PENNSYLVANIA
PUBLIC UTILITY COMMISSION
Harrisburg, PA 17120

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Commissioners Present:

Stephen M. DeFrank, Chairman
Kimberly Barrow, Vice Chair
Ralph V. Yanora
Kathryn L. Zerfuss
John F. Coleman, Jr.

2026 Total Resource Cost (TRC) Test M-2024-3048998

TENTATIVE ORDER

BY THE COMMISSION:

Act 129 of 2008, 66 Pa.C.S. § 2806.1, directs the Pennsylvania Public Utility Commission (Commission) to analyze the benefits and costs of the energy efficiency and conservation (EE&C) plans that certain electric distribution companies (EDCs) are required to file. Before us is the proposed guidance for implementing the Pennsylvania Total Resource Cost (TRC) Test for use in planning for and during a potential Phase V of Act 129, that, if approved, would begin June 1, 2026.[1] As ultimately approved, this version of the TRC Test for use in the potential Phase V will be designated the 2026 TRC Test.

[1] The currently assigned docket for matters relating to the Commission's consideration of a potential Phase V is *Release of the Statewide Evaluator Baseline Studies Secretarial Letter*, Docket No. M-2023-3044490.

TABLE OF CONTENTS

BACKGROUND AND HISTORY

Act 129 requires EDCs[2] with 100,000 or more customers to adopt an EE&C plan, subject to approval by the Commission, to reduce electric consumption. The initial EE&C plans, effective from June 1, 2009, to May 31, 2013, were designated Phase I of Act 129 (Phase I). For Phase I, Act 129 required that an analysis of the benefits and costs of each EDC's EE&C plan, in accordance with a TRC Test, be approved by the Commission. In particular, Act 129 required an EDC to demonstrate that its plan was cost-effective using the TRC test and required that the EDC provide a diverse cross-section of alternatives for customers of all rate classes. 66 Pa.C.S. § 2806.1(b)(1)(i)(I).

Similarly, for subsequent phases, the Commission is charged with determining whether to establish conservation and peak demand reduction requirements and, if so established, to determine if EDCs have met the requirements.[3] Act 129 also addresses energy efficiency (EE) and demand reduction targets from June 1, 2013, forward. 66 Pa.C.S. §§ 2806.1(c)(3) and 2806.1(d)(2).[4]

For Phase II of Act 129 (Phase II), which covered the period from June 1, 2013, to May 31, 2016, the Commission adopted three-year consumption reduction requirements, as recommended by the Phase I Statewide Evaluator (SWE),[5] that varied by EDC based

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[2] There are four EDCs affected by Act 129: Duquesne Light Company (Duquesne), FirstEnergy Pennsylvania Electric Company (FirstEnergy), Pennsylvania Power and Light (PPL Utilities), and Philadelphia Electric Company (PECO). FirstEnergy was granted approval for consolidation by the PUC, at the December 7, 2023 public meeting, of the four independent EDCs it owned: Metropolitan Edison Company (Met-Ed), Pennsylvania Electric Company (Penelec), Pennsylvania Power Company (Penn Power), and West Penn Power Company (West Penn). These former four EDCs are now Rate Districts that comprise the FirstEnergy EDC. Due to timing issues, studies performed to inform this Tentative Order, and discussed herein, were conducted as if the Rate Districts were still independent EDCs.

[3] After 2013, the Commission has had the option to determine what test to use. 66 Pa.C.S.§ 2806.1(m).

[4] Section 2806.1(c)(3) states that, based on a review to be concluded by November 30, 2013, if "the Commission determines that the benefits of the program exceed the costs, the Commission shall adopt additional incremental reductions in consumption."

[5] The SWE is a team of technical consultants. They are engaged by the Commission under contract pursuant to a request for proposal process.

on the specific mix of program potential, acquisition costs, and funding available under the 2% limitation stipulated by Act 129.[6] The SWE produced an *Energy Efficiency Market Potential Study*[7] to document the methodology, assumptions, inputs, and analytical methods used to arrive at the recommended consumption reduction goals for each EDC.

The Commission directed the Phase I SWE to study the cost-effectiveness of current and potential future demand response (DR)[8] programs. On November 1, 2013, the Phase I SWE's *Act 129 Demand Response Study* was released.[9] For Phase II, there were no DR requirements, however, the Commission also directed the Phase II SWE[10] to study the cost-effectiveness of potential future DR programs. On February 27, 2015, the Phase II SWE's *Demand Response Potential Study*[11] was released. In both studies, the SWE collected data and documentation from EDCs to aid in performing an analysis of the cost-effectiveness of compliance with the current legislative DR requirements and of potential improvements to the DR program design.

[6] Act 129 sets a limit on the cost of an EDC's EE&C plan at 2% of the EDC's annual revenue as of December 31, 2006. *See* 66 Pa.C.S. § 2806.1(g).
[7] *See* http://www.puc.pa.gov/electric/pdf/Act129/Act129-PA_Market_Potential_Study051012.pdf. The *EE Market Potential Study* is dated May 10, 2012, and was released May 11, 2012.
[8] Demand Response is a change in electric usage by end-use customers from their normal consumption patterns in response to a signal. Usually, incentive payments are offered to customers to induce lower electric consumption at times of high wholesale market prices or when system reliability is jeopardized. Examples include turning up the temperature on the thermostat to reduce air conditioning loads or slowing down/stopping production at an industrial facility temporarily.
[9] *See* GDS Associates, Inc. (Phase I SWE), Act 129 Demand Response Study (dated May 13, 2013). http://www.puc.pa.gov/pcdocs/1256728.docx.
[10] The SWE for Phase II consisted of GDS Associates, Inc., and its subcontractors.
[11] The *DR Potential Study*, dated February 25, 2015, was released February 27, 2015. *See* http://www.puc.pa.gov/pcdocs/1345077.docxhttp://www.puc.state.pa.us/filing_resources/issues_laws_regulations/act_129_information/act_129_statewide_evaluator_swe_.aspx.

Act 129 also required that the Commission determine if energy efficiency and DR goals should be established beyond the Phase II goals. 66 Pa.C.S. §§ 2806.1(c)(3) and 2806.1(d)(2). Phase III goals were determined in the Phase III Implementation Order at Docket No. M-2014-2424864.[12] To support implementation and the benefit/cost (B/C) analyses for Phase III of Act 129, the Commission adopted the *2016 TRC Test Order* at Docket No. M-2015-2468992 on June 22, 2015.[13] Phase III covered June 1, 2016, to May 31, 2021.

