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Connecticut Department of Energy and Environmental Protection

Updates to Connecticut Conservation and Load Management Cost Effectiveness Testing

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Executive Summary

Connecticut General Statutes §22a-1a and §16a-35k require the Department of Energy and Environmental Protection (DEEP) to coordinate the Conservation and Load Management Plan (C&LM) with other state environmental plans to ensure the achievement of Connecticut's environmental and energy management goals. As a result, the economic analysis used to assess the cost effectiveness of efficiency programs is an essential element in DEEP's review of the C&LM Plan for consistency with state statutes.

Cost-effectiveness testing plays a critical role in shaping C&LM energy efficiency programs, ensuring they are designed and implemented to "obtain energy savings and system benefits" (including mitigation of federally mandated congestion charges) greater than the costs of the programs.[1] State law mandates that the programs in the C&LM plan "be screened through cost-effectiveness that compares the value and payback period of program benefits for all energy savings to program costs."[2]

DEEP's Determination on the 2022-2024 C&LM Plan puts forward several strategies to bring Connecticut's energy efficiency programs into closer alignment with state policy goals, including updating the cost-effectiveness test to capture the impacts of the programs on greenhouse gas emissions and energy affordability.

Current Cost Effectiveness Testing

The 2022-2024 C&LM Plan filed with DEEP on November 1, 2021 uses three cost-effectiveness tests to compare the net present value of program benefits with the cost to achieve those benefits. The Utility Cost Test (UCT), which includes the benefits and costs experienced by the utility system, is the primary test.[3] The UCT complies with the statutory requirement that "programs are designed to obtain energy savings and system benefits" by examining only the costs and benefits borne by the utility system, such as avoided fuel and costs and the costs of incentives and program administration.[4]

The second test, the Modified Utility Cost Test (MUCT), is similar to the UCT but also captures oil and propane savings and the costs associated with achieving those savings. The MUCT was introduced in the 2014 Update to the 2013-2015 C&LM Plan in response to policy direction included in Public Act 13-298, which stated that all programs must be screened in order to compare "program benefits for all energy savings to program costs."[5] In the 2022-2024 C&LM Plan, the MUCT applies only to electric residential programs that have oil or propane savings and is the primary test for those programs.

A third test, the Total Resource Cost (TRC) test, is used as a secondary test to inform energy efficiency program design but passing the TRC is not required for a program to proceed, with the exception of its use when evaluating the Home Energy Solutions-Income Eligible (HES-IE) program. The TRC incorporates the UCT and MUCT as well as several additional costs and benefits important from the perspective of energy-efficiency program participants, including water savings, non-embedded emissions,

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[1] *See:* CGS §16-245m(d)(3)
[2] *See:* Public Act No. 98-28 and Connecticut General Statutes §16-245m(d)(3)
[3] *See:* 2019-2021 Conservation and Load Management Plan, November 2018, *available at:* https://portal.ct.gov/-/media/DEEP/energy/ConserLoadMgmt/Final20192021CLMPlan111918pdf.pdf?la=en&hash=891F955EDEADB86FA2414AC6A6AC4772
[4] *See:* CGS §16-245m(d)(3)
[5] *See:* Public Act No. 13-298 An Act Concerning Implementation of Connecticut's Comprehensive Energy Strategy and Various Revisions to the Energy Statutes, *available at:* https://www.cga.ct.gov/2013/act/pa/pdf/2013PA-00298-R00HB-06360-PA.pdf

and environmental attributes.[6] For HES-IE only, the TRC includes non-energy impacts such as participant comfort, appliance noise, and home value, appearance, and safety.[7]

Basic parameters of Connecticut's testing are outlined in the Program Savings Document and in the C&LM Plan.[8] Although the results of the utilities' cost-effectiveness testing calculations are included in the C&LM Plan, the calculations themselves are not published.

