewed in the context of North Carolina's neighboring states and other electric utilities' performance around the country. In addition, the actual cost-effectiveness results, as demonstrated in the Companies' annual rider proceedings, have shown that these energy savings have generally been cost effective, and as a result, the Public Staff considers the rate impacts to be reasonable.

Notably, this performance spanned a time period during which many utilities were either developing carbon reduction policies or in the early stages of deploying carbon reduction efforts. With the introduction and development of carbon reduction policies across the country, it is expected that the energy reductions from DSM/EE activities will increase over time.

ii. One Mechanism document

The Public Staff requests that the Commission order that, in the Companies' compliance filings, the Companies work with the Public Staff to consolidate the DEC and DEP Mechanisms into one combined document, and that the combined

Southeastern states. ACEEE's 2022 Scorecard is available at: https://www.aceee.org/state-policy/scorecard.

[54] *See* Duke's Submission of Jointly-Prepared Pre-Filed Materials for Technical Conference, filed in the above-captioned dockets on December 19, 2023, at 5.

document incorporate the Decision Tree and the EM&V Agreement in appendices rather than as separately referenced documents.[55]

iii. Cap on rate impact

Finally, the Public Staff is concerned about the ultimate rate impact on customers resulting from this Mechanism review. Recognizing the importance of encouraging Duke to make all reasonable efforts to achieve the energy savings targets discussed herein, the Public Staff believes that applying an overall cap to the rider rates may be warranted to ensure that customers do not experience rate shock as a result of changes approved in this proceeding. The Public Staff will seek to work with Duke and other interested parties to identify an appropriate cap on annual increases in the DSM/EE riders until the next Mechanism review that would prevent or mitigate rate shock, while encouraging Duke to pursue all cost-effective DSM/EE and increase customer offerings and participation.

iv. Product Demand Allocation and Avoided Transmission and Distribution

Concerning product demand allocation, the Public Staff supports Duke's proposed changes to revised Paragraphs 55(b) (DEC) and 50(d) (DEP). These revisions serve to align DSM program cost allocation with overall system cost

[55] The Public Staff notes that revised Paragraph 58 (DEP) as set forth in Duke's filing includes that, upon a merger between DEC and DEP, the Companies' Mechanisms will be consolidated. The Public Staff supports this provision in the sense that, should the Commission disallow the Public Staff's request herein to consolidate the Mechanisms into one document in a compliance filing following the Commission's order on this Mechanism review, it agrees that the Companies should propose a new consolidated Mechanism for the new single operating company. However, the Public Staff's ultimate recommendation on this issue remains that the Mechanism documents be merged into one consolidated document in a compliance filing following the Commission's order on this Mechanism review rather than in a future merger.

allocation, which is derived from current planning drivers as determined by the Commission. Specifically, now that the Companies are no longer solely utilizing the single summer coincident peak for allocation of system capacity resources, applying this flexibility better aligns with the currently approved jurisdictional methodology used in the Duke's most recent general rate cases.

With regard to avoided transmission and distribution, the Public Staff supports Duke's proposed changes to revised Paragraphs 80 and 81 (DEC), and 86 and 87 (DEP). These updates take into consideration not only the current approach to updating this component of avoided benefits, but also create a mutual understanding of how this component will be updated in the future.

IV. CONCLUSION

WHEREFORE, the Public Staff respectfully requests that the Commission adopt its recommendations as set forth herein.

Respectfully submitted, this the 26th day of January, 2024.

PUBLIC STAFF
Christopher J. Ayers
Executive Director

Lucy E. Edmondson
Chief Counsel

Electronically submitted
/s/ Anne M. Keyworth
Anne.Keyworth@psncuc.nc.gov
/s/ Nadia L. Luhr
Nadia.Luhr@psncuc.nc.gov

4326 Mail Service Center
Raleigh, North Carolina 27699-4326
Telephone: (919) 733-6110

CERTIFICATE OF SERVICE

I certify that I have served a copy of the foregoing on all parties of record, the attorneys of such parties of record, or both, in accordance with Commission Rule R1-39, by United States mail, postage prepaid, first class; by hand delivery; or by means of facsimile or electronic delivery upon agreement of the receiving party.

This the 26th day of January, 2024.

Electronically submitted
/s/ Anne M. Keyworth

20. With the exception of Low-Income Programs or other non-cost-effective programs with similar societal benefits as approved by the Commission, all programs submitted for approval will have an estimated UCT result greater than 1.00. Additionally, for purposes of calculating cost-effectiveness for program approval, ~~consistent with the Commission's Orders in Docket Nos. E-7, Sub 1130 and E-7, Sub 1164,~~ the Company shall use projected avoided capacity and energy benefits specifically calculated for the program, as derived from the underlying resource plan, production cost model, and cost inputs that generated the system benefits ~~avoided capacity and avoided energy credits~~ reflected in the ~~most recent~~ Commission's most recently adopted CPIRP as of December 31 of the year immediately preceding the date of the annual DSM/EE rider filing~~-approved Biennial Determination of Avoided Cost Rates for Electric Utility Purchases from Qualifying Facilities as of the date of the filing for the new program approval~~.

20A. The projected EE portfolio hourly shape is used for the purposes of determining the avoided energy benefit; however, to ensure that energy efficiency is primarily avoiding marginal fossil fuel generation, future incremental renewable energy resources are removed from the CPIRP for purposes of determining the avoided energy benefit; provided, however, that the capacity of future incremental renewable energy resources so removed in each model year would have produced an amount of energy equivalent to the forecasted EE savings in that year. For the purposes of determining avoided capacity benefits for EE/DSM resources, the levelized costs over the approved operational life of a dispatchable clean-energy pure capacity resource. Beginning in 2025, a Hydrogen-Capable Advanced Class CT, including fixed O&M and intrastate fuel transportation costs, will be utilized as this pure capacity resource until an alternative dispatchable clean-energy pure capacity resource is identified in future CPIRPs. If it is determined that the capacity resource is also providing material energy benefits as measured by an estimated future capacity factor greater than 20%, the avoided capacity benefits for EE/DSM resources will be reduced by the estimated energy benefits~~However, for the calculation of the underlying avoided energy credits to be used to derive the program-specific avoided energy benefits, the calculation will be based on the projected EE portfolio hourly shape, rather than the assumed 24x7 100 MW reduction typically used to represent a qualifying facility. For purposes of determining cost-effectiveness, estimated incremental EM&V costs attributable to each program shall be included in program costs~~. The avoided system capacity and energy benefits developed for purposes of DSM/EE program evaluation is specific to assessment of EE/DSM programs.

25. ~~Consistent with the Commission's Orders in Docket Nos. E-7, Sub 1130 and E-7, Sub 1164, f~~For purposes of calculating prospective cost-effectiveness in each DSM/EE rider proceeding to be used to determine whether a program should remain in the portfolio, the Company shall assess each program by:

(a) Using projected utility system capacity and energy benefits specifically calculated for the program, as derived from the underlying resource plan, production cost model, and cost inputs that generated system benefits reflected in the Commission's most recently adopted CPIRP as of December 31 of the year immediately preceding the date of the annual DSM/EE rider filing. The projected EE portfolio hourly shape is used for the purposes of determining the avoided energy benefit; however, to ensure that energy efficiency is primarily avoiding marginal fossil fuel generation, future incremental renewable energy resources are removed from the CPIRP for purposes of determining the avoided energy benefit; provided, however, that the capacity of future incremental renewable energy resources so removed in each model year would have produced an amount of energy equivalent to the forecasted EE savings in that year. For the purposes of determining avoided capacity benefits for EE/DSM resources, the levelized costs over the approved operational life of a dispatchable clean-energy pure capacity resource. Beginning in 2025, a Hydrogen-Capable Advanced Class CT, including fixed O&M and intrastate fuel transportation costs, will be utilized as this pure capacity resource until an alternative dispatchable clean-energy pure capacity resource is identified in future~~projected avoided capacity and energy benefits specifically calculated for each program, as derived from the underlying resource plan, production cost model, and cost inputs that generated the avoided capacity and avoided energy credits reflected in the most recent Commission-approved Biennial Determination of Avoided Cost Rates for Electric Utility Purchases from Qualifying Facilities as of December 31 of the year immediately preceding the date of the annual DSM/EE rider filing. However, for the calculation of the underlying avoided energy credits to be used to derive the program-specific avoided energy benefits, the calculation will be based on the projected EE portfolio hourly shape, rather than the assumed 24x7 100 MW reduction typically used to represent a qualifying facility~~; and,

(b) Evaluating each cost-effectiveness test using projections of participation, savings, program costs, and benefits for the upcoming vintage year.

77. For the PPI and PRI for Vintage Years ~~2019~~ 2025 and afterwards, ~~consistent with the Commission's Orders in Docket Nos. E-2, Sub 1145 and E-2, Sub 1174, the program-specific per kW avoided capacity benefits and per kWh avoided energy benefits used for the initial estimate of the PPI and PRI and any PPI or PRI true-up will be derived from the underlying resource plan, production cost model, and cost inputs that generated the avoided capacity and avoided energy credits reflected in the most recent Commission-approved Biennial Determination of Avoided Cost Rates for Electric Utility Purchases from Qualifying Facilities as of December 31 of the year immediately preceding the date of the annual DSM/EE rider filing. However, for the calculation of the underlying avoided energy credits to be used to derive the program-specific avoided energy benefits, the calculation will be based on the projected EE portfolio hourly shape, rather than the assumed 24x7 100 MW reduction typically used to represent a qualifying facility~~ the program-specific per kW system capacity and per kWh system energy benefits will be derived from the underlying resource plan, production cost model, and cost inputs that generated system benefits reflected in the Commission's most recently adopted CPIRP as of December 31 of the year immediately preceding the date of the annual DSM/EE rider filing. The projected EE portfolio hourly shape is used for the purposes of determining the avoided energy benefit; however, to ensure that energy efficiency is primarily avoiding marginal fossil fuel generation, future incremental renewable energy resources are removed from the CPIRP for purposes of determining the avoided energy benefit; provided, however, that the capacity of future incremental renewable energy resources so removed in each model year would have produced an amount of energy equivalent to the forecasted EE savings in that year. For the purposes of determining avoided capacity benefits for EE/DSM resources, the levelized costs over the approved operational life of a dispatchable clean-energy pure capacity resource. Beginning in 2025, a Hydrogen-Capable Advanced Class CT, including fixed O&M and intrastate fuel transportation costs, will be utilized as this pure capacity resource until an alternative dispatchable clean-energy pure capacity resource is identified in future CPIRPs. If it is determined that the capacity resource is also providing material energy benefits as measured by an estimated future capacity factor greater than 20%, the avoided capacity benefits for EE/DSM resources will be reduced by the estimated energy benefits.

35. EM&V of programs, conducted by an independent third-party using a nationally recognized protocol, will be performed to ensure that programs remain cost-effective. This protocol may be modified with approval of the Commission to reflect the evolution of best practices.

In order to create transparency related to the development EM&V plans, in its annual EE/DSM Rider filing, the Company will provide testimony detailing all of the projected EM&V plans anticipated to be developed in the calendar year in which the rider filing is made. Additionally, prior to implementing any new EM&V plans or making material modifications to existing EM&V Plans, the Company will share the EM&V plans or modifications with the Public Staff and will share them with other stakeholders upon request. The Public Staff and any stakeholder electing to receive the EM&V plan may provide feedback on the EM&V Plans or major modifications within 10 days of receiving the EM&V plan, and the Companies shall notify a party within 10 days of receipt of the feedback of what actions, if any, they intend to take in response to the feedback, and justification if the Companies disagree with the feedback.[1]

Customers that have elected to opt-out of the rider pursuant to Commission Rule R8-69 shall not participate in any state of the EM&V process, including the surveys submitted to customers.

[1] Note: the addition of the *second* paragraph has been agreed to by the Active Parties and is included in Duke's filing as revised Paragraph 38.

Net Lost Revenues

56. Unless otherwise ordered by the Commission, when authorized pursuant to Rule R8-69(c), Duke Energy Carolinas shall be permitted to recover~~, through the DSM/EE and DSM/EE EMF riders,~~ Net Lost Revenues associated with the implementation of approved DSM or EE measurement units, subject to the restrictions set out below. With respect to Residential DSM and EE programs:

a) When the Company has a PBR rate year in effect, all Residential NLRs for each Vintage Year of the PBR period will be deemed recovered in the Company's RDM rider and will not be recovered through the DSM/EE rider.

b) For years in which a PBR year is not in effect, and therefore no RDM rider would be in place, the Company may request in a DSM/EE annual filing that the North Carolina retail residential kWh sales reductions that result from approved measurement units installed in a Vintage Year that are not already being recovered through the RDM be eligible for use in calculating NLR eligible for recovery in the DSM/EE rider only for the first 36 months after the installation of the measurement unit. Thereafter, such kWh sales reductions will not be eligible for calculating recoverable NLR for that or any other Vintage Year.

Net Lost Revenues

57. With respect to Non-Residential DSM and EE programs, t~~T~~he North Carolina retail kWh sales reductions that result from an approved measurement unit installed in a given vintage year shall be eligible for use in calculating Net Lost Revenues eligible for recovery in the DSM/EE rider only for the first 36 months after the installation of the measurement unit. Thereafter, such kWh sales reductions will not be eligible for calculating recoverable Net Lost Revenues for that or any other vintage year.

Net Lost Revenues

59. In order to recover estimated Net Lost Revenues associated with a pilot program or measure, that does not fall within the Company's RDM rider, Duke Energy Carolinas must, in its application for program or measure approval, demonstrate (a) that the program or measure is of a type that is intended to be developed into a full-scale, Commission-approved program or measure, and (b) that it will implement an EM&V plan based on industry-accepted protocols for the program or measure. No pilot program or measure will be eligible for Net Lost Revenue recovery upon true-up unless it (a) is ultimately proven to have been cost-effective, and (b) is developed into a full-scale, commercialized program.

Net Lost Revenues

60. Notwithstanding the allowance of ~~36 months'~~ Net Lost Revenues associated with eligible kWh sales reductions, as prescribed above, the kWh sales reductions that result from measurement units installed shall cease being eligible for use in calculating Net Lost Revenues as of the effective date of (a) a Commission-approved alternative recovery mechanism that accounts for the eligible Net Lost Revenues associated with eligible kWh sales reductions, or (b) the implementation of new rates approved by the Commission in a general rate case or comparable proceeding to the extent the rates set in the general rate case or comparable proceeding are set to explicitly or implicitly recover the Net Lost Revenues associated with those kWh sales reductions.

Incentives

71. Unless the Commission determines otherwise in an annual DSM/EE rider proceeding, and subject to the factors and limitations set forth elsewhere in this Mechanism, beginning for Vintage Year ~~2022~~2025, the amount of the pre-income-tax PPI initially to be recovered for the entire DSM/EE portfolio for a vintage year shall be equal to the PPI award based on the tiered achievement discussed below, ~~10.60%~~ multiplied by the present value of the estimated net dollar savings associated with the DSM/EE portfolio installed in that vintage year, calculated by DSM/EE program using the UCT (and excluding Low - Income Programs and other specified societal programs), that are incremental to the Company's underlying savings assumption that is currently modeled for that Vintage Year in the Company's CPIRP. ~~The present value of the estimated net dollar savings shall be the difference between the present value of the annual lifetime avoided cost savings for measurement units projected to be installed in that vintage year and the present value of the annual lifetime program costs for those measurement units. The annual lifetime avoided cost savings for measurement units installed in the applicable vintage year shall be calculated by multiplying the number of each specific type of measurement unit projected to be installed in that vintage year by the most current estimates of each lifetime year's per installation kW and kWh savings and by the most current estimates of each lifetime year's per kW and kWh avoided costs.~~ In calculating the forecasted initial PPI it will be assumed that projections will be achieved.

The PPI shall be determined as follows:

	Achievement of load reduction based on prior year eligible retail sales	**PPI percentage to be applied to incremental savings above prior tier**
Tier 1	< 1%	None
Tier 2	1% - 1.5%	WACC
Tier 3	> 1.5%	WACC + 25 basis points

Incentives

76. The percentage used to determine the estimated PRI for each Vintage Year shall be ~~10.60%~~equal to DEC's WACC. This percentage will be multiplied by the Vintage Year avoided costs projected to be generated by each approved PRI-eligible program. When making its initial estimates of the PRI, ~~DEP~~ DEC shall utilize the best and most accurate estimate of the UCT and the resulting PRI percentage it can determine at that time.

Vintage Years

New Paragraph following existing Paragraph 52: Beginning with Vintage Year 2025, true-ups to Program Costs, PPI, NLR and, any other associated costs will be limited to a maximum of five years from the current Vintage Year. When these true-up corrections are necessary, the identified true-up corrections are to be completed in the identified Vintage Year and the corrections should not be split across multiple Vintage Years.

20. With the exception of Low-Income Programs or other programs explicitly identified at the time of the application for their approval, all Programs submitted for approval will have a Program-level UCT result greater than 1.00. Additionally, for purposes of calculating cost-effectiveness for program approval, ~~consistent with the Commission's Orders in Docket Nos. E-2, Sub 1145 and E-2, Sub 1174,~~ the Company shall use projected avoided capacity and energy benefits specifically calculated for the program, as derived from the underlying resource plan, production cost model, and cost inputs that generated the system benefits ~~avoided capacity and avoided energy credits~~ reflected in the ~~most recent~~ Commission's most recently adopted CPIRP as of December 31 of the year immediately preceding the date of the annual DSM/EE rider filing~~-approved Biennial Determination of Avoided Cost Rates for Electric Utility Purchases from Qualifying Facilities as of the date of the filing for the new program approval~~.

20A. The projected EE portfolio hourly shape is used for the purposes of determining the avoided energy benefit; however, to ensure that energy efficiency is primarily avoiding marginal fossil fuel generation, future incremental renewable energy resources are removed from the CPIRP for purposes of determining the avoided energy benefit; provided, however, that the capacity of future incremental renewable energy resources so removed in each model year would have produced an amount of energy equivalent to the forecasted EE savings in that year. For the purposes of determining avoided capacity benefits for EE/DSM resources, the levelized costs over the approved operational life of a dispatchable clean-energy pure capacity resource. Beginning in 2025, a Hydrogen-Capable Advanced Class CT, including fixed O&M and intrastate fuel transportation costs, will be utilized as this pure capacity resource until an alternative dispatchable clean-energy pure capacity resource is identified in future CPIRPs If it is determined that the capacity resource is also providing material energy benefits as measured by an estimated future capacity factor greater than 20%, the avoided capacity benefits for EE/DSM resources will be reduced by the estimated energy benefits.~~However, for the calculation of the underlying avoided energy credits to be used to derive the program-specific avoided energy benefits, the calculation will be based on the projected EE portfolio hourly shape, rather than the assumed 24x7 100 MW reduction typically used to represent a qualifying facility. For purposes of determining cost-effectiveness, estimated incremental EM&V costs attributable to each Program shall be included in the Program costs.~~ The avoided system capacity and energy benefits developed for purposes of DSM/EE program evaluation is specific to assessment of EE/DSM programs.

24A. ~~Consistent with the Commission's Orders in Docket Nos. E-2, Sub 1145 and E-2, Sub 1174, f~~For purposes of calculating prospective cost-effectiveness in each DSM/EE rider proceeding to be used to determine whether a program should remain in the portfolio, the Company shall assess each program by:

(a) Using ~~projected avoided capacity and energy benefits specifically calculated for each program, as derived from the underlying resource plan, production cost model, and cost inputs that generated the avoided capacity and avoided energy credits reflected in the most recent Commission-approved Biennial Determination of Avoided Cost Rates for Electric Utility Purchases from Qualifying Facilities as of December 31 of the year immediately preceding the date of the annual DSM/EE rider filing. However, for the calculation of the underlying avoided energy credits to be used to derive the program-specific avoided energy benefits, the calculation will be based on the projected EE portfolio hourly shape, rather than the assumed 24x7 100 MW reduction typically used to represent a qualifying facility~~ projected utility system capacity and energy benefits specifically calculated for the program, as derived from the underlying resource plan, production cost model, and cost inputs that generated system benefits reflected in the Commission's most recently adopted CPIRP as of December 31 of the year immediately preceding the date of the annual DSM/EE rider filing. The projected EE portfolio hourly shape is used for the purposes of determining the avoided energy benefit; however, to ensure that energy efficiency is primarily avoiding marginal fossil fuel generation, future incremental renewable energy resources are removed from the CPIRP for purposes of determining the avoided energy benefit; provided, however, that the capacity of future incremental renewable energy resources so removed in each model year would have produced an amount of energy equivalent to the forecasted EE savings in that year. For the purposes of determining avoided capacity benefits for EE/DSM resources, the levelized costs over the approved operational life of a dispatchable clean-energy pure capacity resource. Beginning in 2025, a Hydrogen-Capable Advanced Class CT, including fixed O&M and intrastate fuel transportation costs, will be utilized as this pure capacity resource until an alternative dispatchable clean-energy pure capacity resource is identified in future; and,

(b) Evaluating each cost-effectiveness test using projections of participation, savings, costs, and benefits for the upcoming vintage year.

System Inputs

83. For the PPI and PRI for Vintage Years ~~2019~~ 2025 and afterwards, ~~consistent with the Commission's Orders in Docket Nos. E-2, Sub 1145 and E-2, Sub 1174, the program-specific per kW avoided capacity benefits and per kWh avoided energy benefits used for the initial estimate of the PPI and PRI and any PPI or PRI true-up will be derived from the underlying resource plan, production cost model, and cost inputs that generated the avoided capacity and avoided energy credits reflected in the most recent Commission-approved Biennial Determination of Avoided Cost Rates for Electric Utility Purchases from Qualifying Facilities as of December 31 of the year immediately preceding the date of the annual DSM/EE rider filing. However, for the calculation of the underlying avoided energy credits to be used to derive the program-specific avoided energy benefits, the calculation will be based on the projected EE portfolio hourly shape, rather than the assumed 24x7 100 MW reduction typically used to represent a qualifying facility~~the program-specific per kW system capacity and per kWh system energy benefits will be derived from the underlying resource plan, production cost model, and cost inputs that generated system benefits reflected in the Commission's most recently adopted CPIRP as of December 31 of the year immediately preceding the date of the annual DSM/EE rider filing. The projected EE portfolio hourly shape is used for the purposes of determining the avoided energy benefit; however, to ensure that energy efficiency is primarily avoiding marginal fossil fuel generation, future incremental renewable energy resources are removed from the CPIRP for purposes of determining the avoided energy benefit; provided, however, that the capacity of future incremental renewable energy resources so removed in each model year would have produced an amount of energy equivalent to the forecasted EE savings in that year. For the purposes of determining avoided capacity benefits for EE/DSM resources, the levelized costs over the approved operational life of a dispatchable clean-energy pure capacity resource. Beginning in 2025, a Hydrogen-Capable Advanced Class CT, including fixed O&M and intrastate fuel transportation costs, will be utilized as this pure capacity resource until an alternative dispatchable clean-energy pure capacity resource is identified in future CPIRPs. If it is determined that the capacity resource is also providing material energy benefits as measured by an estimated future capacity factor greater than 20%, the avoided capacity benefits for EE/DSM resources will be reduced by the estimated energy benefits.

Net Lost Revenues

62. When authorized pursuant to Commission Rule R8-69(c) and unless the Commission determines otherwise, DEP shall be permitted to recover~~, through the DSM/EE and DSM/EE EMF riders,~~ NLR associated with the implementation of approved DSM and EE Measurement Units or Programs, subject to the restrictions set out below. With respect to Residential DSM and EE programs:

a) When the Company has a PBR rate year in effect, all Residential NLRs for each Vintage Year of the PBR period will be deemed recovered in the Company's RDM rider and will not be recovered through the DSM/EE rider.

b) For years in which a PBR year is not in effect, and therefore no RDM rider would be in place, the Company may request in a DSM/EE annual filing that the North Carolina retail residential kWh sales reductions that result from approved measurement units installed in a Vintage Year that are not already being recovered through the RDM be eligible for use in calculating NLR eligible for recovery in the DSM/EE rider only for the first 36 months after the installation of the measurement unit. Thereafter, such kWh sales reductions will not be eligible for calculating recoverable NLR for that or any other Vintage Year.

Net Lost Revenues

63. With respect to Non-Residential DSM and EE programs, t~~T~~he North Carolina retail kWh sales reductions that result from an approved measurement unit installed in a given Vintage Year shall be eligible for use in calculating NLR eligible for recovery in the DSM/EE rider only for the first 36 months after the installation of the Measurement Unit. Thereafter, such kWh sales reductions will not be eligible for calculating recoverable NLR for that or any other Vintage Year.

Net Lost Revenues

65. In order to recover estimated NLR associated with a Pilot Program or Measure, that does not fall within the Company's RDM rider, DEP must, in its application for program or measure approval, demonstrate (a) that the program or measure is of a type that is intended to be developed into a full-scale, Commission-approved program or measure, and (b) that it will implement an EM&V plan based on industry-accepted protocols for the program or measure. No pilot program or measure will be eligible for NLR recovery upon true-up unless it (a) is ultimately proven to have been cost-effective, and (b) is developed into a full-scale, commercialized program.

66. Notwithstanding the allowance of ~~36 months'~~ NLR associated with eligible kWh sales reductions, as prescribed above, the kWh sales reductions that result from measurement units installed shall cease being eligible for use in calculating NLR as of the effective date of (a) a Commission-approved alternative recovery mechanism that accounts for the eligible NLR associated with eligible kWh sales reductions, or (b) the implementation of new rates approved by the Commission in a general rate case or comparable proceeding to the extent the rates set in the general rate case or comparable proceeding are set to explicitly or implicitly recover the NLR associated with those kWh sales reductions.

Incentives

77. Unless the Commission determines otherwise in an annual N.C. Gen. Stat. § 62-133.9 DSM/EE rider proceeding, and subject to the factors and limitations set forth elsewhere in this Mechanism, beginning for Vintage Year ~~2022~~ 2025 the amount of the pre-income-tax PPI initially to be recovered for the entire DSM/EE portfolio for a Vintage Year, excluding Programs not eligible for a PPI, shall be equal to the PPI award based on the tiered achievement discussed below, ~~10.60%~~ multiplied by the present value of the estimated net dollar savings associated with the DSM/EE portfolio installed in that Vintage Year, calculated by Program using the UCT (and excluding Low Income Programs and other specified societal programs), that are incremental to the Company's underlying savings assumption that is currently modeled for that Vintage Year in the Company's CPIRP. ~~The present value of the estimated net dollar savings shall be the difference between the present value of the annual lifetime avoided cost savings for measurement units projected to be installed in that Vintage Year and the present value of the annual lifetime program costs for those measurement units. The annual lifetime avoided cost savings for measurement units installed in the applicable Vintage Year shall be calculated by multiplying the number of each specific type of Measurement Unit projected to be installed in that Vintage Year by the most current estimates of each lifetime year's per installation kW and kWh savings and by the most current estimates of each lifetime year's per kW and kWh avoided costs.~~ In calculating the forecasted initial PPI it will be assumed that projections will be achieved.

The PPI shall be determined as follows:

	Achievement of load reduction based on prior year eligible retail sales	**PPI percentage to be applied to incremental savings above prior tier**
Tier 1	< 1%	None
Tier 2	1% - 1.5%	WACC
Tier 3	> 1.5%	WACC + 25 basis points

Incentives

82. The percentage used to determine the estimated PRI for each Vintage Year shall be equal to the Company's WACC~~10.60%~~. This percentage will be multiplied by the Vintage Year avoided costs projected to be generated by each approved PRI-eligible program. When making its initial estimates of the PRI, DEP shall utilize the best and most accurate estimate of the UCT and the resulting PRI percentage it can determine at that time.

Evaluation, Measurement, and Verification – Opt Outs

32. The EM&V of Programs will be conducted using a nationally recognized protocol to ensure that Programs remain cost-effective. Except for DEP's DSDR Program, EM&V of Programs will be conducted by an independent third-party. EM&V of the DSDR Program will be conducted by DEP. EM&V protocol may be modified with approval of the Commission to reflect the evolution of best practices.

In order to create transparency related to the development EM&V plans, in its annual EE/DSM Rider filing, the Company will provide testimony detailing all of the projected EM&V plans anticipated to be developed in the calendar year in which the rider filing is made. Additionally, prior to implementing any new EM&V plans or making material modifications to existing EM&V Plans, the Company will share the EM&V plans or modifications with the Public Staff and will share them with other stakeholders upon request. The Public Staff and any stakeholder electing to receive the EM&V plan may provide feedback on the EM&V Plans or major modifications within 10 days of receiving the EM&V plan, and the Companies shall notify a party within 10 days of receipt of the feedback of what actions, if any, they intend to take in response to the feedback, and justification if the Companies disagree with the feedback.[1]

Customers that have elected to opt-out of the rider pursuant to Commission Rule R8-69 shall not participate in any state of the EM&V process, including the surveys submitted to customers.

[1] Note: the addition of the *second* paragraph has been agreed to by the Active Parties and is included in Duke's filing as revised Paragraph 34.

Vintage Years

New Paragraph after existing Paragraph 60: Beginning with Vintage Year 2025, true-ups to Program Costs, PPI, NLR and, any other associated costs will be limited to a maximum of five years from the current Vintage Year. When these true-up corrections are necessary, the identified true-up corrections are to be completed in the identified Vintage Year and the corrections should not be split across multiple Vintage Years.

Amortization

54. Beginning with Vintage Year 2022, and extending through Vintage Year 2024, DEP may recover subject to approval by the Commission in the annual DSM/EE rider proceedings, all Program Costs incurred over three years amortization period~~unless otherwise ordered by the Commission pursuant to its own motion or at the request of another party, and extending through a Vintage Year as identified in a future Mechanism review, DEP may recover all Program Costs previously recovered through amortization periods exceeding three years over amortization periods of no less than three years~~.

Amortization

~~56. In the next Mechanism review, the parties shall consider whether or not to allow the minimum three-year amortization period designated in Paragraph 54 above to be further reduced, taking into consideration the impact upon customer rates, as well as other relevant factors.~~

Amortization

~~57. Pursuant to Commission Rule R8-69(b)(6), except for administrative and general expenses (addressed in Paragraph No. 58 below), DEP shall be allowed to earn a rate of return at the overall weighted average net-of-tax rate of return approved in DEP's most recent general rate case on all such unamortized deferred costs (net of income taxes). The return so calculated will be adjusted in any rider calculation to reflect necessary recoveries of income taxes. Pursuant to Commission Rule R8-69(c)(3), the Company is not allowed to accrue a return on NLR or the PPI.~~

Amortization

58. Beginning with Vintage Year 2025, unless otherwise ordered by the Commission pursuant to its own initiative or at the request of another party, and extending through a Vintage Year as identified in a future Mechanism review, DEP will recover all Program Costs in the year incurred. ~~To the extent DEP chooses to defer and amortize in future DSM/EE riders the Program Costs for a Program pursuant to Paragraph No. 54 above, non-incremental administrative and general costs reasonably assigned or allocated to, but not directly related to, that Program will be deferred and amortized over a period not to exceed three years, unless the Commission determines otherwise. Pursuant to Commission Rule R8-69(b)(6), DEP shall be allowed to earn a rate of return at the overall weighted average net-of-tax rate of return approved in DEP's most recent general rate case on all such unamortized deferred administrative and general costs (net of income taxes). The return so calculated will be adjusted in any rider calculation to reflect necessary recoveries of income taxes. However, irrespective of the prospective treatment of Program Costs in calendar year 2016 or afterwards, previously deferred administrative and general costs will be recovered using existing amortization rates, until such time that those deferred costs are recovered, in their entirety, through the DSM/EE cost recovery clause, unless the parties recommend, and the Commission approves, a different treatment.~~

Issue	DEC Current → Revised ¶ #s	DEP Current → Revised ¶ #s	Public Staff's Position
System Inputs	20, 20A 25 77	20, 20A 24A 83	Public Staff Appendices A and B
System Inputs	20B → 21B	20B → 21B	See Duke's Filing
As-Found	22 → 23	23 → 24	See Duke's Filing
Low-Income	3	4	See Duke's Filing
EIP	None → 31 49 → 51	None → 31 49 → 51	See Duke's Filing
NLRs	56 57 59 60	62 63 65 66	Public Staff Appendices A and B
Incentives	71 76	77 82	Public Staff Appendices A and B
NEBs	None → 10 14 → 15	None → 11 15 → 16	See Duke's Filing
EM&V – Plans	36 → 37 37 → 38 45 → 46	28 → 29 32 → 34 34 → 36	See Duke's Filing
EM&V – Opt Outs	35	32	Public Staff Appendices A and B
Vintage Years	New ¶ after existing ¶ 52	New ¶ after existing ¶ 60	Public Staff Appendices A and B
Amortization	N/A	54 56 57 58	Public Staff Appendices A and B
Collaborative	44 → 45	27 → 28	See Duke's Filing
Other items – Consolidated Mechanism	N/A	56 → 58	See Duke's Filing *(only in the alternative)*
Other items – Product Demand Allocation	53(b) → 55(b)	48(d) → 50(d)	See Duke's Filing
Other items – Avoided T&D	78 → 80 79 → 81	84 → 86 85 → 87	See Duke's Filing

SKUMATZ ECONOMIC RESEARCH ASSOCIATES, INC.
■ Consulting to Government & Utilities

Colorado Office: PO Box 1486 Silverthorne CO 80498
Washington Office PO Box 23 Orcas WA 98280
Voice: 360-261-3069
email: Skumatz @ serainc.com
Website: www. serainc.com; payt.org

SERA
SKUMATZ ECONOMIC RESEARCH ASSOCIATES

NON-ENERGY BENEFITS / NON-ENERGY IMPACTS (NEBS/NEIS) FOR SELECTED PROGRAMS IN THE DUKE ENERGY CAROLINAS (DEC) AND DUKE ENERGY PROGRESS (DEP) PORTFOLIOS

FINAL REPORT

Prepared by:
Lisa A. Skumatz, Ph.D. and Ann Gibbs
Skumatz Economic Research Associates, Inc. (SERA)
PO Box 1486, Silverthorne, CO 80498
360/261-3069 skumatz@serainc.com

Prepared for:
Jean Williams and Lynda Powers
Duke Energy Carolinas and Duke Energy Progress

Final Report
April 25, 2023

CONTENTS

Acknowledgements: Many thanks to Jean Williams and Lynda Powers for their helpful project guidance. Thanks to Adrian Aguilar and Anna Craggs for very important supporting work on this project.

ABSTRACT

This study finds that the estimated NEBs/NEIs for the eleven Duke (DEC and DEP) programs studied were significant and defensible using conservative methods and assumptions. On average, the values exceeded the value of the electric bill savings that the participants received.

Including the benefit estimates relevant to the TRC (utility and participant effects), the weighted average multiplier was 0.74, and the multiplier for the SCT (utility and participant and societal) was 1.26 times electric bill savings. Income qualified programs had multipliers that were about 0.14 (.12-.16) larger than non-income-qualified programs. The overall dollar values for the NEBs ranged up to $281 per participating household per year for the SCT ($152 of the TRC-relevant benefits). The average for the programs was $120/participant per year for the SCT ($72 for the TRC). The most valued NEBs included equipment performance, water savings, and comfort, health, and safety benefits. The measures that contributed to larger, rather than lower benefits, included HVAC and shell measures, and water measures. These results varied by individual program, and some differences between the DEC and DEP programs were also noted in the report.

0.0 EXECUTIVE SUMMARY, IMPLICATIONS, AND NEXT STEPS

0.1 Background

This project was conducted to develop monetized estimates of the non-energy benefits or non-energy impacts (NEB/NEI) for Duke Energy Carolina (DEC) and Duke Energy Progress (DEP) for a set of residential and multi-family programs in their portfolio.

About NEBs/NEIs: Energy Efficiency (EE) programs are designed to provide energy savings; however, the program interventions also provide a variety of positive and negative effects to utilities, participants, and society beyond energy savings. These effects are called non-energy benefits or non-energy impacts (NEB/NEI). These values are used in cost-effectiveness testing, marketing, program refinement, and reflections of policy progress among other applications.

Benefit-Cost Analysis Uses: A key application is Benefit-Cost Analysis (BCA) Tests. These tests are intended to measure program-induced benefits over program-related costs. Omitting NEBs/NEIs reduces the bias of these tests over BCAs that exclude these effects. This study provides conservative values to help inform any refinements to BCA procedures that Duke may wish to take. The study estimated NEBs associated with all three beneficiaries (utility, participant, and societal). However, not all the estimated NEBs will be relevant for every test. Among these three beneficiaries, the utility perspective is used for the Utility Cost Test, the utility and participant perspectives NEBs/NEIs are included in the Total Resource Cost Test (TRC), and all three perspectives are included in the Societal Cost Test (SCT). These subtotals are referred to in multiple tables.

Literature-Based Scope: The study's scope was literature-and model-based, and did not include primary or customer-facing research. The study included only NEBs/NEIs with a strong base in the literature and generally selected conservative values and approaches toward the monetization of the estimated NEBs/NEIs. The work relied on an existing database with more than 44,000 quantitative NEB entries from the literature, a model to assemble the results (SERA's "NEB-It" model), and data from the utilities.

Programs Studied

The programs studied, and their key measures, include:

- Residential Smart $aver Energy Efficiency Program, which focuses on high efficiency central air conditioning and heat pump systems, attic insulation and sealing, heat pump water heaters, and high efficiency pool pumps.
- The Home Energy House Call Energy Assessments provide energy saving tips along with an energy efficiency start kit including energy efficiency lighting, low-flow water measures, and pipe wrap.

- MyHER behavioral program focuses on feedback on usage and tips delivered through HER reports.[1]
- Multifamily Direct Install aims to decrease energy consumption in multi-family properties by providing energy-saving lighting and water measures, such as low-flow faucet aerators and showerheads, and pipe wrap.
- Neighborhood Energy Saver, which addresses income qualified customers by providing personalized energy efficiency assessment of their homes and a comprehensive set of energy-efficient measures that include energy efficient lighting, low-flow water measures, HVAC winterization kits and filters, and weather-stripping measures.
- Income-Qualified Weatherization Assistance Program provides funding for qualified customers to help with the repair or replacement of weatherization measures, heating systems, and refrigerators.

Measure Groups for NEB/NEI Attribution

The modeling work also attributed the resulting NEB/NEI effects to program measure groups. These groups included:

- HVAC
- Domestic Hot Water (DHW)
- Enclosure / Building Envelope
- Lighting
- Appliances
- Maintenance to measures
- Miscellaneous

NEB Benefit Groups and Individual NEB/NEI Categories

The following NEB/NEI effects were modeled. Some sets were relevant to certain programs and not others, depending on the measures installed under the programs.

