New Jersey Cost Test Proposal

For Public Comment
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New Jersey Board of Public Utilities
Division of Clean Energy
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Introduction

The Clean Energy Act of 2018[1] ("CEA" or "the Act") included requirements to increase the energy savings enjoyed by New Jersey consumers through a new generation of efficiency ("EE") and peak demand reduction ("PDR") programs. Key to the legislation was the concept that the Board of Public Utilities ("Board" or "BPU") shall "ensure investment in *cost-effective* energy efficiency measures," while also ensuring "universal access to energy efficiency measures" and serving "the needs of low-income communities . . . ." (emphasis added). This proposal lays out a primary benefit-cost test for EE and PDR investments in New Jersey that is designed to carefully steward ratepayer dollars by ensuring that these investments are cost-effective, while also ensuring universal access and serving the needs of low-income communities.

The CEA requires that:

> *The energy efficiency programs and peak demand reduction programs shall have a benefit-to-cost ratio greater than or equal to 1.0 at the portfolio level, considering both economic and environmental factors, and shall be subject to review during the stakeholder process established by the board pursuant to subsection f. of this section. The methodology, assumptions, and data used to perform the benefit-to-cost analysis shall be based upon publicly available sources and shall be subject to stakeholder review and comment. A program may have a benefit-to-cost ratio of less than 1.0 but may be appropriate to include within the portfolio if implementation of the program is in the public interest, including, but not limited to, benefitting low-income customers or promoting emerging energy efficiency technologies.*[2]

The Act specifically requires that each portfolio of EE and PDR programs must have a benefit-to-cost ratio ("BCR") greater than or equal to 1.0, which means that the portfolio yields positive net benefits (i.e., benefits less costs) to the New Jersey economy and is therefore "cost-effective." The Act allows (and in fact, for the purposes of serving low-income communities or ensuring universal access to EE, requires) that every program may not meet this cost-effectiveness standard. However, reasonable policy interests should support the adoption of programs with BCRs below 1.0, as their inclusion in a portfolio will reduce overall net benefits achieved. Similarly, individual efficiency measures do not need to be cost-effective, although the cost-effectiveness of individual measures may be considered during the review of program filings. As with programs, non-cost-effective measures should typically only be included for good reason, such as to promote health and safety, to ensure equitable access, or to spur innovation, the adoption of other measures, or longer-term market transformation.

While the CEA is not explicit in prescribing a cost-effectiveness test beyond requiring the inclusion of economic and environmental factors, it is clear that such a test is needed to achieve the purpose of the state's EE and PDR programs serve the public interest of all New Jersey residents. As such, the primary cost-effectiveness test used to evaluate these programs should reflect the impacts of the programs on the state's overall economy and environment, including not only energy but also non-energy benefits that EE and PDR programs can provide to the residents of New Jersey. This proposal outlines Staff's proposed primary cost test for New

[1] P.L. 2018, c. 17 (N.J.S.A. 48:3-87.8 et al.).

[2] N.J.S.A. 48:3-87.9(d)(2).

Jersey's EE and PDR programs, including the costs, benefits, sources for such inputs, and guidelines for the use of the test.

Executive Summary

New Jersey has historically used five standard benefit-cost tests to evaluate the costs and benefits of EE programs: the Total Resource Cost Test ("TRC"), Societal Cost Test ("SCT"), Program Administrator Cost Test ("PACT"), Participant Cost Test ("PCT"), and Ratepayer Impact Measure Test ("RIM"), which are described in more detail in the "Background" section below.

In order to implement the CEA's requirement that EE and PDR portfolios have BCRs greater than or equal to 1.0, Staff proposes that all program administrators should use a primary benefit-cost test. Staff has designed an initial New Jersey Cost Test ("NJCT") to fulfill the CEA's requirements to consider economic and environmental factors, ensure universal access to EE, and serve the needs of low-income communities.[3] Staff expects that this initial NJCT, which will apply to the first three-year term of EE and PDR programs,[4] will evolve over time through the efforts of the EM&V Working Group and may include additional impacts as they are studied further and evaluated for use in New Jersey.

In considering which impacts to include in the initial NJCT, Staff used the TRC as a foundation and added inputs, including non-energy impacts ("NEIs"), that are both relevant to New Jersey's policy goals and can be applied based on readily available research and industry consensus.

Staff has also identified near-term and potential long-term sources for the values for each cost and benefit included in the NJCT.