During planning for Phase IV of Act 129 the Commission determined that energy efficiency goals would remain in place but, dispatchable DR goals would be removed from consideration in favor of peak demand reduction goals, which could be met with coincident demand reductions from EE measures. The goal of this change was to allow more focus on long-lasting everyday reductions from energy efficiency measures rather than have funds be split between EE programs and dispatchable DR programs.[14] Phase IV goals were determined in the Phase IV Implementation Order at Docket No. M-2020-3015228.[15] To support implementation and the benefit/cost (B/C) analyses for Phase IV of Act 129, the Commission adopted the *2021 TRC Test Order* at Docket No. M-2019-3006868 on December 19, 2019.[16] Phase IV covers June 1, 2021, to May 31, 2026.

If the Commission decides to proceed with Phase V of Act 129, it will be necessary to address the B/C measurements for Phase V. To allow for adequate planning for the potential Phase V, the Commission puts forth this Tentative Order regarding a 2026 TRC Test, building on the five previous Pennsylvania TRC Test Orders and industry documents such as the *California Standard Practice Manual: Economic*

[12] *See* http://www.puc.state.pa.us/pcdocs/1367313.doc.
[13] *See* http://www.puc.pa.gov/pcdocs/1367195.docx.
[14] *See* https://www.puc.pa.gov/pcdocs/1666981.docx at page 68.
[15] *See* https://www.puc.pa.gov/pcdocs/1666981.docx.
[16] *See* https://www.puc.pa.gov/pcdocs/1648126.docx.

Analysis of Demand-Side Programs and Projects[17] *(California Manual),* for the B/C analysis of EE&C plans for the potential Phase V.

Pennsylvania conducts the requisite B/C analyses using a TRC Test. The TRC Test for Phase I of Act 129 was adopted by Commission Order at Docket No. M-2009-2108601 on June 23, 2009 (*2009 TRC Test Order*). The TRC Test was refined at the same docket on August 2, 2011 *(2011 TRC Test Order),* and on August 30, 2012, at Docket No. M-2012-2300653 *(2013 TRC Test Order).* The TRC Test was updated for use during Phase III of Act 129 on June 22, 2015, at Docket No. M-2015-2468992 *(2016 TRC Test Order).* The TRC Test was most recently updated for Phase IV of Act 129 on December 19, 2019, at Docket No. M-2019-3006868 *(2021 TRC Test Order).*

2026 Technical Reference Manual

The 2026 Technical Reference Manual (TRM) is the guide to measure and verify applicable EE and Demand Side Management (DSM) measures used by EDCs to meet the Act 129 consumption and peak demand targets. While its use will continue to provide the necessary information that establishes the evaluation process to monitor and verify data collection, quality assurance, and the results of each EDC's EE&C plan, it also provides information that will assist EDCs in their TRC calculations.
The Commission proposed an updated 2026 TRM on May 9, 2024 at Docket No. M-2023-3044491 for use during a potential Phase V.

[17] The *California Standard Practice Manual – Economic Analysis of Demand-Side Programs and Projects,* July 2002, p. 18. See http://www.calmac.org/events/SPM_9_20_02.pdf.

TRC TEST EXPLAINED

Act 129 defines a TRC test as "a standard test that is met if, over the effective life of each plan not to exceed 15 years, the net present value (NPV) of the avoided monetary cost of supplying electricity is greater than the NPV of the monetary cost of energy efficiency conservation measures." 66 Pa.C.S. § 2806.1(m). Thus, the TRC test is a critical measuring tool in determining the cost-effectiveness of an EDC's EE&C plan. Historically, the TRC test has been a regulatory test. It is not a static, one-size-fits-all tool. It can incorporate different factors and evaluate variables in different ways, as determined by the jurisdictional entity using it. Pennsylvania has tailored its TRC test over time to evaluate EDC progress in meeting the requirements of Act 129, consistent with the policy objectives of the Commonwealth within the statutory directives of Act 129.

The purpose of using a TRC test to evaluate EE&C programs is to track the relationship between the benefits to the Commonwealth and the costs incurred to obtain those benefits. Sections 2806.1(c)(3) and 2806.1(d)(2), as well as the definition of the TRC test in Section 2806.1(m) of Act 129, provide that a TRC test be used to determine whether ratepayers received more benefits (in reduced electric energy, capacity, and non-electric resources) than the total costs of the EE&C plans.

In Pennsylvania, the TRC Test considers the combined effects of an EDC's EE&C plan on both participating and non-participating customers based on the costs incurred by the EDC and participating customers. In addition, the benefits calculated for use in the TRC Test include the avoided supply costs, such as the reduction in energy production valued at marginal cost for the periods when there is a consumption reduction, and the avoided cost of generation, transmission, and distribution capacity for measures that reduce peak demand. In addition to the avoided cost of supplying electricity, the avoided cost of supplying fossil fuel and water are included in the algorithms for calculating

TRC benefits. These avoided costs apply to EE&C measures that impact consumption of those resources. Avoided supply costs, depending on the mandate in each jurisdiction, can be calculated using either gross or net program savings. In Pennsylvania, we have primarily looked at avoided supply costs from the perspective of gross program savings, which is how Act 129 compliance targets are measured.

Further, the costs used in the TRC Test include the costs of the various programs paid by an EDC or its Conservation Service Provider (CSP) and the participating customers[18] and reflect any net change in supply costs for the periods in which consumption is increased in the event of load shifting. Thus, for example, equipment, installation, operation and maintenance (O&M) costs, cost of removal (less salvage value), and administrative costs, are included – regardless of who pays for them.

The results of the TRC Test are expressed as both a present value of net benefits (PVNB) and a benefit-cost ratio. The PVNB is the present value of the net benefits (benefits minus costs) of this test over a specified period (*i.e.*, the expected useful life of the EE&C measure or program). The PVNB is a measure of the change in the total resource costs due to the program. A PVNB above zero indicates that the program is a less expensive resource than the supply options upon which the marginal cost forecast is based. A discount rate must be established to calculate the NPV. In the first three phases of Act 129, the discount rate for the Pennsylvania TRC Test was the EDC's weighted average cost of capital. In Phase IV of Act 129, the Commission updated its discount guidance to reflect a 3% real discount rate for all EDCs. *See 2021 TRC Test Order* at 17 - 21.

[18] In this regard, we note that the 2026 TRC Test would continue to use the incremental measure costs of services and equipment. This matter is discussed in more detail below, in the segment addressing incentive payments from an EDC.