Figure ES.1: List of Benefit Groups and Individual NEB/NEI Categories Estimated in the Study

UTILITY NEBS (Relevant for UCT test) Utility Customer Service and Payment-Related NEBs • Reduced Carrying Cost on Arrearages (interest) • Lower Bad Debt Written Off	PARTICIPANT NEBS (Relevant for TRC and SCT test), continued Participant Equipment Performance NEBs/NEIs • Outside Noise Reduction • Inside Noise Reduction (appliances) • Quality / Quantity of Lighting

[1] As described later in this report, there is very little literature on NEBs associated with MyHER-type programs. The results reported in this report are attributable solely to the impacts from the reduced emissions related to the reduction in electricity generation (largely reduced illnesses and deaths). The Duke Utilities plan to explore adding further research on MyHER NEBs into the process evaluations of these programs.

- Fewer Shutoffs
- Fewer Reconnects
- Fewer Customer Calls

PARTICIPANT NEBS (Relevant for TRC and SCT test)

Participant Bills / Payment NEBs

- Fewer Shutoffs
- Fewer Reconnects
- Fewer Calls to Utility

Participant Water Savings

- Reduced water / wastewater bills-All Measures

Participant Comfort, Health, and Safety NEBs

- Comfort
- Fewer fires
- Fewer Sick days from work
- Fewer Sick days from school
- Fewer Asthma Incidences
- Reduction in Allergies
- Reduction in Cold Symptoms
- Household Safety
- Operations & Maintenance Cost Changes
- Measure Lifetime / Deferred Purchase
- Improved Equipment Features/ Performance
- Marketability for Property Managers
- Reduced Tenant Complaints to Property Managers

Participant Hardship, Knowledge NEBs

- Hardship benefits
- Avoided moves / household impacts

S**OCIETAL NEBS** (Relevant for SCT Test with the utility and participant NEBs/NEIs)

Societal / Public NEBs

- Emissions on Public Illnesses & Deaths

0.2 Quantitative Results

The modeling work provided the following quantitative results.

- Monetized benefits values for each individual NEB/NEI category and subcategories and perspectives for each program.
    - Values were provided per program participant, and for the program-wide results, multiplying times participants in the program.
- Attribution of the monetized NEB/NEI values to a set of measures or end uses.
- Importantly, the estimated NEBs are based on electricity savings alone; information on relevant deemed gas savings associated with gas measures in the DEC / DEP programs were not available at the time of the study.[2]

The major results are presented below. The derivations are included in the report and relevant appendices.

NEI Values Overall and By Perspective

[2] Certain deemed Gas savings data are expected to become available in Q3 2024, in a cooperative agreement with Piedmont Natural Gas. The results from this study will be updated.

Figure ES.2 shows the estimated total NEB/NEI value per household, and the colors in the bar represent the NEBs/NEIs from different perspectives.

- The bottom band or color (usually very small), represents the utility NEBs/NEIs, used in the UCT.
- The middle band represents the participant NEBs/NEIs, used with the utility benefits for the TRC.
- Societal NEBs/NEIs are the top band in the bar, and this total represents the SCT benefits.

The results in the Figure are sorted from the program with the highest estimated NEB/NEI values per household on the far left, to the lowest. The three columns at the far right reflect:

- The overall average, including all programs in the list.
- The average for DEC programs, excluding DEC's IQWx program, because there is no comparable program for DEP.
- The average for the DEP programs.

Figure ES.3 shows the same information for the program-wide calculations.

Findings: Review of the two figures shows:

- **NEBs/NEIs are Large**: NEB values are significant, even including only electricity-based valuations. The values range up to $280/hh/year for SCT NEB categories, and $140/year for the TRC NEB categories. Average benefit values are $120/hh/year across the program, or $70 for the TRC-related benefit categories.
- **Measures Matter**: Programs with Weatherization, HVAC, or Water measures have highest NEB/NEI values.
- **MyHER is small individually but large program-wide**: The MyHER program benefits are small and understated because there was minimal research available NEBs for MyHER-Type programs. The literature also had very little information on which measures are implemented under a MyHER-type program, which would have allowed an estimate of more-than-minimal measure-based NEBs for this program in this study. However, program-wide, MyHER shows the largest value for NEBs/NEIs. This is because, even with small NEBs (from some measure-derived savings and emission reductions) per customers, there are so many participants in the program. However, the bulk of these benefits only count for the SCT test, not the TRC. With more information on this program's impacts, the benefits could swamp other values.[3]
- **DEP vs. DEC Programs**: DEP programs, on average, deliver higher benefits per participant than DEC programs. However, review of the program-wide numbers shows that DEC has more participants, and it brings their average program-wide NEBs/NEIs up to nearly the same values as DEP's programs.
- **Highest NEB/NEI Benefit Categories**: Review of other tables in the document shows highest benefit values tend to come from societal emissions, participant equipment performance, and participant water savings. Water savings brings high value due to the number of aerators and low-flow showerheads installed in these programs, valued at the water rates relevant in the Carolinas. Comfort is also valued highly, usually due to HVAC and smart thermostat measures delivered in the programs.

[3] Because the NEBs literature has little information on this program (but the potential is large), Duke is planning to explore adding questions related to NEIs to future MyHER surveys through its process evaluations.

Figure ES.2: NEBs/NEIs by Program and Perspective, per participant, 2023

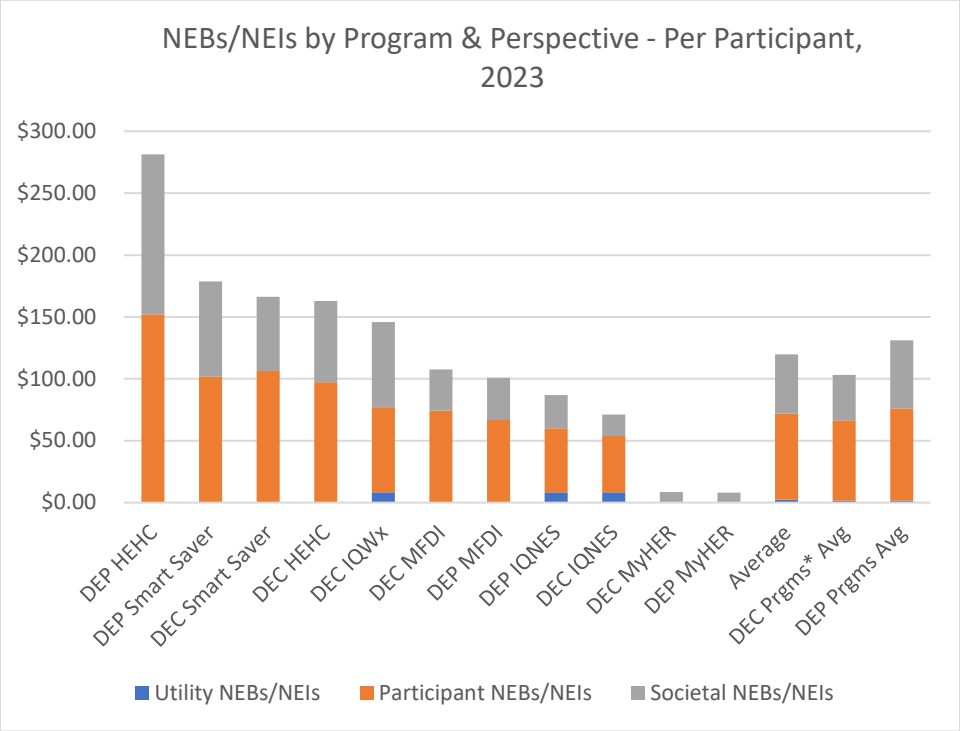


Figure note: (*) DEC programs average excludes DEC IQWx to facilitate comparison with DEP (No IQWx for DEP)
Source: SERA "NEB-It" Computations, 2023

Figure ES.3: NEBs/NEIs by Program and Perspective, Program-wide, 2023

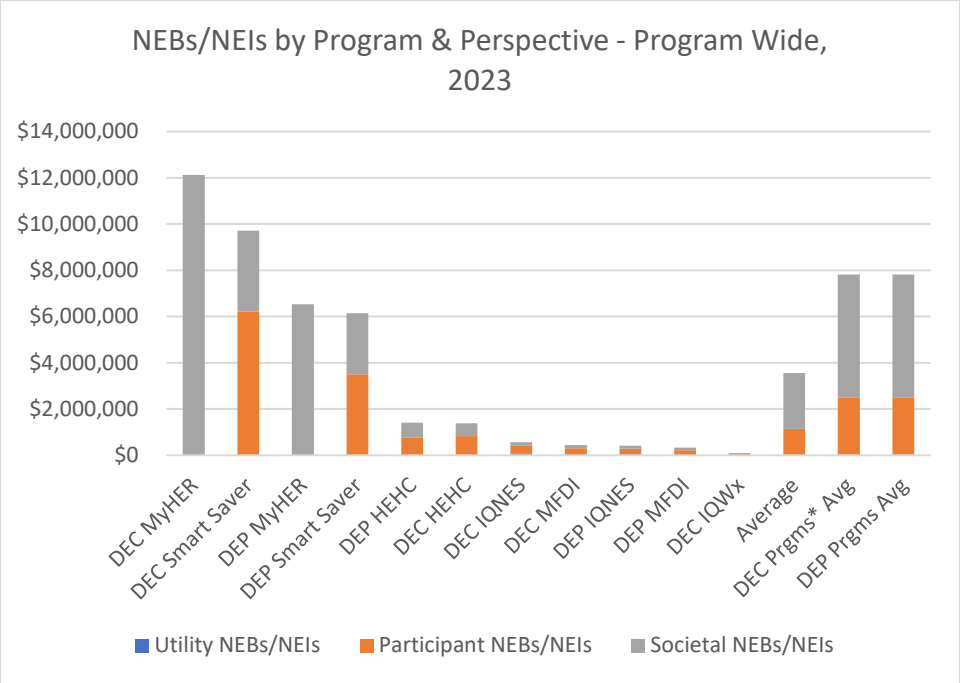


Figure note: (*) DEC programs average excludes DEC IQWx to facilitate comparison with DEP (No IQWx for DEP)
Source: SERA "NEB-It" Computations, 2023

Figure ES.4: NEB/NEI Results, per Household/year and Program Wide/Year, sorted

Year 5 2023	Per Household		Program-Wide		
Program, sorted by Total NEB	TRC NEB group	Total NEB (SCT)	Program, sorted by Total NEB	TRC NEB group	Total NEB (SCT)
DEP HEHC	$152	$281	DEC MyHER	$0	$12,126,582
DEP Smart$aver	$102	$179	DEC Smart$aver	$6,208,855	$9,708,894
DEC Smart$aver	$106	$166	DEP MyHER	$0	$6,533,270
DEC HEHC	$97	$163	DEP Smart$aver	$3,497,864	$6,137,454
DEC IQWx	$77	$146	DEP HEHC	$765,655	$1,415,821
DEC MFDI	$74	$108	DEC HEHC	$827,600	$1,385,685
DEP MFDI	$67	$101	DEC IQNES	$431,401	$568,573
DEP IQNES	$60	$87	DEC MFDI	$305,216	$441,331
DEC IQNES	$54	$71	DEP IQNES	$288,429	$417,733
DEC MyHER	$0	$9	DEP MFDI	$217,480	$328,721
DEP MyHER	$0	$8	DEC IQWx	$51,736	$97,790
Average	$72	$120	Average	$1,144,930	$3,560,169
Avg DEC Prgms*	$66	$103	Avg DEC Prgms*	$1,304,134	$4,054,809
Avg. DEP Prgms	$76	$131	Avg. DEP Prgms	$953,886	$2,966,600
DEP/DEC	115%	127%	DEP/DEC	73%	73%

Table note: (*) DEC programs average excludes DEC IQWx to facilitate comparison with DEP (No IQWx for DEP)
Source: SERA "NEB-It" Computations, 2023

Attribution of NEB/NEI Values to Measure End Uses

The contribution of different measures to delivering NEB/NEI benefits were also studied.

Figure ES.5: Share of Total Program NEBs Attributed to Measure Groups (estimated, year 2023)

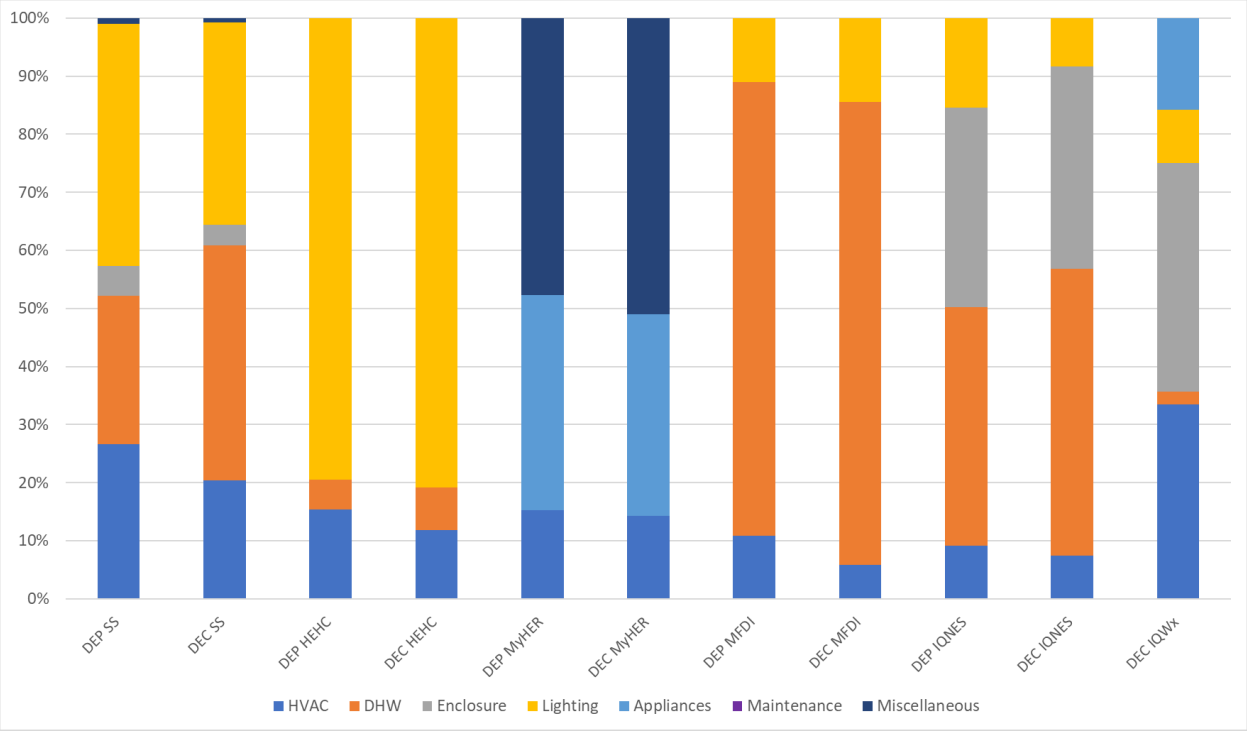


Figure Note: Enclosure = Building Envelope
Source: SERA "NEB-It" Computations, 2023

The figure shows that the contributions from different end use measures vary among the programs.[4]

- **Lighting**: Lighting delivered the vast majority of benefits for the HEHC program kits (and some for Smart$aver), delivering benefits from lighting quality and quantity, and safety-type effects.
- **Domestic Hot Water Measures:** These were the largest source of benefits for the programs and delivered benefits to the IQNES and Smart$aver programs.
- **Enclosure / Building Envelope:** The enclosure / building envelope measures contributed large shares of the benefits in the IQNES and IQWx programs.
- **Appliance:** Appliance benefits are large for the IQWx program, which includes refrigerator replacement as an element.
- **MyHER**: MyHER's benefits come from changes from appliance upgrades and smart thermostats; the bulk of the effects were assigned to miscellaneous because there were no further details on actions taken by the programs.

[4] Recall gas measure savings were not available and attribution to these measures is excluded from this section.

NEB/NEI Multipliers relative to Program Investment

The study also calculated two types of multipliers, shown in Figure ES.6. The first, and less important, identifies the amount of dollar NEB/NEI impact is achieved per (approximate) dollar spent on the programs. Again, the results are shown for the group of NEBs/NEIs that are reliant to the TRC Test (utility and participant), and separately for the group of NEBs/NEIs relevant to the SCT test (adding societal impacts), *considering only the subset of NEBs/NEIs that were estimated in this literature-and-model based study*.

The results show:

- MFDI provided the highest benefit per dollar spent on the program, with 48%-63% multiplier for TRC benefits, and 73%-91% for SCT benefits.
- Close behind the TRC side was the Smart$aver program.
- The MyHER had the highest multiplier for the SCT because it has very low costs and high participation count.[5]

Figure ES.6: NEB Approximate Return on Program Investment (Expenditure), and NEB compared to Bill Savings for TRC NEBs and Total NEBs (per participating household analysis)

Per Household Program, sorted by Total NEB/Savings	TRC NEB/ Expend	TRC NEB/ Energy Savings	Tot NEB (SCT)/ Expend	Tot NEB (SCT)/ Energy Savings
DEC IQNES	8%	180%	11%	237%
DEC MFDI	63%	128%	91%	185%
DEC Smart$aver	43%	101%	67%	159%
DEP IQNES	11%	104%	16%	151%
DEC HEHC	19%	85%	33%	142%
DEP MFDI	48%	91%	73%	138%
DEC IQWx	5%	64%	10%	121%
DEP Smart$aver	32%	62%	57%	109%
DEP HEHC	22%	55%	41%	102%
DEC MyHER	0%	0%	210%	57%
DEP MyHER	0%	0%	192%	47%
Average	23%	79%	73%	132%
Avg DEC prgms*	27%	99%	82%	156%
Avg DEP prgms	23%	63%	76%	109%
DEP/DEC	85%	63%	92%	70%

Table note: (*) DEC programs average excludes DEC IQWx to facilitate comparison with DEP (No IQWx for DEP)
Source: SERA "NEB-It" Computations, 2023

[5] Recall the NEBs for the MyHER program are understated because NEBs research on these programs is limited.

NEB/NEI Multipliers Relative to Program Energy Bill Savings

The more important multiplier, or "adder" value calculated from the NEB/NEI results is the value of the benefits relative to the energy bill savings.[6] This is important because it helps show whether NEB/NEI benefits are significant and may be useful for better representing the full return on investment received from participation in the program, and identifies whether there are strong marketing angles available beyond energy savings. Most importantly, these multipliers are direct influences on the program's performance regarding benefit cost assessments (BCA) or cost-effectiveness tests. If the NEBs/NEIs are included in the numerator, to represent benefits beyond just energy savings, and the denominator (costs) stays the same, these multipliers are the amount by which the BCA is increased due to the NEBs/NEIs.

More than half the states around the country have taken various approaches to incorporate NEBs/NEIs to reduce bias into the BCA or cost-effectiveness tests. A common approach is to establish "adders" that stand in for directly-measured NEBs/NEIs.[7] These adder values used around the US range from 5-30% for gas or electric programs, and often a 5-15% adder on top of that value is appended of low-income programs. The averages (not the ranges) for programs are about 11-12%, with a 13% adder for low income. The results shown in this report are substantially higher than this value. The currently-adopted values are low because many were negotiated on the order of a decade ago when there was less literature on the NEBs/NEIs topic, and negotiations were preliminary and conservative. The literature can clearly support higher values.

The multipliers that the study can support with its conservative estimation approaches, are shown in Figure ES.7. Note that the values vary by program.

- The average multiplier values are about 1.26 for the SCT test.
- The average multipliers are about 0.74 for the benefits associated with the TRC test.
- The adder "bump" for low income is estimated at about 0.14 (14%, and comparable to the number in the state level adders mentioned above (see the results under utility NEBs for Income-Qualified Programs DEP IQ NES, DEC IQ NES, and DEC IQ Wx).

Figure ES.7: Estimated Multiplicative "Adders" by Perspective for the Programs - (Ratio of NEBs/NEIs) over Program Bill Savings

NEBs Included	Utility + Societal + Participant (SCT)	Utility + Participant (TRC)	Utility NEBs only (UCT)
DEP SS	1.09	0.62	0
DEC SS	1.59	1.01	0
DEP HEHC	1.02	0.55	0
DEC HEHC	1.42	0.85	0

[6] Electric-only for this report, as the gas savings data were not available.

[7] As mentioned later in the report, a few examples include Colorado, Washington DC, Illinois, Maryland, Oregon, and Vermont.

NEBs Included	Utility + Societal + Participant (SCT)	Utility + Participant (TRC)	Utility NEBs only (UCT)
DEP My HER	0.47	0	0
DEC My HER	0.57	0	0
DEP MFDI	1.38	0.91	0
DEC MFDI	1.85	1.28	0
DEP IQ NES	1.51	1.04	0.14
DEC IQ NES	2.37	1.8	0.28
DEC IQ Wx	1.21	0.64	0.07
Simple Average	1.32	0.79	0.045
Saving-weighted average	1.26	0.74	0.004
DEC Weighted	1.56	0.98	0.004
DEP Weighted	1.04	0.57	0.001

Source: SERA "NEB-It" Computations, 2023

Explanation of How These Multipliers would be Applied in a Benefit-Cost Test

In general, the multiplier would be applied to the value of energy savings in the numerator of the Cost-effectiveness test or benefit-cost ratio (BCR). More specifically, however, the multipliers provided in this report are based on customer bill savings (specifically electricity bill savings). These ratios represent dollar values to participants and other beneficiaries (utility and society) ratcheted off the retail bill savings. However, in many cases, BCR tests include the energy savings in the numerator in wholesale terms. If that is true in the DEC / DEP territories, then the ratio between retail and wholesale energy savings must also be applied in order to preserve the dollar savings that are being represented by these multipliers.[8]

Monetized Results for Specific NEB Categories for Each Program

To make tables easier to read, most of the figures in the body of this report show the NEB group values, rather than values for individual NEB/NEI categories. Figure ES.8 and Figure ES.9 show the dollar value estimates of the NEBs/NEIs for each of the programs studied for the year 2023. For data for all years, see the appendices.

[8] Specifically, [(Retail rates over wholesale rates) x NEB multiplier shown] is multiplied times the wholesale electric savings for the measure, program, or portfolio.

Figure ES.8: NEB/NEI values by category and subcategory for program year 5 (2023). Per HH

SERA NEB-It/NEI MODEL 2.0		DEP SS	DEP HEHC	DEP MyHER	DEP MFDI	DEP IQNES	DEC SS	DEC HEHC	DEC MyHER	DEC MFDI	DEC IQNES	DEC IQWx
UTILITY NEBS												
Utility Customer Service and Payment-Related												
U_Ar	Reduced Carrying Cost on Arrearages (interest)	$0.00	$0.00	$0.00	$0.00	$1.41	$0.00	$0.00	$0.00	$0.00	$1.44	$1.44
U_BD	Lower Bad Debt Written Off	$0.00	$0.00	$0.00	$0.00	$5.38	$0.00	$0.00	$0.00	$0.00	$5.38	$5.38
U_SO	Fewer Shutoffs	$0.00	$0.00	$0.00	$0.00	$0.67	$0.00	$0.00	$0.00	$0.00	$0.67	$0.67
U_RC	Fewer Reconnects	$0.00	$0.00	$0.00	$0.00	($0.00)	$0.00	$0.00	$0.00	$0.00	($0.00)	($0.00)
U_CC	Fewer Customer Calls	$0.00	$0.00	$0.00	$0.00	$0.87	$0.00	$0.00	$0.00	$0.00	$0.87	$0.87
SOCIETAL / PUBLIC NEBS												
Societal Environmental & Water NEBs												
S_Em	Emissions on Public Illnesses & Deaths	$76.81	$129.21	$8.03	$34.12	$26.94	$59.92	$65.65	$8.53	$33.17	$17.15	$68.74
PARTICIPANT NEBS												
Participant Bills / Payment NEBs												
P_SO	Fewer Shutoffs	$0.00	$0.00	$0.00	$0.00	$0.20	$0.00	$0.00	$0.00	$0.00	$0.20	$0.20
P_Re	Fewer Reconnects	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
P_BC	Fewer Calls to Utility	$0.00	$0.00	$0.00	$0.00	$0.32	$0.00	$0.00	$0.00	$0.00	$0.32	$0.32
Participant Water Savings												
P_WA	Reduced water / wastewater bills-All Measures	$36.94	$11.93	$0.00	$56.75	$27.77	$56.62	$10.56	$0.00	$65.29	$31.72	$0.00
Participant Comfort, Health & Safety NEBs												
P_Co	Comfort	$14.29	$24.04	$0.00	$1.57	$5.01	$9.12	$9.99	$0.00	$0.91	$2.61	$10.46
P_FF	Fewer fires	$0.02	$0.00	$0.00	$0.00	$0.00	$0.02	$0.00	$0.00	$0.00	$0.00	$0.01
P_MW	Fewer Sick days from work	$1.63	$0.00	$0.00	$0.00	$0.00	$1.60	$0.00	$0.00	$0.00	$0.00	$1.60
P_MS	Fewer Sick days from school	$0.27	$0.00	$0.00	$0.00	$0.00	$0.26	$0.00	$0.00	$0.00	$0.00	$0.26
P_As	Fewer Asthma Incidences	$1.02	$0.00	$0.00	$0.00	$0.00	$1.04	$0.00	$0.00	$0.00	$0.00	$1.04
P_RA	Reduction in Allergies	$0.27	$0.00	$0.00	$0.00	$0.00	$0.23	$0.00	$0.00	$0.00	$0.00	$0.23
P_CS	Reduction in Cold Symptoms	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
P_Sa	Household Safety	$0.00	$0.00	$0.00	$0.05	$0.00	$0.00	$0.00	$0.00	$0.03	$0.00	$0.00
Participant Equipment Performance NEBs												
P_NR	Outside Noise Reduction	$6.57	$0.00	$0.00	$0.00	$5.76	$4.19	$0.00	$0.00	$0.00	$3.00	$12.02
P_NA	Inside Noise Reduction (appliances)	$9.86	$16.58	$0.00	$0.00	$4.61	$6.29	$6.89	$0.00	$0.00	$2.40	$9.62
P_LQ	Quality / Quantity of Lighting	$8.21	$13.82	$0.00	$3.66	$5.76	$5.24	$5.74	$0.00	$5.07	$3.00	$12.02
P_OM	Operations & Maintenance Cost Changes	$0.00	$0.00	$0.00	$1.67	$0.00	$0.00	$0.00	$0.00	$0.97	$0.00	$2.06
P_ML	Measure Lifetime / Deferred Purchase	$16.12	$85.78	$0.00	$1.93	$0.00	$17.51	$64.18	$0.00	$1.34	$0.00	$0.00
P_EP	Improved Equipment Features/ Performance	$6.57	$0.00	$0.00	$0.00	$0.00	$4.19	$0.00	$0.00	$0.00	$0.00	$16.71
PM_Mk	Marketability for Property Managers	$0.00	$0.00	$0.00	$0.05	$0.00	$0.00	$0.00	$0.00	$0.04	$0.00	$0.00
PM_TC	Reduced Tenant Complaints to Property Managers	$0.00	$0.00	$0.00	$1.03	$0.00	$0.00	$0.00	$0.00	$0.72	$0.00	$0.00
Participant Hardship, Knowledge NEBs												
P_HS	Hardship benefits	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
P_NM	Avoided moves / household impacts	$0.00	$0.00	$0.00	$0.00	$2.31	$0.00	$0.00	$0.00	$0.00	$2.31	$2.31

Source: SERA "NEB-It" Computations, 2023

Figure ES.9: NEB/NEI values by category and subcategory for program year 5 (2023). Program Wide.

SERA NEB-It/NEI MODEL 2.0		DEP SS	DEP HEHC	DEP MyHER	DEP MFDI	DEP IQNES	DEC SS	DEC HEHC	DEC MyHER	DEC MFDI	DEC IQNES	DEC IQWx
UTILITY NEBS												
Utility Customer Service and Payment-Related												
U_Ar	Reduced Carrying Cost on Arrearages (interest)	$0	$0	$0	$0	$6,770	$0	$0	$0	$0	$11,513	$964
U_BD	Lower Bad Debt Written Off	$0	$0	$0	$0	$25,843	$0	$0	$0	$0	$43,072	$3,607
U_SO	Fewer Shutoffs	$0	$0	$0	$0	$3,235	$0	$0	$0	$0	$5,392	$452
U_RC	Fewer Reconnects	$0	$0	$0	$0	($10)	$0	$0	$0	$0	($4)	($0)
U_CC	Fewer Customer Calls	$0	$0	$0	$0	$4,183	$0	$0	$0	$0	$6,943	$582
SOCIETAL / PUBLIC NEBS												
Societal Environmental & Water NEBs												
S_Em	Emissions on Public Illnesses & Deaths	$2,639,590	$650,166	$6,533,270	$111,241	$129,304	$3,500,039	$558,086	$12,126,582	$136,115	$137,172	$46,054
PARTICIPANT NEBS												
Participant Bills / Payment NEBs												
P_SO	Fewer Shutoffs	$0	$0	$0	$0	$969	$0	$0	$0	$0	$1,615	$135
P_Re	Fewer Reconnects	$0	$0	$0	$0	$17	$0	$0	$0	$0	$21	$2
P_BC	Fewer Calls to Utility	$0	$0	$0	$0	$1,534	$0	$0	$0	$0	$2,557	$214
Participant Water Savings												
P_WA	Reduced water / wastewater bills-All Measures	$1,269,645	$60,047	$0	$184,992	$133,301	$3,307,111	$89,756	$0	$267,960	$253,790	$0
Participant Comfort, Health & Safety NEBs												
P_Co	Comfort	$491,207	$120,991	$0	$5,111	$24,062	$532,458	$84,901	$0	$3,730	$20,868	$7,006
P_FF	Fewer fires	$604	$0	$0	$0	$0	$887	$0	$0	$0	$0	$7
P_MW	Fewer Sick days from work	$56,051	$0	$0	$0	$0	$93,272	$0	$0	$0	$0	$1,070
P_MS	Fewer Sick days from school	$9,130	$0	$0	$0	$0	$15,391	$0	$0	$0	$0	$177
P_As	Fewer Asthma Incidences	$35,143	$0	$0	$0	$0	$60,622	$0	$0	$0	$0	$695
P_RA	Reduction in Allergies	$9,368	$0	$0	$0	$0	$13,599	$0	$0	$0	$0	$156
P_CS	Reduction in Cold Symptoms	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
P_Sa	Household Safety	$0	$0	$0	$167	$0	$0	$0	$0	$122	$0	$0
Participant Equipment Performance NEBs												
P_NR	Outside Noise Reduction	$225,842	$0	$0	$0	$27,658	$244,808	$0	$0	$0	$23,986	$8,053
P_NA	Inside Noise Reduction (appliances)	$338,763	$83,442	$0	$0	$22,126	$367,212	$58,552	$0	$0	$19,189	$6,443
P_LQ	Quality / Quantity of Lighting	$282,303	$69,535	$0	$11,940	$27,658	$306,010	$48,794	$0	$20,808	$23,986	$8,053
P_OM	Operations & Maintenance Cost Changes	$0	$0	$0	$5,459	$0	$0	$0	$0	$3,984	$0	$1,380
P_ML	Measure Lifetime / Deferred Purchase	$553,967	$431,641	$0	$6,280	$0	$1,022,677	$545,596	$0	$5,507	$0	$0
P_EP	Improved Equipment Features/ Performance	$225,842	$0	$0	$0	$0	$244,808	$0	$0	$0	$0	$11,194
PM_Mk	Marketability for Property Managers	$0	$0	$0	$174	$0	$0	$0	$0	$155	$0	$0
PM_TC	Reduced Tenant Complaints to Property Managers	$0	$0	$0	$3,357	$0	$0	$0	$0	$2,949	$0	$0
Participant Hardship, Knowledge NEBs												
P_HS	Hardship benefits	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
P_NM	Avoided moves / household impacts	$0	$0	$0	$0	$11,083	$0	$0	$0	$0	$18,472	$1,547

Source: SERA "NEB-It" Computations, 2023

Priority Follow-on Research

One of the objectives of the study was to use the in-depth research to identify gaps and opportunities for future research in the NEBs/NEI area.

- **Behavioral Program**: The behavioral program shows the opportunity to deliver substantial NEBs/NEIs. While the program is likely cost-effective as it is, it may be that identifying NEB/NEI benefits households received from implementing specific tips may help better engage the program's HER recipients into action and gain even greater savings.

- **Primary Research**: Primary research on NEBs/NEIs in the Southeast is not plentiful or robust. A number of benefit categories could not be well-estimated for lack of existing values that could be applied to the Carolinas area. Priority primary research should include:
    - **Program-specific NEB surveys**: Several targeted survey-based NEB/NEI research studies on several key programs, perhaps prioritized for programs with difficulty meeting cost-effectiveness.
    - **Modeling Economic/Job Impacts**: Third party models exist to measure the area's job and economic output effects from programs such as those examined in this study. This work should be conducted, as these have been shown to be substantial benefits. The information on job and economic multipliers in the literature is not easily transferable or useful. That is because the estimates for these NEBs/NEIs must be: 1) conducted for the specific regional job and manufacturing mix, and 2) modeled for each different program type, as the impacts are very different (i.e., labor-intensive weatherization vs. appliance replacement with equipment made overseas).
    - **Arrearages:** Many of the existing arrearage studies in the literature are older, and do not reflect today's penetration of electronic communication in the bill collection and reminder. An arrearage study, covering the impacts on the array of related topics (reduced billing calls, etc.) could better reflect the costs relevant to the Carolinas today.
    - **Utility benefits:** Detailed interviews with utility staff and in-depth review of utility records on some costs and future planning could provide the information needed to develop estimates related to changes in utility system resilience, emergency calls and other utility NEBs/NEIs would help increase the very low utility-specific benefit values estimates in this literature-based study.

- **Estimate NEBs/NEIs for C&I Programs**: Conduct a study parallel to this study, developing literature-and-model-based estimates for a subset of the DEC's and DEP's C&I portfolio. This would allow estimate of near-term values, like this report's estimated values for residential programs, and identify priority gaps and opportunities.

Next Steps

The research team identified recommendations for next steps, stratified into "near term", medium-term; and longer-term phases.

Near term: Work on Near-Term Proxy / Adder Values and Move to Fill Gaps

- Establish a Near-Term Quantitative adder. Duke DEC and DEP should use the information in this study to begin negotiations to establish a near-term adder for programs, with an extra adder for income qualified programs. If possible, build in language to any agreements that anticipates the calculation of individual program-based NEBs, and a process for introducing more specific values into the TRM.

- Implement regular surveying, with specialized survey modules. DEC and DEP should incorporate NEB/NEI questions into evaluation surveys for localized incidence and values for NEBs/NEIs. Some of this work is already in progress.
- Undertake behavioral program research and surveys to gather the inputs needed to compute defensible NEBs/NEIs for this program.
- Conduct a C&I Literature-and-modeling study, parallel to this study, to identify near term multipliers, and identify priority input, value, and data gaps for medium-term research.

Medium Term: Conduct Next Level Studies

- Add surveying in C&I evaluation studies to develop localized incidence and values for NEBs/NEIs
- Model-based economic and job estimation work for Carolinas, and add other credible NEBs/NEIs
- Conduct the other primary studies identified in the previous section including:
    - Jobs / economics
    - Arrearages
    - Utility benefits
    - Roll out additional work conducting measure-based NEB/NEI studies
- Begin to introduce NEB/NEI values into the DEC and DEP TRMs for programs with strong NEB/NEI studies.

Longer Term: Full Implementation of a NEBs/NEIs Protocol

- Continue to build on the near and medium-term activities, expand the DEC and DEP-specific NEB/NEI studies
- Work to introduce measure-based NEBs/NEIs into the TRM.

0.3 Organization of the Remainder of this Report

This report consists of 5 chapters, and four Appendices.

- Section 0 contained the Abstract and Executive Summary, providing background and high-level summaries of the quantitative results and findings
- Section 1 of the report provides an introduction to the Study and its scope
- Section 2 provides a background on NEBs/NEI research, uses, and State Adders
- Section 3 provides a summary of the project's approach and steps
- Section 4 is a lengthier chapter, and presents overview, and then detailed, results for a variety of topics on the NEB/NEI results, including: overall NEB/NEI values by program, results by measure, results by beneficiary / perspective, most valued NEBs/NEIs, ratio of benefits results to estimated program expenditures, ratio of benefits to energy bill savings, and finally, a list of the values for the individual NEBs/NEIs for each program. The detailed results include calculations for 5 years for each program.
- Appendix A includes tables of detailed NEB values by program.
- Appendix B includes tables of detailed results by measures / end use categories.
- Appendix C includes graphs of measure-based results.
- Appendix D provides the values for the individual NEB categories for every program, at both per-participant and the program-wide levels.

1.0 Introduction to the Study

Energy Efficiency (EE) programs are designed to provide energy savings; however, the program interventions also provide a variety of positive and negative effects to various entities beyond energy savings. These entities include the utility or program administrator, program participants, and society. These values are used in cost-effectiveness testing, among other applications. Benefit-Cost Analysis (BCA) Tests are designed to measure program-induced benefits over program-related costs. The inclusion of net NEBs/NEIs in the numerator reduces the bias that result from tests that are calculated including only energy savings as the benefits of programs. These NEB/NEI values also help programs recognize the degree to which their programs lead to effects that provide auxiliary benefits (beyond energy savings) to the utility and its ratepayers, the participants (including vulnerable customer groups), and the region and society.

This study was focused on providing monetized estimates of these NEB/NEI effects for a subset of the Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) Program Portfolio. The eleven programs in the analysis included:

- Smart$aver (DEP & DEC)
- Home Energy House Call (HEHC) (DEP & DEC)
- MyHER (DEP & DEC)
- Multifamily Direct Install (MFDI) (DEP & DEC)
- Income-Qualified Neighborhood Energy Savings (IQ NES) (DEP & DEC)
- Income-Qualified Weatherization (IQWx) (DEC)

The study was designed as a secondary research study that could provide initial NEB/NEI estimates and identify priority areas for future primary research. This study used a variety of sources to develop estimates of the NEBs/NEIs from the selected programs.