Benefits	Costs

Energy Savings
• Direct Energy Benefits
  ○ Avoided cost of energy using the PJM energy rate
  ○ Avoided cost of capacity using the PJM capacity rate
  ○ Avoided cost of transmission using the PJM transmission rate
  ○ Avoided natural gas consumption
  ○ Avoided delivered fuel costs
	Measure-Related Costs
	• Efficiency Measure Incremental Costs
	• Impacts on O&M
	
	Non-Measure Program Costs
	• Non-Measure, Specific Program Costs
	  ○ Overhead Costs
	  ○ Marketing Costs
	  ○ Data Tracking Costs

[3] *See* In re the Implementation of P.L. 2018, c. 17 Regarding the Establishment of Energy Efficiency and Peak Demand Reduction Programs, BPU Docket No. QO19010040 (Order dated June 10, 2020) ("June 10, 2020 Order"), p. 3.

[4] Each program year will commence on July 1 and end on June 30 of the following year, in alignment with State fiscal years. The first three-year term will include Program Year 1 (July 1, 2020 – June 30, 2022), Program Year 2 (July 1, 2022 – June 30, 2023), and Program Year 3 (July 1, 2023 – June 30, 2024).

• Indirect Energy Benefits
  ○ Demand-Reduction-Induced Price Effects ("DRIPE")
Non-Energy Resource Savings
• Public Health
• Other Low-Income Household Health and Safety Impacts
Non-Energy Resource Savings
• Water and Sewer Benefits
Other Non-Energy Indirect Impacts
• Economic Development
	• Non-Measure, Non-Program-Specific Costs
	  ○ Administrative and Planning Costs
	  ○ EM&V Costs

Background

New Jersey has historically used five standard cost-effectiveness tests, based on the California Standard Practice Manual ("CSPM"),[5] to review the costs and benefits of EE programs. More specifically, the BPU's Division of Clean Energy ("DCE") has required New Jersey's electric and gas public utilities to evaluate their EE programs using the five tests. The DCE has also used the five tests to evaluate New Jersey Clean Energy Program ("NJCEP") offerings, which in turn use avoided cost assumptions developed by the Rutgers Center for Green Building ("RCGB").[6]

These five basic cost-effectiveness tests, as defined below by the CSPM, reflect varying perspectives and include different costs and benefits. Of the jurisdictions that have a primary test, most leading states rely on the SCT or a modified TRC, both of which consider costs and benefits from the entire jurisdiction's economy.

- **Total Resource Cost Test ("TRC")** and **Societal Cost Test ("SCT")**: The TRC measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants' and the utility's costs. The SCT is a variant of the TRC. It goes beyond the TRC in that it attempts to quantify the change in the total resource costs to society as a whole rather than to only the service territory (the utility and its ratepayers). The SCT uses essentially the same input

[5] California Public Utilities Commission, "California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects," https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=7741 (October 2001). As noted on page 6 of the manual, the tests are not intended to be used individually or in isolation. Rather, the manual suggests that the results of tests must compared and that there are tradeoffs between the various tests. The manual provides a description of the strengths and weaknesses of each test to assist users in qualitatively weighing test results.

[6] *See*, for example, "Energy Efficiency Cost-Benefit Analysis Avoided Cost Assumptions Technical Memo: May 1, 2019 Update" ("2019 RCGB Avoided Cost Memo"), https://njcleanenergy.com/files/file/BPU/Avoided%20Cost%20Memo.pdf.

For a list of Recent RCGB Avoided Cost Memos, *see* https://njcleanenergy.com/main/public-reports-and-library/market-analysis-protocols/market-analysis-baseline-studies/market-an

variables as the TRC test, but they are defined with a broader societal point of view. For example, the SCT includes the effects of externalities (e.g., environmental, national security), excludes tax credit benefits, and applies a social discount rate in place of the weighted average cost of capital ("WACC") used in the TRC. As noted in the CSPM, traditionally, implementing agencies have independently determined the details of the SCT, such as the components of the externalities, the externality values, and the policy rules that specify the contexts in which the externalities and tests are used.