Policy Goals

Cost-effectiveness testing determines which energy efficiency programs move forward to implementation and is therefore an essential mechanism for furthering Connecticut's energy goals. However, current C&LM cost-effectiveness testing does not capture or address efficiency program impacts outside of the scope of energy savings and system benefits.

The recommendations outlined in the sections that follow delineate DEEP's interim and future changes to cost effectiveness testing practices in the C&LM Plan and were developed with attention to the core energy goals. **These recommendations are a first step towards the development of a test that is reflective of all state policy goals and priorities, and an ongoing process to modernize the cost-effectiveness test.**

Previous Public Processes and 2020 NSPM Alignment

Over the past several years, DEEP has reviewed and re-evaluated the primary test used to assess the C&LM programs to ensure consistency and integrity in state efficiency programs. Relying initially on the principles of 2017 National Efficiency Screening Project's National Standard Practice Manual (NSPM), DEEP generated opportunities for public participation and comment to begin shaping a set of changes to apply to the current test.[9]

The recommendations outlined below result from the same basic framework found in the now-updated 2020 NSPM for Benefit-Cost Analysis of Distributed Energy Resources and marks an improvement in addressing Connecticut's current pertinent state policies while demonstrating transparency in the reasoning and methodology behind the most recent changes.[10]

DEEP first conducted a review of state policies and narrowed down applicable policy goals to enhance energy affordability, sustainability, resiliency, equity, and economic development. DEEP then performed a gap analysis of current utility system impacts included in the primary test. Based on the identified policy

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[6] *See* 2022-2024 Conservation and Load Management Plan, March 1, 2022, *available at*: http://www.dpuc.state.ct.us/DEEPEnergy.nsf/c6c6d525f7cdd1168525797d0047c5bf/cf59b4f99ec97597852587fb00021000?OpenDocument

[7] *See* Connecticut's 2022 Program Savings Document, March 1, 2022, *available at*: http://www.dpuc.state.ct.us/DEEPEnergy.nsf/c6c6d525f7cdd1168525797d0047c5bf/cf59b4f99ec97597852587fb00021000?OpenDocument

[8] *See* 2022-2024 Conservation and Load Management Plan, March 1, 2022, *available at*: http://www.dpuc.state.ct.us/DEEPEnergy.nsf/c6c6d525f7cdd1168525797d0047c5bf/cf59b4f99ec97597852587fb00021000?OpenDocument

[9] For an overview of past public processes, *see*: DEEP Benefit Cost Testing, updated November 26, 2018, *available at*: https://portal.ct.gov/DEEP/Energy/Conservation-and-Load-Management/Benefit-Cost-Testing

[10] *See:* National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources, August 2020, *available at*: https://www.nationalenergyscreeningproject.org/wp-content/uploads/2020/08/NSPM-DERs_08-24-2020.pdf

goals, DEEP elected to add utility system impacts of avoided greenhouse gas emissions and reduced arrearages, collection costs, debt write-offs, or administrative costs. To ensure a proper addressal of costs and benefits, DEEP carefully reviewed and researched feasible methodologies for addressing the new utility system impacts and will finalize an approach to quantifying these benefits in collaboration with the utilities, EEB, and independent evaluators. Any changes to the cost-effectiveness test will be documented in the C&LM Plan and Program Savings Document.

The Role of Cost Effectiveness Testing

The cost-effectiveness test resulting from these recommendations do not account for every possible benefit of energy efficiency programs. However, that does not mean that these benefits are not tracked and reported. Marketing material and legislative reports on energy efficiency programs promote the many participant, societal, and other program benefits, which play a key role in justifying continual funding, garnering legislative support, and encouraging consumer participation.[11]

Another important distinction to draw is that the primary cost effectiveness test does not determine program funding and incentive levels. For example, even when a program clears the cost-effectiveness threshold, the test only determines how big an incentive *can* be rather than mandating what an incentive *must* be. This provides flexibility on incentive decisions as long as a program's benefits outweigh its costs.