- Measure, savings, and participant data for each program, rates, and other data provided by the utilities
- Secondary NEB/NEI literature on total NEB/NEI values and results on program-associated changes in incidence of NEB/NEI effects[9]
- Secondary data on valuations of certain effects, specific to the Carolinas area, including values of average regional medical costs associated with specific types of illnesses whose incidences are affected by the EE programs
- Third party models to monetize the avoided effects from reductions in emissions-induced illnesses and deaths in the region[10]
- SERA's in-house NEB/NEI estimation model, that included calculations for individual NEBs for each program, using assembled results from all these sources and:
    - Developed NEB/NEI estimates for programs, at the household and program level

[9] all housed in SERA's proprietary "NEB-It" database.
[10] Specifically, the EPA's very user-friendly COBRA and AVERT models.

- Disaggregated the NEB/NEI estimates to assign portions to the various measures included in the programs
- Produced tables and graphs for use in developing adders and values by program, NEB/NEI, and measure or measure group

The results are provided in tables and graphics throughout this report and appendices. They are provided in forms useful for Benefit-Cost Tests. However, they are also useful in providing a better understanding of the values – and their sources, in both effects and the underlying EE measure sources - that the programs provide to participants, society, and the utilities, beyond the direct energy savings.

Note that the results in this report are conservative.

- The study was requested under a tight budget, and the scope was limited to secondary sources.
- Some effects were identified as beyond the scope of the study, both for time and budget reasons. Specifically, the study did not model the impacts of economics and job effects.
- Most importantly, the hierarchy of the development of estimates did not always find strong estimates that could be well-adapted to the Carolinas. Therefore, estimates for all NEBs could not be included, leading to an underestimate of NEB/NEI effects.
- The results relate to electricity savings only.

The study is intentionally conservative, but it also identified the priority "next steps" to provide a more complete estimate of the NEBs/NEIs for these and additional programs within the DEC and DEP portfolios.

2. Background on NEBs / NEIs

2.1 Net NEBs/NEIs

Non-Energy Benefits (NEBs) or Non-Energy Impacts (NEIs) have been extensively studied since the 1990s. One key aspect of NEBs/NEIs is their versatility, as they have different applications beyond just energy savings. For example, NEBs/NEIs can be used for marketing and communicating to potential participants the return on investment they can expect from participating in the program. This variety of primary uses of NEB/NEI values is represented in the circle diagram in Figure 2.1.1

Figure 2.1.1: NEB Uses

Source: SERA 2014

Marketing: Including the NEBs/NEIs of energy efficiency programs when marketing to customers utilities will bring the focus beyond energy efficiency to additional items that customers may value, such as comfort, reduced noise, improved productivity, and more. Not only can it be easier to sell the NEBs/NEIs to customers than energy efficiency, but some of the NEBs/NEIs research indicates these auxiliary benefits can be more valuable to the participants than the energy savings. Decision-making at the customer level is based on more than simply energy savings. NEBs/NEIs represent some of these other factors and give a fuller picture of the return on investment that customers consider beyond energy savings.

Program Refinement: NEB/NEI values also provide information useful for refining the program. Participants base their choice of whether to purchase an EE measure or not based partly on the energy savings, but the real decision factor is the "bundle" of assorted features and services associated with the measure. Households or businesses decide on their "return on investment" (ROI), either formally or informally, and decide whether to purchase. Program incentives that are based solely on the energy-based cost-effectiveness may not be well-aligned with this fuller analysis, but monetized NEBs/NEIs (like those in this report) can be used to consider refinements in incentives that take these "bundles" into

account and achieve the desired purchase behaviors. NEB/NEI estimates that are negative[11] can be clear indications of existing program barriers or problems; concerns about the capabilities of in-house custodial or local HVAC firms to properly maintain high-tech HVAC equipment is a relatively common barrier. These negative NEBs/NEIs can directly reflect the dollar value of the barrier and identify the value of additional intervention that it would take to bring potential participants to consider purchasing the measure or participating in the program.

Train the Chain: Similar to marketing applications, NEB/NEI estimates identify factors that are valuable to customers. Making sure the contractors, retailers, and other stakeholders involved in the "chain" of getting measures installed understand these factors will make the program more effective at getting measures installed. Therefore, it is vital to train and educate everyone involved in the program to ensure that the NEBs are understood to better relate the program to factors the customer cares about, not only what the utilities cares about, or what contractors may, mistakenly think customers value most.

Policy progress: Policies and goals are crucial, particularly for low-income customers, as these programs commonly have goals that go beyond energy efficiency and focus on improving quality of life. NEBs/NEIs related to reduction in illnesses, ability to pay other bills, greater home retention, and other categories can reflect these goals. NEBs can also be measured to assess the program's impact on areas such as Greenhouse Gas Emissions, which may be a significant utility goal.

Benefit-Cost Tests / Cost-Effectiveness Tests: NEBs can be used as inputs to traditional Benefit-Cost Tests, which include various tests such as the Utility Cost Test (UCT), the Rate Payer Impact Test (RIM), the Participant Cost Test (PCT), the Total Resource Cost Test (TRC), and the Societal Cost Test (SCT). When conducting a full benefit-cost test, economics would argue strongly that it should not just include energy benefits, but all attributable net program benefits, and these missing items are precisely the monetized NEBs/NEIs. Not all NEBs/NEIs are included in all benefit-cost tests. The specific NEB/NEI categories that should be included in the computation depend on the perspective of the test; for example, NEBs/NEIs realized by society only belong in certain tests. By including NEBs/NEIs in these tests, a more comprehensive assessment of the program's costs and benefits can be achieved. The check marks in Figure 2.1.2 indicate the tests in which NEBs/NEIs reflecting impacts to each of the three beneficiary or perspective categories are included.

[11] Nearly all NEBs/NEIs are positive in the aggregate. However, primary research studies gather information on the range of impacts from participants, and these primary data show the distribution of respondents giving negative responses – and the specific negative dollar value associated with the barrier. These dollar values can be used to assess the "amount" of intervention (say, a bought-up warranty, free repair visit or larger rebate) that might bring the barrier to neutral and get the measure adopted. See Skumatz 2006 and after.

Figure 2.1.2: NEBs/NEIs included in Cost-Effectiveness Tests Based on Beneficiary/Perspective

C/E Tests across, perspective down	UCT/PAT	RIM	PCT	TRC	SCT
Utility NEIs	☑	☑		☑	☑
Societal NEIs					☑
Participant NEIs			☑	☑	☑

Source: Skumatz and Gibbs, "NEBs/NEIs: Analysis of Alternatives for Updates for the State of NJ", 3/7/23 And Skumatz and Gibbs EEDAL 2022, Skumatz and Vander Vliet 2021 and earlier

2.2 Why NEBs Are Used

While many studies focus only on energy benefits, incorporating NEBs provides a more comprehensive and less biased assessment of the program's costs and benefits. Instead of considering only some benefits over all costs, basic economics suggests that all attributable benefits should be weighed against the cost to calculate a real benefit-cost ratio that guides decision-making in a less biased way. By assuming that other benefits are zero because they are traditionally harder to measure, the ratio becomes biased. Therefore, it is crucial to include NEBs in the analysis to obtain a more accurate picture of the program's benefits and costs.

The challenge is that there were not many NEB/NEI studies available initially, leading to a chicken and egg problem. These benefits were excluded because they were harder to measure, such as comfort, job effects, and illness effects. However, without applying these benefits to important areas and providing funding to support studies, there weren't many studies available. Over time, the body of research has grown, and there are now hundreds of serious studies that use scientific statistical principles that can now be considered as supporting information for use in benefit cost analysis. Despite this progress, there are still multiple barriers to the use of NEBs/NEIs more widely.

2.3 Barriers to Universal Use of NEBs

NEB/NEI Study Cost: One of the key barriers is the concern that NEB/NEI studies may be expensive. However, costs can be reduced by including NEBs' studies as part of the normal evaluation process (including NEB questions in the normal process or impact evaluation surveys), evaluating the transferability of existing studies for some NEBs/NEIs, and focusing on local studies that fill gaps that are applicable to the program. New, well-vetted models are also available to estimate effects that used to be more expensive to estimate at a local level.[12]

Increases in Program Budgets: NEBs/NEIs will tend to increase the benefit-cost ratio associated with individual measures, programs, or portfolios. Adding a positive number (like the NEB/NEI value) to the numerator, with no change in the denominator, will increase the business cost ratio (BCR, or the state's

[12] Specifically, reduced emissions and societal illnesses now easily measured using COBRA and AVERT; and IMPLAN and RIMs II for economic effects.

selected cost-effectiveness test). If state policy requires all measures or programs with a BCR>1 to be funded, then including NEBs will increase the program budgets. However, for other states, the policies require that the funded measure / programs / portfolio must have a BCR >1 and in that case, including NEBs/NEIs will not necessarily increase the program budget. What including NEBs/NEIs will do is reorder the program priorities within that established total portfolio budget. If the state is in the first case, then the best approach may be to have the BCR that includes NEBs be a secondary metric, advising priorities.

Transferability Concerns: There is a robust literature to support the inclusion of NEBs in the analysis, and values from hundreds of studies. However, some jurisdictions have been concerned that values used from other studies may not be "transferable" to the local program or location, and that local studies may be expensive. Some values should be locally derived, but many others can be borrowed from other studies. This is particularly true for measure-based NEBs/NEIs, and incidence changes, and other NEBs/NEIs. As mentioned before, localized model-based values can be developed inexpensively. Finally, many NEB/NEI values from other studies can be "localized" by applying multipliers related to price inflation, regional cost differences, and other simple normalizing factors. Many NEBs/NEIs are transferable, or adjustable; others need local estimation work. Economic / jobs impacts need this type of local estimation work.

Complicated Processes, Resistance to Changes, and Inertia: Benefit-cost tests, their inputs, and algorithms are hard-fought negotiations with multiple stakeholders. Changes in inputs or policy like that involved with NEBs/NEIs can be a daunting process to consider undertaking. However, more than two-dozen states have moved in this direction, and the literature is there to reduce the existing bias in those State's cost-effectiveness test that are calculated excluding NEBs/NEIs.

Perceived Riskiness of NEBs/NEIs and Resistance to Include "Soft" Benefits: Some NEB values are based on surveys, while some values monetize operations / maintenance savings and others represent "softer effects like comfort." Many inputs used in the existing benefit-cost tests are also based on surveys, including net-to-gross, measure lifetimes, and other values. In addition, net-to-gross is a concept based on surveys with hypotheticals about what the customer would have done without the program's influence. The methodologies used to estimate NEBs are comparable or stronger than those used for other values that are already accepted into the State's cost-effectiveness tests.

2.4 State Treatment of NEBs/NEIs and State Adders

States have used different methods to integrate NEB/NEI values into their cost-benefit equations. The options, ranging from least-analytic to most analytic or study-based, are listed below:

- "Adders", or pre-established, are deemed multiplicative or additive factors standing in as proxies for some set of omitted NEBs/NEIs. The deemed values may be established uniformly for all programs, or have separate deemed values for electric or gas, and residential, commercial, or low-income programs.
- "Easily quantified" are very direct and easily calculated or demonstrated values are accepted.
- Hybrid are when states may use a combination of some base "adders" plus measured values.

- Full Measured / quantified NEIs/NEBs are when the state conducts NEB/NEI studies for programs as part of its evaluation protocols.

The most common of these approaches is the use of adders. Approximately half the states in the US have some form of adder. A few examples include Colorado, Washington DC, Illinois, Maryland, Oregon, and Vermont. There is continual change in the application of NEBs/NEIs in states; new states are considering NEBs/NEIs and states with NEBs/NEIs are constantly updating their NEB policies. Examples of some using "easily quantified" NEBs/NEIs include Oregon, and others using measured / quantified NEBs/NEIs include Massachusetts, which includes an extensive set of values in its Technical Reference Manual (TRM).

The NEB adders across states for electricity, gas, and low-income average at 12%, 11%, and 13%, respectively. These adders allow a simple, low cost, and predictable way for the non-energy effects associated with the programs to be incorporated into the benefit side of the BCA equation. Figure 2.4.1 shows the range and average for the values for states with multiplicative adders. The range is quite broad, with the lowest being in New Jersey and the highest in Washington D.C.

Figure 2.4.1: Average and Range of Multiplicative NEB/NEI Adders in US States

	Electric	Gas	Extra Adders for Low Income (added to base)
States with Percent Adders	14	14	5
Average Percent Adder	12%	11%	13%
Range	5-30%	5-30%	10-15%

Source: Skumatz and Gibbs, "NEBs/NEIs: Analysis of Alternatives for Updates for the State of NJ", 3/7/23

The "adder" approach is valuable in reducing the bias in cost-effectiveness tests for measures, programs, or portfolios, because it includes a non-zero value for a set of omitted impacts that is not zero. However, the adder approach suffers from several main weaknesses, each of which are addressed by moving toward including directly measured NEBs/NEIs, measured as a part of the normal program evaluation protocols.

- Many of these adders were negotiated values and were not based on measured values associated with a clearly laid out list of NEB/NEI factors.
- Initial adder values were developed more than a decade ago, and have been adopted in additional states over time, often by negotiated process rather than direct measurement.
- Older adder values may have been based somewhat on direct estimates and the literature available at the time; however, the literature on NEBs/NEIs has expanded manyfold since these multipliers were assigned. Upgraded estimates are available for values that were included in early literature, and many more NEBs/NEIs are now routinely, consistently, and reliably measured, adding to the citable values that could be incorporated if multipliers were negotiated based on the newer base of literature.

As a consequence, the NEB/NEI adders in use in the states significantly understate the NEB/NEI values that would be estimated from direct estimation work. Based on work by the authors[13], the adders may not dramatically understate the utility-side benefits, but using average values from nationwide literature, the sum of the research-estimated values for NEBs/NEIs that could be included in the societal NEBs/NEIs, and the participant NEBs/NEIs are both multiple times the adder values represented in the tables above. This work indicates that the adder values have not kept pace with the citable body of literature.

Finally, not all estimated NEBs/NEIs should be included in all cost-effectiveness tests. The most important things to remember regarding inclusion of NEBs/NEIs in program cost-effectiveness are that:

- The included NEBs/NEIs must be relevant to the perspective or beneficiaries that the test reflects; societal NEBs/NEIs are excluded for all except the SCT test; utility values are included in the UCT, TRC, and SCT; and participant NEBs/NEIs are included in the SCT and TRC and PCT. The full mapping for the Five California tests is included in the checkmark figure above.
- The included NEBs/NEIs within the perspective will also be influenced based on the State's policies.

[13] see several 2019-2023 ECEEE, ACEEE, and IEPEC papers by Skumatz and Gibbs

3.0 Project Approach

3.1 Project Background and Approach Summary

The project's objective focused on developing NEB/NEI estimates for Duke Energy Carolina (DEC) and Duke Energy Progress (DEP) for a wide range of residential and multi-family programs. The Duke Energy Carolina and Duke Energy Progress residential and multifamily NEB estimates cover values applicable to the UCT and TRC (the primary tests of interest), as well as values applicable to the SCT. The programs studied, and their key measures, include:

- Residential Smart $aver Energy Efficiency Program, which focuses on high efficiency central air conditioning and heat pump systems, attic insulation and sealing, heat pump water heaters, and high efficiency pool pumps.
- The Home Energy House Call Energy Assessments provide energy saving tips along with an energy efficiency start kit including energy efficiency lighting, low-flow water measures, and pipe wrap.
- MyHER behavioral program focuses on feedback on usage and tips delivered through home energy reports.
- Multifamily Direct Install aims to decrease energy consumption in multi-family properties by providing energy-saving lighting and water measures, such as low-flow faucet aerators and showerheads, and pipe wrap.
- Neighborhood Energy Saver, which addresses income qualified customers by providing personalized energy efficiency assessment of their homes and a comprehensive set of energy-efficient measures that include energy efficient lighting, low-flow water measures, HVAC winterization kits and filters, and weather-stripping measures.
- Low Income Weatherization Assistance Program provides funding for qualified customers to help with the repair or replacement of weatherization measures, heating systems, and refrigerators.

To provide values of use to the requirements of the UCT and TRC, the study needed to estimate a broad range of NEBs for these programs. This literature-and model-based study prioritized using input from the Southeast and national sources and relied on Duke Energy's data as much as possible. However, the study faced some challenges in obtaining sufficiently reliable NEB/NEI data in some cases. Specifically, sufficiently reliable literature could not be found to support participant, social, or utility side estimates for Home Energy Reports (HER) or pool pumps, except for energy savings.

As mentioned, the study did not include collecting primary data from the field; the scope called for the NEBs/NEI research to be based on existing literature. The major steps are illustrated in Figure 3.1.1 below.

The researchers prepared data requests to the utilities to make sure the study would incorporate the specific types of measures installed, the number installed under the program, the number of participants, and data to support calculation of the program's savings and bill savings and other

information. These factors are essential to provide local, program-tailored NEB/NEI estimates. Then SERA used its "NEB-It" database[14] to assemble the "best" NEB value or input data available from the available literature on NEBs. In selecting values or inputs (used for multi-step NEB calculations) from the literature, the researchers used a variety of criteria and a hierarchy: data needed to be from a similar program and measures; be measured with strong underpinnings, be within the ranges of the bulk of the literature, be a clear and primary NEB/NEI[15], and be well-accepted in the literature. The hierarchy looked for Carolinas' data first, and if that wasn't available, then the EPA region was reviewed, and then national NEB/NEI data or inputs. Carolinas-specific data were gathered from secondary sources for several NEBs/NEIs. In particular, the MEPS survey provides state-specific average data on the cost of doctor and hospital visits and other medical costs associated with a series of specific illnesses. Incidence changes in terms of changes in the numbers of asthma attacks may be based on a similar program for another state, but the valuation of the associated medical costs is local. Similarly, the COBRA and AVERT models were used to estimate the value of societal illnesses and deaths avoided from lower emissions and the estimated values take specific account of the generation mix for the Carolina utilities.

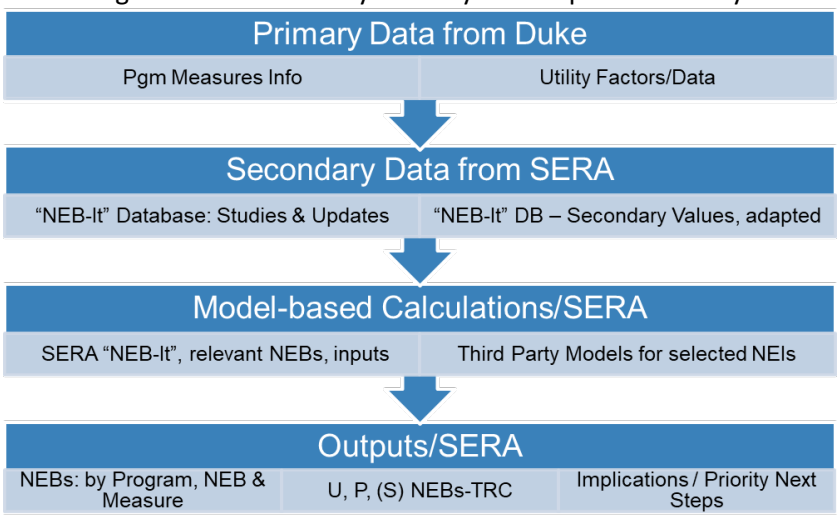
SERA's "NEB-It"[16] estimation model assembles the inputs from primary and secondary sources for each program and each NEB. The model then calculates the NEBs for the program, attributes NEB/NEI values to the program's measures, and prepares the graphics and tables shown in this report. SERA staff identified the best primary or secondary value for each individual input for each individual NEB/NEI calculation for each program – from among the array of values available from the literature and included in the database. The project also noted priority gaps for use in future work.

[14] SERA's "NEB-It" database contains the results of a comprehensive US and international literature review of NEBs/NEIs literature. The review examined 1800 studies, and found 800 had relevant, quantitative NEB information – either values or inputs. The NEB-It database includes the values from more than 550 of the highest prioritized, most robust, data-rich studies, and the database contains 44,000 lines of data. This database is continually updated and is current through 2022 studies.

[15] A primary NEB/NEI means an effect caused directly and immediately by the program's intervention or measures. NEB/NEIs that have steps-removed effects include, for instance, high energy bills can be a major factor in lower income residents having to change residences / move. Frequent moves have been linked to higher dropout rates for children, and dropouts have lower earnings for life. The authors have estimated these impacts for other studies. This is a very important effect, for hardship and policy reasons, but this study focused on conservative, direct NEB/NEI categories.

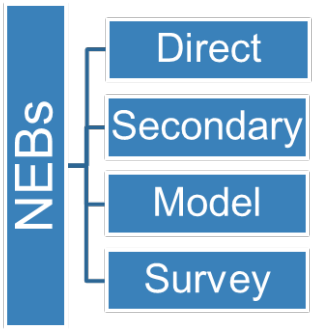
[16] This SERA "NEB-It" model, developed in 2000 and continually enhanced, and then overhauled in 2021, supports estimation of more than 100 NEB categories, covering residential and commercial programs, and reports results at the NEB and measures level for each program modeled. It links to the SERA "NEB-It" database to allow speedy and well-documented estimation of NEBs. The model defaults to secondary information if primary information is not available.

Figure 3.1.1: Summary of Analytical Steps in the Study



3.2 Modeling Individual Nebs – Four Main Measurement Approaches

There are four main methods for measuring NEBS individually, and most are incorporated into the NEB-It model, depending on which approach represents best practice for each specific NEBs. The first method is through direct measurement, which involves using corporate records or utility data such as an arrearage study to provide information on NEBS. Because DEC and DEP did not have a direct arrearage study, the model was set to use the "secondary" method for this NEB/NEI category.



The second method involves the use of secondary data and uses a two-step formula. It uses an estimate of the change in incidence due to the program's intervention (such as changes in the frequency of a particular illness due to the program) and multiplies it times the most relevant "valuation" for each change in incidence (e.g., cost of each occurrence of that illness). This method can also include financial calculations. This is one of the most common estimation methods used in the "NEB-It" model, allowing transfer of "incidence changes" from other programs, multiplied times localized valuation figures. Almost no information can be taken directly from the literature without adjusting or localizing work; for example, some studies are for an earlier period and need inflation adjustments.

The third method is model based, which uses well-vetted third-party models to estimate NEBs/NEIs for a specific state or utility territory. The two most common NEBs/NEIs to be estimated with model-based approaches are jobs or economic effects, and emissions and their effects on societal health. When these NEBs/NEIs are included in the study, the values are modeled outside the "NEB-It" model, usually in a normalized form. That is, the impact on social health is estimated for 1000 kWh. Then the values are transferred into the spreadsheet tab sheet associated with the relevant NEB/NEI, and multiplied times the savings relevant for the program being modeled.

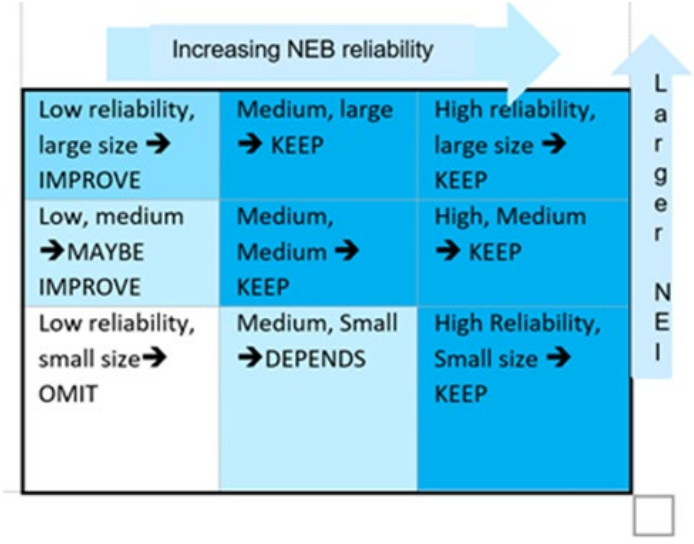
The fourth method is based on survey results that are used to estimate certain types of NEBs/NEIs. Some NEB/NEI effects are best valued based on perceptions: changes in comfort, noise, or other effects derived from installation of energy efficient measures relative to the baseline of a standard efficient piece of equipment. The most common approach for these survey calculations end up reporting the results in terms of the relative value of the NEB/NEI (say, comfort) relative to the bill savings attributable to the program. In this form, the "multiplier" results from the most similar program found in the literature are entered into the model, and are multiplied times the calculated bill savings from the specific Carolina program.

The last three approaches were used for various NEBs/NEIs estimated in the "NEB-It" model for this project.

3.3 Selection of NEBs/NEIs For the Duke Programs

Working with DEP and DEC staff, the research team determined that, to keep the study within scope, budget, and time, certain criteria would be considered before undertaking extensive research to estimate all possible NEBs/NEIs. The NEBs to be retained in the estimation work were those NEBs/NEIs in the upper right triangle (darker colors). They are the NEBs/NEIs with the highest reliability and greatest magnitude, as these are the most important ones to focus on. Conversely, in the lower left cells, where the NEBS have lower reliability and smaller magnitudes, the study would not dedicate as much time or resources. Reliability tends to correlate with having multiple studies available in the literature, so the focus on reliability also tends to correlate with keeping the list of NEBs/NEIs conservative.

Figure 3.3.1. NEB/NEI Include / Exclude Criteria for the DEP/DEC study



Another check on the NEBs/NEIs to retain in the analysis came from the staging of the project. In the initial stage of the project, SERA submitted program data requests to Duke, enabling SERA to understand the program's foundational data available to support the work, and identify the energy and bill saving and other effects from each program. SERA then modeled the first program using existing literature and

models and reviewed it with Duke to make necessary adjustments and review the included / excluded NEB/NEI categories. SERA also used this first program (and the later draft results on the other programs) to identify the most useful missing data elements and discussed what might still be available from the utilities. Then SERA then proceeded to model the remaining programs. These results were reviewed with staff and the stakeholder committee. Finally, SERA reviewed the priority gaps in the NEB/NEI estimation work that could be filled using primary or other data collection in follow-up work.

4.0 QUANTITATIVE NEB/NEI RESULTS

4.1 Summary of Results by Program

The NEB modeling work provided average NEB/NEI values for the participating households, and program-wide, calculated as the household results times number of participants). The appendices and later sections show the results for each year of the five-year period studied. For simplicity, this summary section focuses on year five results, 2023.

Results Per Participant

Figure 4.1.1 shows the estimated total NEB/NEI value per household, and the colors in the bar represent the NEBs/NEIs from different perspectives.

- The bottom color (usually very small), represents the utility NEBs/NEIs
- The middle color represents the participant NEBs/NEIs
- Societal NEBs/NEIs are the top color in the bar.

Recall that the bottom two – the utility and participant NEBs/NEIs – represent the values that would be included in a TRC cost test calculation. The total of all three colors would be used in an SCT Test computation. Therefore, for cost-test purposes, the NEB totals discussed in this section focus on either the total height of the bar (SCT), or the height excluding the top color (TRC).

The results in the Figure are sorted from the program with the highest estimated NEB/NEI values per household on the far left, to the lowest. The three columns at the far right reflect:

- The overall average, including all programs in the list.
- The average for DEC programs, excluding DEC's IQWx program, because there is no comparable program for DEP.
- The average for the DEP programs.

Figure 4.1.1: NEBs/NEIs by Program and Perspective, per participant, 2023

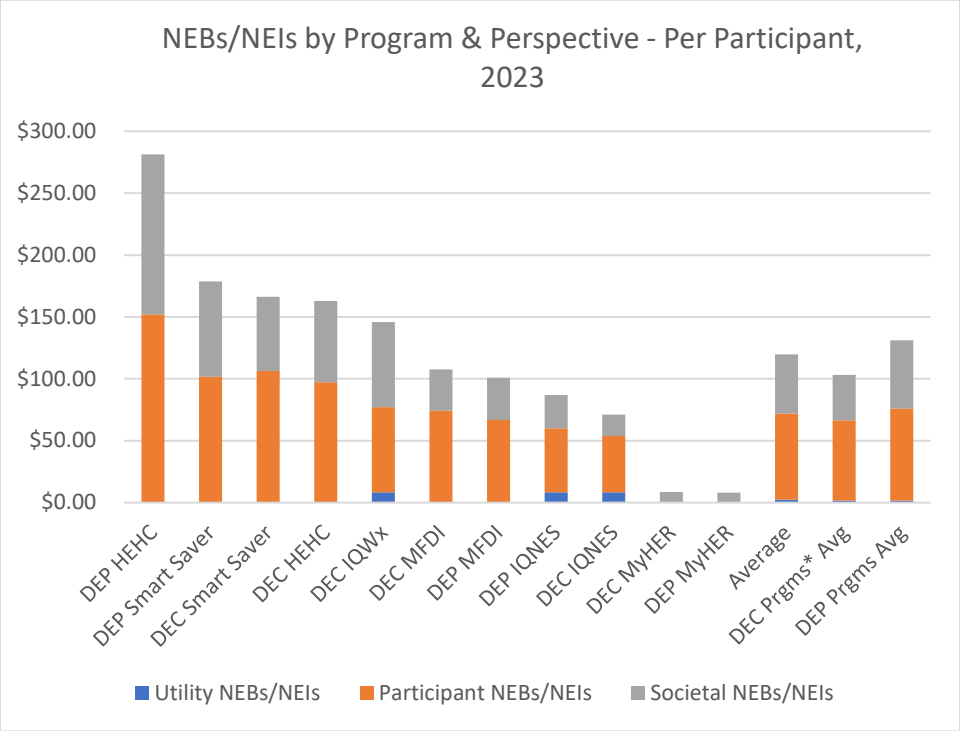


Figure note: (*) DEC programs average excludes DEC IQWx to facilitate comparison with DEP (No IQWx for DEP)
Source: SERA "NEB-It" Computations, 2023

Range: The values range from about $280/year including all three NEB/NEI categories (used in the SCT), to very small values (about $8). The NEBs/NEIs excluding the top color band are those relevant to the TRC, and these values range from about $150 to about $50/year and again, about $8 for MyHER. Note the dollar values are presented in a table below.

High Values – Programs with weatherization and water measures tend to have higher estimated benefits in this study. The highest value NEB/NEI values are delivered by the HEHC programs, which provide participants with a kit that includes lighting, water measures, pipe wrap and other measures. The other high-NEB/NEI program is the Smart$aver program, which provides participants with air conditioning, heat pump, attic insulation, water heating and other measures. The other program resulting in high per-household NEBs/NEIs is the DEC-specific program, Income-qualified Weatherization, which includes repair/replacement of HVAC, refrigerators, and weatherization measures.

Low Values – MyHER programs have not been studied enough: The programs delivering the lowest estimated per-household NEBs/NEIs are the MyHER programs. This is not because the programs do not deliver NEBs/NEIs. The low value results from no high-quality studies that have estimated the NEBs/NEIs from these programs. Recall that the MyHER program is a tips and feedback-based behavioral program. A variety of behavior changes can be made by any participating household, and in many cases, any measures purchased because of hints from these programs may be logged under other programs that the MyHER program information may have directed participants to. The variety of

actions and these possible interactions make NEB/NEI studies complicated for this sector, and NEBs/NEIs have not yet been a focus for these programs. The only NEBs/NEIs that this study estimated were the societal health effects, which are calculated using only the energy savings from these programs, and the generation-created emissions avoided. However, note that these societal NEBs/NEIs are not relevant for the computation of the UCT or TRC, and are only relevant for the SCT computations.

Averages – DEP Programs generally delivered more per-participant benefits than DEC from the programs: A review of the three right-hand columns indicates that the average TRC-relevant NEBs/NEIs for the programs is about $120/participant household (HH) per year, and about $70/HH/year for TRC purposes. The figure also shows that, on average, comparing the programs that the two utilities both deliver, the DEP-delivered programs deliver higher values of NEBs/NEIs per household per year than do the DEC programs, for both the SCT and TRC calculations. The direction is not universal; there are some programs for DEP that exceed the NEBs/NEIs compared to DEC, but others deliver approximately the same NEBs/NEIs.

Program-Wide Results

Figure 4.1.2 shows the same information as the previous Figure, except it represents program-wide results, or the total of the household results multiplied times the number of participants in the programs.

Here, the rankings and results differ substantially from the per-household results. These two most important variations include:

- **MyHER has so many participants it delivers the most benefits program-wide**: MyHER brings the highest value of NEBs/NEIs; however, the values are only relevant for SCT computations, as they are purely societal NEBs/NEIs. Although the per-participant values were the lowest, these programs have far more participants than any of the other programs. Recall that only one NEB/NEI could be estimated in this literature-based study. A NEB/NEI study of this program is a recommended future priority.
- **DEC has more program participants than DEP, making per-program average benefits about the same for the utilities:** The averages for DEC and DEP programs are very similar. Recall that the per-household NEB/NEI values for DEC were lower than DEP. The results for program-wide values indicate that DEC programs have more participants than DEP.

Figure 4.1.2: NEBs/NEIs by Program and Perspective, Program-wide, 2023

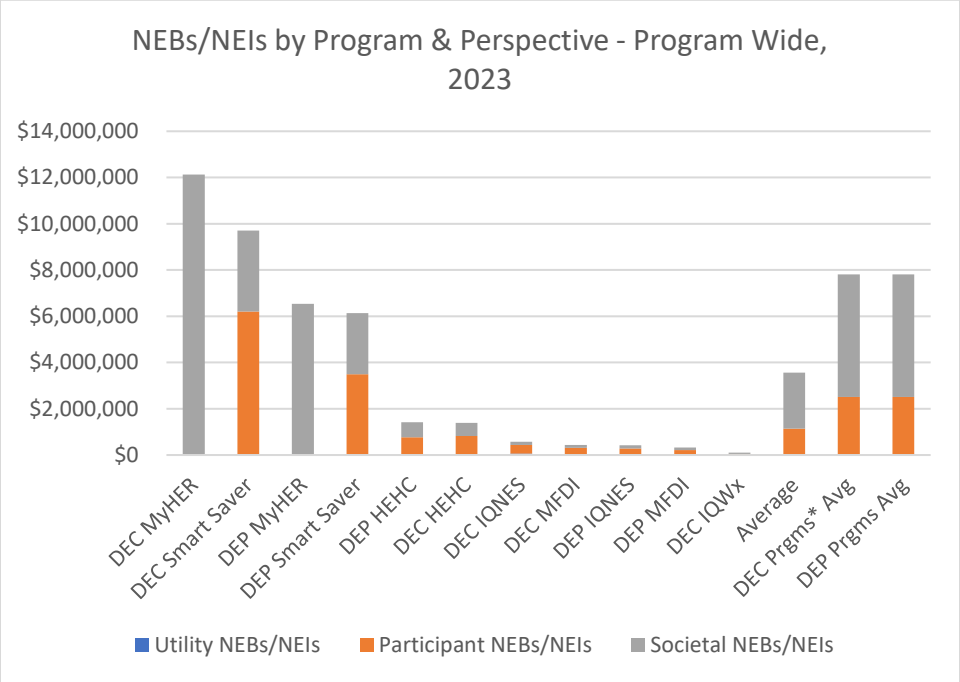


Figure note: (*) DEC programs average excludes DEC IQWx to facilitate comparison with DEP (No IQWx for DEP)
Source: SERA "NEB-It" Computations, 2023

Most Valuable Individual NEB Groupings by Program

Figure 4.1.3 lists the most valuable individual benefit categories for each program. The NEB category with the largest percentage of value is listed in descending order for each program. The highest benefit values tend to come from societal emissions, participant equipment performance, and participant water savings. Water savings brings high value due to the number of aerators and low-flow showerheads installed in these programs, valued at the water rates relevant in the Carolinas. Comfort is also valued highly, usually due to HVAC and smart thermostat measures delivered in the programs.

Figure 4.1.3: Largest Value NEBs/NEIs for Each Program Studied

DEP Smart$aver	DEC Smart$aver	DEP HEHC	DEC HEHC
Societal Environmental & Emissions NEBs	Societal Environmental & Emissions NEBs	Societal Environmental & Emissions NEBs	Participant Equipment Performance NEBs
Participant Equipment Performance NEBs	Participant Water Savings	Participant Equipment Performance NEBs	Societal Environmental & Emissions NEBs
Participant Water Savings	Participant Equipment Performance NEBs	Participant Comfort, Health & Safety NEBs	Participant Water Savings
Participant Comfort, Health & Safety NEBs	Participant Comfort, Health & Safety NEBs	Participant Water Savings	Participant Comfort, Health & Safety NEBs

DEP IQ NES	DEC IQWx	DEP MyHER
Participant Water Savings	Societal Environmental & Emissions NEBs	Societal Environmental & Emissions NEBs
Societal Environmental & Emissions NEBs	Participant Equipment Performance NEBs	
Participant Equipment Performance NEBs	Participant Comfort, Health & Safety NEBs	
Utility Customer Service and Payment-Related	Utility Customer Service and Payment-Related	
Participant Comfort, Health & Safety NEBs	Participant Hardship, Knowledge NEBs	
Participant Hardship, Knowledge NEBs	Participant Bills / Payment NEBs	
Participant Bills / Payment NEBs		

Source: SERA "NEB-It" Computations, 2023

Ratio of NEB/NEI Results to Program Investment and Savings

Figure 4.1.4 shows the benefits totals on a per-household basis on the left, and program-wide on the right. The programs for each section are sorted from largest to smallest on the basis of the total NEB (SCT) column. The two NEB/NEI columns are, respectively, the TRC total (including utility and participant), and the SCT total, which includes all three perspectives (utility, participant, and societal). Two new columns are introduced. The first is an estimate of the program expenditures, and the second is an estimate of the value of the bill savings from each program. One finding from the computations and averages is that, *considering only the subset of NEBs/NEIs that were estimated in this study*:

- On average, DEP received higher benefits per participating household that the DEC programs
- On average, DEC programs recouped greater benefits program-wide than the DEP programs.
- The DEP programs spent somewhat more per household on the programs (expenditures column)
- The DEP programs achieved substantially more bill savings per household across the same program list as did DEC
- Program-wide, DEC programs achieved higher NEIs, for somewhat higher expenditures overall, and slightly higher bill savings in total.

Figure 4.1.4: Total NEB/NEI values for the Programs for Program Year 5 (2023), Sorted. Results Presented Per Participating Household and Program Wide.