- **Program Administrator Cost Test ("PACT")**[7]: The PACT measures the net costs of a demand-side management program as a resource option based on the costs incurred by the program administrator (including incentive costs) and excluding any net costs incurred by the participant.
- **Participant Cost Test ("PCT")**: The PCT measures quantifiable benefits and costs to the customer due to participation in a program. As noted in the CSPM, since many customers do not base their decision to participate in a program entirely on quantifiable benefits, this test cannot be a complete measures of the benefits and costs of a program to a customer.
- **Ratepayer Impact Measure Test ("RIM")**: The RIM measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program. Rates will go down if the change in revenues from the program is greater than the change in utility costs. Conversely, rates or bills will go up if revenues collected after program implementation are less than the total costs incurred by the utility in implementing the program. This test indicates the direction and magnitude of the expected change in customer bills or rate levels.

There are also other methods for developing primary cost tests, such as through the methods described in the National Standard Practice Manual ("NSPM").[8] The NSPM method results in a state-specific test, referred to as a Resource Value Test ("RVT"), that is based on a jurisdiction's articulated policy and other objectives.

Procedural History

Following the passage of the CEA, Staff provided multiple opportunities for stakeholder input on a range of topics related to the development and implementation of the EE and PDR programs required by the CEA. Staff solicited input specifically related to the evaluation, measurement, and verification ("EM&V") of the programs and their associated energy savings through a public stakeholder meeting on December 18, 2019, including recommendations for

[7] It is also referred to as the "utility cost test" ("UCT"); however, PACT is preferred because program administrators may not always be utilities, and it is reasonable to consider the entire costs and benefits on both gas and electric systems (which may reflect different utilities) when programs are addressing both fuels.

[8] National Efficiency Screening Project, "National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources," available at https://nationalefficiencyscreening.org/wp-content/uploads/2017/05/NSPM_May-2017_final.pdf.

BCA methodologies, and invited stakeholders to provide written comments by January 17, 2020. As a result of these recommendations, Staff proposed an EM&V framework for New Jersey's next generation of EE and PDR programs through a Full Straw Proposal, released on March 20, 2020, and accepted comments through April 10, 2020.

In the Full Straw Proposal, Staff recommended developing a New Jersey-specific primary cost test without proposing the specifics of that test. In comments on the Full Straw Proposal, stakeholders voiced concerns about using the NSPM to develop a primary test for New Jersey, given the time required to develop an RVT before program implementation in July 2021. Stakeholders further suggested that the EM&V Working Group ("EM&V WG") could consider development of an RVT in the future. Additionally, based on the CEA's emphasis on the importance of including both environmental and economic benefits in BCA methods, several commenters suggested that the SCT should be used as the primary cost test for the first program cycle.

Based on stakeholder comments, Staff recommended to the Board that a primary cost test be developed for use by all program administrators in the state and that this test be called the New Jersey Cost Test. Staff recommended that the State's current TRC Test be modified to balance the State's policy objectives with the goal of developing a test in the near-term that has reasonably quantifiable inputs and is based on publicly available sources. On June 10, 2020, the Board adopted Staff's recommendation to propose a modified TRC Test as the primary test used to evaluate utility- and State-led EE and PDR programs while continuing to use the CSPM tests for information purposes for the first three-year program cycle.[9]

Staff now seeks stakeholder input about Staff's specific recommendations for the costs and benefits to be included in the NJCT, including NEIs, as well as the practices and assumptions used to develop common statewide inputs. Staff anticipates providing its final recommendations on the NJCT to the Board for adoption following stakeholder input. If adopted by the Board, this would serve as the NJCT to be used by all program administrators for the first program cycle and would be reviewed by the EM&V WG for potential future updates on an ongoing basis.

New Jersey Cost Test Framework

Staff proposes the NJCT as the State's primary test for determining cost-effectiveness of EE and PDR programs, to be used in plan development, approval, and evaluation assessments. The NJCT should be used to determine compliance with the CEA's 1.0 BCR requirement. The NJCT should include all costs and benefits relevant to a proposed portfolio of EE programs that are reasonably quantifiable and that align with the policies articulated in the CEA, as well as additional public interest goals of the BPU and the State of New Jersey.

Staff anticipates that the NJCT will take the place of the TRC and SCT in the CSPM. Therefore, if adopted by the Board, Staff expects to recommend to the Board that program administrators

[9] June 10, 2020 Order at 32.

use the NJCT as the primary cost-effectiveness test during the first three-year program cycle while reporting the results of the PACT, PCT, and RIM for information purposes.

Efficiency programs can provide additional benefits to society beyond the ratepayer cost savings directly resulting from using less energy. Including appropriate NEIs ensures that benefit-cost screening adequately captures the full range of impacts that these programs have on participants and society. Given the requirements of the CEA and the additional societal benefits provided by EE programs, Staff believes that it is appropriate to include NEIs in the NJCT.