The benefit-cost ratio (B/C ratio or TRC ratio) is the ratio of the discounted total benefits of the program to the discounted total costs over the expected useful life (up to a maximum of 15 years) of the energy efficiency measure, program, or portfolio. The B/C ratio gives an indication of the rate of return of this program to the utility and its ratepayers. A B/C ratio greater than one indicates that the program is beneficial to the utility and its ratepayers on a TRC basis.[19] The explicit formulae for use in Pennsylvania are set forth in Appendix A of this order.

As discussed in prior TRC Test Orders, the *California Manual* was the starting point for the Pennsylvania TRC Test but does not address all issues specific to Pennsylvania. For this reason, the Commission will continue to explore how best to structure and apply the TRC Test for Pennsylvania.[20] In preparation of this Tentative Order, the Commission and the SWE[21] have reviewed industry literature on benefit-cost analysis to refine the TRC Test to meet Pennsylvania policy objectives. The TRC Test for Phase V, if implemented, would be applicable throughout the course of Phase V, potentially concluding May 31, 2031. However, many issues involved in EE&C plans, program implementation, and operation of the TRC Test are ongoing in nature, and future updates may be proposed by stakeholders, or the Commission as needed. A final order at this docket regarding the 2026 TRC Test will set forth constraints that the Phase IV SWE will need to finalize the Phase V market potential study.

[19] See *Appendix A – TRC Definitions and Formulae* of this Tentative Order for detailed methodology to calculate the PVNB and B/C ratio of the 2026 TRC Test.
[20] After November 30, 2013, and every five years thereafter, the Commission is to evaluate the costs and benefits of the EE&C program established under Section 2806.1(a) and of the approved EE&C plans using a TRC test or a benefit/cost analysis of the Commission's determination. 66 Pa.C.S. § 2806.1(c)(3).
[21] The SWE for Phase IV is NMR Group, Inc. and its subcontractors. The SWE for Phase V has not been determined at the time of this Tentative Order.

This Tentative Order sets out the proposed continuations and clarifications from the prior TRC Tests and the proposed changes for the 2026 TRC Test for use in a potential Phase V. The continuations, clarifications, changes, and new items are summarized in Appendix C and explained in detail in this Tentative Order.

A. General Issues

1. TRC Test Assumptions In Other Matters

The TRC Test requires EDCs to make numerous financial and technical assumptions about the costs of operating an electric power system, future market structures, and the time-value of money. Consistent with our determination in prior TRC Test Orders, the Commission proposes to maintain the provision that TRC Test assumptions are used exclusively for Act 129 related matters. TRC Test assumptions are not to be presumed to be binding in other regulatory matters such as prudence, cost-of-service, or other inquiries. Stakeholder comments on the proposed 2021 TRC Test Order encouraged the commission to synchronize the methodologies used for the avoided costs of natural gas with the calculation of these benefit streams in the EE&C plans filed by natural gas distribution companies (NGDCs). The Commission agreed that consistency across EE&C plans filed by different utilities that serve Pennsylvania customers is desirable, but the differing statutory requirements and goals of NGDCs ultimately make this synchronization infeasible. *See 2021 TRC Test Order* at 9-11. If there are significant differences between the assumptions used in the TRC Test and the assumptions or facts at issue in such other proceedings, parties may inquire into the validity and underlying rationale of the differences in EE&C plan proceedings.

2. Frequency Of Review Of The TRC Test

Consistent with our determination in past TRC Test Orders, the Commission proposes in the 2026 TRC Test Tentative Order to maintain the provision that the 2026 TRC Test apply for the entirety of Phase V. This would promote consistency across the Market Potential Studies, EE&C plan development, and annual benefit-cost reporting during the entire phase. The Commission recognizes that this 2026 TRC Test is being developed almost two years prior to the beginning of a potential Phase V, and it is possible that new issues will arise that were not considered in this Order. Consequently, we propose to reserve the right to update or modify the 2026 TRC Test during a potential Phase V or to direct the Phase V SWE to develop guidance memos on such topics to promote consistency across EDCs and TRC Test results that are in line with Act 129 and the policy objectives of the Commonwealth.

In the 2021 TRC Test Order, the Commission directed the Phase IV SWE to include in its Final Annual Reports a comparison of forecasted avoided costs of electricity to actual market conditions. *See 2021 TRC Test Order* at 30-31. During PY13 of Phase IV, actual avoided costs deviated substantially from the Phase IV forecasted values. The major cause of the deviations from the expected values were from increases in the prices of natural gas due to ongoing global conflicts. The Phase IV SWE team cautioned the Commission against updating its long-term avoided cost forecast based on this volatility and recommended the Commission wait to see if market conditions returned to more normal levels.[22] This forbearance turned out well as PY14 market conditions returned to levels that were closely aligned with the Phase IV avoided cost forecast.[23] As was the case in the Phase IV of Act 129, the Commission continues to see value in annual comparisons between avoided cost projections and actual market

[22] *See* https://www.puc.pa.gov/media/2152/py13_swe_annual_report120522final.pdf at page 106.
[23] *See* https://www.puc.pa.gov/media/2688/swe_py14_final_annual_report120123.pdf at page 101.

prices for informational purposes, but cautions against any over reactions to short-term market volatility from year to year.

3. Level At Which To Calculate And Report TRC Test Results

Prior TRC Test Orders provided that "compliance will be measured separately going forward in any phase for which there will be DR or EE goals." The Commission proposes to maintain this requirement for Phase V if separate goals are established for dispatchable DR programs. However, the Phase V Tentative Implementation Order may include a more integrated EE/DR program design that includes "daily load shifting" rather than an event-based DR program design. Peak demand impacts from a daily load shifting style of DR are much like coincident demand reductions from energy efficiency, and it may be possible to have a single peak demand reduction goal that could be satisfied by either coincident demand reductions from EE or daily load shifting DR programs (see Section G.2). If Phase V goals follow this more integrated structure, the Commission proposes to determine cost-effectiveness at the EE&C plan level rather than separately for EE and DR.

EDCs are required to develop and implement a portfolio of programs wherein the benefits of the portfolio are greater than the costs. Conducting TRC testing at the plan level gives new programs and technologies adequate opportunity to establish whether they can contribute to the EE and DR goals of Act 129. Comments on past TRC Orders suggested conducting TRC Tests at the measure level but were rejected. Screening cost-effectiveness at the measure level could lead to adverse outcomes where EDCs are forced to limit the scope of efficiency projects within homes and businesses based on assumptions about avoided costs and incremental measure costs (IMCs) that each carry a degree of uncertainty.