Year 5 2023	Per Household				Program-Wide				
Program, sorted by Total NEB	TRC NEB	Total NEB (SCT)	Expendi-tures (est)	Bill Savings	Program, sorted by Total NEB	TRC NEB	Total NEB (SCT)	Expenditures (est)	Bill Savings
DEP HEHC	$152	$281	$690	$276	DEC MyHER	$0	$12,126,582	$5,769,725	$21,204,672
DEP Smart S	$102	$179	$314	$164	DEC Smart S	$6,208,855	$9,708,894	$14,389,085	$6,120,205
DEC Smart S	$106	$166	$246	$105	DEP MyHER	$0	$6,533,270	$3,400,677	$13,974,590
DEC HEHC	$97	$163	$499	$115	DEP Smart S	$3,497,864	$6,137,454	$10,800,880	$5,646,054
DEC IQWx	$77	$146	$1,455	$120	DEP HEHC	$765,655	$1,415,821	$3,472,258	$1,390,698
DEC MFDI	$74	$108	$119	$58	DEC HEHC	$827,600	$1,385,685	$4,244,919	$975,874
DEP MFDI	$67	$101	$139	$73	DEC IQNES	$431,401	$568,573	$5,126,446	$239,860
DEP IQNES	$60	$87	$531	$58	DEC MFDI	$305,216	$441,331	$487,129	$238,013
DEC IQNES	$54	$71	$641	$30	DEP IQNES	$288,429	$417,733	$2,550,986	$276,579
DEC MyHER	$0	$9	$4	$15	DEP MFDI	$217,480	$328,721	$452,592	$237,944
DEP MyHER	$0	$8	$4	$17	DEC IQWx	$51,736	$97,790	$974,522	$80,531
Average	$72	$120	$422	$94	Average	$1,144,930	$3,560,169	$4,697,202	$4,580,456
Avg DEC Prgms*	$66	$103	$302	$64	Avg DEC Prgms*	$1,304,134	$4,054,809	$5,165,304	$4,809,859
Avg. DEP Prgms	$76	$131	$336	$118	Avg. DEP Prgms	$953,886	$2,966,600	$4,135,479	$4,305,173
DEP/DEC	115%	127%	111%	182%	DEP/DEC	73%	73%	80%	90%

Table note: (*) DEC programs average excludes DEC IQWx to facilitate comparison with DEP (No IQWx for DEP)
Source: SERA "NEB-It" Computations, 2023

Figure 4.1.5 below uses the data in the previous table to compute ratios of NEBs per Expenditure, and NEBs per energy savings, or the amount of extra benefits that households receive relative to the energy savings delivered but each program. Recall that these results are contingent on the subset of categories of NEBs that could be estimated by the program. The Figure is sorted by the last column and highlights the highest four values in each column. Results for both TRC-based benefits and SCT benefits are computed. The results show:

- **MFDI and Smart$aver deliver the highest NEB/NEI Return per Program Dollar:** The MFDI and the Smart$aver programs deliver the highest values for NEB/NEI return on dollars spent on the program (based on the NEB/NEI categories estimated in this study). When Societal benefits are added (SCT), the highest return is from the very-low-cost MyHER program; note, for these programs only the social health benefits were calculated.

- **NEB/NEI benefits are more valuable than savings for most programs:** The programs that have highest ratio of benefits to bill savings are the Income-Qualified NES program, and DEC's MFDI and Smart-Saver Programs. In each case, these benefits had greater dollar value than the energy or bill savings delivered to households. Note that this ratio of greater than 100% ratios to energy savings are also evident in the last SCT column where all but the MyHER program for both utilities show the NEBs/NEIs delivered are more valuable to households than the energy savings.

.

Figure 4.1.5: NEB Approximate Return on Program Investment (Expenditure), and NEB compared to Bill Savings for TRC NEBs and Total NEBs (per participating household analysis)

Per Household Program, sorted by Total NEB/Savings	TRC NEB/ Expend	TRC NEB/ Energy Savings	Tot NEB (SCT)/ Expend	Tot NEB (SCT)/ Energy Savings
DEC IQNES	8%	180%	11%	237%
DEC MFDI	63%	128%	91%	185%
DEC Smart$aver	43%	101%	67%	159%
DEP IQNES	11%	104%	16%	151%
DEC HEHC	19%	85%	33%	142%
DEP MFDI	48%	91%	73%	138%
DEC IQWx	5%	64%	10%	121%
DEP Smart$aver	32%	62%	57%	109%
DEP HEHC	22%	55%	41%	102%
DEC MyHER	0%	0%	210%	57%
DEP MyHER	0%	0%	192%	47%
Average	23%	79%	73%	132%
Avg DEC prgms*	27%	99%	82%	156%
Avg DEP prgms	23%	63%	76%	109%
DEP/DEC	85%	63%	92%	70%

Table note: (*) DEC programs average excludes DEC IQWx to facilitate comparison with DEP (No IQWx for DEP)
Source: SERA "NEB-It" Computations, 2023

Detailed analyses of the individual values for each program across five years are provided in Section 4.2.

4.2 Detailed NEB/NEI Results by Program

The results of the NEB or NEI value and energy savings for each program modeled are shown in the following figures. The results in Figure 4.2.1 show the NEB or NEI value is near or greater than the energy savings for every program. Additionally, for the income-qualified programs, the NEB value approaches almost double the energy savings, which is a typical result for low-income programs. The multicolored bars on the left of each pair represent the different NEB categories, while the solid green bars represent the energy savings of each program. The non-income qualified programs, Smart$aver and Home Energy House Call, are shown first, followed by My Home Energy Report and the Multi-Family Direct Install program. The three income-qualified programs, Neighborhood Energy Saver and Income-Qualified Weatherization are on the far right. The DEP and DEC programs are graphed next to each other for each program.

Figure 4.2.1: NEB/NEIs & Energy Savings by Program 2023 – Results Per Household

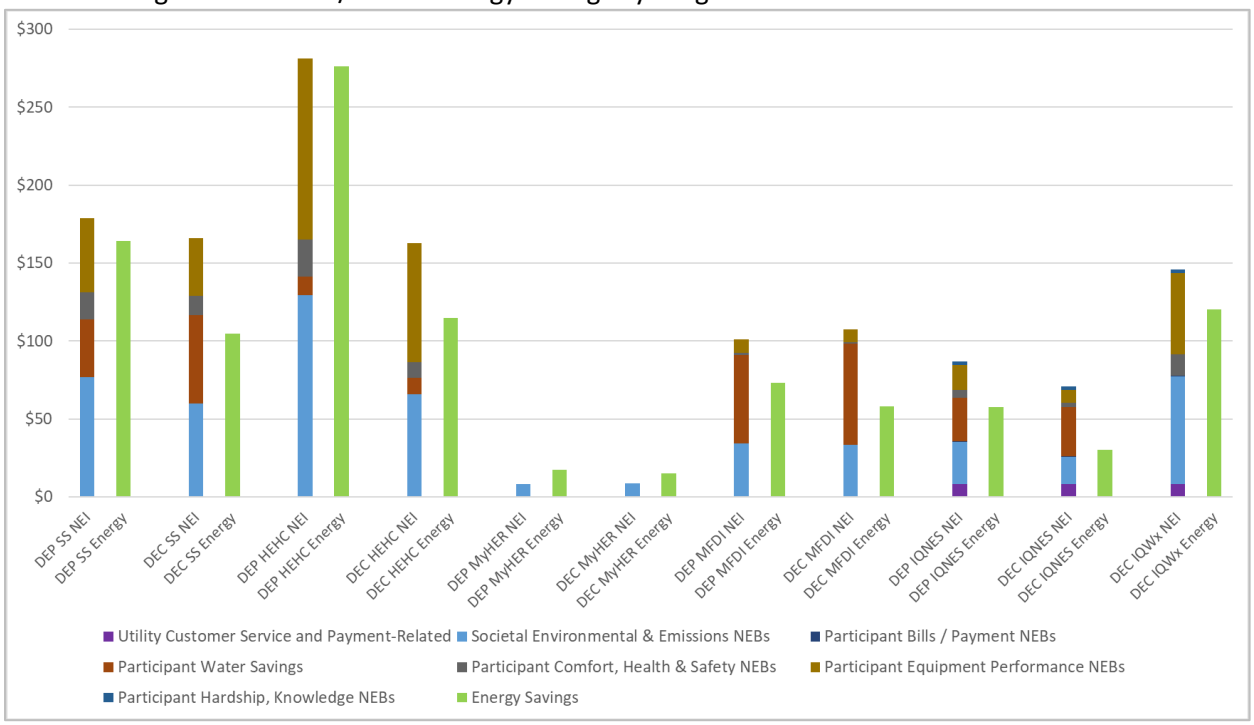


Figure Notes: Results are shown for Year 5 (2023). X-axis labels are as follows: DEP Smart$aver NEI Value, DEP Smart$aver Energy Savings, DEC Smart$aver NEI Value, DEC Smart$aver Energy Savings, DEP Home Energy House Call NEI Value, DEP Home Energy House Call Energy Savings, DEC Home Energy House Call NEI Value, DEC Home Energy House Call Energy Savings, DEP My Home Energy Report NEI Value, DEP My Home Energy Report Energy Savings, DEC My Home Energy Report NEI Value, DEC My Home Energy Report Energy Savings, DEP Multi-family Direct Install NEI Value, DEP Multi-family Direct Install Energy Savings, DEC Multi-family Direct Install NEI Value, DEC Multi-family Direct Install Energy Savings, DEP Income Qualified Neighborhood Energy Saver NEI Value, DEP Income Qualified Neighborhood Energy Saver Energy Savings, DEC Income Qualified Neighborhood Energy Saver NEI Value, DEC Income Qualified Neighborhood Energy Saver Energy Savings, DEC Income Qualified Weatherization NEI Value, DEC Income Qualified Weatherization Energy Savings. NEI's listed from bottom to top: Utility Customer Service and Payment-Related; Societal Environmental & Emissions NEBs; Participant Bills / Payment NEBs; Participant Water Savings; Participant Comfort, Health, & Safety NEBs; Participant Equipment Performance NEBs; Participant Hardship, Knowledge NEBs.
Source: SERA "NEB-It" Computations, 2023

Figure 4.2.2 shows the value of each program on a program-wide basis without including the energy savings. The Smart$aver and MyHER Programs have significantly higher program-wide NEB values compared to the other programs. This outcome is largely due to high participation rates in these programs. The program-wide results are the per household results multiplied by the number of participants. Utility benefits are not visible in this figure and are expected to be small.

Figure 4.2.2: NEB/NEI Value by Program - Program Wide Results

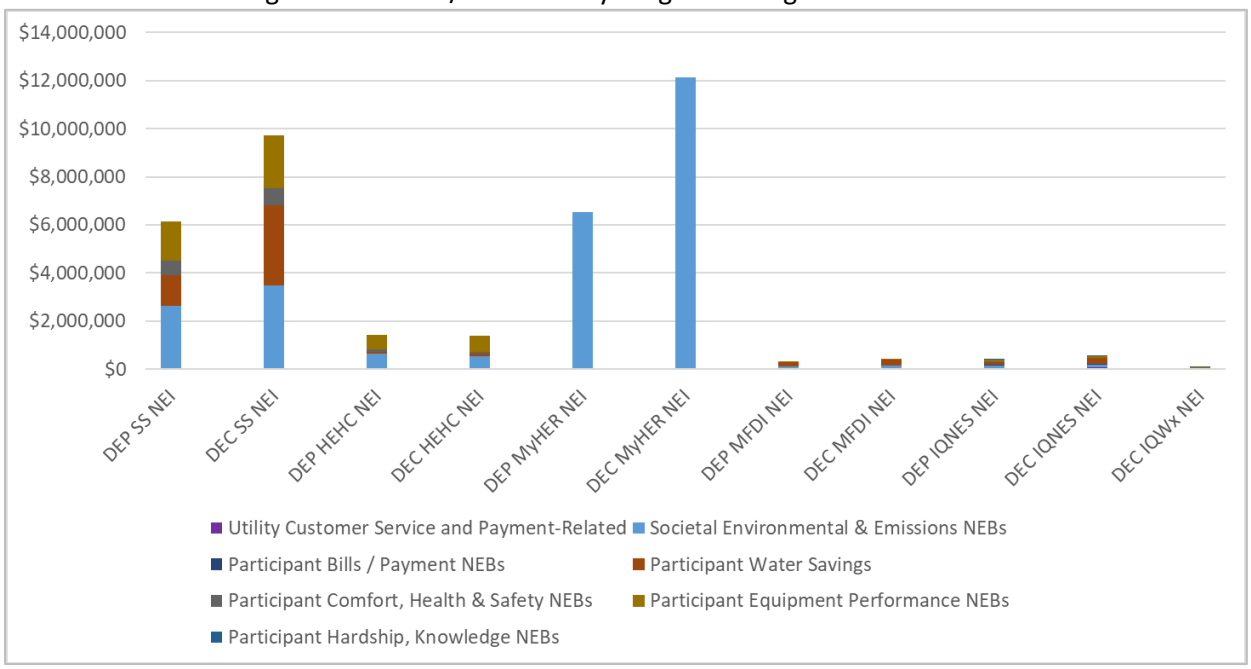


Figure Notes: Results are shown for Year 5 (2023).
Source: SERA "NEB-It" Computations, 2023

This previous figure displays the program-wide results for all the programs, while Figure 4.2.3 below presents the program-wide results excluding the Smart$aver and MyHER Programs to highlight the differences in the remaining programs. These program-wide results support the findings from the per-household results, indicating that the NEB value is either equal to or greater than the energy savings for all the programs.

Figure 4.2.3: NEB/NEI & Energy Savings by Category and Program - Program Wide Results (excluding Smart$aver & MyHER)

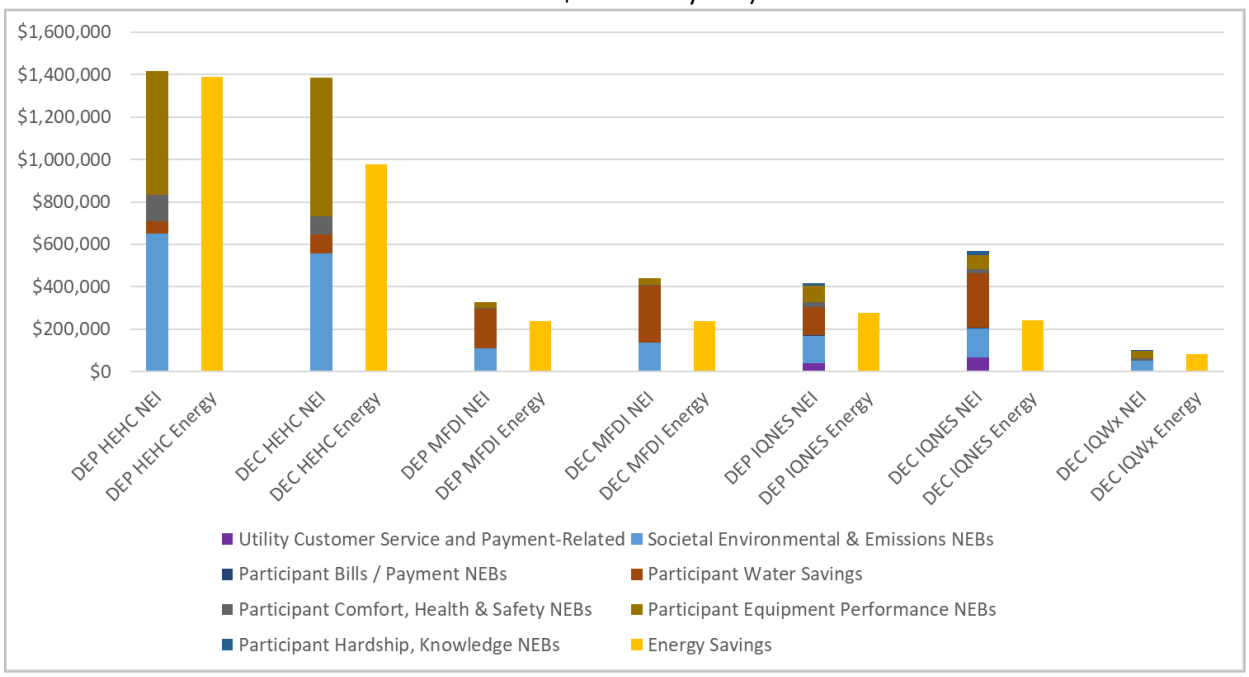
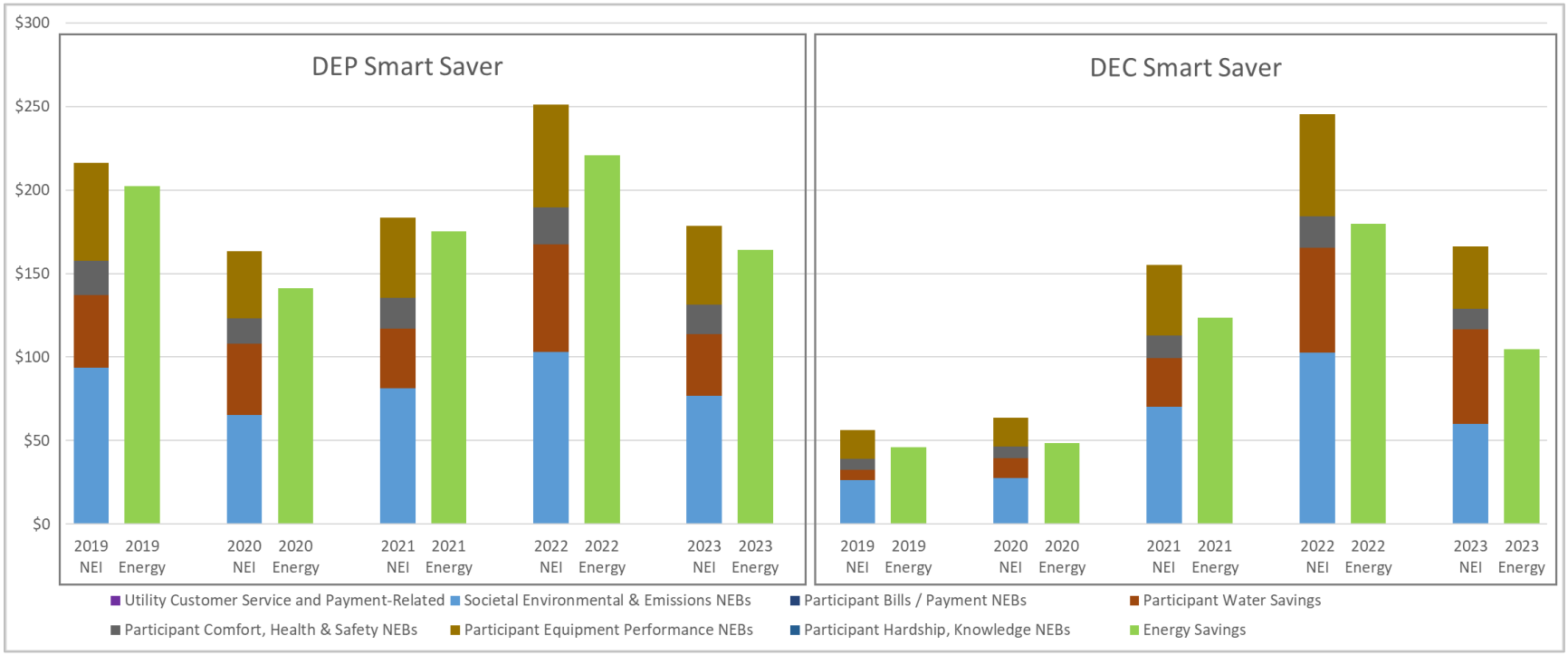


Figure Notes: Results are shown for Year 5 (2023).
Source: SERA "NEB-It" Computations, 2023

Results by Program

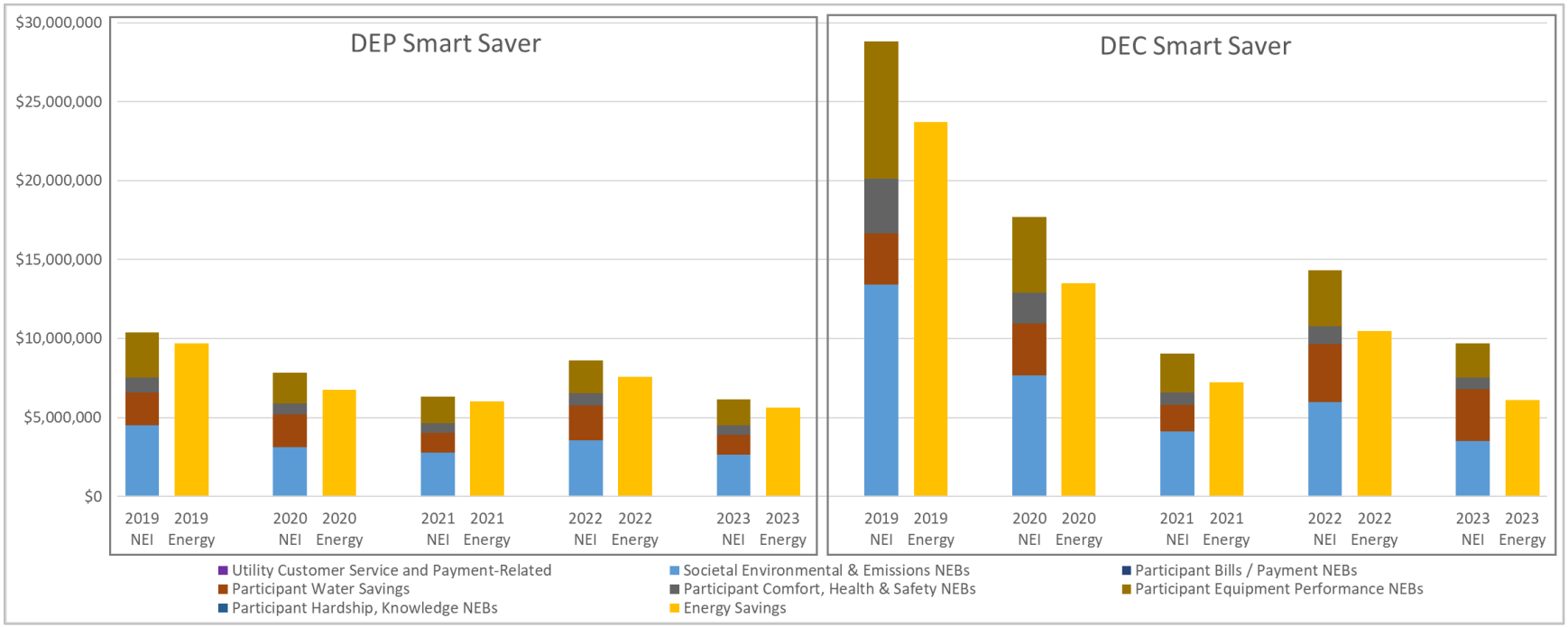
The following figures display five years of data for each program, starting in 2019. Results are presented for each program first by per household values and then program wide values. The DEP and DEC are shown in the same figure. The first program, Figure 4.2.4 is the Smart$aver program. The household results for DEP are consistent across the years. DEC Smart$aver has lower per household NEI values and energy savings for 2019 and 2020 due to very high participation in those years compared to the following years. This also contributes to the high program wide results for DEC in 2019 and 2020, show in Figure 4.2.5. Program-wide results are higher for DEC than DEP due to overall higher participation.

Figure 4.2.4: Smart$aver NEB/NEIs & Energy Savings by Category and Program - Per Household



Source: SERA "NEB-It" Computations, 2023

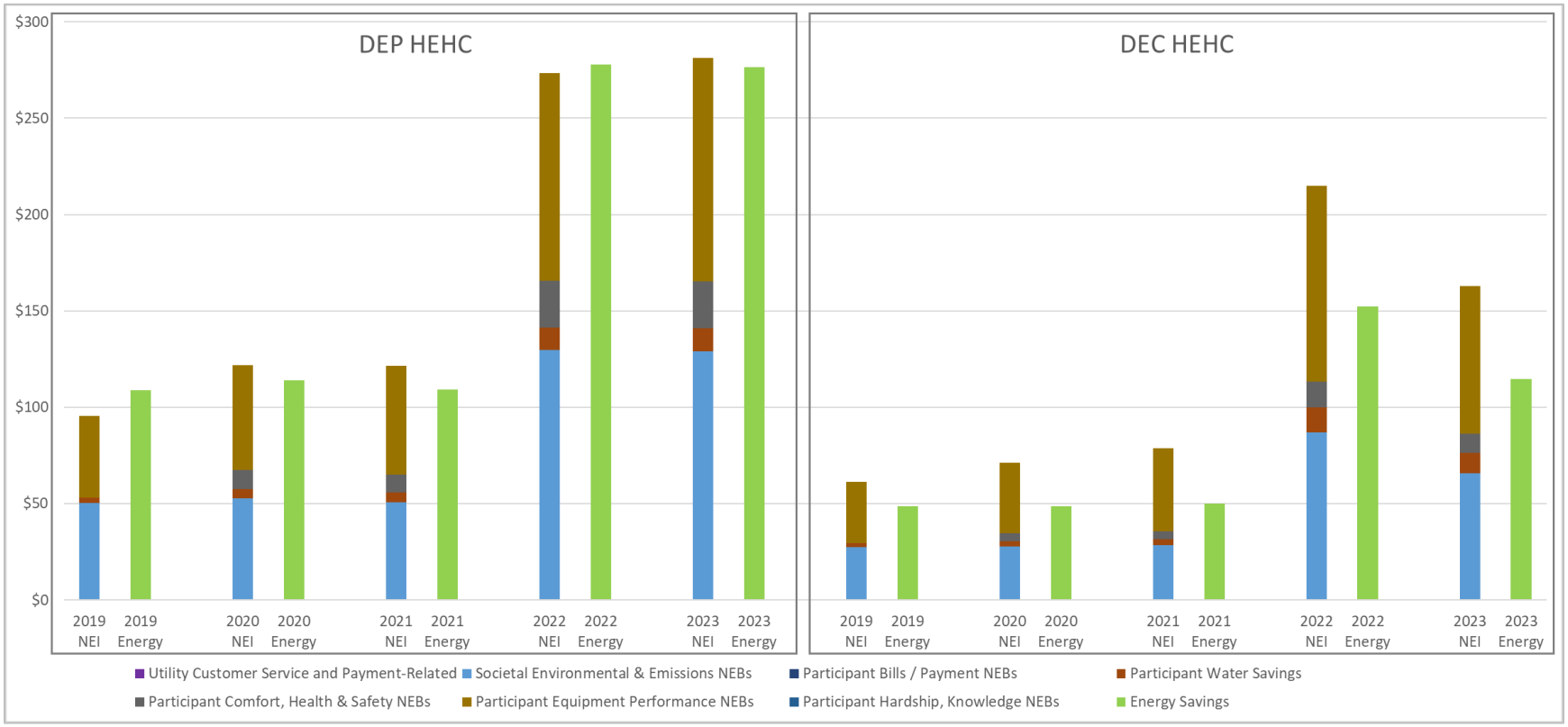
Figure 4.2.5: Smart$aver NEB/NEIs & Energy Savings by Category and Program – Program Wide Results



Source: SERA "NEB-It" Computations, 2023

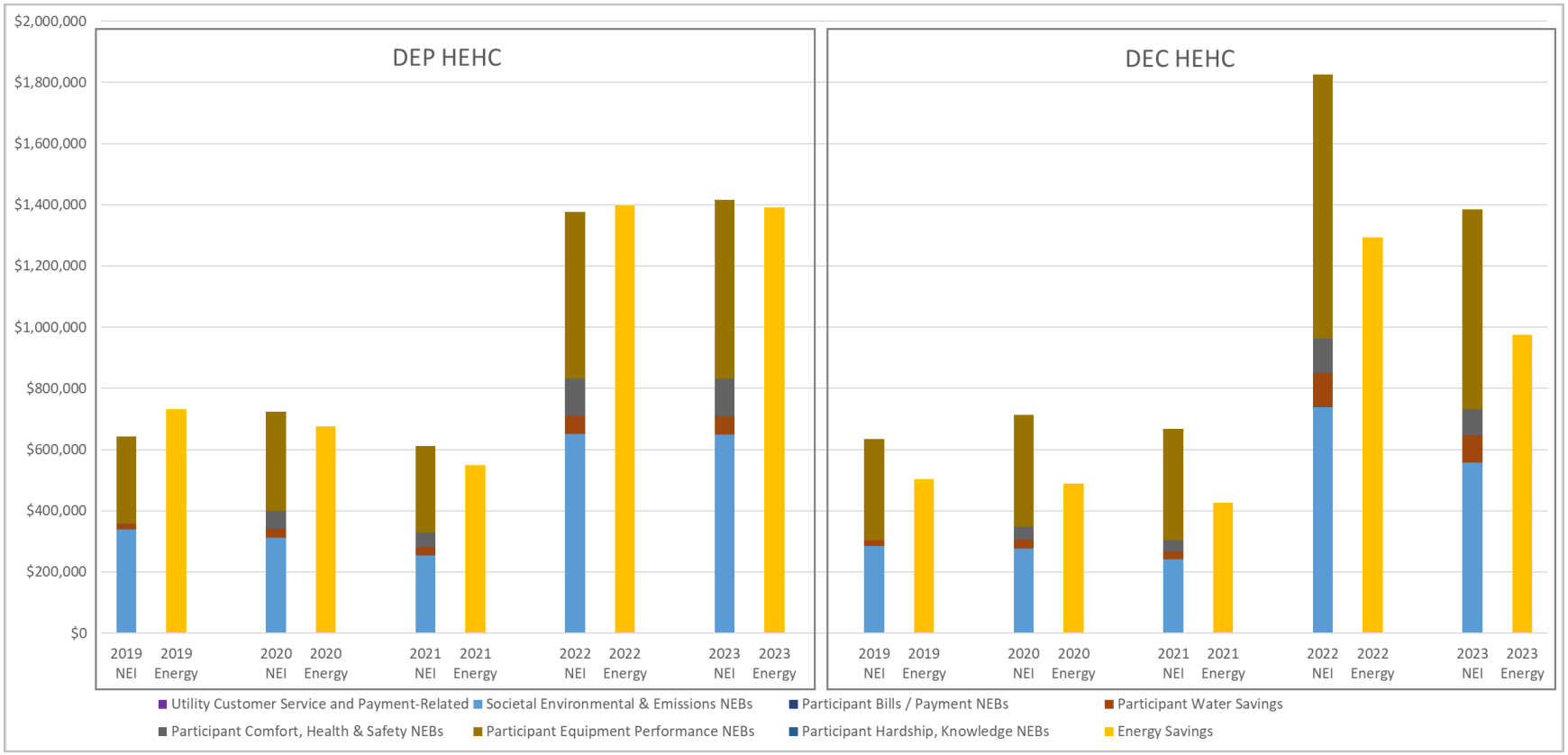
The Home Energy House Call (HEHC) Program shows that per participant/household savings (Figure 4.2.6) are higher in 2022 and 2023 compared to the earlier years. This trend is also evident in the program-wide results (Figure 4.2.7).

Figure 4.2.6: Home Energy House Call NEB/NEIs & Energy Savings by Category – Per Household Results



Source: SERA "NEB-It" Computations, 2023

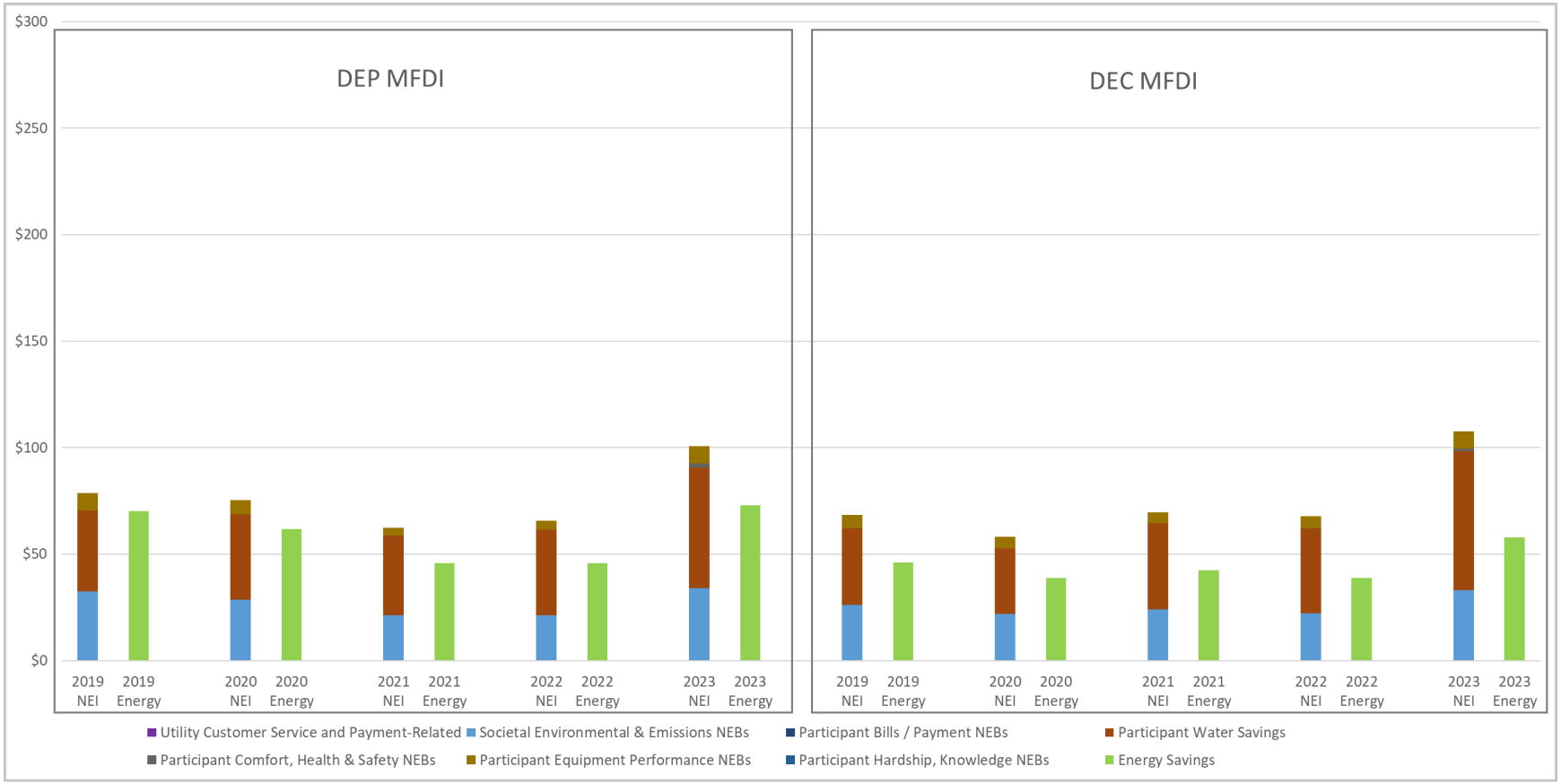
Figure 4.2.7: Home Energy House Call NEB/NEIs & Energy Savings by Category – Program Wide Results



Source: SERA "NEB-It" Computations, 2023

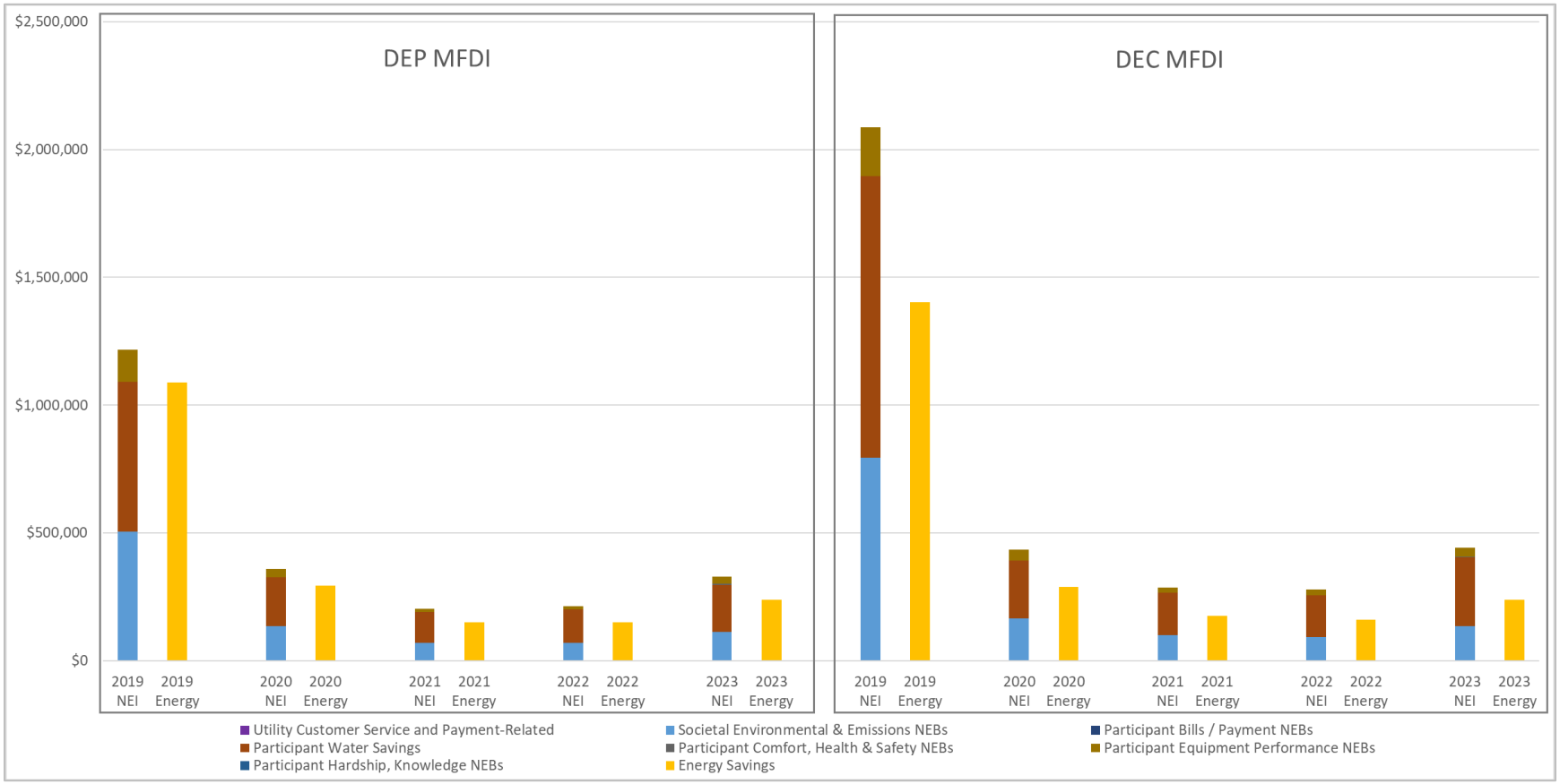
The Multi-Family Direct Install program has consistent values per household, with a slight increase in 2023 due to the inclusion of more measures such as smart thermostats (Figure 4.2.8). Program-wide results in 2019 have much higher values due to higher reported participation compared to following years (Figure 4.2.9).