Staff recommends that the EM&V WG review the overall NJCT framework on an ongoing basis and consider modifications in collaboration with Staff. In addition, the Board should task the EM&V WG with developing a process for all EE and PDR programs through which the methodologies for developing the value of relevant costs and benefits are appropriately updated and memorialized ahead of each program cycle and/or as needed. All NJCT changes will be adopted by the Board before being considered final.

Staff recommends that the methods and policies used to administer the NJCT be consistent across all program administrators. Inputs should be established according to the process described above prior to each three-year program cycle and for retrospective evaluation of program performance related to a given cycle. In addition, most input values should reflect average statewide estimates, rather than be utility-specific. This will ensure fair comparisons of all BCA results across program administrators and for statewide co-managed and BPU-administered programs. However, utility-specific values may be used for certain inputs where deemed appropriate by the Board, such as for transmission and distribution costs, and where the use of such values is in keeping with the CEA's requirement that input values be publicly available.[10]

To the extent that they are not specifically discussed below, the starting point for inputs and methods used to develop the values for the NJCT should be to maintain current practices, as articulated in the RCGB Avoided Cost Memo,[11] which has historically provided the inputs and methods utilized to update the avoided cost assumptions for integration into cost-benefit analyses of the New Jersey Clean Energy Program.

Global NJCT Inputs

Staff recommends that most of the key inputs for conducting the NJCT be variable and measure-, program-, or portfolio-specific, such as the actual stream of annual costs and savings. Others are expected to be consistent statewide ("global") but updated with each three-year EE and PDR program cycle. This section outlines the key global inputs or methods that Staff proposes for the NJCT.

[10] N.J.S.A. 48:3-87.9(d)(2).

[11] Rutgers Center for Green Buildings, "Energy Efficiency Cost-Benefit Analysis Avoided Cost Assumptions Technical Memo: May 2019 Update," https://njcleanenergy.com/files/file/BPU/Avoided%20Cost%20Memo.pdf. For a list of Recent RCGB Avoided Cost Memos, *see* https://njcleanenergy.com/main/public-reports-and-library/market-analysis-protocols/market-analysis-baseline-studies/market-an.

Discount Rates

EE measures typically have relatively high upfront costs that need to be recovered by savings over the life of the measure. Benefit-cost analyses for programs or projects with streams of costs or benefits over more than 1-2 years use the standard accounting practice of discounting future payments and savings. Discounting is especially important when comparing projects or programs with different lifespans. Discounting to a present value therefore allows a more apples-to-apples comparison of projects with various lifespans. The Office of Management and Budget ("OMB"), in Circular A-4, states that "'Opportunity cost' is the appropriate concept for valuing both benefits and costs. The principle of 'willingness-to-pay' ("WTP") captures the notion of opportunity cost by measuring what individuals are willing to forgo to enjoy a particular benefit."[12] As such, discount rates for any benefit-cost analysis should be based on the relevant opportunity cost(s) for the program or project investment under analysis.

Many other states that promote EE programs, especially utility-administered programs, use the utility weighted-average cost of capital ("WACC") as the discount rate, although several states have employed lower discount rates. OMB Circular A-94, companion to Circular A-4 specific to discount rates, recommends a rate of 7% for benefit-cost analysis, with sensitivity analysis at 3% and at a rate higher than 7% if the "main cost is to reduce business investment."

As described in EPA *Guidelines for Preparing Economic Analyses*, if the benefits of a given program occur 30 years in the future and are valued in real terms at $5 billion at that time, the rate at which the $5 billion in future benefits is discounted can dramatically alter the economic assessment of the policy. $5 billion 30 years in the future discounted at 1% is $3.71 billion, at 3% it is worth $2.06 billion, at 7% it is worth $657 million, and at 10% it is worth $287 million.[13]

Staff seeks stakeholder feedback on the appropriate discount rate to include in the NJCT.

Line Losses

Due to electric line losses, a kWh saved from efficiency at site translates to more than one kWh saved at generation. The higher the load on the electric system, the higher the line losses. This means that the line losses from energy saved through efficiency, which saves energy at the margin, are significantly higher than average system losses.