As in prior phases, the Commission proposes in the 2026 TRC Test Tentative Order to continue applying the TRC Test at the plan level and to continue to reserve the right to reject any program with a low TRC ratio. EDCs are required to estimate and report program-level TRC ratios in their EE&C plans and in each final annual report. TRC ratios should also be reported for the EE and dispatchable DR portfolios, if applicable, as well as the entire EE&C plan (inclusive of both EE and DR).

4. Discount Rate

A discount rate is the percentage used to calculate the present value of future costs and benefits. Discounting reflects the reality that, all else equal, people prefer benefits now rather than later, and vice versa for costs. When choosing a discount rate, it is important to consider whose preferences are reflected by the discount rate. In the case of energy efficiency programs and other public policy, the discount rate is typically selected to reflect the preferences of the public at large. Because Act 129 is an energy efficiency and conservation program, we are proposing to continue using a discount rate that reflects the preferences of the public at large. Act 129 did not set discount rates, but the 2021 TRC Test Order set a discount rate of 3% in real terms or 5% in nominal terms.

The Commission proposes to continue using a discount rate of 3% in real terms or 5% in nominal terms for Pennsylvania's EE&C programs in Phase V, the same discount rates as Phase IV. The difference between the real discount rate and nominal discount rate is the assumed rate of inflation. We further propose a standard 2% inflation assumption be used by all EDCs for Phase V, based on the projections of the United States (US) Congressional Budget Office's 2024 to 2034 Budget and Economic Outlook.[24] A 3% real discount rate for the 2026 TRC Test is supported by economic theory of benefit-cost analysis that indicates that long-term gross domestic product (GDP) growth rates can be used as a rough proxy for the public's preference for tradeoffs

[24] *See* *https://www.cbo.gov/system/files/2024-02/59710-Outlook-2024.pdf* at page 5.

over time. In the US, real GDP growth has averaged 3.15% since 1948, according to the US Bureau of Economic Analysis.[25]

5. Effective Useful Life

As established in Act 129 and as discussed in prior TRC Test Orders, any given measure is limited to a maximum of 15 years of savings benefits. 66 Pa.C.S. § 2806.1(m). Measures that require recurring expenditures, such as increased natural gas consumption for combined heat and power (CHP) projects, are also limited to 15 years of negative benefits. Typically, the costs of energy efficiency are front-loaded, and the benefits accrue over many years. This can result in a situation where benefits for a subset of the measure's technical life are compared to its full lifetime costs, since costs are incurred up front. In previous TRC Test Orders stakeholders have suggested various methodologies whereby costs are reduced proportionately to truncated lifetime benefits. The position of the Commission is unchanged on this issue, and considers such end effects adjustments not acceptable for use in a potential Phase V. While certain technologies may have an expected useful life (EUL) greater than 15 years, Act 129 is clear about the 15-year limit, and any adjustment to the cost ledger would circumvent the legislative directive.

For some EE&C measures, a single baseline may not be appropriate for the duration of the mechanical life of the equipment. Although compliance with Act 129 goals has historically been based on "first-year" savings, lifetime savings are required for the calculation of TRC benefits. Dual baselines are appropriate when a known change in codes and standards lowers the savings opportunity in future years or the equipment that served as the baseline initially reaches the end of its useful life and a code-minimum baseline needs to be assumed for the remainder of the measure life. The latter situation is often appropriate for early replacement measures where it is not reasonable to assume the

[25] *See* https://tradingeconomics.com/united-states/gdp-growth.

replaced equipment would continue to operate for the full EUL of the program-supported efficient equipment. In this situation, the remaining useful life (RUL) of the baseline equipment should be less than the EUL of the efficient equipment.

For the 2026 TRC Test, the Commission proposes that EDCs and their evaluation contractors continue to use dual baselines where appropriate and practical. Specifically, when an early replacement measure characterization is used to estimate first-year savings or a known change to codes and standards calls for a second savings level during the EUL. There are multiple ways to implement a dual baseline calculation within a benefit-cost model. The EDCs and their evaluation contractors should use professional judgement when selecting an implementation method based on the structure of their program tracking data, impact evaluation results, and TRC model.

6. Low-Income Programs

The Commission is proposing a modification to the avoided costs for low-income programs by incorporating into Phase V avoided cost forecasts of the benefit of EDC's financial savings from their Act 129 low-income EE programs (see Section B.12). The Commission is not proposing any special reporting requirements for low-income programs. Like any other EE&C program, low-income programs are not required to have a TRC ratio greater than 1.0. If an EDC has multiple low-income programs, there is no need to aggregate the cost-effectiveness results across low-income programs for reporting purposes.

7. Basis Of TRC Test Impacts

The Commission proposes no changes and would continue the process established in Phases III and IV, under which EDCs are required to report verified gross savings, verified net savings, and actual costs in their final annual reports. *See 2021 TRC Test Order* at 26-27. Compliance will be based on verified gross kWh and kW electric

savings, and costs will be based on actual costs. Because EDCs use net savings for planning purposes, they shall also continue to report net savings for each program and the total portfolio of programs and describe how such net savings are calculated. In addition, EDCs shall continue to report TRC ratios in EE&C plans in two ways: (1) based on projected gross savings and (2) based on projected net savings. Actual costs are not known at the time of EE&C plan submission, so all cost values will also be projected.

8. Measures Supported By Both Act 129 Programs And Other Funding Streams

The Commission is not proposing any changes regarding this issue from its position established in prior TRC Test Orders. Outside incentives, whether they are rebates or tax credits, reduce the participating customers' costs; therefore, the reduction must be reflected in lower IMCs and be factored into an EDC's TRC Test calculation. The Commission recognizes that tracking non-Act 129 incentives paid to EDC customers may be difficult as some customers may not be inclined to provide the requested information or may not have access to it. Consistent with prior TRC Test Orders, the Commission proposes that EDCs only need to factor in, as reductions to cost, the non-Act 129 incentives that are reasonably quantifiable by the EDC at the time the Act 129 transaction is recorded. Examples of reasonably quantifiable non-Act 129 incentives include energy efficiency rebate programs administered by the Pennsylvania Department of Environmental Protection and grants from the Alternative and Clean Energy Program jointly administered by the Pennsylvania Department of Community and Economic Development and the Pennsylvania Department of Environmental Protection. EDCs can continue to include the full benefits determined by the gross verified calculations of the TRC Test for measures that include incentives from non-Act 129 funding sources if any portion of the measure is attributable to Act 129. The availability of non-Act 129 funding streams for a measure may increase the estimates of free-ridership, which would reduce benefits in the net verified calculations for the measure. *See 2013 TRC Test Order at 21*.