Figure 4.2.8: Multifamily Direct Install NEB/NEIs & Energy Savings by Category - Per Household Results



Source: SERA "NEB-It" Computations, 2023

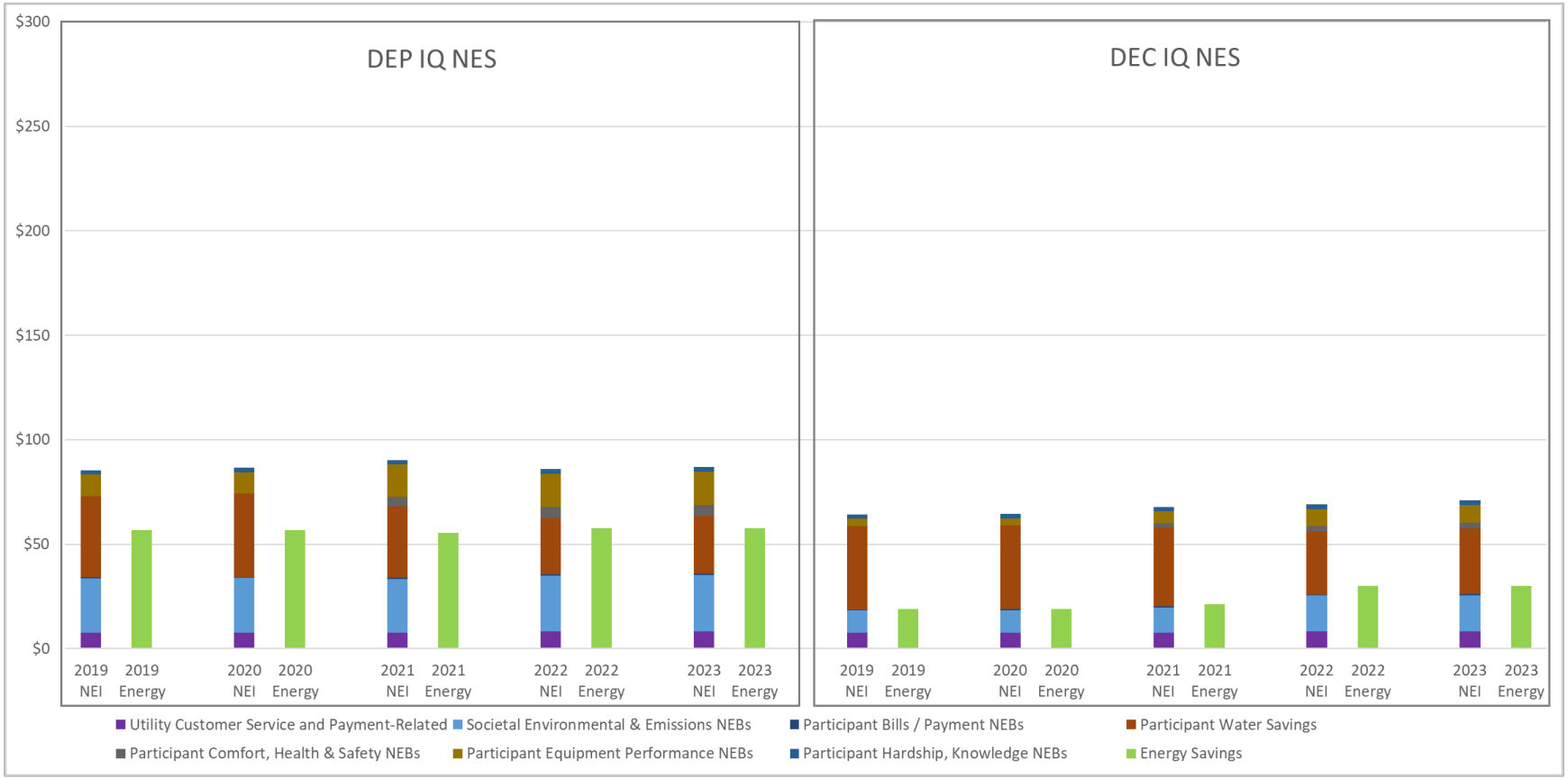
Figure 4.2.9: Multifamily Direct Install NEB/NEIs & Energy Savings by Category – Program Wide Results



Source: SERA "NEB-It" Computations, 2023

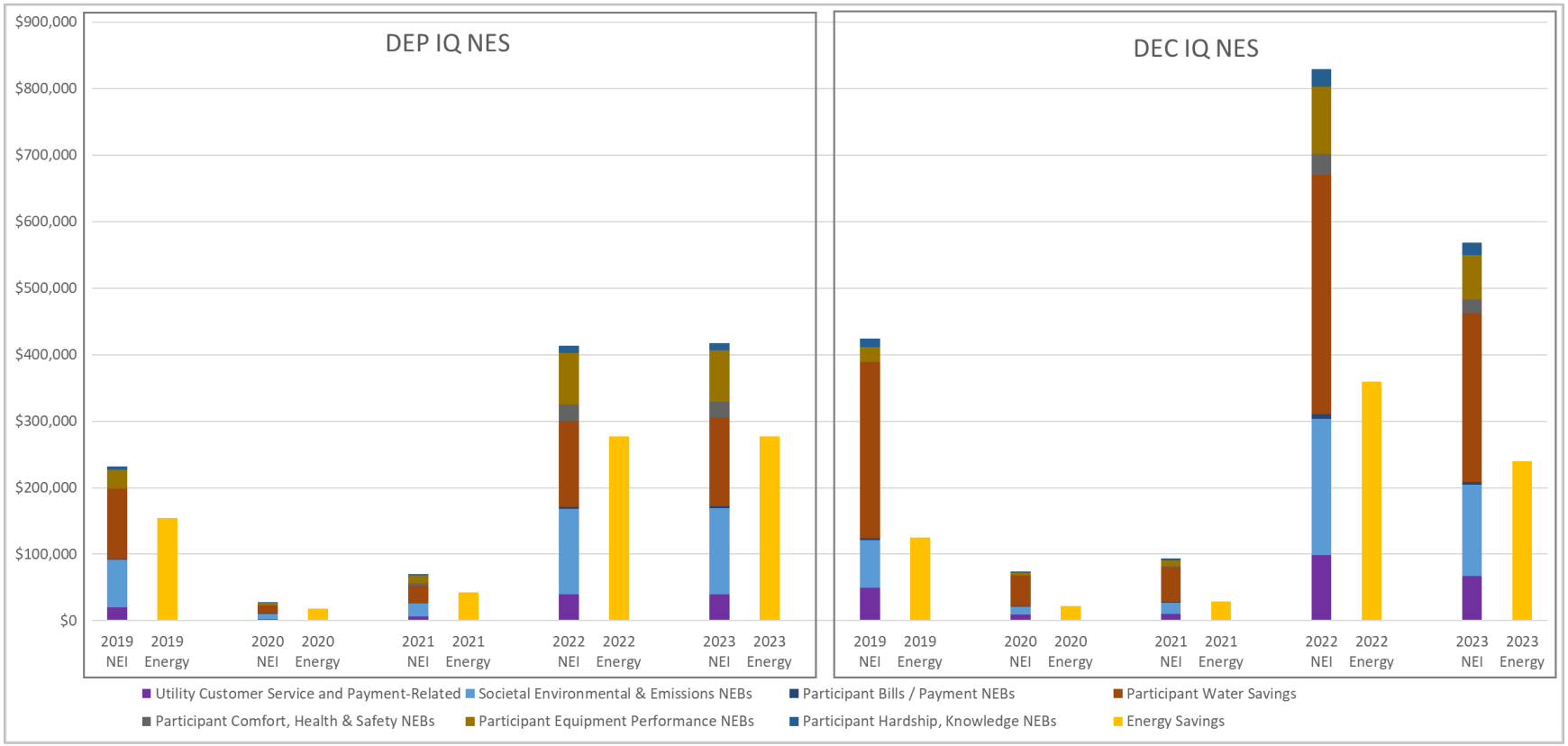
In the Income-Qualified programs, the Neighborhood Energy Saver (IQ NES) has almost double the energy savings in program-wide results (Figure 4.2.11) compared to per household results (Figure 4.2.10), but there was a dip in program-wide savings due to a drop in participation during 2020. The Income Qualified Weatherization (IQ Wx) is generally consistent both per household and program-wide, with a possible dip from 2020 to 2022, although 2021 had higher participation than those other two years.

Figure 4.2.10: IQ NES NEI Savings by Category and Energy Savings - Per Household Results



Source: SERA "NEB-It" Computations, 2023

Figure 4.2.11: IQ NES NEB/NEIs & Energy Savings by Category - Program Wide Results



Source: SERA "NEB-It" Computations, 2023

Figure 4.2.12: DEC IQ Wx NEB/NEIs & Energy Savings by Category - Per Household Results

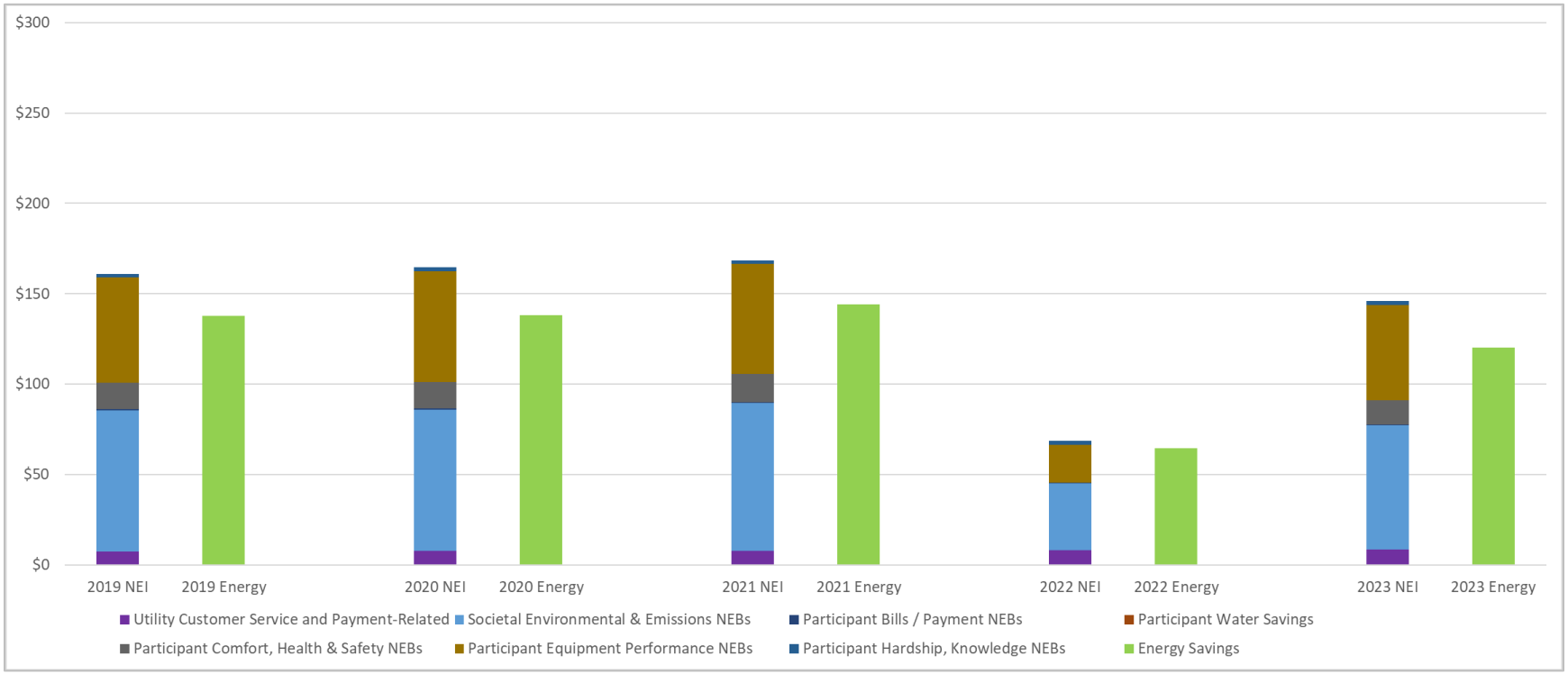


Figure Note: The Income-Qualified Weatherization program is only a DEC program
Source: SERA "NEB-It" Computations, 2023

Figure 4.2.13: DEC IQ Wx NEB/NEIs & Energy Savings by Category - Program Wide Results

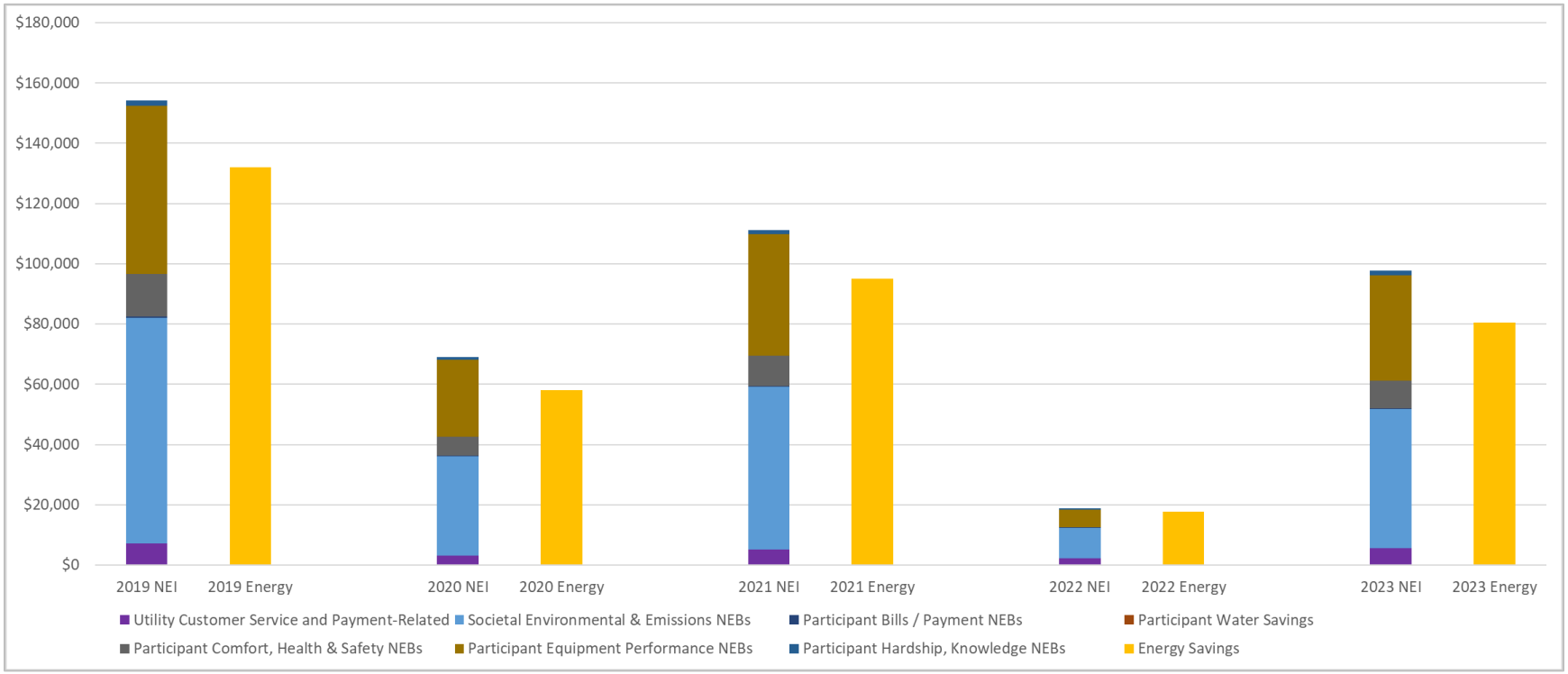


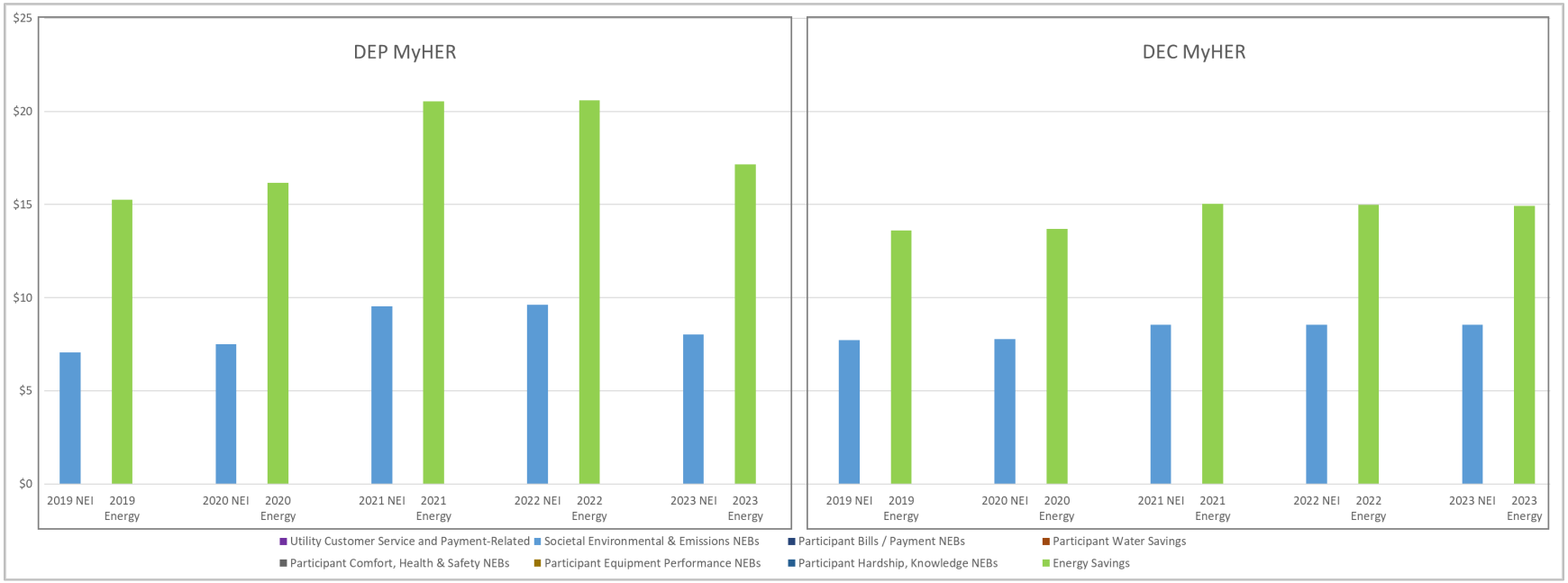
Figure Note: The Income-Qualified Weatherization program is only a DEC program
Source: SERA "NEB-It" Computations, 2023

The last program examined was the My Home Energy Report (MyHER). Duke implemented water savings measures through the MyHER program, but the VT process evaluation study[17] did not observe a significant adoption of these measures. If Duke conducts a future process evaluation of the MyHER program, it should include inquiries about water-saving measures. The water-saving measures that were examined by VT included taking shorter showers, as well as purchasing and installing low-flow showerheads, faucet heads, or aerators. The purchase of ENERGY STAR or high-efficiency appliances, installation of a programmable or smart thermostat, and unplugging appliances when not in use were some of the measures and behaviors that demonstrated significant adoption in the VT study. Based on these results, measure-based

[17] Residential Customer Behavioral Savings Pilot" (Vermont Public Service Department), https://publicservice.vermont.gov/sites/dps/files/documents/VT%20PSD%20RCBS%20Y3%20Evaluation%20Report%20FINAL.pdf

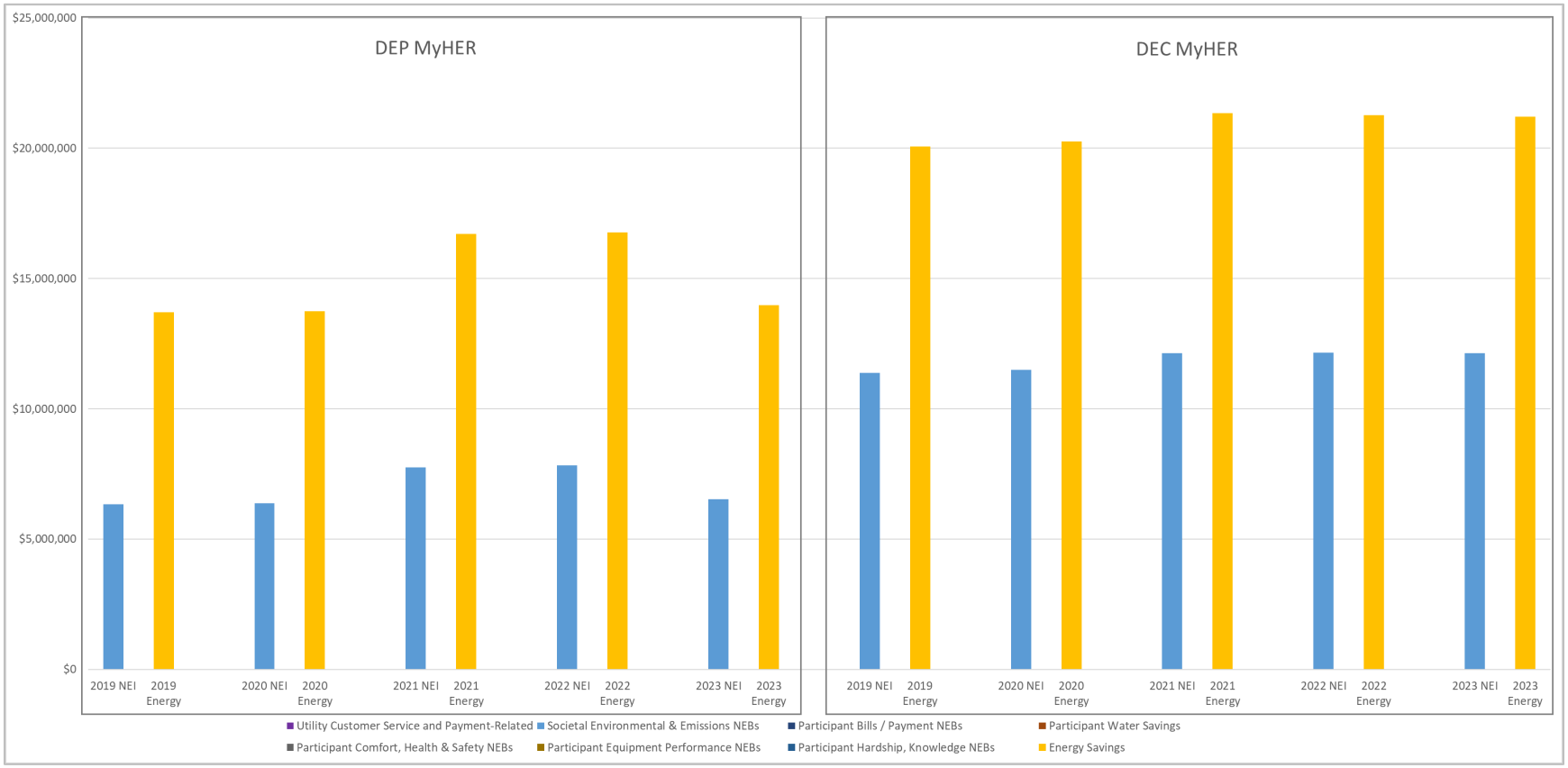
savings were assigned to HVAC equipment and appliance end-uses. Only emission related NEBs were available for this program, which resulted in a lower NEB value per household (Figure 4.2.14) compared to other programs. Nevertheless, the program-wide (Figure 4.2.15) savings are substantial since every participant receives an energy insert with their energy bill, resulting in a high participation rate. Despite having lower per household energy savings, the MyHER has high program wide NEB values compared to other programs driven from participation.

Figure 4.2.14: My HER NEB/NEIs & Energy Savings by Category - Per Household Results



Source: SERA "NEB-It" Computations, 2023

Figure 4.2.15: My HER NEBs/NEIs & Energy Savings by Category - Program Wide Draft Results



Source: SERA "NEB-It" Computations, 2023

4.3 Summary Results by Perspective

The NEBs results in total were presented in the previous sections. This section focuses on analyzing the NEBs by perspective. Recall that the perspectives represent the three entities that receive positive and negative effects, beyond energy savings, from the program and its interventions.

- The net utility NEBs/NEIs are generally the smallest in value, but largely because some potentially-valuable benefits like system resiliency and other system wide effects have been little-studied, and therefore are not included in this literature-based report. These NEBs/NEIs are included in the Utility Cost test (UCT)
- The net participant NEBs/NEIs generally are high in value; participants benefit from programs in many ways beyond the direct energy bill savings. These benefit categories include items like program-attributable changes in operations and maintenance, comfort, noise level, illness incidences, and similar. The sum of these first two NEB perspectives is appropriately included in TRC cost-effectiveness tests.
- The net societal perspective NEB/NEI values also tend to be high in value. Benefits in this category include societal health effects from lower generation and its emissions, as well as job impacts and other effects that were not measured in this study. NEBs from the sum of all three of these perspectives are relevant to the SCT Test.

Recall that not all NEBs worldwide have been measured in this initial study on NEBs for the utilities. The study included only those NEBs/NEIs for each perspective based on secondary and primary data provided by the utility and literature, as well as modeling work. The study carefully selected only the most reliable NEBs/NEIs and those that could be well-adapted to the Carolinas and opted for conservative valuations.

Figure 4.3.1 shows the total per-household values for each of the three perspectives, and totals for the TRC-relevant categories and the SCT-relevant categories. The table is sorted by the last blue column, the total, or SCT-related NEBs/NEIs. The last two columns identify the percent of each program's total SCT NEBs/NEIs are from the participant benefits, and from the societal benefits. The results show:

Dollar Values:

- **Utility benefits are not high and focus on Income-Eligible Programs**: Because the study estimated only a strongly-researched NEB/NEI benefits, the utility benefits are low. Research on insurance risk benefits is not strong, and estimating some additional benefits would have required more utility-specific data than could be made available to this study. Therefore, the main benefits estimated related to arrearage reduction and associated effects.
- **Participant benefits were largest for the HEHC and Smart$aver programs, which provide weatherization and water-saving measures:** These programs delivered about $100-$150 per year to the participating households.
- **Societal benefits were highest for the four programs with largest energy and bill savings – the HEHC, Smart$aver, and IQWx programs.** This is expected, as the main societal benefit was related to emission reductions and associated societal health, a benefit that is directly driven by reduced energy generation reductions. These programs also had the highest Total TRC and total SCT NEB/NEI values.

Percentage Values:

- **For the TRC, 97% of the estimated benefits were Participant effects. For the SCT, the shares were 2% utility, 58% participant, and 40% societal.**
- **Between 50% and 70% of the SCT benefits were realized by participants.** Participants had the strongest benefits from the MFDI, Smart$aver, HEHC, and IQ NES program. However, the other programs, with the exception of MyHER, were within a fairly narrow band.
- **Societal benefits generally represented 25% to 47% of the total SCT benefits for the programs**. Shares were highest for IQWx, HEHC, and Smart$aver programs. The MyHER programs had the highest value, because societal benefits were the only benefits estimated for these programs.

Figure 4.3.1 shows the same content as the per-household figure, but for program-wide NEB/NEI results. Similar patterns were identified for the program side, except:

- **MyHER has the highest societal and total NEBs, because there are so many participants.** This far outweighs the relatively low per-household benefits from this program, but the low per-participant value is driven by the limited number of NEBs/NEIs that could be estimated for this program.
- **For the TRC, 99% of the estimated benefits were Participant effects. For the SCT, the shares were 0.3% utility, 32% participant, and 68% societal.**

Figure 4.3.1: NEB/NEI Values by Perspective for Program Year 5 (2023). Per Household Results.

Program, sorted by Total NEBs (per Household)	Utility	Participant	Societal	Total Util & Partic NEBs (TRC)	Total All NEBs (SCT)	Percent of SCT from Participants	Percent of SCT from Society
DEP HEHC	$0.00	$152.16	$129.21	$152.16	$281.36	54%	46%
DEP Smart$aver	$0.00	$101.78	$76.81	$101.78	$178.59	57%	43%
DEC Smart$aver	$0.00	$106.30	$59.92	$106.30	$166.22	64%	36%
DEC HEHC	$0.00	$97.35	$65.65	$97.35	$163.00	60%	40%
DEC IQWx	$8.36	$68.85	$68.74	$77.21	$145.96	47%	47%
DEC MFDI	$0.00	$74.37	$33.17	$74.37	$107.54	69%	31%
DEP MFDI	$0.00	$66.71	$34.12	$66.71	$100.83	66%	34%
DEP IQNES	$8.34	$51.75	$26.94	$60.09	$87.03	59%	31%
DEC IQNES	$8.36	$45.56	$17.15	$53.92	$71.07	64%	24%
DEC MyHER	$0.00	$0.00	$8.53	$0.00	$8.53	0%	100%
DEP MyHER	$0.00	$0.00	$8.03	$0.00	$8.03	0%	100%
Average	$2.28	$69.53	$48.02	$71.81	$119.83	58%	40%
DEC Prgms* Avg	$1.67	$64.72	$36.88	$66.39	$103.27	63%	36%
DEP Prgms Avg	$1.67	$74.48	$55.02	$76.15	$131.17	57%	42%
DEP/DEC Values	100%	115%	149%	115%	127%		
Percent of Total TRC NEBs	3.2%	96.8%		100.0%			
Percent of Total SCT NEBs	1.9%	58.0%	40.1%	59.9%	100.0%		

Table note: (*) DEC programs average excludes DEC IQWx to facilitate comparison with DEP (No IQWx for DEP)
Source: SERA "NEB-It" Computations, 2023

Figure 4.3.2: NEB/NEI Values by Perspective for Program Year 5 (2023). Program Wide Results.

Program, sorted by Total NEBs (program-wide)	Utility	Participant	Societal	Total Util & Partic NEBs (TRC)	Total All NEBs (SCT)	Percent of SCT from Participants	Percent of SCT from Society
DEC MyHER	$0	$0	$12,126,582	$0	$12,126,582	0%	100%
DEC Smart$aver	$0	$6,208,855	$3,500,039	$6,208,855	$9,708,894	64%	36%
DEP MyHER	$0	$0	$6,533,270	$0	$6,533,270	0%	100%
DEP Smart$aver	$0	$3,497,864	$2,639,590	$3,497,864	$6,137,454	57%	43%
DEP HEHC	$0	$765,655	$650,166	$765,655	$1,415,821	54%	46%
DEC HEHC	$0	$827,600	$558,086	$827,600	$1,385,685	60%	40%
DEC IQNES	$66,917	$364,484	$137,172	$431,401	$568,573	64%	24%
DEC MFDI	$0	$305,216	$136,115	$305,216	$441,331	69%	31%
DEP IQNES	$40,021	$248,408	$129,304	$288,429	$417,733	59%	31%
DEP MFDI	$0	$217,480	$111,241	$217,480	$328,721	66%	34%
DEC IQWx	$5,604	$46,131	$46,054	$51,735	$97,790	47%	47%
Average	$10,231	$1,134,699	$2,415,238	$1,144,930	$3,560,169	32%	68%
DEC Prgms* Avg	$21,389	$2,487,113	$5,304,314	$2,508,501	$7,812,814	32%	68%
DEP Prgms Avg	$21,389	$2,487,113	$5,304,314	$2,508,501	$7,812,814	32%	68%
DEP/DEC Values	100%	100%	100%	100%	100%		
Percent of Total TRC NEBs	0.9%	99.1%		100.0%			
Percent of Total SCT NEBs	0.3%	31.9%	67.8%	32.2%	100.0%		

Table note: (*) DEC programs average excludes DEC IQWx to facilitate comparison with DEP (No IQWx for DEP)
Source: SERA "NEB-It" Computations, 2023

Detailed results on the results for each program by perspective is provided in the next section. Information for each year of the program is also provided.

4.4 Detailed Study Results by Perspective

In the following figures, NEBs are aggregated for each program across the three perspectives: societal, participant, and utility. It's worth noting that the utility perspective typically accounts for a small portion of NEBs studies, often representing no more than 10% of the total NEBs available. This is primarily because it is more measurable for low-income programs, where it can provide benefits to the utility in terms of payment behavior and lower carrying costs. However, it also provides benefits to the participants and society. Figure 4.4.1 shows the NEBs for each program and the ratio of NEBs to energy savings. The height of the bar corresponds to the NEBs per household per year, while the number at the top indicates the ratio of NEBs to energy savings. For example, the DEP Smart$aver NEBs are worth over $150 per household per year and represent a 9% increase in value compared to the energy savings provided by the program. The Neighborhood Energy Saver program from DEC has the highest ratio of NEBs to energy savings, providing over twice as much NEB value as the energy savings. This information gives insight into which programs provide the biggest NEBs in both ratio and value per household.

Figure 4.4.1: NEIs per Program and NEB/Savings Ratio (Per Household) – All Three NEB Perspectives Included – Results per Household

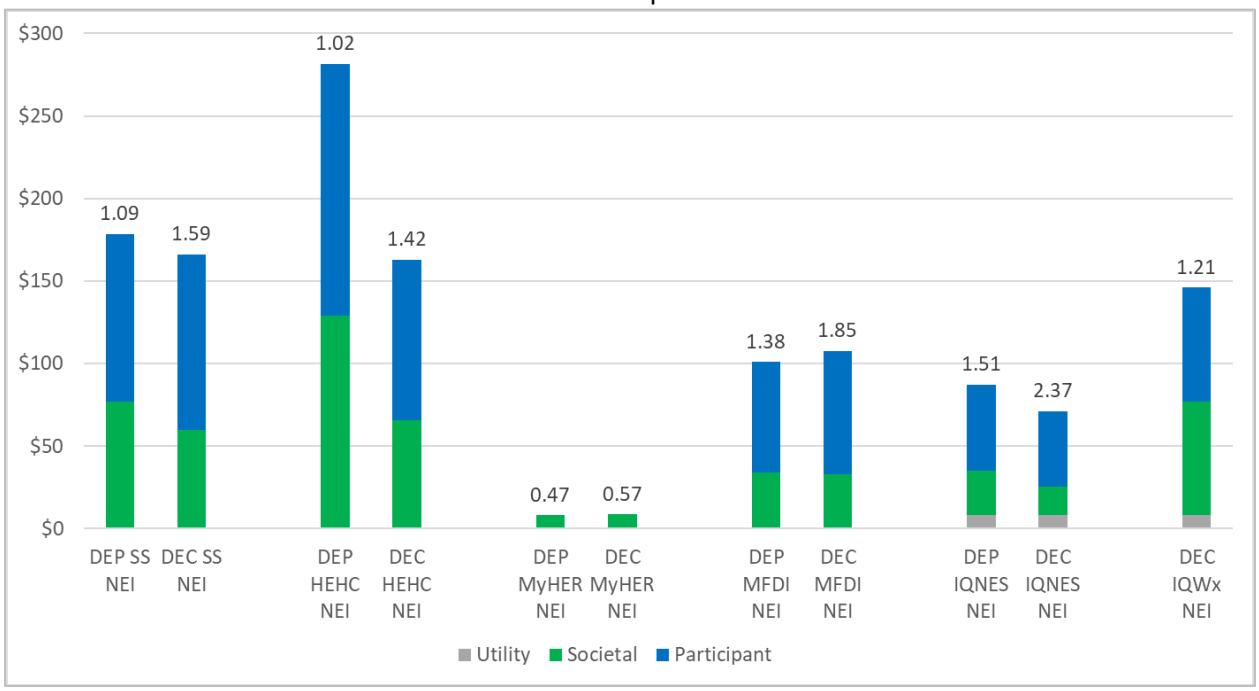


Figure Notes: Results are shown for Year 5 (2023).
Source: SERA "NEB-It" Computations, 2023

In the next figure, we exclude the societal perspective and only consider the utility and participant benefits. As expected, the benefits are lower due to the absence of the societal perspective, and the ratios adjust accordingly. The MyHER program is shown to have zero benefits because there is no NEB study available on MyHER behaviors, which makes it impossible to estimate most NEBs. The only NEBs estimated for the MyHER program are societal based, related to emissions. Since we take out societal emissions, there are no benefits left for the MyHER program. Additionally, there are no water savings shown in either societal or participant perspectives because MyHER program evaluations only focus on energy savings and do not consider surveys to translate water savings. Unfortunately, we did not have any secondary information to estimate how much water savings either society or participant would receive in the MyHER program. This is an important factor to consider in the next steps of the evaluation process.

Figure 4.4.2: NEIs per Program and NEB/Savings Ratio (Per Household) – Excluding Societal Perspective

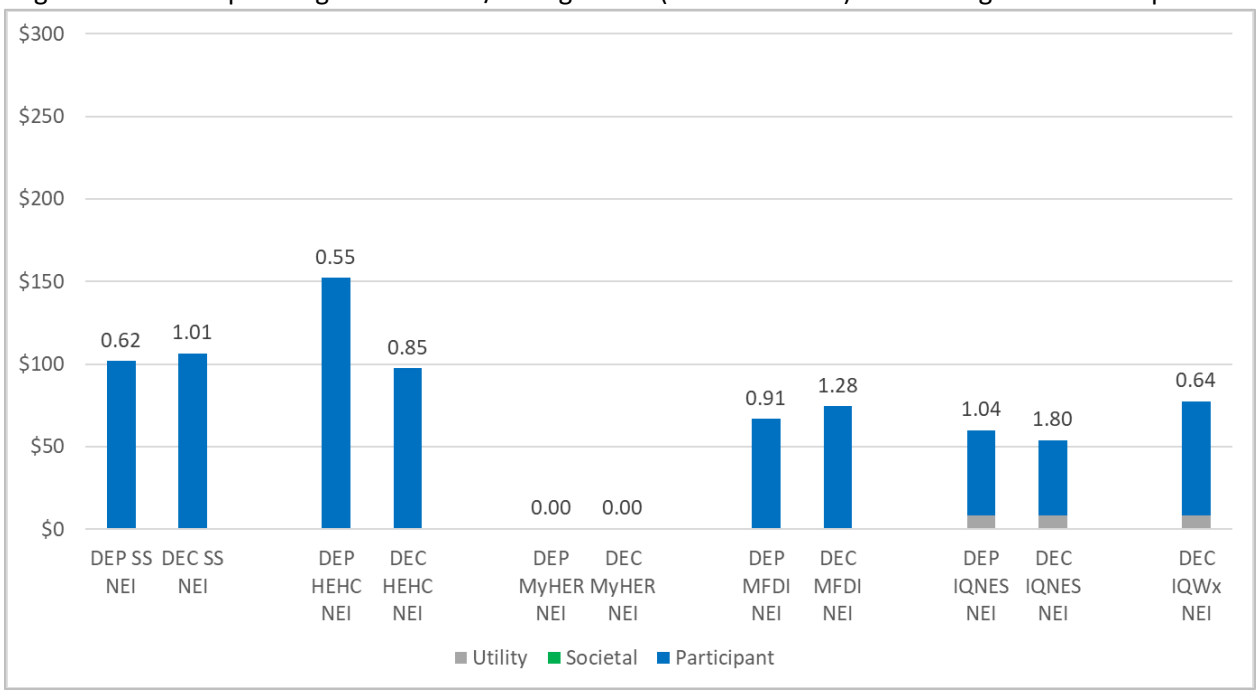


Figure Notes: Results are shown for Year 5 (2023).
Source: SERA "NEB-It" Computations, 2023

Removing the participant benefits, we are left with the utility perspective in Figure 4.4.3. As discussed earlier, most programs do not emphasize the benefits related to arrearages and utility resilience (which are currently not well-measured in the literature). The primary effects that are measured in this case are the payment effects, which are mainly centered on the income-qualified programs.