Staff requests comment on whether and how these line losses should be accounted for in the NJCT. Staff requests comment on whether to use a 4.97% line loss adjustment to convert wholesale sales to retail sales, which the BPU is using to assess the state's retail electricity sales relative to the goal of achieving 5.1% of retail electricity sales from solar electric generation facilities. Staff also requests comment on whether average line losses should be converted to marginal line losses, and, if so, if an inflation factor should be applied.

[12] Office of Management and Budget, Circular A-4 (September 17, 2003), https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4

[13] U.S. Environmental Protection Agency, *Guidelines for Preparing Economic Analyses* (2016) at 75, https://www.epa.gov/sites/production/files/2017-08/documents/ee-0568-50.pdf.

Costs

Efficiency Measure Incremental Costs

Efficiency measure incremental costs are the total costs associated with the efficiency measure implemented (i.e., material and labor) less the costs of the baseline measure. For example, in a retrofit project where the customer would have otherwise made no investment, the incremental costs are equal to the total cost of the efficiency measure, since the baseline is no customer action. For a failed equipment replacement, renovation, or new construction project, the incremental costs equal the high efficiency measure costs less the cost of what the customer would have otherwise implemented.

Other measure-related costs such as impacts on equipment operation and maintenance ("O&M") and deferral of capital expenditures over the life of the measure should be quantified and treated as positive or negative costs in the NJCT.

Incremental costs, O&M, and deferred capital expenditures should be tracked and reported by the program administrators. Where feasible, such cost assumptions should be documented in the Technical Resource Manual ("TRM") to provide consistency of approach among all program administrators.

Non-Measure Program Costs

Staff recommends including all "non-measure" program costs (i.e., those costs that do not directly cover some portion of the incremental measure costs) in overall portfolio level cost-effectiveness. Non-measure costs can generally be divided into two broad categories: non-measure specific program costs and non-program specific costs.

Non-Measure, Specific Program Costs

Non-measure specific program costs include those costs attributable to specific programs but not individual measures. Such costs may include, but are not limited to, overhead, marketing, and data tracking costs.

Non-Measure, Non-Program-Specific Costs

Non-program specific costs include, but are not limited to, non-program-specific planning and analysis, EM&V, and regulatory costs. Both program and non-program costs should be tracked and reported by program administrators.

Benefits

Energy Savings

EE investments provide two main types of energy savings that need to be quantified in any cost-benefit analysis. First, customers enjoy *direct* savings associated with lower utility bills because they consume less electricity or other forms of energy. Second, all New Jersey residents benefit from *indirect* savings because of the reduced costs of operating the electric grid when total electricity consumption decreases. The energy savings economic benefits to society are the sum of these two values. There are numerous components to avoided costs to

account separately for energy and peak capacity reductions and to reflect electric generation, T&D, and gas and delivered fuels avoided costs.

Direct Energy Benefits

Direct energy benefits are created when utilities do not have to purchase electricity because a consumer has invested in EE infrastructure and reduced its total consumption. The reductions in wholesale purchases by the utility represent a net savings to society equal to the quantity of avoided electricity multiplied by the wholesale cost of procuring that electricity, including capacity and other associated costs. For purposes of measuring direct electricity benefits, Staff proposes to consider the following factors:

- The PJM energy rate (locational marginal price ("LMP")) in $/MW-hour);
- The PJM capacity rate (in $/MW-day);
- The PJM transmission rate (in $/MW-year);
- Avoided delivered fuel costs; and
- Avoided natural gas consumption.

Staff requests additional comment on whether to include avoided distribution investment attributable to EE-driven load reductions in this calculation and, if so, how to calculate those savings.

Avoided Cost of Energy Using the PJM Energy Rate:

Staff proposes to define the relevant PJM energy rate as the three-year rolling average of historic PJM wholesale real-time LMP.[14] The seasonal peak and off-peak factors may be derived using historic PJM LMP data.[15]

Avoided Cost of Capacity Using the PJM Capacity Rate:

For EE measures, the direct benefits of avoided capacity purchases could be calculated by multiplying the demand offered into, and cleared, in the PJM Reliability Pricing Model ("RPM") by the relevant zonal clearing price in the Base Residual Auction on a three-year rolling average. However, Staff also notes the so-called "EE-addback," which increases the amount of capacity New Jersey customers must procure in the RPM for each MW of EE cleared.[16] In light of these market rules, Staff requests comment on the