B. Avoided Costs Of Supplying Electricity

The Commission proposes continued use of the *status quo* Act 129 methodology to develop forecasted avoided costs of electricity. In the 2021 TRC Order, the commission proposed the use of a single Avoided Cost Calculator[26] (ACC), developed by the Phase III SWE, that implemented the methodologies outlined within the 2021 TRC Test Order. The intention was that more detailed instructions would improve consistency across EDCs and lead to better alignment with market conditions. The Commission proposes the use of an updated ACC, developed by the Phase IV SWE, for use in Phase V and that EDCs must utilize this standard tool when developing avoided costs for Phase V. The ACC is Exhibit 1 of this Tentative Order and is located on the Commission's website at: http://www.puc.pa.gov/filing_resources/issues_laws_regulations/act_129_information/total_resource_cost_test.aspx.

The following paragraphs are the topics of proposed changes and topics of continuation from prior TRC Test Orders as they relate to avoided costs of supplying electricity.

1. Vintage Of Avoided Cost Forecasts

The Commission proposes that EDCs continue to develop a single forecast of avoided costs for use in Phase V EE&C plans and all cost-effectiveness reporting in the Phase V annual reports. For simplicity in compliance, EDCs are not expected to update avoided costs mid-phase. However, the Commission plans to direct the Phase V SWE to include in its Final Annual Reports a comparison of forecasted avoided costs of electricity to actual market conditions for each EDC/Rate District service area.

[26] *See* https://www.puc.pa.gov/pcdocs/1648144.xlsx.

The Commission reserves the right to require updating, and the EDCs may request updating depending on market changes.

2. Avoided Cost Of Electric Energy

The proposed methodology entails the use of a 20-year period for calculating avoided electricity energy costs and is dissected into three segments. Forecasted avoided energy costs should be calculated in a time-differentiated format with a minimum of six distinct seasonal periods per annum, as defined by the proposed 2026 TRM, Volume 1, Table 1-3.[27]

a. The first segment, years one through four: The proposed methodology for segment one (calendar years 2026 through 2029) should utilize NYMEX PJM electricity futures prices for on-peak and off-peak periods as a basis. It is the Commission's recommendation to utilize market-based electricity prices whenever possible. NYMEX futures prices should be obtained at the PJM Interconnection Western Hub location with an EDC/Rate District zonal basis adjustment based on the *2024 PJM State of the Market Report, Chapter 11*. The zonal adjustment factor shall be defined as the ratio of zone-specific real-time load-weighted average locational marginal price (LMP) against the Western Hub real-time load-weighted average LMP for the prior 5-years (2020 through 2024).

[27] On-peak is defined as 7am to 11pm on weekdays. Off-peak is defined as 11pm to 7am on weekdays and all weekend and holiday hours. Summer includes May-September. Winter includes December-February. The shoulder period includes March, April, October, and November.

The same zonal adjustment shall be used for both on-peak and off-peak price periods. The prompt month for NYMEX PJM electricity futures is established as three months prior to the EE&C plan filing date.[28]

b. **The second segment, years five through ten:** The methodology for segment two (calendar years 2030 through 2035) should be based on NYMEX natural gas futures converted into electricity costs. Medium-term NYMEX natural gas futures shall be blended with the longer-term US Energy Information Administration (EIA) Annual Energy Outlook (AEO) projected natural gas costs across the segment two period to shift from market-based conditions to a more stable model that is public and transparent. Natural gas costs shall be converted into an electric energy price, with an additional spark price spread[29] using the following calculation steps:

i. Collect monthly NYMEX natural gas futures at Henry Hub for years one through ten. The prompt month for NYMEX futures is established as three months prior to the EE&C plan filing date.

ii. Use the differential between the Henry Hub as the source and TETCO M-3 as the destination for the locational basis adjustment to the natural gas prices for EDCs/Rate Districts west of the Susquehanna River. The locational basis adjustment to the natural gas prices for EDCs/Rate Districts east of the Susquehanna River is the basis differential between the Henry Hub as the source and Transco Zone 6 non-New York as the destination. For EDCs that have service territory on both sides of the river, such as PPL Utilities

[28] For instance, if the EDC EE&C plan is due in November 2025, the prompt month will be August 2025.
[29] "Spark price spread" refers to the difference between the price of electricity sold by a generator and the price of the fuel used to generate it, adjusted for equivalent units. *See* https://en.wikipedia.org/wiki/Spark_spread.

and FirstEnergy, the location shall be based where the majority of the electric load is present. Adjustments shall be based on the average of adjustment prices in years one and two and applied to NYMEX natural gas futures at Henry Hub for years one through ten.

iii. Gather annual forecasted natural gas costs from the 2025 US EIA AEO projected costs for Electric Power Users in the Mid-Atlantic region using nominal dollars. Annual AEO natural gas costs shall be converted into monthly or seasonal periods that align with the TRM utilizing adjustment factors derived from zone location adjusted NYMEX natural gas futures prices years one and two.

iv. Derive final natural gas costs by blending NYMEX natural gas futures and EIA AEO projected natural gas costs over the segment two horizon. This shall be executed by adding one-seventh of the differential between EIA AEO natural gas costs and locational adjusted NYMEX natural gas futures for each segment year starting in year five to the zone location adjusted NYMEX natural gas futures.

v. Convert final natural gas costs into electricity costs utilizing assumed heat rates for the average existing natural gas generating station. Heat rates of a gas turbine shall be utilized for on-peak periods and the heat rate of a combined cycle unit shall be utilized for off-peak periods. The proposed heat rate for on-peak shall be 11,030 BTU/kWh, and off-peak shall be 7,596 BTU/kWh.[30]

[30] 2023 EIA AEO source for the average existing natural gas prime mover in the US.

vi. Add a spark spread cost to the avoided energy costs for segment two. The spark spread shall be determined as the average difference between the zone location adjusted NYMEX PJM electricity futures and zone locational adjusted electricity costs based on NYMEX natural gas futures for years one through three.

c. The third segment, years eleven through twenty: The methodology for segment three (calendar years 2036 through 2045) shall be a similar methodology as for the second segment but based solely on long-term EIA AEO projected natural gas costs. Natural gas projected costs shall be converted into an electric energy price using a spark price spread calculation, with the following calculation steps:

i. Gather annual forecasted natural gas costs from the 2025 US EIA AEO projected costs for Electric Power Users in the Mid-Atlantic region using nominal dollars. Annual AEO natural gas costs shall be converted into monthly or seasonal periods that align with the TRM utilizing adjustment factors derived from zone location adjusted NYMEX natural gas futures prices years one and two.

ii. Convert final natural gas costs into electricity costs utilizing the same heat rates for on-peak and off-peak periods as the second segment.

iii. Add the spark spread cost to the avoided energy costs for segment three. The spark spread shall be the same as determined in the second segment.