When considering the appropriate benefit-cost test to use, there are three sets of data to consider: the societal perspective, the participant perspective, and the utility perspective. For the utility cost test, only the data from the utility perspective is necessary. However, for other benefit-cost tests such as TRC (total resource cost) and SCT (societal cost test), a combination of data from the different perspectives is required. Therefore, depending on the benefit-cost test being used, the appropriate set of data will need to be utilized.

Figure 4.4.3: NEIs per Program and NEB/Savings Ratio (Per Household) – Excluding Societal Perspective

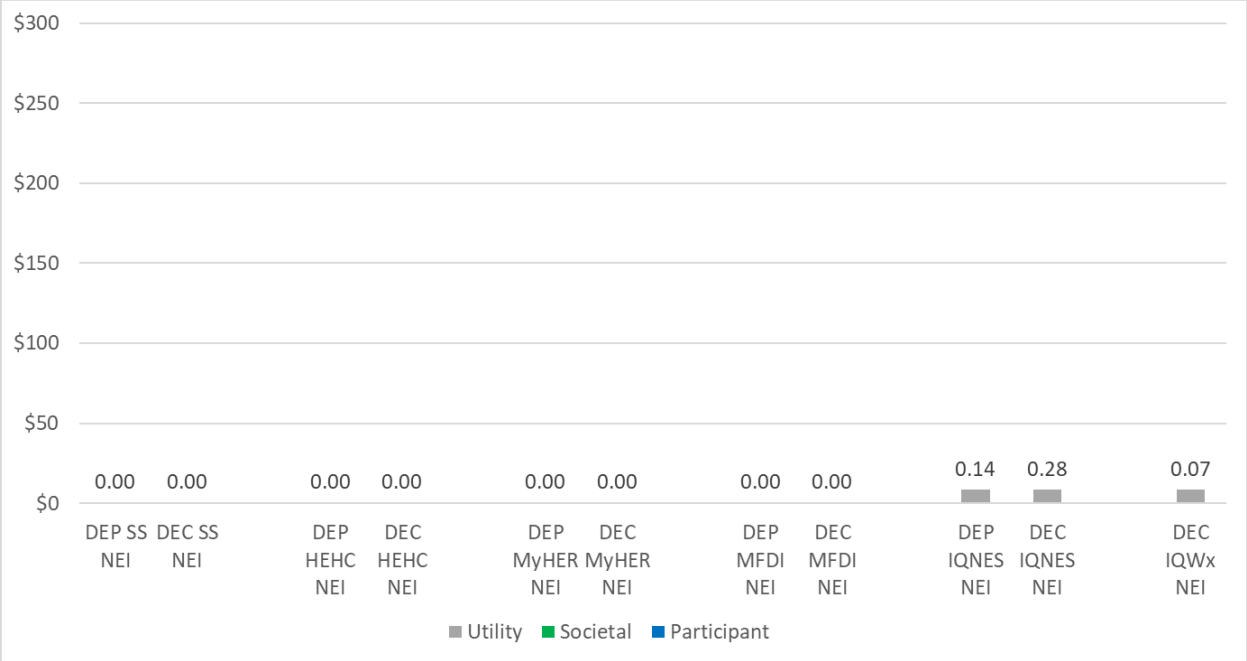


Figure Notes: Results are shown for Year 5 (2023).
Source: SERA "NEB-It" Computations, 2023

4.5 Summary of Benefit Results by Measure

Figure 4.5.1 shows the share of the total NEB/NEI valuation that is attributed to each of several major measure categories, including:

- HVAC
- Domestic Hot Water (DHW)
- Enclosure / Building Envelope
- Lighting
- Appliances
- Maintenance to measures, and
- Miscellaneous.

The miscellaneous category was particularly assigned for the MyHER program, because it is unknown what specific behavioral or measure changes were implemented as a result of that program.

The results show:

- **Lighting**: Lighting delivered the vast majority of benefits for the HEHC program kits. This includes benefits from lighting quality and quantity, and safety-type effects. Lighting also delivered a substantial share of benefits for the Smart$aver programs.

- **Domestic Hot Water Measures:** DHW measures contributed the vast majority of the benefits estimated for the MFDI pragmas. They also delivered a substantial share of benefits for the IQNES and Smart$aver programs.
- **Enclosure / Building Envelope:** The enclosure / building envelope measures contributed large shares of the benefits in the IQNES and IQWx programs.
- **Appliance:** Appliance benefits are large for the IQWx program, which includes refrigerator replacement as an element.
- **MyHER**: The study's limited ability to estimate the wide variety of benefits from this program caused the majority of contributing measures to be miscellaneous. This likely understates substantial contributions from changes in customer behavior in the lighting and HVAC areas, among others. MyHER shows some measure-specific results because a process evaluation study was identified that indicated some of the most common behavior changes related to appliance upgrades and smart thermostat; the rest of the effects were assigned to miscellaneous because there were no further details available.

Figure 4.5.1: Share of Total Program NEBs Attributed to Measure Groups (estimated, year 2023)

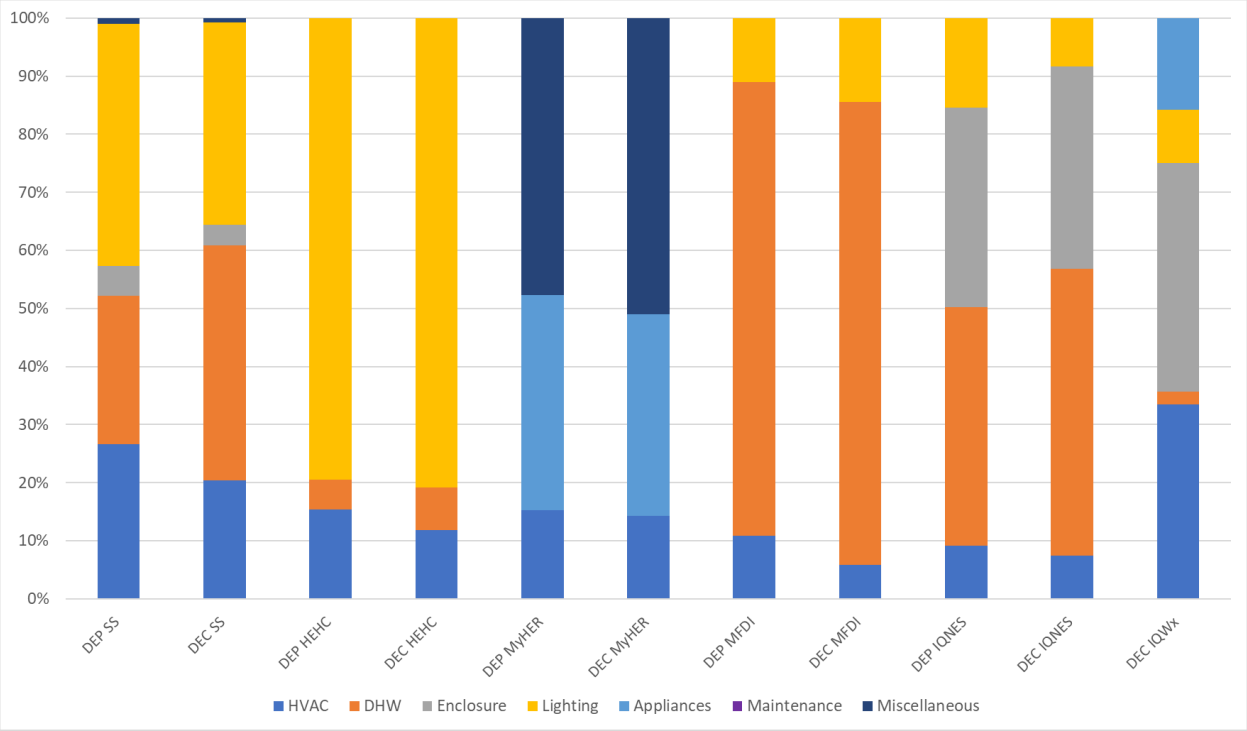


Figure Note: Enclosure = Building Envelope
Source: SERA "NEB-It" Computations, 2023

Detailed results by measure are provided in the Appendices.

4.6 Energy Bill Savings NEB/NEI Multiplier Results for the Programs

Figure 4.6.1 presents the ratios extracted from the top of the previous figures and explains their application in conducting the Total Resource Cost (TRC), Utility Cost Test (UCT), and Societal Cost Test (SCT). A graphical representation of the information is included in Figure 4.6.2. The program also highlights the largest multipliers in each column. These ratios represent the multiple of bill savings that could be used to compute the associated NEB/NEI benefits. These can be expressed in number forms (as below) or in percentages terms. In the figure below, 1.09 means that the SS program delivers 109% of the value of the energy savings. This would be the adder that would be applied in a cost-effectiveness test. These multiplier or adder values would be akin to the state "adder" values shown previously in this report. These state adder value averages are shown again in Figure 4.6.3.

This section examined these benefit adders to identify if there were patterns that might be useful to Duke DEC and DEP for identifying placeholders for the TRC (or SCT) cost-effectiveness tests, until more detailed analysis on NEBs is conducted. Adders are simpler to apply than individually-measured benefit values. However, individually-measured benefit values provide much more information and direct program advice.

Ranges and Averages: The figure shows that the TRC multipliers associated with this very limited set of NEB/NEI categories, ranges from 0 (for MyHER, for reasons mentioned before) to a benefit value of 1.8 times the bill savings from the program (for DEC IQ NES). The range for the SCT is from a low of 0.47 (MyHER) to 2.37 times the bill savings (for DEC IQ NES). The simple average multiplier or adder for the TRC is 0.79 or an energy-weighted average of 0.74. Similar figures for the SCT are 1.32 and 1.26. Note that there are patterns in the values for the DEC and DEP programs, with the DEC multipliers about 50-70% higher, on average.

Highest Adders: The highest adders are associated with the IQ NES, MFDI, and Smart$aver programs. The NES programs include pipe insulation, water measures, sealing, HVAC filters, and attic measures. The Smart$aver program has a few more measures, but measures that affect some of the same NEB/NEI categories. Envelope/sealing and water measures deliver higher multipliers, based on the subset of NEBs estimated in this study.

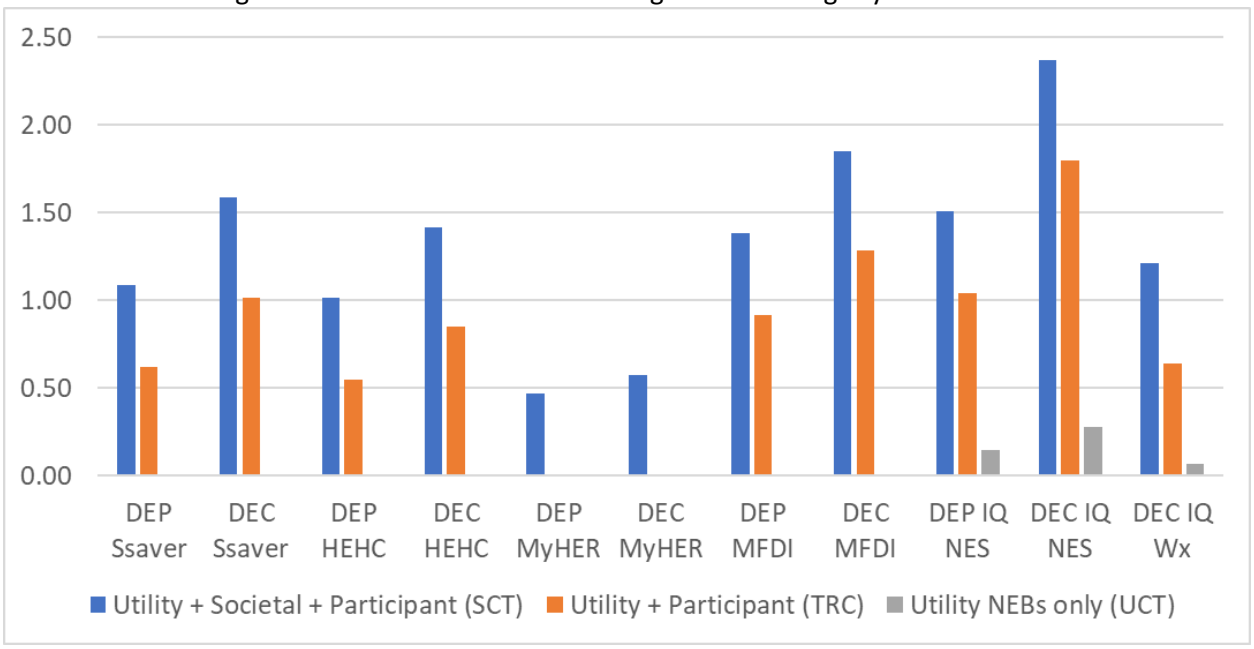
Income Qualified Adder "Bump": The difference between adders for income-qualified programs and non-IQ programs is shown in Figure 4.6.4. Income-qualified programs had higher benefit multipliers. The value differences for both the SCT and TRC (weighted) was about 0.12 to 0.16. The simple averages were closer to 0.5. The IQ multipliers were about 13-16% larger for the IQ compared to the non-IQ program, or about 45% to 78% larger than the non-IQ values.

Figure 4.6.1: Estimated Multiplicative "Adders" by Perspective for the Programs - (Ratio of NEBs/NEIs) over Program Bill Savings

NEBs Included	Utility + Societal + Participant (SCT)	Utility + Participant (TRC)	Utility NEBs only (UCT)
DEP SS	1.09	0.62	0
DEC SS	1.59	1.01	0
DEP HEHC	1.02	0.55	0
DEC HEHC	1.42	0.85	0
DEP My HER	0.47	0	0
DEC My HER	0.57	0	0
DEP MFDI	1.38	0.91	0
DEC MFDI	1.85	1.28	0
DEP IQ NES	1.51	1.04	0.14
DEC IQ NES	2.37	1.8	0.28
DEC IQ Wx	1.21	0.64	0.07
Simple Average	1.32	0.79	0.045
Saving-weighted average	1.26	0.74	0.004
DEC Weighted	1.56	0.98	0.004
DEP Weighted	1.04	0.57	0.001

Source: SERA "NEB-It" Computations, 2023

Figure 4.6.2.: Ratio of NEBs Over Program Bill Savings by NEB Subsets



Source: SERA "NEB-It" Computations, 2023

Figure 4.6.3: State NEB / NEI Adders – Averages and Ranges by Category

	Electric	Gas	Low Income Additional Adder over Fuels Value
Average Percent Adder	12%	11%	13%
Range	5-30%	5-30%	10-15%

Source: Skumatz and Gibbs, "NEBs/NEIs: Analysis of Alternatives for Updates for the State of NJ", 3/7/23
Analysis of the subset of states that have developed percent adders.

Figure 4.6.4: Low Income Qualified Multipliers compared to Non-IQ programs.

Average	IQ	Not IQ	IQ - Not IQ	IQ/Not IQ
SCT simple	1.70	1.17	0.52	145%
SCT Weighted	1.42	1.26	0.16	113%
TRC simple	1.16	0.65	0.51	178%
TRC weighted	0.86	0.74	0.12	116%

SERA, 2023, Weighting is by program bill savings.

The adder values estimated in this report are larger than those included in state adder tables. To incorporate these values into a benefit-cost analysis, the energy savings is multiplied by the value (e.g., 1.09). Given that the denominator of the equation does not change, the revised benefit-cost equation can be expressed as the sum of the energy savings plus 1.09 times the energy savings.

The study's results have several practical applications, including informing program design and implementation. The study's findings can support any efforts to consider the inclusion of Non-Energy Benefits (NEBs) or NEB adders in the future. Adders can be considered, using various structures, including a base adder for basic program benefits, along with additional adders for high-impact measures like HVAC or health improvements, water measures, or income-qualified scenarios. Overall, the study provides information that could be used to enhance program efficacy and promote the uptake of energy efficiency measures.

4.7 NEB/NEI Value by Category and Subcategory

Results have been presented for NEB categories and by measure end-use. Figure 4.7.1 and Figure 4.7.2 show the NEB/NEI values from program year 5 (2023) for each NEB/NEI category and subcategory. Results are presented first as per household, followed by program wide. Detailed results for program years 1-5 (2019-2023) can be found in Appendix D.

Figure 4.7.1: NEB/NEI values by category and subcategory for program year 5 (2023). Per HH.

SERA NEB-It/NEI MODEL 2.0		DEP SS	DEP HEHC	DEP MyHER	DEP MFDI	DEP IQNES	DEC SS	DEC HEHC	DEC MyHER	DEC MFDI	DEC IQNES	DEC IQWx
UTILITY NEBS												
Utility Customer Service and Payment-Related												
U_Ar	Reduced Carrying Cost on Arrearages (interest)	$0.00	$0.00	$0.00	$0.00	$1.41	$0.00	$0.00	$0.00	$0.00	$1.44	$1.44
U_BD	Lower Bad Debt Written Off	$0.00	$0.00	$0.00	$0.00	$5.38	$0.00	$0.00	$0.00	$0.00	$5.38	$5.38
U_SO	Fewer Shutoffs	$0.00	$0.00	$0.00	$0.00	$0.67	$0.00	$0.00	$0.00	$0.00	$0.67	$0.67
U_RC	Fewer Reconnects	$0.00	$0.00	$0.00	$0.00	($0.00)	$0.00	$0.00	$0.00	$0.00	($0.00)	($0.00)
U_CC	Fewer Customer Calls	$0.00	$0.00	$0.00	$0.00	$0.87	$0.00	$0.00	$0.00	$0.00	$0.87	$0.87
SOCIETAL / PUBLIC NEBS												
Societal Environmental & Water NEBs												
S_Em	Emissions on Public Illnesses & Deaths	$76.81	$129.21	$8.03	$34.12	$26.94	$59.92	$65.65	$8.53	$33.17	$17.15	$68.74
PARTICIPANT NEBS												
Participant Bills / Payment NEBs												
P_SO	Fewer Shutoffs	$0.00	$0.00	$0.00	$0.00	$0.20	$0.00	$0.00	$0.00	$0.00	$0.20	$0.20
P_Re	Fewer Reconnects	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
P_BC	Fewer Calls to Utility	$0.00	$0.00	$0.00	$0.00	$0.32	$0.00	$0.00	$0.00	$0.00	$0.32	$0.32
Participant Water Savings												
P_WA	Reduced water / wastewater bills-All Measures	$36.94	$11.93	$0.00	$56.75	$27.77	$56.62	$10.56	$0.00	$65.29	$31.72	$0.00
Participant Comfort, Health & Safety NEBs												
P_Co	Comfort	$14.29	$24.04	$0.00	$1.57	$5.01	$9.12	$9.99	$0.00	$0.91	$2.61	$10.46
P_FF	Fewer fires	$0.02	$0.00	$0.00	$0.00	$0.00	$0.02	$0.00	$0.00	$0.00	$0.00	$0.01
P_MW	Fewer Sick days from work	$1.63	$0.00	$0.00	$0.00	$0.00	$1.60	$0.00	$0.00	$0.00	$0.00	$1.60
P_MS	Fewer Sick days from school	$0.27	$0.00	$0.00	$0.00	$0.00	$0.26	$0.00	$0.00	$0.00	$0.00	$0.26
P_As	Fewer Asthma Incidences	$1.02	$0.00	$0.00	$0.00	$0.00	$1.04	$0.00	$0.00	$0.00	$0.00	$1.04
P_RA	Reduction in Allergies	$0.27	$0.00	$0.00	$0.00	$0.00	$0.23	$0.00	$0.00	$0.00	$0.00	$0.23
P_CS	Reduction in Cold Symptoms	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
P_Sa	Household Safety	$0.00	$0.00	$0.00	$0.05	$0.00	$0.00	$0.00	$0.00	$0.03	$0.00	$0.00
Participant Equipment Performance NEBs												
P_NR	Outside Noise Reduction	$6.57	$0.00	$0.00	$0.00	$5.76	$4.19	$0.00	$0.00	$0.00	$3.00	$12.02
P_NA	Inside Noise Reduction (appliances)	$9.86	$16.58	$0.00	$0.00	$4.61	$6.29	$6.89	$0.00	$0.00	$2.40	$9.62
P_LQ	Quality / Quantity of Lighting	$8.21	$13.82	$0.00	$3.66	$5.76	$5.24	$5.74	$0.00	$5.07	$3.00	$12.02
P_OM	Operations & Maintenance Cost Changes	$0.00	$0.00	$0.00	$1.67	$0.00	$0.00	$0.00	$0.00	$0.97	$0.00	$2.06
P_ML	Measure Lifetime / Deferred Purchase	$16.12	$85.78	$0.00	$1.93	$0.00	$17.51	$64.18	$0.00	$1.34	$0.00	$0.00
P_EP	Improved Equipment Features/ Performance	$6.57	$0.00	$0.00	$0.00	$0.00	$4.19	$0.00	$0.00	$0.00	$0.00	$16.71
PM_Mk	Marketability for Property Managers	$0.00	$0.00	$0.00	$0.05	$0.00	$0.00	$0.00	$0.00	$0.04	$0.00	$0.00
PM_TC	Reduced Tenant Complaints to Property Managers	$0.00	$0.00	$0.00	$1.03	$0.00	$0.00	$0.00	$0.00	$0.72	$0.00	$0.00
Participant Hardship, Knowledge NEBs												
P_HS	Hardship benefits	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
P_NM	Avoided moves / household impacts	$0.00	$0.00	$0.00	$0.00	$2.31	$0.00	$0.00	$0.00	$0.00	$2.31	$2.31

Source: SERA "NEB-It" Computations, 2023

Figure 4.7.2: NEB/NEI values by category and subcategory for program year 5 (2023). Program Wide.

SERA NEB-It/NEI MODEL 2.0		DEP SS	DEP HEHC	DEP MyHER	DEP MFDI	DEP IQNES	DEC SS	DEC HEHC	DEC MyHER	DEC MFDI	DEC IQNES	DEC IQWx
UTILITY NEBS												
Utility Customer Service and Payment-Related												
U_Ar	Reduced Carrying Cost on Arrearages (interest)	$0	$0	$0	$0	$6,770	$0	$0	$0	$0	$11,513	$964
U_BD	Lower Bad Debt Written Off	$0	$0	$0	$0	$25,843	$0	$0	$0	$0	$43,072	$3,607
U_SO	Fewer Shutoffs	$0	$0	$0	$0	$3,235	$0	$0	$0	$0	$5,392	$452
U_RC	Fewer Reconnects	$0	$0	$0	$0	($10)	$0	$0	$0	$0	($4)	($0)
U_CC	Fewer Customer Calls	$0	$0	$0	$0	$4,183	$0	$0	$0	$0	$6,943	$582
SOCIETAL / PUBLIC NEBS												
Societal Environmental & Water NEBs												
S_Em	Emissions on Public Illnesses & Deaths	$2,639,590	$650,166	$6,533,270	$111,241	$129,304	$3,500,039	$558,086	$12,126,582	$136,115	$137,172	$46,054
PARTICIPANT NEBS												
Participant Bills / Payment NEBs												
P_SO	Fewer Shutoffs	$0	$0	$0	$0	$969	$0	$0	$0	$0	$1,615	$135
P_Re	Fewer Reconnects	$0	$0	$0	$0	$17	$0	$0	$0	$0	$21	$2
P_BC	Fewer Calls to Utility	$0	$0	$0	$0	$1,534	$0	$0	$0	$0	$2,557	$214
Participant Water Savings												
P_WA	Reduced water / wastewater bills-All Measures	$1,269,645	$60,047	$0	$184,992	$133,301	$3,307,111	$89,756	$0	$267,960	$253,790	$0
Participant Comfort, Health & Safety NEBs												
P_Co	Comfort	$491,207	$120,991	$0	$5,111	$24,062	$532,458	$84,901	$0	$3,730	$20,868	$7,006
P_FF	Fewer fires	$604	$0	$0	$0	$0	$887	$0	$0	$0	$0	$7
P_MW	Fewer Sick days from work	$56,051	$0	$0	$0	$0	$93,272	$0	$0	$0	$0	$1,070
P_MS	Fewer Sick days from school	$9,130	$0	$0	$0	$0	$15,391	$0	$0	$0	$0	$177
P_As	Fewer Asthma Incidences	$35,143	$0	$0	$0	$0	$60,622	$0	$0	$0	$0	$695
P_RA	Reduction in Allergies	$9,368	$0	$0	$0	$0	$13,599	$0	$0	$0	$0	$156
P_CS	Reduction in Cold Symptoms	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
P_Sa	Household Safety	$0	$0	$0	$167	$0	$0	$0	$0	$122	$0	$0
Participant Equipment Performance NEBs												
P_NR	Outside Noise Reduction	$225,842	$0	$0	$0	$27,658	$244,808	$0	$0	$0	$23,986	$8,053
P_NA	Inside Noise Reduction (appliances)	$338,763	$83,442	$0	$0	$22,126	$367,212	$58,552	$0	$0	$19,189	$6,443
P_LQ	Quality / Quantity of Lighting	$282,303	$69,535	$0	$11,940	$27,658	$306,010	$48,794	$0	$20,808	$23,986	$8,053
P_OM	Operations & Maintenance Cost Changes	$0	$0	$0	$5,459	$0	$0	$0	$0	$3,984	$0	$1,380
P_ML	Measure Lifetime / Deferred Purchase	$553,967	$431,641	$0	$6,280	$0	$1,022,677	$545,596	$0	$5,507	$0	$0
P_EP	Improved Equipment Features/ Performance	$225,842	$0	$0	$0	$0	$244,808	$0	$0	$0	$0	$11,194
PM_Mk	Marketability for Property Managers	$0	$0	$0	$174	$0	$0	$0	$0	$155	$0	$0
PM_TC	Reduced Tenant Complaints to Property Managers	$0	$0	$0	$3,357	$0	$0	$0	$0	$2,949	$0	$0
Participant Hardship, Knowledge NEBs												
P_HS	Hardship benefits	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
P_NM	Avoided moves / household impacts	$0	$0	$0	$0	$11,083	$0	$0	$0	$0	$18,472	$1,547

Source: SERA "NEB-It" Computations, 2023

APPENDIX A: DETAILED NEB VALUES BY PROGRAM

The NEB/NEI value for each NEB Group is shown in the following tables. NEB/NEI value is presented for each of the five program years (2019-2023) and are presented per participant and for the overall program. The total NEB/NEI value, total energy savings, and the calculated multiplier are shown in each table.

Figure A.1: DEP Smart$aver – NEB Results by NEB Group

DEP Smart$aver	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$93.73	$4,495,110	$65.51	$3,140,100	$81.39	$2,797,299	$103.05	$3,541,349	$76.81	$2,639,590
Participant Bills / Payment NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Water Savings	$43.28	$2,075,716	$42.66	$2,044,574	$35.79	$1,229,907	$64.29	$2,209,492	$36.94	$1,269,645
Participant Comfort, Health & Safety NEBs	$20.41	$979,004	$15.16	$726,796	$18.17	$624,418	$22.34	$767,901	$17.50	$601,502
Participant Equipment Performance NEBs	$58.85	$2,822,178	$40.00	$1,917,223	$48.19	$1,656,213	$61.50	$2,113,712	$47.33	$1,626,717
Participant Hardship, Knowledge NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Total (for NEBs Included)	$216.28	$10,372,008	$163.33	$7,828,692	$183.54	$6,307,836	$251.18	$8,632,455	$178.59	$6,137,454
Energy Savings	$202.43	$9,707,745	$141.25	$6,770,135	$175.32	$6,025,257	$220.81	$7,588,425	$164.29	$5,646,054
Multiplier: NEB value relative to program bill savings	1.07	1.07	1.16	1.16	1.05	1.05	1.14	1.14	1.09	1.09

Source: SERA "NEB-It" Computations, 2023

Figure A.2: DEC Smart$aver – NEB Results by NEB Group

DEC Smart$aver	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$26.20	$13,431,283	$27.45	$7,657,042	$70.28	$4,104,653	$102.61	$5,992,966	$59.92	$3,500,039
Participant Bills / Payment NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Water Savings	$6.42	$3,292,860	$12.42	$3,463,093	$36.66	$2,141,388	$65.42	$3,821,184	$56.62	$3,307,111
Participant Comfort, Health & Safety NEBs	$6.77	$3,470,547	$7.03	$1,959,523	$13.62	$795,506	$18.71	$1,092,708	$12.26	$716,228
Participant Equipment Performance NEBs	$16.99	$8,712,529	$17.20	$4,796,544	$42.19	$2,463,944	$61.19	$3,573,715	$37.42	$2,185,516
Participant Hardship, Knowledge NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Total (for NEBs Included)	$56.39	$28,907,219	$64.10	$17,876,202	$162.75	$9,505,491	$247.93	$14,480,573	$166.23	$9,708,895
Energy Savings	$46.22	$23,696,920	$48.36	$13,488,435	$123.69	$7,224,182	$179.72	$10,496,780	$104.79	$6,120,205
Multiplier: NEB value relative to program bill savings	1.22	1.22	1.33	1.33	1.32	1.32	1.38	1.38	1.59	1.59

Source: SERA "NEB-It" Computations, 2023

Figure A.3: DEC HEHC – NEB Results by NEB Group

DEP HEHC	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Low Income Rate Subsidies	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Economic NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$50.36	$338,867	$52.80	$313,183	$50.63	$254,757	$129.62	$652,230	$129.21	$650,166
Societal Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Bills / Payment NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Water Savings	$2.89	$19,459	$4.76	$28,250	$5.11	$25,713	$11.71	$58,931	$11.93	$60,047
Participant Comfort, Health & Safety NEBs	$0.00	$0	$9.90	$58,745	$9.49	$47,740	$24.16	$121,591	$24.04	$120,991
Participant Equipment Performance NEBs	$42.39	$285,260	$54.52	$323,429	$56.39	$283,756	$108.00	$543,446	$116.18	$584,618
Participant Hardship, Knowledge NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Total (for NEBs Included)	$95.64	$643,585	$121.98	$723,606	$121.62	$611,967	$273.49	$1,376,198	$281.36	$1,415,821
Energy Savings	$108.76	$731,825	$113.83	$675,230	$109.05	$548,736	$277.74	$1,397,603	$276.37	$1,390,698
Multiplier: NEB value relative to program bill savings	0.88	0.88	1.07	1.07	1.12	1.12	0.98	0.98	1.02	1.02

Source: SERA "NEB-It" Computations, 2023

Figure A.4: DEC HEHC – NEB Results by NEB Group

DEC HEHC	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Low Income Rate Subsidies	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Economic NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$27.59	$285,440	$27.70	$277,766	$28.49	$242,157	$86.89	$738,648	$65.65	$558,086
Societal Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Bills / Payment NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Water Savings	$1.85	$19,154	$2.75	$27,589	$2.98	$25,296	$13.17	$111,945	$10.56	$89,756
Participant Comfort, Health & Safety NEBs	$0.00	$0	$4.25	$42,569	$4.36	$37,079	$13.24	$112,557	$9.99	$84,901
Participant Equipment Performance NEBs	$31.99	$330,968	$36.49	$365,858	$42.84	$364,171	$101.57	$863,449	$76.81	$652,943
Participant Hardship, Knowledge NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Total (for NEBs Included)	$61.43	$635,562	$71.19	$713,782	$78.66	$668,703	$214.87	$1,826,599	$163.00	$1,385,685
Energy Savings	$48.68	$503,604	$48.80	$489,304	$50.13	$426,196	$152.19	$1,293,754	$114.80	$975,874
Multiplier: NEB value relative to program bill savings	1.26	1.26	1.46	1.46	1.57	1.57	1.41	1.41	1.42	1.42

Source: SERA "NEB-It" Computations, 2023

Figure A.5: DEP MyHER – NEB Results by NEB Group

DEP MyHER	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Low Income Rate Subsidies	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Economic NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$7.07	$6,342,514	$7.50	$6,375,810	$9.53	$7,757,730	$9.61	$7,822,139	$8.03	$6,533,270
Societal Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Bills / Payment NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Water Savings	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Comfort, Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Equipment Performance NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Hardship, Knowledge NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Total (for NEBs Included)	$7.07	$6,342,514	$7.50	$6,375,810	$9.53	$7,757,730	$9.61	$7,822,139	$8.03	$6,533,270
Energy Savings	$15.27	$13,697,441	$16.18	$13,746,409	$20.53	$16,709,804	$20.59	$16,761,332	$17.17	$13,974,590
Multiplier: NEB value relative to program bill savings	0.46	0.46	0.46	0.46	0.46	0.46	0.47	0.47	0.47	0.47

Source: SERA "NEB-It" Computations, 2023

Figure A.6: DEC MyHER – NEB Results by NEB Group

DEC MyHER	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Low Income Rate Subsidies	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Economic NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$7.71	$11,369,703	$7.77	$11,501,644	$8.54	$12,131,844	$8.55	$12,145,341	$8.53	$12,126,582
Societal Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Bills / Payment NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Water Savings	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Comfort, Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Equipment Performance NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Hardship, Knowledge NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Total (for NEBs Included)	$7.71	$11,369,703	$7.77	$11,501,644	$8.54	$12,131,844	$8.55	$12,145,341	$8.53	$12,126,582
Energy Savings	$13.61	$20,059,658	$13.69	$20,260,981	$15.03	$21,352,026	$14.97	$21,272,768	$14.92	$21,204,672
Multiplier: NEB value relative to program bill savings	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57

Source: SERA "NEB-It" Computations, 2023

Figure A.7: DEP MFDI – NEB Results by NEB Group

DEP MFDI	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Low Income Rate Subsidies	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Economic NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$32.58	$503,768	$28.63	$136,146	$21.23	$69,200	$21.34	$69,560	$34.12	$111,241
Societal Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Bills / Payment NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Water Savings	$37.97	$587,149	$40.13	$190,845	$37.48	$122,172	$40.28	$131,310	$56.75	$184,992
Participant Comfort, Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$1.62	$5,278
Participant Equipment Performance NEBs	$8.16	$126,191	$6.73	$32,015	$3.81	$12,407	$4.09	$13,335	$8.35	$27,210
Participant Hardship, Knowledge NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Total (for NEBs Included)	$78.72	$1,217,108	$75.48	$359,006	$62.51	$203,779	$65.71	$214,205	$100.83	$328,721
Energy Savings	$70.36	$1,087,949	$61.72	$293,534	$45.72	$149,054	$45.72	$149,054	$72.99	$237,944
Multiplier: NEB value relative to program bill savings	1.12	1.12	1.22	1.22	1.37	1.37	1.44	1.44	1.38	1.38

Source: SERA "NEB-It" Computations, 2023

Figure A.8: DEC MFDI – NEB Results by NEB Group

DEC MFDI	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Low Income Rate Subsidies	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Economic NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$26.07	$794,775	$22.02	$164,367	$24.17	$99,186	$22.23	$91,214	$33.17	$136,115
Societal Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Bills / Payment NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Water Savings	$36.12	$1,101,187	$30.59	$228,385	$40.37	$165,687	$39.97	$164,033	$65.29	$267,960
Participant Comfort, Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.94	$3,852
Participant Equipment Performance NEBs	$6.29	$191,889	$5.52	$41,197	$5.21	$21,362	$5.59	$22,960	$8.14	$33,403
Participant Hardship, Knowledge NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Total (for NEBs Included)	$68.49	$2,087,852	$58.12	$433,949	$69.75	$286,235	$67.79	$278,207	$107.54	$441,331
Energy Savings	$46.00	$1,402,228	$38.78	$289,544	$42.54	$174,567	$38.93	$159,762	$58.00	$238,013
Multiplier: NEB value relative to program bill savings	1.49	1.49	1.50	1.50	1.64	1.64	1.74	1.74	1.85	1.85

Source: SERA "NEB-It" Computations, 2023

Figure A.9: DEP IQNES – NEB Results by NEB Group

DEP IQNES	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$7.47	$20,325	$7.62	$2,399	$7.70	$5,955	$8.18	$39,241	$8.34	$40,021
Utility Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Low Income Rate Subsidies	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Economic NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$26.22	$71,384	$26.27	$8,275	$25.66	$19,832	$26.89	$129,073	$26.94	$129,304
Societal Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Bills / Payment NEBs	$0.50	$1,350	$0.50	$158	$0.48	$369	$0.51	$2,461	$0.52	$2,520
Participant Water Savings	$38.85	$105,747	$39.82	$12,542	$34.11	$26,363	$27.12	$130,177	$27.77	$133,301
Participant Comfort, Health & Safety NEBs	$0.00	$0	$0.00	$0	$4.81	$3,716	$5.01	$24,062	$5.01	$24,062
Participant Equipment Performance NEBs	$10.19	$27,749	$10.19	$3,211	$15.47	$11,961	$16.13	$77,442	$16.13	$77,442
Participant Hardship, Knowledge NEBs	$2.02	$5,495	$2.07	$652	$2.10	$1,622	$2.25	$10,823	$2.31	$11,083
Total (for NEBs Included)	$85.25	$232,051	$86.47	$27,237	$90.32	$69,818	$86.10	$413,281	$87.03	$417,733
Energy Savings	$56.64	$154,163	$56.64	$17,840	$55.26	$42,716	$57.62	$276,579	$57.62	$276,579
Multiplier: NEB value relative to program bill savings	1.51	1.51	1.53	1.53	1.63	1.63	1.49	1.49	1.51	1.51

Source: SERA "NEB-It" Computations, 2023

Figure A.10: DEC IQNES – NEB Results by NEB Group

DEC IQNES	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$7.49	$49,649	$7.64	$8,807	$7.73	$10,623	$8.20	$98,427	$8.36	$66,917
Utility Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Low Income Rate Subsidies	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Economic NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$10.71	$70,985	$10.73	$12,363	$12.05	$16,550	$17.12	$205,417	$17.15	$137,172
Societal Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Bills / Payment NEBs	$0.50	$3,281	$0.50	$577	$0.48	$655	$0.51	$6,144	$0.52	$4,193
Participant Water Savings	$39.97	$264,776	$40.05	$46,133	$37.75	$51,863	$30.06	$360,710	$31.72	$253,790
Participant Comfort, Health & Safety NEBs	$0.00	$0	$0.00	$0	$1.84	$2,534	$2.61	$31,302	$2.61	$20,868
Participant Equipment Performance NEBs	$3.40	$22,543	$3.40	$3,920	$5.94	$8,156	$8.40	$100,741	$8.40	$67,161
Participant Hardship, Knowledge NEBs	$2.02	$13,374	$2.07	$2,383	$2.10	$2,883	$2.25	$27,058	$2.31	$18,472
Total (for NEBs Included)	$64.09	$424,608	$64.40	$74,183	$67.88	$93,264	$69.15	$829,799	$71.07	$568,573
Energy Savings	$18.90	$125,240	$18.90	$21,778	$21.20	$29,128	$29.98	$359,791	$29.98	$239,860
Multiplier: NEB value relative to program bill savings	3.39	3.39	3.41	3.41	3.20	3.20	2.31	2.31	2.37	2.37

Source: SERA "NEB-It" Computations, 2023

Figure A.11: DEC IQWx – NEB Results by NEB Group

DEC IQWx	Year 1 2019		Year 2 2020		Year 3 2021		Year 4 2022		Year 5 2023	
NEB Results by NEB Group	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide	Per HH	Program-wide
Utility Customer Service and Payment-Related	$7.49	$7,179	$7.64	$3,211	$7.73	$5,095	$8.20	$2,256	$8.36	$5,604
Utility Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Utility Low Income Rate Subsidies	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Economic NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Societal Environmental & Emissions NEBs	$78.12	$74,840	$78.36	$32,913	$81.88	$53,958	$36.92	$10,155	$68.74	$46,054
Societal Health & Safety NEBs	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Bills / Payment NEBs	$0.50	$474	$0.50	$211	$0.48	$314	$0.51	$141	$0.52	$351
Participant Water Savings	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Participant Comfort, Health & Safety NEBs	$14.74	$14,118	$14.83	$6,227	$15.39	$10,145	$0.00	$0	$13.60	$9,111
Participant Equipment Performance NEBs	$58.17	$55,723	$61.11	$25,666	$61.01	$40,205	$20.90	$5,749	$52.42	$35,122
Participant Hardship, Knowledge NEBs	$2.02	$1,934	$2.07	$869	$2.10	$1,383	$2.25	$620	$2.31	$1,547
Total (for NEBs Included)	$161.03	$154,269	$164.51	$69,096	$168.59	$111,100	$68.79	$18,921	$145.96	$97,790
Energy Savings	$137.83	$132,040	$138.04	$57,979	$144.11	$94,967	$64.67	$17,787	$120.20	$80,531
Multiplier: NEB value relative to program bill savings	1.17	1.17	1.19	1.19	1.17	1.17	1.06	1.06	1.21	1.21

Source: SERA "NEB-It" Computations, 2023

APPENDIX B: DETAILED RESULTS BY MEASURES / MEASURE END-USE CATEGORIES

The NEB/NEI values are attributed to different measures and end uses for each program. The tables in this appendix present the percent of the total NEB/NEI value that is attributed to the different end-uses for each program. The percent of the total NEB/NEI from each end-use is the same for each participant and the program overall. Results for 5 program years (2019-2023) are presented for each program.