Recommendations

1. **Recommendation 1** – Create a new Connecticut Efficiency Test (CTET) that applies the principles of the MUCT to all programs and continue the use of the TRC as a supplemental test for income-eligible programs.
2. **Recommendation 2** - Modify the primary CTET to capture avoided greenhouse gas emissions.
3. **Recommendation 3** – Modify the CTET to capture the utility system benefit of reduced arrearages, collection costs, debt write-offs, or administrative costs.

The following recommendations, described more in-depth below, address changes to the structure of the primary cost-effectiveness test and propose values for new test component, where applicable.

1. **Recommendation 1 –** Create a new Connecticut Efficiency Test (CTET) that applies the principles of the MUCT to all programs and continue the use of the TRC as a supplemental test for income-eligible programs.

Although using a UCT (or variant of a UCT like the MUCT) as a primary test was once common, Connecticut is now one of only eight states that still uses a UCT as its primary test. These states, unlike Connecticut, generally do not perform well in national rankings of state energy efficiency programs. A majority of states use TRC tests, and many states use Societal Cost Tests (SCT),[12] state-specific tests, or multiple primary assessments.[13] Many states continue to use a UCT as their secondary test but have

[11] *See, for example*: Energy Efficiency Board Annual Legislative Reports, *available at*: https://energizect.com/connecticut-energy-efficiency-board/about-energy-efficiency-board/annualreports

[12] The SCT includes costs and benefits to the utility system, program participant impacts, and societal impacts. *See:* Cost-Effectiveness Tests: Overview of State Approaches to Account for Health and Environmental Benefits of Energy Efficiency, ACEEE, December 2018, *available at*: https://www.aceee.org/sites/default/files/he-ce-tests-121318.pdf

[13] *See:* Database of Screening Practices, NESP, *available at:* https://www.nationalenergyscreeningproject.org/state-database-dsesp/

assessed the need to incorporate public policy mandates and goals into their analyses. In these cases, states use a broader test as the backbone of their energy efficiency program design — either some variant of the TRC or, in a handful of cases, the much broader SCT.

While DEEP acknowledges this shift in cost-benefit analysis practices, it must also recognize that at its core, the C&LM Plan's intention is to motivate investment in energy efficiency and encourage market transformation through program administration and implementation.[14] As mentioned above, Public Act 13-298 also mandates that all cost and energy savings be in the benefit-cost screening.[15]

In other words, the purpose of the plan is more directly to use ratepayer funds to promote private investment in energy efficiency in order to indirectly achieve energy conservation and load management. This narrow purpose supports Connecticut's use of a new primary test, the Connecticut Efficiency Test, modeled after the state's current MUCT, as the primary cost-effectiveness test. Previously, the MUCT was only used to screen Residential programs. Using the MUCT to screen all programs as a primary test will mean that all programs can capture oil and propane savings as a benefit.[16] Paired with updates to the methodology for baseline savings calculations, the CTET will more fully capture the benefits of adopting cost-effective efficiency measures.

2. **Recommendation 2** - Modify the primary CTET to capture avoided greenhouse gas emissions.
Energy efficiency reduces energy demand and therefore the production of greenhouse gas emissions. While reducing emissions is not explicitly stated as a direct intention of the C&LM Plan, it is a policy goal cited in multiple public acts, statutes, state planning documents and implementation plans.[17] Given this strong policy focus, DEEP recommends that the CTET evaluate the impact of reduced greenhouse gas emissions, using one of the following methods:

A. Through the avoided cost of compliance with Connecticut's Global Warming Solutions Act
B. Using non-embedded greenhouse gas emissions cost determined in the 2021 Avoided Energy Supply Component study

The sections below discuss these methods in more detail.