3. Nominal Vs. Real Dollars

The Commission proposes that for Phase V, EDC avoided cost forecasts should continue to be developed in nominal dollars (e.g., the avoided cost of supplying electricity in 2040 should be expressed in 2040 dollars). A nominal discount rate is used to calculate the NPV of benefits in the base year (2026). Assumed inflation rate would be 2.0%, consistent with the US Congressional Budget Office assumptions.[31]

4. Line Losses

The algorithms and assumptions in the TRM calculate energy and demand savings at the customer meter. Similarly, EDC CSPs and evaluation contractors produce savings estimates for custom projects at the meter level. When calculating TRC benefits, these resource savings must be scaled to the system level to account for losses during transmission and distribution (T&D). Volume 1 of the proposed 2026 TRM[32] provides line loss factors by EDC and customer class. The Commission proposes that EDCs/Rate Districts continue to use these values to calculate system-level electric energy and peak demand impacts and to determine TRC benefits.

5. Escalation Rate

The Commission proposes that any avoided electricity costs that require escalation from a given year shall utilize the Bureau of Labor Statistics' (BLS) Electric Power Generation Transmission Distribution (GTD) sector price index[33] (BLS factor: NAICS 221110) as a proxy rate. The electric escalation statistic would be derived from the compound average growth rate (CAGR) of the average annual values of the prior five years with data for all twelve months.

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[31] *See* https://www.cbo.gov/publication/60419.
[32] *See Proposed 2026 Technical Reference Manual, Volume 1* at Docket No. M-2023-3044491, entered May 9, 2024. Page 13. https://www.puc.pa.gov/pcdocs/1829634.docx
[33] *See* https://data.bls.gov/timeseries/PCU221110221110.

The electric escalation rate should not be confused with the rate of inflation. The escalation rate deals with the rate of increase in costs in real dollars. The escalation rate plus the inflation rate captures the increase in cost projections in nominal dollars. Because the GTD BLS price index is inclusive of inflation, historical inflation across the same five-year period should be removed to isolate the electric escalation rate.

Because of recent inflationary volatility, if in the event the calculated escalation rate is less than zero, the Commission proposes that the escalation rate shall be set to zero percent.

6. Allocation Of Avoided Capacity Costs Between Summer And Winter Peak

Act 129 reporting of peak demand impacts and the associated capacity benefits have historically relied exclusively on reductions in summer peak demand. In the 2026 TRM Tentative Order[34] the Commission proposed to bifurcate the Act 129 peak demand definition to include both summer peak and winter peak. To support this transition, the proposed 2026 TRM provides the algorithms and assumptions needed to estimate winter peak demand impacts as well as summer peak demand impacts. The transition to a seasonal peak demand definition raises a critical question for the estimation of capacity benefits within the TRC Test. Specifically, how should annual capacity value ($/kW-year) be prorated across the two seasons?

For the avoided cost of generation capacity, the Commission proposes a 50/50 allocation between summer and winter demand. The same 50/50 allocation would apply to the generation capacity Demand Reduction Induced Price Effects (DRIPE) discussed in Section B.10 of this Tentative Order. If the avoided cost of generation

[34] See *2026 TRM Tentative Order*, at Docket No. M-2023-3044491, entered May 9, 2024 (2026 TRM Tentative Order). Page 8-9. https://www.puc.pa.gov/pcdocs/1828766.pdf.

capacity for an EDC zone in PY18 is $60/kW-year, EDCs and their evaluation contractors would value each kW of summer peak demand reduction at $30/kW-year and each kW of winter peak demand reduction at $30/kW-year. Alternatively, the EDCs could average the summer and winter kW reductions from a program or measure and multiply the average by $60/kW-year.

The proposed 50/50 allocation method is simple and avoids taking a strong position on long-term trajectories of load growth and generation mix in the region. Jurisdictions like New York with aggressive policies to electrify space heating and water heating end uses might consider the transition to a winter-peaking system a foregone conclusion. PJM's 2024 Load Forecast Report[35] projects winter peak demand to grow more rapidly than summer demand over the next 15 years, bringing the seasonal peaks closer together in magnitude, but the system is still forecast to be summer peaking in 2039. However, recent modeling by PJM shows higher risk of unserved energy and loss of load in the winter season.[36] The extent to which PJM States adopt electrification policies, and the success of those initiatives, is still very uncertain. Thus, the Commission believes a neutral position on this issue is prudent. Additionally, current valuation procedures for energy efficiency resources recognized in the Forward Capacity Market require that resources deliver both summer and winter capacity or get "matched up" with a complementary resource. When resources match up, the value is split by days ($/MW-day) with an effective 50/50 split between the summer and winter resource.

[35] *See* https://www.pjm.com/-/media/library/reports-notices/load-forecast/2024-load-report.ashx.
[36] *See* https://www.pjm.com/-/media/committees-groups/committees/pc/2024/20240216-special/elcc-education.ashx.

In comments[37] to FERC in response to PJM's October 2023 *Capacity Market Reforms to Accommodate the Energy Transition While Maintaining Resource Adequacy* filing, the Commission expressed support for a seasonal capacity construct with separate accreditation and price signals for summer and winter capacity. The Commission recognized the administrative complexities of a seasonal design but encouraged PJM to move toward a seasonal structure. To date, PJM has not adopted a seasonal construct for its scheduled auctions. However, if PJM elects to formally bifurcate the capacity market, resulting in separate resource clearing prices for summer capacity resources and winter capacity resources, our proposed 50/50 allocation would be unnecessary. If market rules change, and separate resource clearing prices exist by season in time for EDCs to reflect those values in potential Phase V EE&C Plans, we propose the EDCs use those values rather than allocate the annual value across seasons using assumed shares.