[14] Historic 2018 New Jersey wholesale electric prices from PJM Data Miner 2 were escalated based on the annual percent change in the *EIA 2019 Annual Energy Outlook* using the Reliability First Corporation/East Electricity Generation Prices. https://www.eia.gov/outlooks/aeo/data/browser/#/?id=62-AEO2019&region=3-9&cases=ref2019&start=2017&end=2050&f=A&linechart=ref2019-d111618a.130-62-AEO2019.3-9&map=&ctype=linechart&sourcekey=0

[14] The seasonal peak and off-peak factors were derived using historic 2018 PJM LMP data. http://www.pjm.com/markets-and-operations/energy.aspx

[16] *See* June 10, 2020 Order at n.21 citing PJM Manual 18, § 2.4.5 ("After EE Providers propose EE Resource(s) in their EE Measurement and Verification Plans and PJM reviews and accepts the Nominated EE Value of the

appropriate measure of PJM capacity benefits for use in the direct energy benefits calculation.

Avoided Cost of Transmission Using the PJM Transmission Rate:

Staff proposes to calculate the direct benefits of avoided wholesale PJM transmission costs by multiplying the demand offered into, and cleared, in the RPM by the relevant zonal transmission rate, as identified in Schedule 12 of the PJM Open Access Transmission Tariff for each EDC, on a three-year rolling average.

Avoided Natural Gas Consumption:

EE projects can also be structured to reduce a customer's consumption of natural gas against an established baseline. Staff recommends including avoided natural gas consumption costs in the NJCT, using a three-year rolling average of EIA Annual Energy Outlook Henry Hub price projections.[17] The winter and summer ratios may be derived from the historic average ratio of summer and winter prices to Henry Hub (97.3% for the summer and 102.7% for the winter).[18] Table 1 shows the most recent wholesale natural gas price projections developed for benefit-cost analysis.

Table 1: Wholesale Natural Gas Prices (Nominal $/MMBtu)

	Henry Hub Wholesale Prices		
	Average Price	*Summer*	*Winter*
2018	2.99	$2.91	$3.07
2019	3.10	$3.02	$3.19
2020	3.25	$3.16	$3.34

Staff also proposes that avoided investment in new natural gas capacity, or the value of the beneficial resale of natural gas capacity, associated with EE investments should also be reflected in the NJCT. For the first program cycle, Staff proposes that utilities be allowed to reflect wholesale natural gas transportation costs in their benefits. Staff

proposed EE Resource(s), PJM will use the resulting Nominated EE Value to: (1) create an EE Resource to be offered into the upcoming auction, and (2) **increase the reliability requirement to be satisfied for the region and for any affected Zones (or sub-Zonal LDAs). For each BRA, the Reliability Requirement of the RTO and each affected LDA will be increased by the total UCAP Value of all EE Resource(s) for which PJM accepted an EE M&V Plan for that auction, and upon which PJM created an EE Resource to be offered into that upcoming BRA"**)(emphasis added).

[17] Wholesale natural gas prices are taken from the EIA Annual Energy Outlook 2019 (Henry Hub) - https://www.eia.gov/outlooks/aeo/data/browser/#/?id=13-AEO2019&sourcekey=0

[18] https://www.eia.gov/dnav/ng/hist/rngc1m.htm

seeks comments on what specific criteria utilities would have to demonstrate to show the benefit.

Avoided Delivered Fuel Costs:

Staff proposes to likewise include the value of avoided delivered fuel costs (propane or fuel oil) in the NJCT. Staff proposes that avoided costs for #2 fuel oil and propane be included in the NJCT, using a three-year rolling average of historic EIA New Jersey residential fuel oil and propane prices escalated using an annual growth rate derived from the Mid-Atlantic Region EIA Annual Energy Outlook projections.[19] Table 2 shows the most recent residential propane and fuel oil projections developed for benefit-cost analysis.

Table 2: Residential Propane and Heating Oil Prices (Nominal $/Gallon)

	Propane Residential	*Heating Oil Residential*
2018	$3.84	$3.29
2019	$4.39	$3.46
2020	$4.82	$3.65

Indirect Energy Benefits

In addition to direct energy benefits, the reduced load associated with EE and PDR deployment also reduces *indirect* energy and capacity prices for all New Jersey consumers. PJM operates a single-clearing price market, and the price is set at the point that supply and demand meet. PJM determines the clearing price by creating a "supply stack" of all eligible resources based on their strike price. The least expensive resources are lower on the supply stack and are selected first. The next least expensive resource is selected next, and so on, until supply matches the anticipated demand. This effect is often referred to as the Demand-Reduction-Induced Price Effect ("DRIPE") and occurs in both the PJM energy and capacity markets.