A. Avoided cost of compliance with the Global Warming Solutions Act
Connecticut's cost-effectiveness tests already contain some carbon pricing that is embedded in energy rates through the Regional Greenhouse Gas Initiative (RGGI); a cooperative among nine Northeastern states, including Connecticut, that operates a market-based carbon dioxide emissions reduction program that requires fossil-fuel-fired electric power generators to cap their carbon dioxide emissions of three-year control periods. This means that the RGGI cost per emissions unit is recovered through the price of electricity that these generators produce. Additionally, as mentioned above, the TRC captures the per-ton cost of fossil fuel emissions carbon dioxide and nitrogen oxides.[18]

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[14] *See*: C.G.S. §16-245m(d)(5), *available at*: https://www.cga.ct.gov/current/pub/chap_283.htm#sec_16-245m
[15] *See:* Public Act No. 13-298 An Act Concerning Implementation of Connecticut's Comprehensive Energy Strategy and Various Revisions to the Energy Statutes, *available at:* https://www.cga.ct.gov/2013/act/pa/pdf/2013PA-00298-R00HB-06360-PA.pdf
[16] It is worth noting that C&I customers are less likely to use oil and propane as primary heating sources and therefore do not accrue these types of savings at the same rate of residential customers.
[17] These citations include but are not limited to DEEP Statutory Authority (PA 11-80), Conservation & Load Management Plan (CGS 16-245m), Comprehensive Energy Strategy, Renewable Portfolio Standard, Global Warming Solutions Act, Climate Change Action Plan, and Climate Change Preparedness Plan

While RGGI helps to regionally reduce emissions, it does not reflect the costs incurred by individual states to meet their own policy goals, such as Connecticut's cost of complying with its Global Warming Solutions Act (GWSA). Applying the avoided cost of compliance with the GWSA in the CTET is a mechanism for more completely valuing emissions reductions achieved through energy efficiency as a utility-system benefit. This would allow Connecticut to account for the costs and benefits of meeting overarching policy goals while remaining within C&LM statutory intent.

The 2021 Avoided Energy Supply Component Study (AESC) calculates the avoided cost of compliance with Massachusetts' Global Warming Solutions Act by comparing the cost of meeting state targets assuming no new incremental energy efficiency, to the cost of meeting the targets with energy efficiency resources included.[19] For Massachusetts, this amounts to a 15-year levelized cost of 1.79 cents per kWh for 2019-2033.[20] The rationale behind this approach considers the fact that energy efficiency lowers overall system demand, and therefore proportionately lowers the quantity of renewables that would need to be procured to meet the goals of the Massachusetts Global Warming Solution Act. As part of the update process described above, the Connecticut Energy Efficiency Board considered, but ultimately elected not to pursue, a similar study to calculate the cost of compliance with Connecticut's Global Warming Solutions Act.

B. Non-embedded costs of greenhouse gas emissions in the Avoided Energy Supply Component Study

Alternatively, the CTET could capture the impact of avoided GHG emissions using the per ton cost for non-embedded emissions from the AESC. The 2021 AESC provides multiple pathways for quantifying non-embedded GHG costs, referenced in the table below.[21]

Table 76. Comparison of GHG costs under different approaches (2021 $ per short ton) in Counterfactual #1

	AESC 2018	AESC 2021	Difference	% Difference
Social cost of carbon (SCC or "damage cost") at 2% discount rate	Not quantified	$128	-	-
Global marginal abatement cost	$105	$92	-$13	-12%
New England-based marginal abatement cost, derived from the electric sector	$72	$125	$53	75%
New England-based marginal abatement cost, derived from multiple sectors	Not calculated	$493	-	-

Notes: All values shown are levelized over 15 years. All AESC 2021 values except the SCC are levelized using a 0.81 percent discount rate (SCC uses a 2.0 percent discount rate). All AESC 2018 values are levelized using a 1.34 percent discount rate, then converted into 2021 dollars. In AESC 2018, damage costs were discussed, but not quantified. AESC 2018 did not discuss or estimate a New England-based marginal abatement cost derived from multiple sectors. Values shown above remove energy prices, but not embedded costs. Values shown above do not include losses.