Figure B.1: DEP Smart$aver – NEB Results by Measure End Use Category

DEP Smart$aver	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm Wide	Per HH & Pgm Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	23%	24%	27%	31%	29%
DHW	26%	34%	26%	33%	26%
Enclosure / Building Envelope	5%	4%	5%	4%	5%
Lighting	46%	36%	42%	31%	39%
Appliances	0%	0%	0%	0%	0%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	1%	1%	1%	1%	1%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

Figure B.2: DEC Smart$aver – NEB Results by Measure End Use Category

DEC Smart$aver	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	22%	21%	21%	26%	20%
DHW	14%	24%	28%	32%	40%
Enclosure / Building Envelope	4%	4%	5%	4%	4%
Lighting	60%	50%	45%	38%	35%
Appliances	0%	0%	0%	0%	0%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	0%	0%	1%	1%	1%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

Figure B.3: DEP HEHC – NEB Results by Measure End Use Category

DEP HEHC	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	0%	14%	14%	16%	15%
DHW	4%	5%	6%	5%	5%
Enclosure / Building Envelope	0%	0%	0%	0%	0%
Lighting	96%	81%	80%	79%	80%
Appliances	0%	0%	0%	0%	0%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	0%	0%	0%	0%	0%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

Figure B.4: DEC HEHC– NEB Results by Measure End Use Category

DEC HEHC	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	0%	10%	11%	12%	12%
DHW	4%	6%	5%	7%	7%
Enclosure / Building Envelope	0%	0%	0%	0%	0%
Lighting	96%	84%	83%	81%	81%
Appliances	0%	0%	0%	0%	0%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	0%	0%	0%	0%	0%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

Figure B.5: DEP MFDI – NEB Results by Measure End Use Category

DEP MFDI	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	0%	0%	0%	0%	11%
DHW	70%	75%	83%	83%	78%
Enclosure / Building Envelope	0%	0%	0%	0%	0%
Lighting	30%	25%	17%	17%	11%
Appliances	0%	0%	0%	0%	0%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	0%	0%	0%	0%	0%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

Figure B.6: DEC MFDI – NEB Results by Measure End Use Category

DEC MFDI	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	0%	0%	0%	0%	6%
DHW	73%	72%	78%	77%	80%
Enclosure / Building Envelope	0%	0%	0%	0%	0%
Lighting	27%	28%	22%	23%	14%
Appliances	0%	0%	0%	0%	0%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	0%	0%	0%	0%	0%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

Figure B.7: DEP MyHER – NEB Results by Measure End Use Category

DEP MyHER	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	17%	16%	13%	13%	15%
DHW	0%	0%	0%	0%	0%
Enclosure / Building Envelope	0%	0%	0%	0%	0%
Lighting	0%	0%	0%	0%	0%
Appliances	42%	39%	31%	31%	37%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	41%	44%	56%	56%	48%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

Figure B.8: DEC MyHER – NEB Results by Measure End Use Category

DEC MyHER	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	16%	16%	14%	14%	14%
DHW	0%	0%	0%	0%	0%
Enclosure / Building Envelope	0%	0%	0%	0%	0%
Lighting	0%	0%	0%	0%	0%
Appliances	38%	38%	34%	35%	35%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	46%	47%	51%	51%	51%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

Figure B.9: DEP IQNES – NEB Results by Measure End Use Category

DEP IQNES	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	7%	7%	9%	9%	9%
DHW	60%	60%	49%	41%	41%
Enclosure / Building Envelope	12%	12%	24%	35%	34%
Lighting	21%	20%	17%	16%	15%
Appliances	0%	0%	0%	0%	0%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	0%	0%	0%	0%	0%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

Figure B.10: DEC IQNES – NEB Results by Measure End Use Category

DEC IQNES	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	4%	4%	5%	8%	7%
DHW	72%	72%	64%	48%	49%
Enclosure / Building Envelope	13%	13%	21%	36%	35%
Lighting	11%	11%	10%	8%	8%
Appliances	0%	0%	0%	0%	0%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	0%	0%	0%	0%	0%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

Figure B.11: DEC IQWx – NEB Results by Measure End Use Category

DEC IQWx	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023
NEB Results by Measure End Use Category	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide	Per HH & Pgm-Wide
HVAC	28%	31%	38%	0%	33%
DHW	3%	3%	3%	0%	2%
Enclosure / Building Envelope	44%	44%	45%	0%	39%
Lighting	10%	9%	10%	0%	9%
Appliances	16%	13%	5%	100%	16%
Maintenance	0%	0%	0%	0%	0%
Miscellaneous	0%	0%	0%	0%	0%
Total (for NEBs Included)	100%	100%	100%	100%	100%

Source: SERA "NEB-It" Computations, 2023

APPENDIX C: MEASURE RESULT GRAPHS

This appendix displays a graphical representation of those results. The percent of the total NEB/NEI value that is attributed to each end use for each program can be found in the tables in Appendix B. The NEB/NEI values are attributed to different measures and end uses for each program. The percent of the total NEB/NEI from each end-use is the same for each participant and the program overall. Results for 5 program years (2019-2023) are presented for each program.

Figure C.1: Smart$aver - NEI Percent by Measure

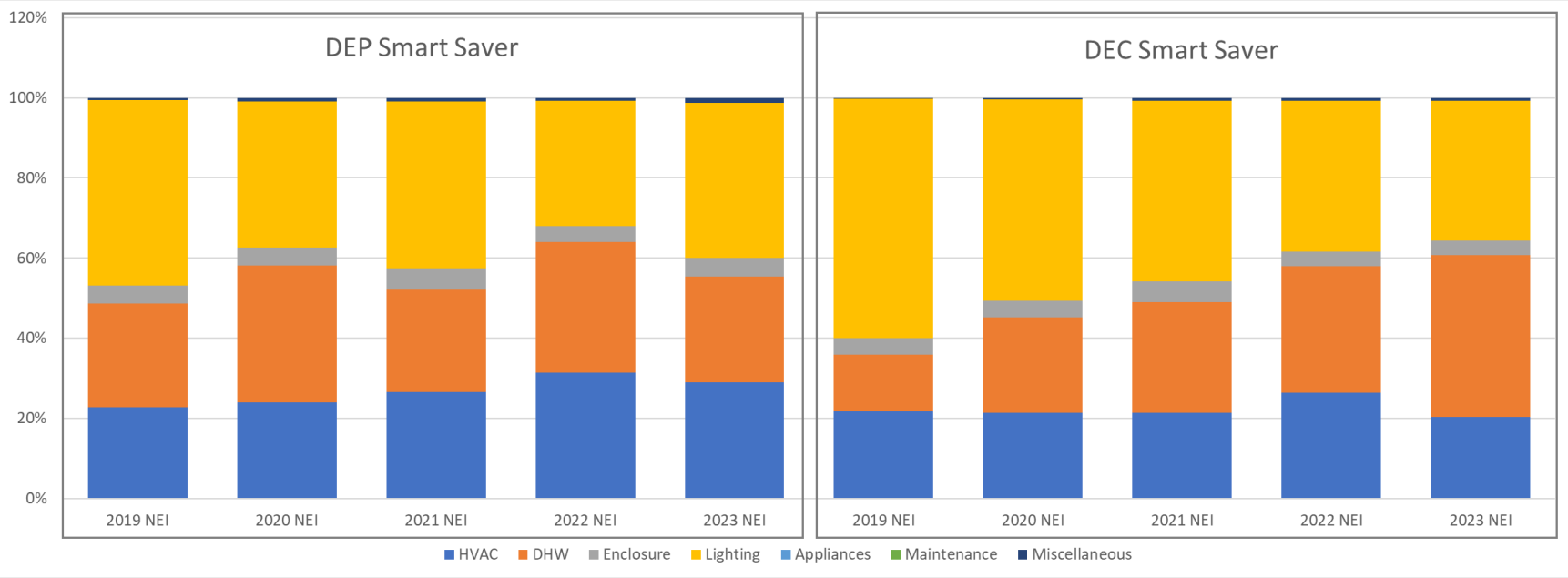


Figure Note: Enclosure = Building Envelope
Source: SERA "NEB-It" Computations, 2023

Figure C.2: Home Energy House Call - NEI Percent by Measure

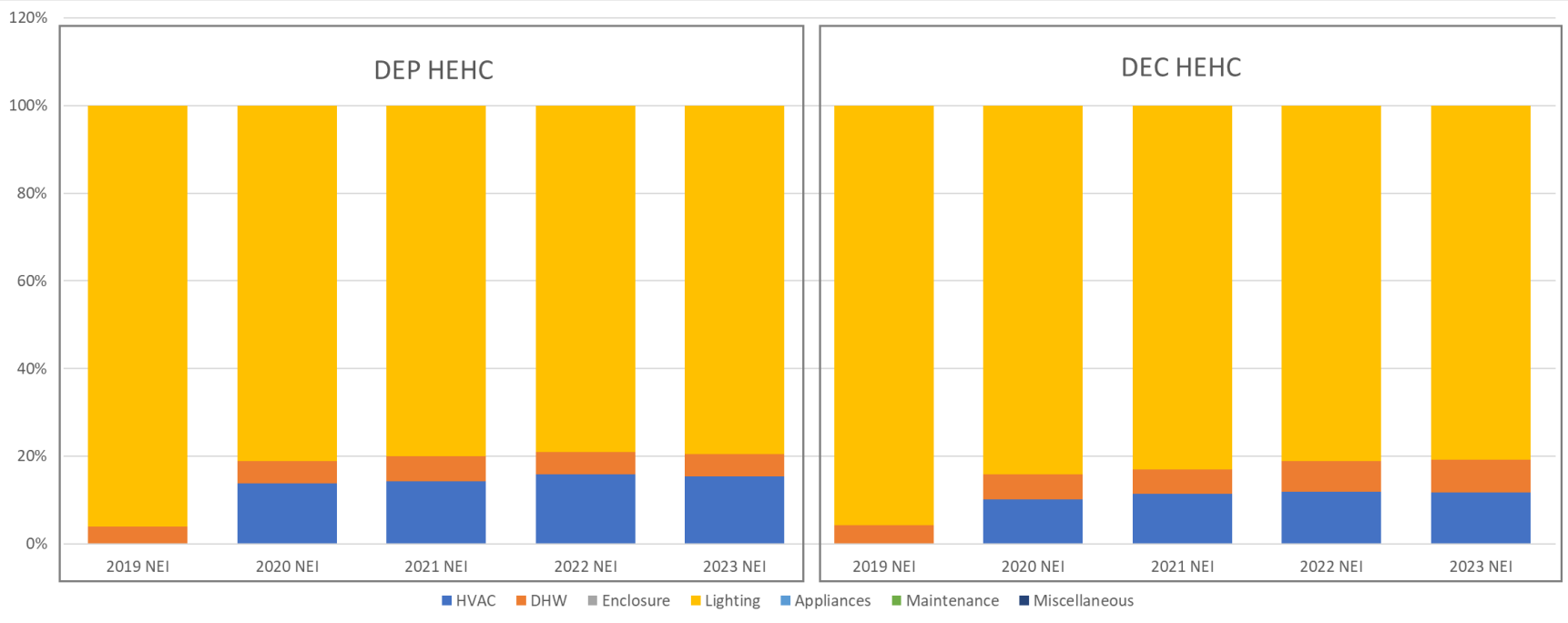


Figure Note: Enclosure = Building Envelope
Source: SERA "NEB-It" Computations, 2023

Figure C.3: MyHER - NEI Percent by Measure

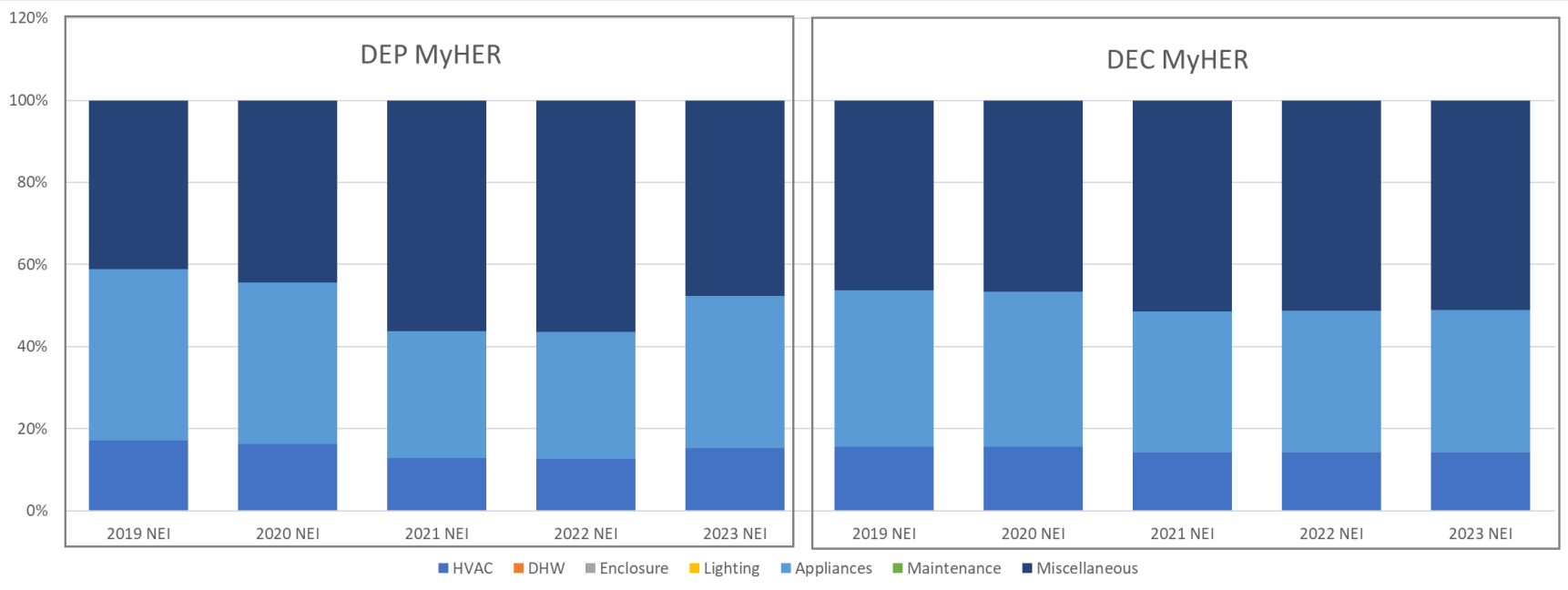


Figure Note: Enclosure = Building Envelope
Source: SERA "NEB-It" Computations, 2023

Figure C.4: Multifamily Direct Install - NEI Percent by Measure

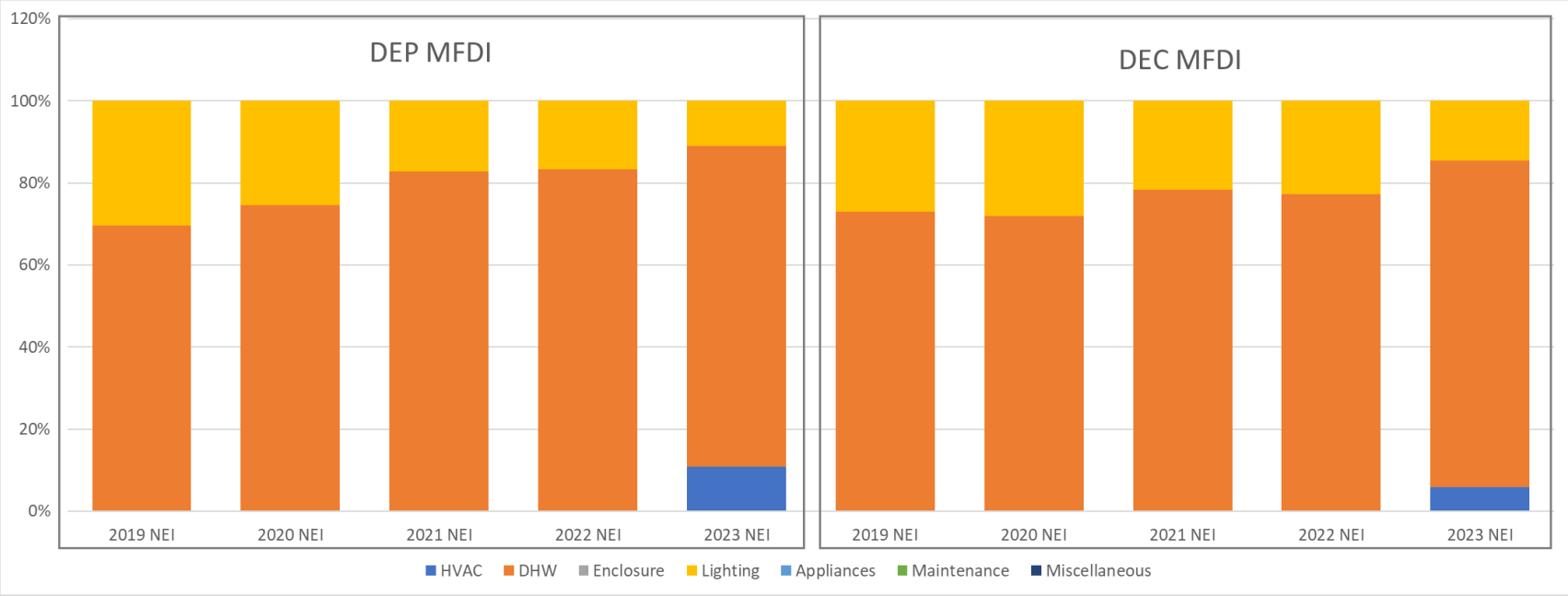


Figure Note: Enclosure = Building Envelope. High percent of value attributed to DHW measure due to multiple faucet aerators and low flow showerheads installed. Smart thermostats were introduced in 2023, attributing to the HVAC value in that year.
Source: SERA "NEB-It" Computations, 2023

Figure C.5: Income Qualified Neighborhood Energy Saver – NEI Percent by Measure

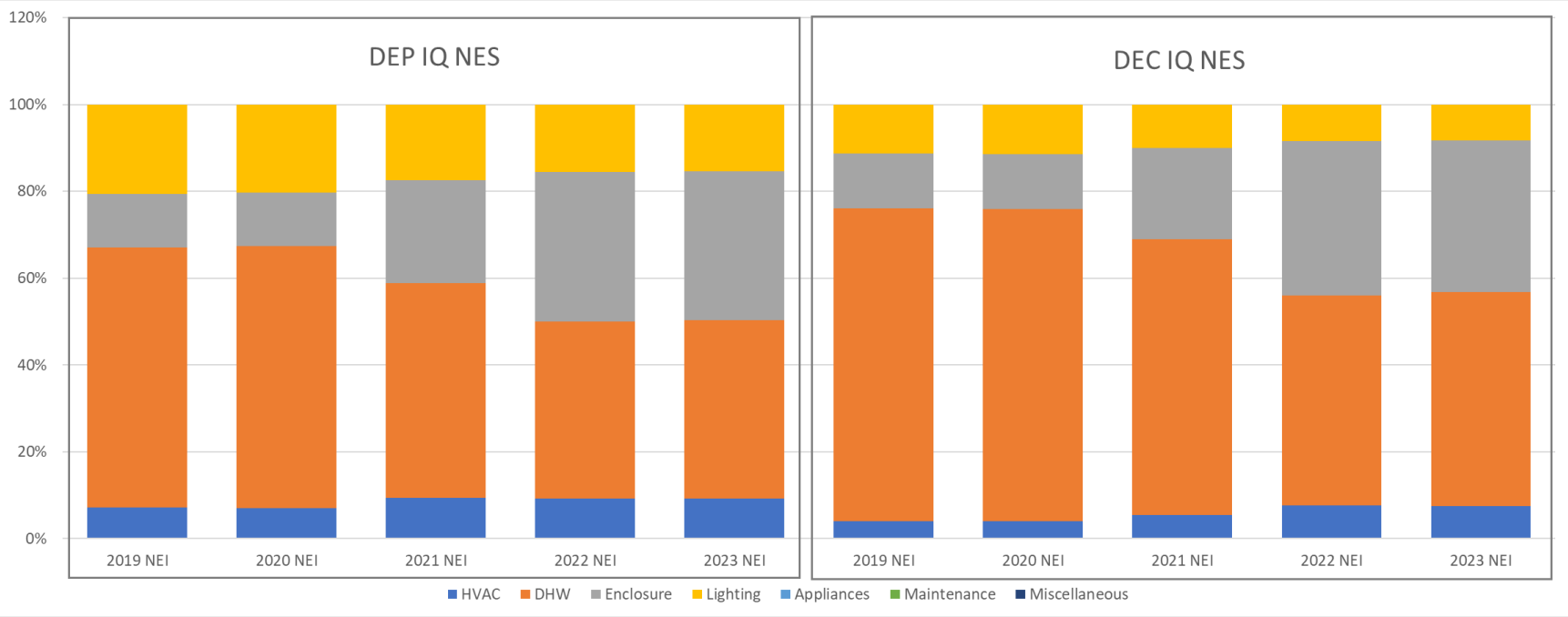


Figure Note: Enclosure = Building Envelope
Source: SERA "NEB-It" Computations, 2023

Figure C.6: Income Qualified Weatherization - NEI Percent by Measure

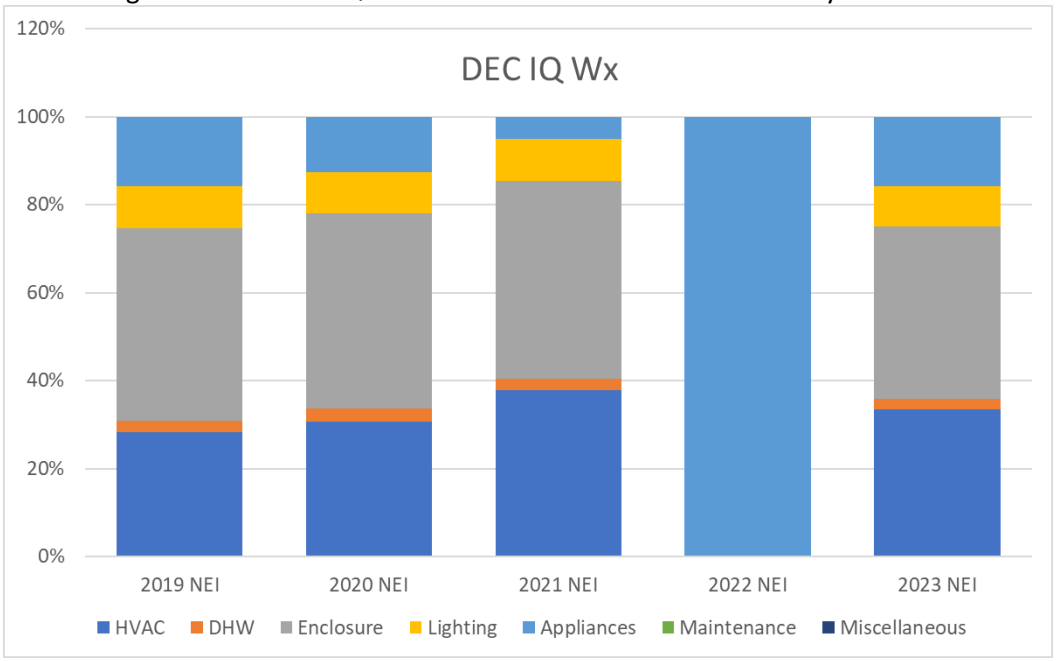


Figure Note: Enclosure = Building Envelope. Only refrigerator replacement occurred in 2022.
Source: SERA "NEB-It" Computations, 2023

APPENDIX D NEB/NEI BY CATEGORY AND SUBCATEGORY

The following tables present the NEB/NEI results for each program. Results are presented first as per household for each program, followed by program wide results. The results are shown for each NEB/NEI that was calculated in each individual program. NEBs/NEIs varied based on the program type (Income qualified, non-income qualified, Multifamily, Home Energy Report) and varied based on the measures installed from that program. Results are shown for five years.

Figure D.1: NEB/NEI results by category and subcategory for DEP Smart$aver Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0

DEP SMART SAVER

INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$93.73*	*$65.51*	*$81.39*	*$103.05*	*$76.81*	*$420.49*
S_Em	Emissions on Public Illnesses & Deaths	*$93.73*	*$65.51*	*$81.39*	*$103.05*	*$76.81*	*$420.49*
PARTICIPANT NEBS							
Participant Water Savings		*$43.28*	*$42.66*	*$35.79*	*$64.29*	*$36.94*	*$222.96*
P_WA	Reduced water / wastewater bills-All Measures	*$43.28*	*$42.66*	*$35.79*	*$64.29*	*$36.94*	*$222.96*
Participant Comfort, Health & Safety NEBs		*$20.41*	*$15.16*	*$18.17*	*$22.34*	*$17.50*	*$93.59*
P_Co	Comfort	*$17.61*	*$12.29*	*$15.25*	*$19.21*	*$14.29*	*$78.66*
P_FF	Fewer fires	*$0.01*	*$0.01*	*$0.02*	*$0.02*	*$0.02*	*$0.08*
P_MW	Fewer Sick days from work	*$1.43*	*$1.46*	*$1.48*	*$1.59*	*$1.63*	*$7.59*
P_MS	Fewer Sick days from school	*$0.23*	*$0.24*	*$0.24*	*$0.26*	*$0.27*	*$1.24*
P_As	Fewer Asthma Incidences	*$0.89*	*$0.92*	*$0.93*	*$1.00*	*$1.02*	*$4.76*
P_RA	Reduction in Allergies	*$0.24*	*$0.24*	*$0.25*	*$0.27*	*$0.27*	*$1.27*
P_CS	Reduction in Cold Symptoms	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
P_Sa	Household Safety	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Participant Equipment Performance NEBs		*$58.85*	*$40.00*	*$48.19*	*$61.50*	*$47.33*	*$255.88*
P_NR	Outside Noise Reduction	*$8.10*	*$5.65*	*$7.01*	*$8.83*	*$6.57*	*$36.16*
P_NA	Inside Noise Reduction (appliances)	*$12.15*	*$8.47*	*$10.52*	*$13.25*	*$9.86*	*$54.25*
P_LQ	Quality / Quantity of Lighting	*$10.12*	*$7.06*	*$8.77*	*$11.04*	*$8.21*	*$45.20*
P_OM	Operations & Maintenance Cost Changes	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
P_ML	Measure Lifetime / Deferred Purchase	*$20.39*	*$13.16*	*$14.88*	*$19.55*	*$16.12*	*$84.10*
P_EP	Improved Equipment Features/ Performance	*$8.10*	*$5.65*	*$7.01*	*$8.83*	*$6.57*	*$36.16*

Source: SERA "NEB-It" Computations, 2023

Figure D.2: NEB/NEI results by category and subcategory for DEC Smart$aver Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0

DEC SMART SAVER

INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$26.20*	*$27.45*	*$70.28*	*$102.61*	*$59.92*	*$286.46*
S_Em	Emissions on Public Illnesses & Deaths	*$26.20*	*$27.45*	*$70.28*	*$102.61*	*$59.92*	*$286.46*
PARTICIPANT NEBS							
Participant Water Savings		*$6.42*	*$12.42*	*$36.66*	*$65.42*	*$56.62*	*$177.55*
P_WA	Reduced water / wastewater bills-All Measures	*$6.42*	*$12.42*	*$36.66*	*$65.42*	*$56.62*	*$177.55*
Participant Comfort, Health & Safety NEBs		*$6.77*	*$7.03*	*$13.62*	*$18.71*	*$12.26*	*$58.39*
P_Co	Comfort	*$4.02*	*$4.21*	*$10.76*	*$15.64*	*$9.12*	*$43.74*
P_FF	Fewer fires	*$0.01*	*$0.01*	*$0.01*	*$0.02*	*$0.02*	*$0.07*
P_MW	Fewer Sick days from work	*$1.40*	*$1.43*	*$1.45*	*$1.56*	*$1.60*	*$7.43*
P_MS	Fewer Sick days from school	*$0.23*	*$0.24*	*$0.24*	*$0.26*	*$0.26*	*$1.23*
P_As	Fewer Asthma Incidences	*$0.91*	*$0.93*	*$0.94*	*$1.01*	*$1.04*	*$4.83*
P_RA	Reduction in Allergies	*$0.20*	*$0.21*	*$0.21*	*$0.23*	*$0.23*	*$1.08*
P_CS	Reduction in Cold Symptoms	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
P_Sa	Household Safety	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Participant Equipment Performance NEBs		*$16.99*	*$17.20*	*$42.19*	*$61.19*	*$37.42*	*$174.98*
P_NR	Outside Noise Reduction	*$1.85*	*$1.93*	*$4.95*	*$7.19*	*$4.19*	*$20.11*
P_NA	Inside Noise Reduction (appliances)	*$2.77*	*$2.90*	*$7.42*	*$10.78*	*$6.29*	*$30.17*
P_LQ	Quality / Quantity of Lighting	*$2.31*	*$2.42*	*$6.18*	*$8.99*	*$5.24*	*$25.14*
P_OM	Operations & Maintenance Cost Changes	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
P_ML	Measure Lifetime / Deferred Purchase	*$8.21*	*$8.01*	*$18.69*	*$27.04*	*$17.51*	*$79.46*
P_EP	Improved Equipment Features/ Performance	*$1.85*	*$1.93*	*$4.95*	*$7.19*	*$4.19*	*$20.11*

Source: SERA "NEB-It" Computations, 2023

Figure D.3: NEB/NEI results by category and subcategory for DEP HEHC Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0

DEP HOME ENERGY HOUSE CALL (HEHC)

INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$50.36*	*$52.80*	*$50.63*	*$129.62*	*$129.21*	*$412.60*
S_Em	Emissions on Public Illnesses & Deaths	*$50.36*	*$52.80*	*$50.63*	*$129.62*	*$129.21*	*$412.60*
PARTICIPANT NEBS							
Participant Water Savings		*$2.89*	*$4.76*	*$5.11*	*$11.71*	*$11.93*	*$36.41*
P_WA	Reduced water / wastewater bills-All Measures	*$2.89*	*$4.76*	*$5.11*	*$11.71*	*$11.93*	*$36.41*
Participant Comfort, Health & Safety NEBs		*$0.00*	*$9.90*	*$9.49*	*$24.16*	*$24.04*	*$67.60*
P_Co	Comfort	*$0.00*	*$9.90*	*$9.49*	*$24.16*	*$24.04*	*$67.60*
Participant Equipment Performance NEBs		*$42.39*	*$54.52*	*$56.39*	*$108.00*	*$116.18*	*$377.48*
P_NA	Inside Noise Reduction (appliances)	*$0.00*	*$6.83*	*$6.54*	*$16.66*	*$16.58*	*$46.62*
P_LQ	Quality / Quantity of Lighting	*$5.44*	*$5.69*	*$5.45*	*$13.89*	*$13.82*	*$44.29*
P_OM	Operations & Maintenance Cost Changes	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
P_ML	Measure Lifetime / Deferred Purchase	*$36.95*	*$42.00*	*$44.39*	*$77.45*	*$85.78*	*$286.58*

Source: SERA "NEB-It" Computations, 2023

Figure D.4: NEB/NEI results by category and subcategory for DEC HEHC Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0

DEC HOME ENERGY HOUSE CALL (HEHC)

INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$27.59*	*$27.70*	*$28.49*	*$86.89*	*$65.65*	*$236.32*
S_Em	Emissions on Public Illnesses & Deaths	*$27.59*	*$27.70*	*$28.49*	*$86.89*	*$65.65*	*$236.32*
PARTICIPANT NEBS							
Participant Water Savings		*$1.85*	*$2.75*	*$2.98*	*$13.17*	*$10.56*	*$31.31*
P_WA	Reduced water / wastewater bills-All Measures	*$1.85*	*$2.75*	*$2.98*	*$13.17*	*$10.56*	*$31.31*
Participant Comfort, Health & Safety NEBs		*$0.00*	*$4.25*	*$4.36*	*$13.24*	*$9.99*	*$31.83*
P_Co	Comfort	*$0.00*	*$4.25*	*$4.36*	*$13.24*	*$9.99*	*$31.83*
Participant Equipment Performance NEBs		*$31.99*	*$36.49*	*$42.84*	*$101.57*	*$76.81*	*$289.69*
P_NA	Inside Noise Reduction (appliances)	*$0.00*	*$2.93*	*$3.01*	*$9.13*	*$6.89*	*$21.96*
P_LQ	Quality / Quantity of Lighting	*$2.43*	*$2.44*	*$2.51*	*$7.61*	*$5.74*	*$20.73*
P_OM	Operations & Maintenance Cost Changes	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
P_ML	Measure Lifetime / Deferred Purchase	*$29.56*	*$31.12*	*$37.32*	*$84.83*	*$64.18*	*$247.01*

Source: SERA "NEB-It" Computations, 2023

Figure D.5: NEB/NEI results by category and subcategory for DEP MyHER Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0

DEP MyHER

INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$7.07*	*$7.50*	*$9.53*	*$9.61*	*$8.03*	*$41.74*
S_Em	Emissions on Public Illnesses & Deaths	*$7.07*	*$7.50*	*$9.53*	*$9.61*	*$8.03*	*$41.74*

Source: SERA "NEB-It" Computations, 2023

Figure D.6: NEB/NEI results by category and subcategory for DEC MyHER Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0

DEC MyHER

INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$7.71*	*$7.77*	*$8.54*	*$8.55*	*$8.53*	*$41.10*
S_Em	Emissions on Public Illnesses & Deaths	*$7.71*	*$7.77*	*$8.54*	*$8.55*	*$8.53*	*$41.10*

Source: SERA "NEB-It" Computations, 2023

Figure D.7: NEB/NEI results by category and subcategory for DEP MFDI Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0 DEP MULTIFAMILY DIRECT INSTALL INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD							
	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$32.58*	*$28.63*	*$21.23*	*$21.34*	*$34.12*	*$137.89*
S_Em	Emissions on Public Illnesses & Deaths	*$32.58*	*$28.63*	*$21.23*	*$21.34*	*$34.12*	*$137.89*
PARTICIPANT NEBS							
Participant Water Savings		*$37.97*	*$40.13*	*$37.48*	*$40.28*	*$56.75*	*$212.60*
P_WA	Reduced water / wastewater bills-All Measures	*$37.97*	*$40.13*	*$37.48*	*$40.28*	*$56.75*	*$212.60*
Participant Comfort, Health & Safety NEBs		*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$1.62*	*$1.62*
P_Co	Comfort	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$1.57*	*$1.57*
P_Sa	Household Safety	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.05*	*$0.05*
Participant Equipment Performance NEBs		*$8.16*	*$6.73*	*$3.81*	*$4.09*	*$8.35*	*$31.14*
P_LQ	Quality / Quantity of Lighting	*$7.28*	*$6.03*	*$3.33*	*$3.58*	*$3.66*	*$23.88*
P_OM	Operations & Maintenance Cost Changes	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$1.67*	*$1.67*
P_ML	Measure Lifetime / Deferred Purchase	*$0.62*	*$0.45*	*$0.30*	*$0.33*	*$1.93*	*$3.63*
PM_Mk	Marketability for Property Managers	*$0.01*	*$0.01*	*$0.01*	*$0.01*	*$0.05*	*$0.10*
PM_TC	Reduced Tenant Complaints to Property Managers	*$0.24*	*$0.24*	*$0.16*	*$0.18*	*$1.03*	*$1.86*