Investment in EE decreases the amount of demand in both the PJM energy and capacity markets (for wholesale projects). The DRIPE effect in the PJM capacity market for EE deployment is limited in PJM due to the "EE-addback" to the capacity market referenced above. For behind-the-meter projects, PJM's demand requirements are reduced, but reflected instead in PJM's load forecast. The reduced energy demand translates directly into reduced wholesale prices because the most expensive resource in the supply stack is no longer needed as demand decreases. These savings represent a societal benefit to all consumers in New Jersey, whether they invested in EE themselves or not, and is thus appropriate to include in the tally of EE benefits.

[19] Historic 2018 EIA New Jersey residential fuel oil and propane prices were escalated using an annual growth rate derived from the Mid-Atlantic Region *EIA Annual Energy Outlook 2019* forecasts: https://www.eia.gov/dnav/pet/pet_pri_wfr_dcus_sNJ_w.htm

DRIPE effects are relatively small when expressed in terms of an impact on market prices. However, DRIPE impacts can be significant when expressed in absolute dollar terms when applied to all wholesale purchases by New Jersey consumers. Staff seeks comment on how these benefits should be measured and reported.

Non-Energy Resource Savings

Public Health

The understanding of potential health and safety impacts on human health due to weatherization has grown over time, and advances in fields such as environmental epidemiology, exposure science, and indoor environmental quality have led to more robust valuations of weatherization non-energy benefits. A recent source of monetized public health benefit estimates associated with EE is EPA's Public Health Benefits per kWh ("BPK") for the Great Lakes/Mid-Atlantic region.[20] These benefits estimate the monetized public health benefits of investments in EE and renewable energy; include NOx, SO_2, and $PM_{2.5}$; and are based on published estimates of the costs of treating illness (which can include direct medical costs and costs of lost productivity) or the willingness-to-pay to avoid the illness or reduce the risk of premature death (i.e., value of a statistical life ("VSL").

Table 3 shows the EPA report's recommended values for uniform EE (EE programs, projects, and measures that achieve a constant level of savings over time) and EE at peak (EE programs, projects, and measures that achieve savings between 12pm and 6pm when energy demand is high). The low estimates of mortality use health impact functions that assume that people are not very sensitive to changes in $PM_{2.5}$ levels and high estimates of mortality use functions that assume people are more sensitive to changes in $PM_{2.5}$. The EPA recommends that these BPK values should not be used to estimate EE benefits past 2022. Staff recommends using the 3% discount rate values and high estimates of mortality use functions.

Table 3: Public Health Benefits per kWh Values

	3% Discount Rate		7% Discount Rate	
	2017 ¢/kWh (low estimate)	2017 ¢/kWh (high estimate)	2017 ¢/kWh (low estimate)	2017 ¢/kWh (high estimate)
Uniform EE	3.51	7.95	3.14	7.09
EE at peak	3.57	8.08	3.19	7.21

Staff also seeks stakeholder input on estimation methods and values for avoided emissions not included in the benefits above. Emissions of compounds such as mercury and greenhouse gases like methane and carbon dioxide (CO_2) are known to cause air quality impacts affecting human health and other environmental impacts like global

[20] US EPA, *Public Health Benefits per kWh of Energy Efficiency and Renewable Energy in the United States: A Technical Report* (July 2019), https://www.epa.gov/sites/production/files/2019-07/documents/bpk-report-final-508.pdf

warming. To the extent that emissions of harmful pollutants are avoided by installation of EE measures and conservation through changes in behavior, Staff recommends that benefits resulting from avoided emissions also be included in the NJCT.

Other Low-Income Health and Safety Impacts

Recent studies have quantified both household components (income benefits, health and safety benefits, well-being benefits, expenditure benefits, and physical changes to homes) and societal benefits (economic, environmental, and medical/social service cost benefits) for low-income households.[21] These studies divided low-income health and safety NEIs into the following three tiers: Tier 1 included estimates based on observed monetizable outcomes attributable to weatherization and highly reliable cost data. Tiers 2 and 3 estimates were established to have underlying sound methodologies but may have lacked direct observations of improved health or well-being and/or relied on relatively more assumptions.

Staff notes that research by other states has shown an annual household benefit per treated unit for low-income programs, according to the methodology described in more detail below.