[19] *See:* Synapse Energy Economics, Inc. Analysis of the Avoided Cost of Compliance of the Massachusetts Global Warming Solutions Act: Supplement to 2018 AESC Study, 2018, *available at*: http://www.synapse-energy.com/sites/default/files/MA-GWSA-Supplement-AESC-2018-18-066.pdf

[20] *See* Id.

[21] *See:* Avoided Energy Supply Components in New England: 2021 Report, May 2021, *available at*:https://www.synapse-energy.com/sites/default/files/AESC 2021_20-068.pdf

The social cost of carbon (SCC) monetizes future damages resulting from greenhouse gas emissions on a global scale. The 2021 AESC outlines several social cost of carbon (SCC) methodologies, but ultimately recommends alignment with New York's Value of Carbon Guidance: using a 2 percent discount rate to generate a 15-year levelized SCC of $128 per short ton.[22]

The global marginal abatement cost in the 2021 AESC derives the cost of non-embedded greenhouse gas emissions using large-scale carbon capture and sequestration (CCS) as the economy-wide marginal abatement technology.[23] For this international perspective, the 2021 AESC estimates a global marginal abatement cost of $92 per short ton.[24]

The New England-based marginal abatement costs provide a local perspective by looking at the cost of marginal abatement technologies, either in the electric sector or across multiple sectors in the region. For the electric sector, the marginal abatement cost assumes a scenario where all end-uses must be electrified and powered by zero- or low-carbon technology. The AESC 2021 found that offshore wind is the most appropriate marginal abatement technology for New England and projected the cost of this resource through 2035 to determine a cost of $125 per short ton GHG (carbon dioxide-equivalent). This regional marginal abatement cost is the current value used in Connecticut's TRC test for both electricity and natural gas. Lastly, across multiple sectors, the emissions cost is derived from future cost trajectories for renewable natural gas (RNG), resulting in $493 per short ton GHG.[25]

3. **Recommendation 3** - Modify the CTET to capture the utility system benefit of reduced arrearages, collection costs, debt write-offs, or administrative costs.

Benefits in the form of reduced arrearages, collection costs, debt write-off costs, or administrative costs can take a variety of forms, including costs of notices and support provided to customers in arrears, costs associated with shutting off and restoring service, carrying costs associated with arrears, and costs of writing off bad debt.[26] Since efficiency programs lower customers' energy use and energy bills, they can reduce the probability of customers falling behind or defaulting on bill payment obligations. All ratepayers can benefit from this, as the costs of arrearages accrue to all utility customers. Current testing practices exclude these utility system benefits but include the higher energy costs resulting from arrearages. This asymmetrical testing warrants inclusion of these benefits to the utilities and ratepayers in analysis.

The inclusion of these impacts in cost-effectiveness testing is particularly relevant to Connecticut, which has some of the highest electricity rates in the nation. Any impact that energy efficiency programs might have on affordability should be accounted for in the primary cost-effectiveness test, especially given that these large arrearages and shutoff protections are significantly larger for low-income customers,

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[22] *See:* Establishing a Value of Carbon: Guidelines for use by State Agencies, 2020, *available at*: https://www.dec.ny.gov/docs/administration_pdf/vocfguid.pdf

[23] The marginal abatement cost Is a measure of the cost of reducing one additional unit of greenhouse gas emissions. The values In the 2021 AESC assume that the marginal abatement cost will be at least equal to the most expensive abatement technology (the marginal abatement technology). *See:* Avoided Energy Supply Components in New England: 2021 Report, May 2021, *available at*: https://www.synapse-energy.com/sites/default/files/AESC 2021_20-068.pdf

[24] *See* Id.

[25] *See* Id.