Source: SERA "NEB-It" Computations, 2023

Figure D.8: NEB/NEI results by category and subcategory for DEC MFDI Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0

DEC MULTIFAMILY DIRECT INSTALL

INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$26.07*	*$22.02*	*$24.17*	*$22.23*	*$33.17*	*$127.65*
S_Em	Emissions on Public Illnesses & Deaths	*$26.07*	*$22.02*	*$24.17*	*$22.23*	*$33.17*	*$127.65*
PARTICIPANT NEBS							
Participant Water Savings		*$36.12*	*$30.59*	*$40.37*	*$39.97*	*$65.29*	*$212.35*
P_WA	Reduced water / wastewater bills-All Measures	*$36.12*	*$30.59*	*$40.37*	*$39.97*	*$65.29*	*$212.35*
Participant Comfort, Health & Safety NEBs		*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.94*	*$0.94*
P_Co	Comfort	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.91*	*$0.91*
P_Sa	Household Safety	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.03*	*$0.03*
Participant Equipment Performance NEBs		*$6.29*	*$5.52*	*$5.21*	*$5.59*	*$8.14*	*$30.75*
P_LQ	Quality / Quantity of Lighting	*$5.60*	*$5.08*	*$4.61*	*$4.95*	*$5.07*	*$25.31*
P_OM	Operations & Maintenance Cost Changes	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.97*	*$0.97*
P_ML	Measure Lifetime / Deferred Purchase	*$0.50*	*$0.28*	*$0.38*	*$0.41*	*$1.34*	*$2.91*
PM_Mk	Marketability for Property Managers	*$0.01*	*$0.01*	*$0.01*	*$0.01*	*$0.04*	*$0.08*
PM_TC	Reduced Tenant Complaints to Property Managers	*$0.19*	*$0.15*	*$0.21*	*$0.22*	*$0.72*	*$1.48*

Source: SERA "NEB-It" Computations, 2023

Figure D.9: NEB/NEI results by category and subcategory for DEP IQNES Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0

DEP INCOME QUALIFIED NEIGHBORHOOD ENERGY SAVER

INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD

	Year =>	2019	2020	2021	2022	2023	Sum
UTILITY NEBS							
Utility Customer Service and Payment-Related		*$7.47*	*$7.62*	*$7.70*	*$8.18*	*$8.34*	*$39.30*
U_Ar	Reduced Carrying Cost on Arrearages (interest)	*$1.41*	*$1.41*	*$1.41*	*$1.41*	*$1.41*	*$7.05*
U_BD	Lower Bad Debt Written Off	*$4.71*	*$4.82*	*$4.89*	*$5.26*	*$5.38*	*$25.07*
U_SO	Fewer Shutoffs	*$0.59*	*$0.60*	*$0.61*	*$0.66*	*$0.67*	*$3.14*
U_RC	Fewer Reconnects	*($0.00)*	*($0.00)*	*($0.00)*	*($0.00)*	*($0.00)*	*($0.01)*
U_CC	Fewer Customer Calls	*$0.76*	*$0.78*	*$0.79*	*$0.85*	*$0.87*	*$4.06*
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$26.22*	*$26.27*	*$25.66*	*$26.89*	*$26.94*	*$131.98*
S_Em	Emissions on Public Illnesses & Deaths	*$26.22*	*$26.27*	*$25.66*	*$26.89*	*$26.94*	*$131.98*
PARTICIPANT NEBS							
Participant Bills / Payment NEBs		*$0.50*	*$0.50*	*$0.48*	*$0.51*	*$0.52*	*$2.51*
P_SO	Fewer Shutoffs	*$0.19*	*$0.19*	*$0.18*	*$0.20*	*$0.20*	*$0.96*
P_Re	Fewer Reconnects	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.02*
P_BC	Fewer Calls to Utility	*$0.30*	*$0.31*	*$0.29*	*$0.31*	*$0.32*	*$1.53*
Participant Water Savings		*$38.85*	*$39.82*	*$34.11*	*$27.12*	*$27.77*	*$167.66*
P_WA	Reduced water / wastewater bills-All Measures	*$38.85*	*$39.82*	*$34.11*	*$27.12*	*$27.77*	*$167.66*
Participant Comfort, Health & Safety NEBs		*$0.00*	*$0.00*	*$4.81*	*$5.01*	*$5.01*	*$14.83*
P_Co	Comfort	*$0.00*	*$0.00*	*$4.81*	*$5.01*	*$5.01*	*$14.83*
Participant Equipment Performance NEBs		*$10.19*	*$10.19*	*$15.47*	*$16.13*	*$16.13*	*$68.13*
P_NR	Outside Noise Reduction	*$0.00*	*$0.00*	*$5.53*	*$5.76*	*$5.76*	*$17.05*
P_NA	Inside Noise Reduction (appliances)	*$4.53*	*$4.53*	*$4.42*	*$4.61*	*$4.61*	*$22.70*
P_LQ	Quality / Quantity of Lighting	*$5.66*	*$5.66*	*$5.53*	*$5.76*	*$5.76*	*$28.38*
P_OM	Operations & Maintenance Cost Changes	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Participant Hardship, Knowledge NEBs		*$2.02*	*$2.07*	*$2.10*	*$2.25*	*$2.31*	*$10.75*
P_HS	Hardship benefits	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
P_NM	Avoided moves / household impacts	*$2.02*	*$2.07*	*$2.10*	*$2.25*	*$2.31*	*$10.75*

Source: SERA "NEB-It" Computations, 2023

Figure D.10: NEB/NEI results by category and subcategory for DEC IQNES Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0

DEC INCOME QUALIFIED NEIGHBORHOOD ENERGY SAVER

INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD

	Year =>	2019	2020	2021	2022	2023	Sum
UTILITY NEBS							
Utility Customer Service and Payment-Related		*$7.49*	*$7.64*	*$7.73*	*$8.20*	*$8.36*	*$39.44*
U_Ar	Reduced Carrying Cost on Arrearages (interest)	*$1.44*	*$1.44*	*$1.44*	*$1.44*	*$1.44*	*$7.20*
U_BD	Lower Bad Debt Written Off	*$4.71*	*$4.82*	*$4.89*	*$5.26*	*$5.38*	*$25.07*
U_SO	Fewer Shutoffs	*$0.59*	*$0.60*	*$0.61*	*$0.66*	*$0.67*	*$3.14*
U_RC	Fewer Reconnects	*($0.00)*	*($0.00)*	*($0.00)*	*($0.00)*	*($0.00)*	*($0.00)*
U_CC	Fewer Customer Calls	*$0.76*	*$0.78*	*$0.79*	*$0.85*	*$0.87*	*$4.04*
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$10.71*	*$10.73*	*$12.05*	*$17.12*	*$17.15*	*$67.76*
S_Em	Emissions on Public Illnesses & Deaths	*$10.71*	*$10.73*	*$12.05*	*$17.12*	*$17.15*	*$67.76*
PARTICIPANT NEBS							
Participant Bills / Payment NEBs		*$0.50*	*$0.50*	*$0.48*	*$0.51*	*$0.52*	*$2.51*
P_SO	Fewer Shutoffs	*$0.19*	*$0.19*	*$0.18*	*$0.20*	*$0.20*	*$0.96*
P_Re	Fewer Reconnects	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.01*
P_BC	Fewer Calls to Utility	*$0.30*	*$0.31*	*$0.29*	*$0.31*	*$0.32*	*$1.53*
Participant Water Savings		*$39.97*	*$40.05*	*$37.75*	*$30.06*	*$31.72*	*$179.54*
P_WA	Reduced water / wastewater bills-All Measures	*$39.97*	*$40.05*	*$37.75*	*$30.06*	*$31.72*	*$179.54*
Participant Comfort, Health & Safety NEBs		*$0.00*	*$0.00*	*$1.84*	*$2.61*	*$2.61*	*$7.06*
P_Co	Comfort	*$0.00*	*$0.00*	*$1.84*	*$2.61*	*$2.61*	*$7.06*
Participant Equipment Performance NEBs		*$3.40*	*$3.40*	*$5.94*	*$8.40*	*$8.40*	*$29.53*
P_NR	Outside Noise Reduction	*$0.00*	*$0.00*	*$2.12*	*$3.00*	*$3.00*	*$8.12*
P_NA	Inside Noise Reduction (appliances)	*$1.51*	*$1.51*	*$1.70*	*$2.40*	*$2.40*	*$9.52*
P_LQ	Quality / Quantity of Lighting	*$1.89*	*$1.89*	*$2.12*	*$3.00*	*$3.00*	*$11.90*
P_OM	Operations & Maintenance Cost Changes	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Participant Hardship, Knowledge NEBs		*$2.02*	*$2.07*	*$2.10*	*$2.25*	*$2.31*	*$10.75*
P_HS	Hardship benefits	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
P_NM	Avoided moves / household impacts	*$2.02*	*$2.07*	*$2.10*	*$2.25*	*$2.31*	*$10.75*

Source: SERA "NEB-It" Computations, 2023

Figure D.11: NEB/NEI results by category and subcategory for DEC IQWx Program. Per HH Results.

SERA NEB-It/NEI MODEL 2.0

DEC INCOME QUALIFIED WEATHERIZATION

INDIVIDUAL NEB CATEGORY RESULTS PER HOUSEHOLD

	Year =>	2019	2020	2021	2022	2023	Sum
UTILITY NEBS							
Utility Customer Service and Payment-Related		*$7.49*	*$7.64*	*$7.73*	*$8.20*	*$8.36*	*$39.44*
U_Ar	Reduced Carrying Cost on Arrearages (interest)	*$1.44*	*$1.44*	*$1.44*	*$1.44*	*$1.44*	*$7.20*
U_BD	Lower Bad Debt Written Off	*$4.71*	*$4.82*	*$4.89*	*$5.26*	*$5.38*	*$25.07*
U_SO	Fewer Shutoffs	*$0.59*	*$0.60*	*$0.61*	*$0.66*	*$0.67*	*$3.14*
U_RC	Fewer Reconnects	*($0.00)*	*($0.00)*	*($0.00)*	*($0.00)*	*($0.00)*	*($0.00)*
U_CC	Fewer Customer Calls	*$0.76*	*$0.78*	*$0.79*	*$0.85*	*$0.87*	*$4.04*
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$78.12*	*$78.36*	*$81.88*	*$36.92*	*$68.74*	*$344.03*
S_Em	Emissions on Public Illnesses & Deaths	*$78.12*	*$78.36*	*$81.88*	*$36.92*	*$68.74*	*$344.03*
PARTICIPANT NEBS							
Participant Bills / Payment NEBs		*$0.50*	*$0.50*	*$0.48*	*$0.51*	*$0.52*	*$2.51*
P_SO	Fewer Shutoffs	*$0.19*	*$0.19*	*$0.18*	*$0.20*	*$0.20*	*$0.96*
P_Re	Fewer Reconnects	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.01*
P_BC	Fewer Calls to Utility	*$0.30*	*$0.31*	*$0.29*	*$0.31*	*$0.32*	*$1.53*
Participant Comfort, Health & Safety NEBs		*$14.74*	*$14.83*	*$15.39*	*$0.00*	*$13.60*	*$58.56*
P_Co	Comfort	*$11.99*	*$12.01*	*$12.54*	*$0.00*	*$10.46*	*$47.00*
P_FF	Fewer fires	*$0.01*	*$0.01*	*$0.01*	*$0.00*	*$0.01*	*$0.04*
P_MW	Fewer Sick days from work	*$1.40*	*$1.43*	*$1.45*	*$0.00*	*$1.60*	*$5.88*
P_MS	Fewer Sick days from school	*$0.23*	*$0.24*	*$0.24*	*$0.00*	*$0.26*	*$0.97*
P_As	Fewer Asthma Incidences	*$0.91*	*$0.93*	*$0.94*	*$0.00*	*$1.04*	*$3.82*
P_RA	Reduction in Allergies	*$0.20*	*$0.21*	*$0.21*	*$0.00*	*$0.23*	*$0.86*
P_CS	Reduction in Cold Symptoms	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
P_Sa	Household Safety	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Participant Equipment Performance NEBs		*$58.17*	*$61.11*	*$61.01*	*$20.90*	*$52.42*	*$253.61*
P_NR	Outside Noise Reduction	*$13.78*	*$13.80*	*$14.41*	*$0.00*	*$12.02*	*$54.02*
P_NA	Inside Noise Reduction (appliances)	*$11.03*	*$11.04*	*$11.53*	*$5.17*	*$9.62*	*$48.39*
P_LQ	Quality / Quantity of Lighting	*$13.78*	*$13.80*	*$14.41*	*$0.00*	*$12.02*	*$54.02*
P_OM	Operations & Maintenance Cost Changes	*$0.42*	*$3.27*	*$0.63*	*$6.74*	*$2.06*	*$13.11*
P_EP	Improved Equipment Features/ Performance	*$19.16*	*$19.19*	*$20.03*	*$8.99*	*$16.71*	*$84.07*
Participant Hardship, Knowledge NEBs		*$2.02*	*$2.07*	*$2.10*	*$2.25*	*$2.31*	*$10.75*
P_HS	Hardship benefits	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
P_NM	Avoided moves / household impacts	*$2.02*	*$2.07*	*$2.10*	*$2.25*	*$2.31*	*$10.75*

Source: SERA "NEB-It" Computations, 2023

Figure D.12: NEB/NEI results by category and subcategory for DEP Smart$aver Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEP SMART SAVER

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$4,495,110*	*$3,140,100*	*$2,797,299*	*$3,541,349*	*$2,639,590*	*$16,613,448*
S_Em	Emissions on Public Illnesses & Deaths	*$4,495,110*	*$3,140,100*	*$2,797,299*	*$3,541,349*	*$2,639,590*	*$16,613,448*
PARTICIPANT NEBS							
Participant Water Savings		*$2,075,716*	*$2,044,574*	*$1,229,907*	*$2,209,492*	*$1,269,645*	*$8,829,333*
P_WA	Reduced water / wastewater bills-All Measures	*$2,075,716*	*$2,044,574*	*$1,229,907*	*$2,209,492*	*$1,269,645*	*$8,829,333*
Participant Comfort, Health & Safety NEBs		*$979,004*	*$726,796*	*$624,418*	*$767,901*	*$601,502*	*$3,699,621*
P_Co	Comfort	*$844,574*	*$589,002*	*$524,197*	*$660,193*	*$491,207*	*$3,109,173*
P_FF	Fewer fires	*$604*	*$712*	*$556*	*$588*	*$604*	*$3,064*
P_MW	Fewer Sick days from work	*$68,384*	*$70,048*	*$50,928*	*$54,737*	*$56,051*	*$300,147*
P_MS	Fewer Sick days from school	*$11,139*	*$11,410*	*$8,295*	*$8,916*	*$9,130*	*$48,889*
P_As	Fewer Asthma Incidences	*$42,875*	*$43,918*	*$31,931*	*$34,319*	*$35,143*	*$188,186*
P_RA	Reduction in Allergies	*$11,429*	*$11,707*	*$8,512*	*$9,148*	*$9,368*	*$50,163*
P_CS	Reduction in Cold Symptoms	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
P_Sa	Household Safety	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Participant Equipment Performance NEBs		*$2,822,178*	*$1,917,223*	*$1,656,213*	*$2,113,712*	*$1,626,717*	*$10,136,043*
P_NR	Outside Noise Reduction	*$388,310*	*$270,805*	*$241,010*	*$303,537*	*$225,842*	*$1,429,505*
P_NA	Inside Noise Reduction (appliances)	*$582,465*	*$406,208*	*$361,515*	*$455,306*	*$338,763*	*$2,144,257*
P_LQ	Quality / Quantity of Lighting	*$485,387*	*$338,507*	*$301,263*	*$379,421*	*$282,303*	*$1,786,881*
P_OM	Operations & Maintenance Cost Changes	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
P_ML	Measure Lifetime / Deferred Purchase	*$977,707*	*$630,897*	*$511,414*	*$671,912*	*$553,967*	*$3,345,896*
P_EP	Improved Equipment Features/ Performance	*$388,310*	*$270,805*	*$241,010*	*$303,537*	*$225,842*	*$1,429,505*

Source: SERA "NEB-It" Computations, 2023

Figure D.13: NEB/NEI results by category and subcategory for DEC Smart$aver Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEC SMART SAVER

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$13,431,283*	*$7,657,042*	*$4,104,653*	*$5,992,966*	*$3,500,039*	*$34,685,982*
S_Em	Emissions on Public Illnesses & Deaths	*$13,431,283*	*$7,657,042*	*$4,104,653*	*$5,992,966*	*$3,500,039*	*$34,685,982*
PARTICIPANT NEBS							
Participant Water Savings		*$3,292,860*	*$3,463,093*	*$2,141,388*	*$3,821,184*	*$3,307,111*	*$16,025,637*
P_WA	Reduced water / wastewater bills-All Measures	*$3,292,860*	*$3,463,093*	*$2,141,388*	*$3,821,184*	*$3,307,111*	*$16,025,637*
Participant Comfort, Health & Safety NEBs		*$3,470,547*	*$1,959,523*	*$795,506*	*$1,092,708*	*$716,228*	*$8,034,512*
P_Co	Comfort	*$2,061,632*	*$1,173,494*	*$628,504*	*$913,220*	*$532,458*	*$5,309,307*
P_FF	Fewer fires	*$5,408*	*$3,510*	*$834*	*$891*	*$887*	*$11,530*
P_MW	Fewer Sick days from work	*$715,795*	*$399,088*	*$84,747*	*$91,086*	*$93,272*	*$1,383,987*
P_MS	Fewer Sick days from school	*$118,115*	*$65,855*	*$13,984*	*$15,030*	*$15,391*	*$228,375*
P_As	Fewer Asthma Incidences	*$465,231*	*$259,387*	*$55,081*	*$59,201*	*$60,622*	*$899,523*
P_RA	Reduction in Allergies	*$104,365*	*$58,188*	*$12,356*	*$13,281*	*$13,599*	*$201,789*
P_CS	Reduction in Cold Symptoms	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
P_Sa	Household Safety	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Participant Equipment Performance NEBs		*$8,712,529*	*$4,796,544*	*$2,463,944*	*$3,573,715*	*$2,185,516*	*$21,732,250*
P_NR	Outside Noise Reduction	*$947,877*	*$539,537*	*$288,967*	*$419,871*	*$244,808*	*$2,441,061*
P_NA	Inside Noise Reduction (appliances)	*$1,421,815*	*$809,306*	*$433,451*	*$629,807*	*$367,212*	*$3,661,591*
P_LQ	Quality / Quantity of Lighting	*$1,184,846*	*$674,422*	*$361,209*	*$524,839*	*$306,010*	*$3,051,326*
P_OM	Operations & Maintenance Cost Changes	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
P_ML	Measure Lifetime / Deferred Purchase	*$4,210,114*	*$2,233,742*	*$1,091,350*	*$1,579,327*	*$1,022,677*	*$10,137,210*
P_EP	Improved Equipment Features/ Performance	*$947,877*	*$539,537*	*$288,967*	*$419,871*	*$244,808*	*$2,441,061*

Source: SERA "NEB-It" Computations, 2023

Figure D.14: NEB/NEI results by category and subcategory for DEP HEHC Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEP HOME ENERGY HOUSE CALL (HEHC)

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$338,867*	*$313,183*	*$254,757*	*$652,230*	*$650,166*	*$2,209,203*
S_Em	Emissions on Public Illnesses & Deaths	*$338,867*	*$313,183*	*$254,757*	*$652,230*	*$650,166*	*$2,209,203*
PARTICIPANT NEBS							
Participant Water Savings		*$19,459*	*$28,250*	*$25,713*	*$58,931*	*$60,047*	*$192,399*
P_WA	Reduced water / wastewater bills-All Measures	*$19,459*	*$28,250*	*$25,713*	*$58,931*	*$60,047*	*$192,399*
Participant Comfort, Health & Safety NEBs		*$0*	*$58,745*	*$47,740*	*$121,591*	*$120,991*	*$349,067*
P_Co	Comfort	*$0*	*$58,745*	*$47,740*	*$121,591*	*$120,991*	*$349,067*
Participant Equipment Performance NEBs		*$285,260*	*$323,429*	*$283,756*	*$543,446*	*$584,618*	*$2,020,508*
P_NA	Inside Noise Reduction (appliances)	*$0*	*$40,514*	*$32,924*	*$83,856*	*$83,442*	*$240,736*
P_LQ	Quality / Quantity of Lighting	*$36,591*	*$33,762*	*$27,437*	*$69,880*	*$69,535*	*$237,205*
P_OM	Operations & Maintenance Cost Changes	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
P_ML	Measure Lifetime / Deferred Purchase	*$248,668*	*$249,153*	*$223,395*	*$389,710*	*$431,641*	*$1,542,567*

Source: SERA "NEB-It" Computations, 2023

Figure D.15: NEB/NEI results by category and subcategory for DEC HEHC Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEC HOME ENERGY HOUSE CALL (HEHC)

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$285,440*	*$277,766*	*$242,157*	*$738,648*	*$558,086*	*$2,102,096*
S_Em	Emissions on Public Illnesses & Deaths	*$285,440*	*$277,766*	*$242,157*	*$738,648*	*$558,086*	*$2,102,096*
PARTICIPANT NEBS							
Participant Water Savings		*$19,154*	*$27,589*	*$25,296*	*$111,945*	*$89,756*	*$273,739*
P_WA	Reduced water / wastewater bills-All Measures	*$19,154*	*$27,589*	*$25,296*	*$111,945*	*$89,756*	*$273,739*
Participant Comfort, Health & Safety NEBs		*$0*	*$42,569*	*$37,079*	*$112,557*	*$84,901*	*$277,106*
P_Co	Comfort	*$0*	*$42,569*	*$37,079*	*$112,557*	*$84,901*	*$277,106*
Participant Equipment Performance NEBs		*$330,968*	*$365,858*	*$364,171*	*$863,449*	*$652,943*	*$2,577,389*
P_NA	Inside Noise Reduction (appliances)	*$0*	*$29,358*	*$25,572*	*$77,625*	*$58,552*	*$191,108*
P_LQ	Quality / Quantity of Lighting	*$25,180*	*$24,465*	*$21,310*	*$64,688*	*$48,794*	*$184,437*
P_OM	Operations & Maintenance Cost Changes	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
P_ML	Measure Lifetime / Deferred Purchase	*$305,788*	*$312,035*	*$317,289*	*$721,136*	*$545,596*	*$2,201,845*

Source: SERA "NEB-It" Computations, 2023

Figure D.16: NEB/NEI results by category and subcategory for DEP MyHER Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEP MyHER

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$6,342,514*	*$6,375,810*	*$7,757,730*	*$7,822,139*	*$6,533,270*	*$34,831,463*
S_Em	Emissions on Public Illnesses & Deaths	*$6,342,514*	*$6,375,810*	*$7,757,730*	*$7,822,139*	*$6,533,270*	*$34,831,463*

Source: SERA "NEB-It" Computations, 2023

Figure D.17: NEB/NEI results by category and subcategory for DEC MyHER Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEC MyHER

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$11,369,703*	*$11,501,644*	*$12,131,844*	*$12,145,341*	*$12,126,582*	*$59,275,114*
S_Em	Emissions on Public Illnesses & Deaths	*$11,369,703*	*$11,501,644*	*$12,131,844*	*$12,145,341*	*$12,126,582*	*$59,275,114*

Source: SERA "NEB-It" Computations, 2023

Figure D.18: NEB/NEI results by category and subcategory for DEP MFDI Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEP MULTIFAMILY DIRECT INSTALL

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$503,768*	*$136,146*	*$69,200*	*$69,560*	*$111,241*	*$889,915*
S_Em	Emissions on Public Illnesses & Deaths	*$503,768*	*$136,146*	*$69,200*	*$69,560*	*$111,241*	*$889,915*
PARTICIPANT NEBS							
Participant Water Savings		*$587,149*	*$190,845*	*$122,172*	*$131,310*	*$184,992*	*$1,216,468*
P_WA	Reduced water / wastewater bills-All Measures	*$587,149*	*$190,845*	*$122,172*	*$131,310*	*$184,992*	*$1,216,468*
Participant Comfort, Health & Safety NEBs		*$0*	*$0*	*$0*	*$0*	*$5,278*	*$5,278*
P_Co	Comfort	*$0*	*$0*	*$0*	*$0*	*$5,111*	*$5,111*
P_Sa	Household Safety	*$0*	*$0*	*$0*	*$0*	*$167*	*$167*
Participant Equipment Performance NEBs		*$126,191*	*$32,015*	*$12,407*	*$13,335*	*$27,210*	*$211,158*
P_LQ	Quality / Quantity of Lighting	*$112,634*	*$28,665*	*$10,849*	*$11,660*	*$11,940*	*$175,748*
P_OM	Operations & Maintenance Cost Changes	*$0*	*$0*	*$0*	*$0*	*$5,459*	*$5,459*
P_ML	Measure Lifetime / Deferred Purchase	*$9,616*	*$2,133*	*$992*	*$1,066*	*$6,280*	*$20,088*
PM_Mk	Marketability for Property Managers	*$193*	*$64*	*$30*	*$32*	*$174*	*$494*
PM_TC	Reduced Tenant Complaints to Property Managers	*$3,747*	*$1,153*	*$536*	*$576*	*$3,357*	*$9,370*

Source: SERA "NEB-It" Computations, 2023

Figure D.19: NEB/NEI results by category and subcategory for DEC MFDI Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEC MULTIFAMILY DIRECT INSTALL

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$794,775*	*$164,367*	*$99,186*	*$91,214*	*$136,115*	*$1,285,657*
S_Em	Emissions on Public Illnesses & Deaths	*$794,775*	*$164,367*	*$99,186*	*$91,214*	*$136,115*	*$1,285,657*
PARTICIPANT NEBS							
Participant Water Savings		*$1,101,187*	*$228,385*	*$165,687*	*$164,033*	*$267,960*	*$1,927,253*
P_WA	Reduced water / wastewater bills-All Measures	*$1,101,187*	*$228,385*	*$165,687*	*$164,033*	*$267,960*	*$1,927,253*
Participant Comfort, Health & Safety NEBs		*$0*	*$0*	*$0*	*$0*	*$3,852*	*$3,852*
P_Co	Comfort	*$0*	*$0*	*$0*	*$0*	*$3,730*	*$3,730*
P_Sa	Household Safety	*$0*	*$0*	*$0*	*$0*	*$122*	*$122*
Participant Equipment Performance NEBs		*$191,889*	*$41,197*	*$21,362*	*$22,960*	*$33,403*	*$310,812*
P_LQ	Quality / Quantity of Lighting	*$170,703*	*$37,936*	*$18,907*	*$20,321*	*$20,808*	*$268,674*
P_OM	Operations & Maintenance Cost Changes	*$0*	*$0*	*$0*	*$0*	*$3,984*	*$3,984*
P_ML	Measure Lifetime / Deferred Purchase	*$15,253*	*$2,076*	*$1,563*	*$1,680*	*$5,507*	*$26,080*
PM_Mk	Marketability for Property Managers	*$287*	*$63*	*$47*	*$51*	*$155*	*$602*
PM_TC	Reduced Tenant Complaints to Property Managers	*$5,647*	*$1,122*	*$845*	*$908*	*$2,949*	*$11,472*

Source: SERA "NEB-It" Computations, 2023

Figure D.20: NEB/NEI results by category and subcategory for DEP IQNES Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEP INCOME QUALIFIED NEIGHBORHOOD ENERGY SAVER

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
UTILITY NEBS							
Utility Customer Service and Payment-Related		*$20,325*	*$2,399*	*$5,955*	*$39,241*	*$40,021*	*$107,942*
U_Ar	Reduced Carrying Cost on Arrearages (interest)	*$3,839*	*$444*	*$1,090*	*$6,770*	*$6,770*	*$18,913*
U_BD	Lower Bad Debt Written Off	*$12,813*	*$1,520*	*$3,781*	*$25,238*	*$25,843*	*$69,195*
U_SO	Fewer Shutoffs	*$1,604*	*$190*	*$473*	*$3,159*	*$3,235*	*$8,662*
U_RC	Fewer Reconnects	*-$6*	*-$1*	*-$2*	*-$10*	*-$10*	*-$29*
U_CC	Fewer Customer Calls	*$2,074*	*$246*	*$612*	*$4,085*	*$4,183*	*$11,201*
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$71,384*	*$8,275*	*$19,832*	*$129,073*	*$129,304*	*$357,868*
S_Em	Emissions on Public Illnesses & Deaths	*$71,384*	*$8,275*	*$19,832*	*$129,073*	*$129,304*	*$357,868*
PARTICIPANT NEBS							
Participant Bills / Payment NEBs		*$1,350*	*$158*	*$369*	*$2,461*	*$2,520*	*$6,859*
P_SO	Fewer Shutoffs	*$512*	*$60*	*$142*	*$946*	*$969*	*$2,629*
P_Re	Fewer Reconnects	*$9*	*$1*	*$3*	*$17*	*$17*	*$47*
P_BC	Fewer Calls to Utility	*$829*	*$97*	*$225*	*$1,498*	*$1,534*	*$4,183*
Participant Water Savings		*$105,747*	*$12,542*	*$26,363*	*$130,177*	*$133,301*	*$408,129*
P_WA	Reduced water / wastewater bills-All Measures	*$105,747*	*$12,542*	*$26,363*	*$130,177*	*$133,301*	*$408,129*
Participant Comfort, Health & Safety NEBs		*$0*	*$0*	*$3,716*	*$24,062*	*$24,062*	*$51,841*
P_Co	Comfort	*$0*	*$0*	*$3,716*	*$24,062*	*$24,062*	*$51,841*
Participant Equipment Performance NEBs		*$27,749*	*$3,211*	*$11,961*	*$77,442*	*$77,442*	*$197,806*
P_NR	Outside Noise Reduction	*$0*	*$0*	*$4,272*	*$27,658*	*$27,658*	*$59,588*
P_NA	Inside Noise Reduction (appliances)	*$12,333*	*$1,427*	*$3,417*	*$22,126*	*$22,126*	*$61,430*
P_LQ	Quality / Quantity of Lighting	*$15,416*	*$1,784*	*$4,272*	*$27,658*	*$27,658*	*$76,788*
P_OM	Operations & Maintenance Cost Changes	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Participant Hardship, Knowledge NEBs		*$5,495*	*$652*	*$1,622*	*$10,823*	*$11,083*	*$29,675*
P_HS	Hardship benefits	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
P_NM	Avoided moves / household impacts	*$5,495*	*$652*	*$1,622*	*$10,823*	*$11,083*	*$29,675*

Source: SERA "NEB-It" Computations, 2023

Figure D.21: NEB/NEI results by category and subcategory for DEC IQNES Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEC INCOME QUALIFIED NEIGHBORHOOD ENERGY SAVER

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
UTILITY NEBS							
Utility Customer Service and Payment-Related		*$49,649*	*$8,807*	*$10,623*	*$98,427*	*$66,917*	*$234,423*
U_Ar	Reduced Carrying Cost on Arrearages (interest)	*$9,534*	*$1,658*	*$1,977*	*$17,270*	*$11,513*	*$41,952*
U_BD	Lower Bad Debt Written Off	*$31,186*	*$5,558*	*$6,722*	*$63,094*	*$43,072*	*$149,631*
U_SO	Fewer Shutoffs	*$3,904*	*$696*	*$841*	*$7,898*	*$5,392*	*$18,731*
U_RC	Fewer Reconnects	*-$3*	*-$1*	*-$1*	*-$5*	*-$4*	*-$13*
U_CC	Fewer Customer Calls	*$5,027*	*$896*	*$1,084*	*$10,171*	*$6,943*	*$24,121*
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$70,985*	*$12,363*	*$16,550*	*$205,417*	*$137,172*	*$442,486*
S_Em	Emissions on Public Illnesses & Deaths	*$70,985*	*$12,363*	*$16,550*	*$205,417*	*$137,172*	*$442,486*
PARTICIPANT NEBS							
Participant Bills / Payment NEBs		*$3,281*	*$577*	*$655*	*$6,144*	*$4,193*	*$14,850*
P_SO	Fewer Shutoffs	*$1,245*	*$220*	*$252*	*$2,366*	*$1,615*	*$5,698*
P_Re	Fewer Reconnects	*$18*	*$3*	*$4*	*$32*	*$21*	*$77*
P_BC	Fewer Calls to Utility	*$2,018*	*$355*	*$399*	*$3,746*	*$2,557*	*$9,075*
Participant Water Savings		*$264,776*	*$46,133*	*$51,863*	*$360,710*	*$253,790*	*$977,273*
P_WA	Reduced water / wastewater bills-All Measures	*$264,776*	*$46,133*	*$51,863*	*$360,710*	*$253,790*	*$977,273*
Participant Comfort, Health & Safety NEBs		*$0*	*$0*	*$2,534*	*$31,302*	*$20,868*	*$54,704*
P_Co	Comfort	*$0*	*$0*	*$2,534*	*$31,302*	*$20,868*	*$54,704*
Participant Equipment Performance NEBs		*$22,543*	*$3,920*	*$8,156*	*$100,741*	*$67,161*	*$202,521*
P_NR	Outside Noise Reduction	*$0*	*$0*	*$2,913*	*$35,979*	*$23,986*	*$62,878*
P_NA	Inside Noise Reduction (appliances)	*$10,019*	*$1,742*	*$2,330*	*$28,783*	*$19,189*	*$62,064*
P_LQ	Quality / Quantity of Lighting	*$12,524*	*$2,178*	*$2,913*	*$35,979*	*$23,986*	*$77,580*
P_OM	Operations & Maintenance Cost Changes	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Participant Hardship, Knowledge NEBs		*$13,374*	*$2,383*	*$2,883*	*$27,058*	*$18,472*	*$64,170*
P_HS	Hardship benefits	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
P_NM	Avoided moves / household impacts	*$13,374*	*$2,383*	*$2,883*	*$27,058*	*$18,472*	*$64,170*

Source: SERA "NEB-It" Computations, 2023

Figure D.22: NEB/NEI results by category and subcategory for DEC IQWx Program. Per Program Wide Results.

SERA NEB-It/NEI MODEL 2.0

DEC INCOME QUALIFIED WEATHERIZATION

INDIVIDUAL NEB CATEGORY RESULTS PROGRAM WIDE

	Year =>	2019	2020	2021	2022	2023	Sum
UTILITY NEBS							
Utility Customer Service and Payment-Related		*$7,179*	*$3,211*	*$5,095*	*$2,256*	*$5,604*	*$23,345*
U_Ar	Reduced Carrying Cost on Arrearages (interest)	*$1,379*	*$604*	*$948*	*$396*	*$964*	*$4,292*
U_BD	Lower Bad Debt Written Off	*$4,510*	*$2,026*	*$3,224*	*$1,446*	*$3,607*	*$14,813*
U_SO	Fewer Shutoffs	*$565*	*$254*	*$404*	*$181*	*$452*	*$1,854*
U_RC	Fewer Reconnects	*$0*	*$0*	*$0*	*$0*	*$0*	*-$1*
U_CC	Fewer Customer Calls	*$727*	*$327*	*$520*	*$233*	*$582*	*$2,388*
SOCIETAL / PUBLIC NEBS							
Societal Environmental & Water NEBs		*$74,840*	*$32,913*	*$53,958*	*$10,155*	*$46,054*	*$217,921*
S_Em	Emissions on Public Illnesses & Deaths	*$74,840*	*$32,913*	*$53,958*	*$10,155*	*$46,054*	*$217,921*
PARTICIPANT NEBS							
Participant Bills / Payment NEBs		*$474*	*$211*	*$314*	*$141*	*$351*	*$1,491*
P_SO	Fewer Shutoffs	*$180*	*$80*	*$121*	*$54*	*$135*	*$571*
P_Re	Fewer Reconnects	*$3*	*$1*	*$2*	*$1*	*$2*	*$8*
P_BC	Fewer Calls to Utility	*$292*	*$129*	*$191*	*$86*	*$214*	*$913*
Participant Comfort, Health & Safety NEBs		*$14,118*	*$6,227*	*$10,145*	*$0*	*$9,111*	*$39,601*
P_Co	Comfort	*$11,487*	*$5,044*	*$8,262*	*$0*	*$7,006*	*$31,800*
P_FF	Fewer fires	*$8*	*$4*	*$8*	*$0*	*$7*	*$27*
P_MW	Fewer Sick days from work	*$1,338*	*$601*	*$956*	*$0*	*$1,070*	*$3,965*
P_MS	Fewer Sick days from school	*$221*	*$99*	*$158*	*$0*	*$177*	*$654*
P_As	Fewer Asthma Incidences	*$869*	*$391*	*$621*	*$0*	*$695*	*$2,577*
P_RA	Reduction in Allergies	*$195*	*$88*	*$139*	*$0*	*$156*	*$578*
P_CS	Reduction in Cold Symptoms	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
P_Sa	Household Safety	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Participant Equipment Performance NEBs		*$55,723*	*$25,666*	*$40,205*	*$5,749*	*$35,122*	*$162,464*
P_NR	Outside Noise Reduction	*$13,204*	*$5,798*	*$9,497*	*$0*	*$8,053*	*$36,552*
P_NA	Inside Noise Reduction (appliances)	*$10,563*	*$4,638*	*$7,597*	*$1,423*	*$6,443*	*$30,664*
P_LQ	Quality / Quantity of Lighting	*$13,204*	*$5,798*	*$9,497*	*$0*	*$8,053*	*$36,552*
P_OM	Operations & Maintenance Cost Changes	*$398*	*$1,372*	*$414*	*$1,853*	*$1,380*	*$5,417*
P_EP	Improved Equipment Features/ Performance	*$18,354*	*$8,059*	*$13,200*	*$2,472*	*$11,194*	*$53,279*
Participant Hardship, Knowledge NEBs		*$1,934*	*$869*	*$1,383*	*$620*	*$1,547*	*$6,353*
P_HS	Hardship benefits	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
P_NM	Avoided moves / household impacts	*$1,934*	*$869*	*$1,383*	*$620*	*$1,547*	*$6,353*

Source: SERA "NEB-It" Computations, 2023