For the avoided cost of transmission and distribution values (see Section B.8), the Commission proposes EDC/Rate District-specific values split by season based on historic and projected peaking conditions. If the proposed specific allocations are utilized, a top-down allocation of annual value is not necessary for transmission capacity or distribution capacity.

7. Avoided Cost Of Generation Capacity

Generation capacity for the region is procured through PJM's forward capacity auction process – the Reliability Pricing Model. The Base Residual Auctions (BRAs) happen approximately three years prior to the beginning of the delivery year, so the actual generation capacity values for the first years of the forecast horizon are known.

[37] *See* https://www.puc.pa.gov/media/2655/ferc_comments-pjm_er24-99-110923.pdf, Section A.

When available, the actual zonal BRA clearing prices should be used as the values for the avoided cost of generation capacity. When projecting further into the future than the known values, the Commission proposes the following methodology:

i. Take a simple average of the five most recent BRA clearing prices for the zone. The Commission's position is that taking a five-year average is prudent because clearing prices vary from year-to-year, and an average will dampen this volatility. For Phase V EE&C plans, EDC/Rate Districts are expected to have actual BRA clearing price values for the 2026/2027 and 2027/2028 delivery years (Act 129 PY18 and PY19).

ii. Use the averaged value as the avoided cost of capacity for the first year that BRA clearing pricing prices are not available.

iii. Escalate using a compound annual growth rate of the BLS index for the power sector to calculate the avoided cost of generation capacity in real dollars for the remainder of the forecast horizon.

iv. Apply the electric escalation and inflation rates to convert real dollars to nominal dollars.

8. Avoided Cost Of Transmission And Distribution Capacity

Beginning in Phase III of Act 129, the avoided cost of transmission and distribution capacity has been valued on a $/kW-year rather than a $/kWh basis. *See 2016 TRC Test Order at 34-35.* The Commission maintains that investments in T&D infrastructure are driven by the need to accommodate peak demand rather than the volume of energy sales and proposes that EDCs continue to calculate the avoided T&D benefits of Act 129 EE&C plans using the gross and net verified peak demand reductions.

As discussed in previous TRC Test Orders, the Commission proposes that no avoided cost of distribution capacity be calculated for EE or DR peak demand reductions from participants in the Large Commercial and Industrial (C&I) class that receive service at high voltage. Peak demand reductions achieved by these facilities are presumed unlikely to avoid or defer load growth-related investments in an EDC distribution system because these accounts take service directly from the sub-transmission network. We recognize that EDC/Rate District tariffs vary, so the Large C&I customers will possibly map more cleanly to the rate codes of some EDCs/Rate Districts than to the rate codes of other EDCs/Rate Districts. As a rule, we propose EDCs apply the avoided cost of distribution capacity to residential customers and non-residential customers who take service at secondary voltage and omit the distribution capacity benefit stream for Large C&I customers that take service at primary voltage (13 kV and above).

The methodology used to estimate avoided T&D costs has been the subject of much discussion in comments and reply comments to prior TRC Test Orders. For Phases III and IV of Act 129, the Commission proposed a simplified system wide value wherein the cost of growth-related capital investments is divided by system-level load growth. Challenges were identified with this approach in the face of flat or declining load growth. *See 2021 TRC Test Order* at 46. We also agreed with stakeholder comments that expressed concerns regarding the amount of variation in avoided distribution capacity costs and directed the Phase IV SWE, in collaboration with EDC system planners, to develop a more granular alternative methodology that is not predicated on load growth at the zonal level. *See 2021 TRC Test Order at 49.*

Listed in Section H, Exhibit 4, to this Tentative Order is the SWE's Avoided Cost of Transmission and Distribution (T&D) Capacity Study. The Commission appreciates the efforts of the EDC's planners to assemble the large volume of data required for this study and the collaborative work to help the SWE understand the nuances of their

distribution systems. The Commission believes the SWE's T&D study represents a methodological improvement over the status quo approach and propose the EDCs use the avoided T&D values presented in Table 1 of Exhibit 4 to calculate avoided T&D benefits for a potential Phase V of Act 129. The proposed 2026 ACC (Exhibit 1 to this Tentative Order) contains a full 20-year forecast with adjustments for inflation and escalation by EDC/Rate District and season. As described in Section B.6 of this Tentative Order, the SWE study recommends separate values for summer and winter demand impacts, so no assumed split is required.

In addition to presenting forecasts of avoided T&D benefits by EDC/Rate District, the SWE T&D study raises several methodological topics that could potentially influence the application of avoided T&D costs and Phase V planning. Specifically, the Commission invites comments on the following observations by the SWE:

- The heat maps of deferral value for each EDC/Rate District clearly show that avoided T&D benefits are concentrated in specific locations that are highly loaded and or expected to grow. Other locations have little or no deferral value. Taking a load-weighted average across an EDC/Rate District territory simplifies the accounting but may mute important price signals regarding where load relief would be most beneficial. In the Conclusions and Recommendations section of its report, the SWE describes a low-medium-high value location taxonomy that could preserve some of the locational value. This suggestion would add a spatial component to EE&C program tracking or require EDCs to map participants to distribution circuit after the fact.

- Similarly, the SWE study notes that individual locations tend to be summer-peaking or winter-peaking, but rarely both. A load-weighted average at the EDC/Rate District territory level assigns a mix of summer and winter value to all demand reductions. Like the low-medium-high suggestion above, a seasonal classification scheme would help match EE&C plan measures with system need. A seasonal classification could justify more aggressive marketing or incentives on cooling equipment in summer-peaking areas and focus outreach for electric heating conservation or load shifting measures in winter-peaking areas.
- The SWE also raises the possibility of a non-wires alternative (NWA) demonstration project for the EDCs. We see this as a logical conclusion based on the concentration of deferral value in certain pockets of a territory. The goal of an NWA would be to assess if EE&C resources in combination with other resources can be used to modify the load shapes, bend the growth, and avoid or defer likely upgrades.

9. Compliance with Alternative Energy Portfolio Standards Act (AEPS)

In Phases I and II, the Commission required that the costs of compliance with the AEPS Act[38] that are known and knowable be included in the TRC Test calculation. The cost was applicable to all the power "avoided." Further, for Phase II, it was noted that a reduction in electric consumption would reduce an EDC's costs of complying with the AEPS Act requirements. *See 2013 TRC Test Order* at 44-45.

[38] *See* 73 P.S. §§ 1648.1–1648.8 and 66 Pa.C.S. § 2814. *See also* 52 Pa. Code §§ 75.1–75.72.