[26] *See:* National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources, August 2020, *available at*: https://www.nationalenergyscreeningproject.org/wp-content/uploads/2020/08/NSPM-DERs_08-24-2020.pdf

particularly in states where low-income customers are offered discounted rates or shutoff protection provisions that can sometimes result in large arrearages.

Because arrearages and debt collections are already expressed in monetary terms, evaluators can directly monetize these utility non-energy impacts (NEIs), typically by taking the average of pre- and post-participation data and finding the difference in the NEI for a treatment group.[27] The Evaluation Committee of the Energy Efficiency Board has an NEI study underway that will include analysis of arrearage data. The study proposal calls for examining billing and payment data for participants and non-participants of the Home Energy Solutions-Income Eligible program to compare incidence and financial changes attributable to that program. The resulting NEIs may address arrearages, bad debt write-offs, customer calls and collections, and terminations, among others.[28] Once finalized, the NEIs from this study could be applied to the CTET as a utility system benefit.

While these values are in development, it may be possible to derive a value for this NEI from existing sources. A 2018 literature review of non-energy impacts prepared for the Energy Efficiency Board provides guidance on potential adders that could capture the impact of reduced arrearages. Reviews of program studies from Colorado and Maryland found that the impact of efficiency programs on arrearage carrying costs was about five dollars per unit (see table below).[29]

Table ES-9
Utility Rates and Arrearage Reduction Impacts from Weatherization

Weatherization Impact	Study	Annual Benefit Per Unit
Reconnections	CO Low-Income EE NEB Study (2010)	-$0.66
Notices	CO Low-Income EE NEB Study (2010)	$0.07
Shutoffs	CO Low-Income EE NEB Study (2010)	$0.94
Customer Calls	CO Low-Income EE NEB Study (2010)	$1.36
Arrearage Carrying Cost	CO Low-Income EE NEB Study (2010)	$5.25
Arrearage Carrying Cost	MD Empower Energy Efficiency NEBs (2014)	$5.50
Reduced Rate Subsidy	CA LI Public Purpose Test (2001)	$7.27

A 2019 study prepared for California's investor-owned utilities reviewed several studies on the utility arrearage NEI from the past few decades and found that the value of this NEI ranged from about $0.50-$5.00 per household, with a typical value of $3.00 per household.[30]

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[27] *See:* Non-Energy Impacts Approaches and Values: an Examination of the Northeast, Mid-Atlantic, and Beyond, NEEP, June 2017, *available at*: https://www.puc.nh.gov/EESE Board/Final NEI Report for NH-6-2-17.pdf
[28] *See:* X1942 Non-Energy Impacts Study (presentation to Energy Efficiency Board Evaluation Committee), NMR Group, Inc., March 22, 2021, *available at*: https://www.energizect.com/sites/default/files/2021-06/X1942 NEI Kickoff 20210322x2.pdf
[29] *See:* Connecticut Non-Energy Impacts Literature Review: R1709, prepared by APPRISE for the Energy Efficiency Board, December 2018, *available at*: https://www.energizect.com/sites/default/files/R1709_CT Non-Energy Impacts Literature Review_Final Report_Dec 2018.pdf
[30] *See:* Non-Energy Benefits and Non-Energy Impact (NEB/NEI) Study for the California Energy Savings Assistance (ESA) Program, Skumatz Economic Research Associates, July 2019, *available at*: Microsoft Word - ESA NEB Study Draft Report Volume1.docx (energydataweb.com)

These findings provide a range of values from which Connecticut might quantify the impact of reduce arrears resulting from efficiency programs.

Conclusion

While statutory constraints limit cost-effectiveness testing to the consideration of only utility system impacts, these recommendations, and the introduction of a new Connecticut-specific test, the CTET, provide pathways for evaluating a broader set of costs and benefits associated with C&LM programs both within and without the confines of the statute. As the energy landscape evolves, the screening tools that evaluate energy programs must evolve with it. This new cost test creates the foundation for a modernized and comprehensive method of cost-effectiveness testing to align with evolving state policy priorities.