For example, a Massachusetts study, *Low Income Single Family Health and Safety Related Non-Energy Impacts*,[22] included an avoided death benefit, also known as the VSL, and defined it not as the value of a life but, rather, as the value of a change in one's mortality risk. The study suggested an annual household benefit value of $871.93 per treated unit for low-income programs, including adjustments that were recommended by the studies' authors.[23] The study based its findings on a subset of data from an earlier national Weatherization Study,[24] including all of the cold climate states in the study (MA, CT, RI, NY, NJ, PA, WV, OH, IN, IL, IA, NE, CO, and UT).

[21] ORNL, *Health and Household-Related Benefits Attributable to the Weatherization Assistance Program*, (September 2014), https://weatherization.ornl.gov/wp-content/uploads/pdf/WAPRetroEvalFinalReports/ORNL_TM-2014_345.pdf

[22] *Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study* (August 2016), http://ma-eeac.org/wordpress/wp-content/uploads/Low-Income-Single-Family-Health-and-Safety-Related-NonEnergy-Impacts-Study.pdf

[23] The MA study recommended that MA program administrators incorporate 100% of Tier 1 NEIs. The study did not recommend including the "reduced use of short-term, high interest loans" component because it is derived from customer bill savings, which would result in double counting since participant bill savings partially overlap with avoided costs accounted for in the Avoided Energy Supply Costs ("AESC") in New England. The study recommended that only 61.25% of reduced home fire savings be counted ($57.48), which reflects the reduction in fire risk due specifically to measures installed by the programs, including the safety inspection, replacement, and/or installation of smoke detectors. For increased home productivity, the study recommended only counting 50% of the value because of potential overlap with thermal comfort (weatherized homes are more comfortable and conducive to sleep).

[24] Oak Ridge National Lab, *Health and Household-Related Benefits Attributable to the Weatherization Assistance Program* (September 2014).

Table 4 reproduces the recommendations from the Massachusetts study and depicts the estimated annual per unit net benefit to a low-income household and a potential adjusted household benefit for New Jersey. Staff notes that, if these values were adopted, some of them, such as for reduced asthma symptoms, would not be applicable if the recommended EPA benefits per kWh values described in the section above included the same benefits.

Staff requests comment on which low-income health and safety benefits should be included in the NJCT and, if so, how the benefits should be quantified.

Table 4: Low-Income Household Health and Safety Impacts Per Weatherized Unit

	Estimated Household	**Adjusted Household**
Tier 1		
Reduced asthma symptoms	$9.99	N/A
Reduced cold-related thermal stress	$463.21	$463.21
Reduced heat-related thermal stress	$145.93	$145.93
Fewer missed workdays	$149.45	$149.45
Tier 2		
Reduced use of short-term, high interest loans	$4.72	$0
Reduced CO poisoning	$36.98	$36.98
Tier 3		
Increased home productivity	$37.75	$18.88
Reduced home fires	$93.84	$57.48
Annual total - per weatherized home	$941.87	$871.93

Water and Sewer Benefits

Staff suggests that the avoided costs of water production and treatment resulting from efficiency program efforts should be valued and included in the NJCT. While there are no specific water efficiency measures related to the consumption of electricity and natural gas, when a project in which consumers have invested to save electricity or fuel also affects water consumption (e.g., high efficiency dishwashers and washing machines), a resource benefit is created. In some cases, a measure may increase the consumption of water. Depending on the project and metering configuration, changes in water consumption may also affect the costs of water treatment and sewerage billings. Staff requests stakeholder comment on the inclusion in the NJCT of avoided water and sewer costs that are based on average water and sewer rates in New Jersey.

Other Non-Energy Indirect Benefits

Staff also requests comments on whether other non-energy indirect benefits should be incorporated. Specifically, Staff requests comment on whether and how economic development impacts of EE investments should be calculated or whether those are subsumed in other categories of benefits.

Next Steps

Staff provides this proposal as its recommendation for the New Jersey Cost Test. Comments on this proposal will help the shape final recommendations by Staff to the Board, with action anticipated in August 2020.

Stakeholders interested in submitting written comments may file them electronically to EnergyEfficiency@bpu.nj.gov in PDF or Word Format. Please include an email subject line of "New Jersey Cost Test Proposal." **Written comments must be received on or before 5 p.m. on August 5, 2020.**

An opportunity for feedback and oral comments will be provided via webinar on **July 30, 2020**.