Because no EDCs had included AEPS Act costs through Phase III, beginning in Phase IV, the Commission provided the EDCs with Alternative Energy Credit (AEC) pricing to ensure uniform valuation of AECs (and hence avoided cost estimates) by EDCs in their EE&C plans and their cost-effectiveness calculations. The Commission has access to several subscription-based services that forecast AEC pricing, including Marex.[39] Using forecast data from May 1, 2024, for the year 2026, the Commission proposes that the AEPS Act avoided costs shall be $6.88 MWh for the first year of Phase V and escalated by the BLS escalation factor and the 2% inflation rate every year thereafter.[40]

In addition, the Commission directs the Phase V SWE to include a summary of the AEPS costs with its Phase V annual reports for comparison purposes. If this comparison reveals significant differences between the assumed forecasted AEPS costs and the actual future AEPS costs, the Commission reserves the right to require a mid-phase update to avoided cost forecasts should the variance become large enough to fundamentally alter the benefit/cost results at the portfolio level.

10. Price Suppression Effects

In organized markets, such as the capacity, energy, and ancillary services markets operated by PJM, reductions in demand tend to place downward pressure on the supply side of the market and can potentially lower the market equilibrium price. These wholesale price suppression effects are also known as Demand Reduction Induced Price Effects (DRIPE).[41] The Commission directed the Phase IV SWE to conduct an updated

[39] Marex is a United Kingdom-based broker of financial instruments and provider of market data services across the metals, agricultural and energy markets. See https://www.marex.com/about-us/.
[40] The AEPS Act avoided cost is established using a price of $37.25 for solar photovoltaic sources at 0.5% of retail sales; $34.20 for Tier I sources at 8% of retail sales; and $39.63 for Tier II sources at 10% of retail sales. Obligations are set in https://www.pabulletin.com/secure/data/vol38/38-51/2286.html.
[41] For a detailed explanation of the economics and benefits of DRIPE, see Industrial Energy Efficiency & Combined Heat and Power Working Groups, *State Approaches to Demand Reduction Induced Price*

study to quantify the value of DRIPE under current market conditions. The Phase IV SWE used similar methodologies to nearby jurisdictions such as Maryland and New England.[42] Evidence of price suppression effects were found for both avoided electric energy and avoided generation capacity.

This issue has been investigated previously by the SWE and discussed in prior Commission Orders. In a Secretarial Letter, dated May 17, 2013, the Commission released the *Act 129 Demand Response Study – Final Report* at Docket No. M-2012-2289411.[43] The Commission held a DR Study Stakeholder Meeting on Tuesday, June 11, 2013. At the suggestion of stakeholders, the Commission directed the Phase II SWE to conduct a Preliminary Wholesale Price Suppression and Prospective TRC Test Analysis of the DR program. The Phase II SWE's *Act 129 Demand Response Study – Final Report; Amended November 1, 2013*[44] was released for comment on November 14, 2013.[45] Following a review of comments, the Commission issued its *Peak Demand Reduction Cost Effectiveness Determination* Final Order, which directed the Phase II SWE to perform a DR Potential Study.[46] In the *Peak Demand Reduction Cost Effectiveness Determination* Final Order, the Commission was persuaded by stakeholder comments opposing further price suppression research and directed the Phase II SWE to perform a DR Potential Study for Phase III without inclusion of price

Effects: Examining How Energy Efficiency Can Lower Prices for All, (December 2015), https://www4.eere.energy.gov/seeaction/system/files/documents/DRIPE-finalv3_0.pdf, at page 5.

[42] https://www.synapse-energy.com/sites/default/files/AESC%202024.pdf. See page 227.

[43] *See Release of the Act 129 Demand Response Study – Final Report and Stakeholder Meeting Announcement*, at http://www.puc.pa.gov/pcdocs/1230512.docx.

[44] The May 2013 and November 2013 versions of the *SWE's Act 129 Demand Response Study – Final Report* are available on the Commission's website at http://www.puc.pa.gov/filing_resources/issues_laws_regulations/act_129_information/act_129_statewide_evaluator_swe_.aspx.

[45] *See Energy Efficiency and Conservation Program* Tentative Order, Docket Nos. M-2012-2289411 and M-2008-2069887 (entered November 14, 2013).

[46] *See Energy Efficiency and Conservation Program* Final Order, Docket Nos. M-2012-2289411 and M-2008-2069887 (entered Feb. 20, 2014) (PDR Cost Effectiveness Determination Final Order).

suppression benefits. Therefore, no price suppression benefits were included in the 2016 TRC Test Order for energy efficiency or DR.

The 2021 TRC Test Order stated that avoided costs for Phase IV of Act 129 would not include any DRIPE but directed the Phase IV SWE to monitor the issue and provide recommendations regarding a study to re-examine capacity and/or energy DRIPE in the Commonwealth. *See 2021 TRC Test Order* at 55. In preparation for this Tentative Order and Phase V planning, the SWE completed an analysis of price suppression effects and developed a recommended set of DRIPE values. The SWE's Pennsylvania Demand Reduction Induced Price Effects Study is included in Section H, Exhibit 3.

Based on review of the SWE's DRIPE study, the Commission proposes to include price suppression effects in the TRC benefit calculations for Phase V of Act 129. The SWE's analysis shows that these benefits exist in the wholesale capacity and energy markets operated by PJM and are a real avoided cost of supplying electricity. While there is uncertainty in the DRIPE benefits estimated by the SWE, every component of the avoided cost forecast is based on estimates which contain uncertainty. The Natural Gas Distribution Companies of Pennsylvania include the value of DRIPE in their set of avoided costs used in benefit cost analysis.[47] Inclusion of DRIPE in the avoided cost of supplying electricity will promote alignment between electric and natural gas conservation programs.

[47] *See* Philadelphia Gas Works (PGW) ENERGYSENSE DSM Portfolio Implementation Plan FY 2024-2026 at Docket No. 2014-2459362 (Entered June 16, 2023) https://www.puc.pa.gov/pcdocs/1790192.pdf. Page 13.

As discussed in Exhibit 3, the Commission directed the SWE to only include price suppression benefits that accrue to Pennsylvania ratepayers and exclude effects on neighboring states. The proposed 2026 ACC (Exhibit 1) reflects the specific price suppression effects values recommended in Chapter 4 of the SWE's DRIPE study. Consistent with the proposal for generation capacity in Section B.6 of this Tentative Order, the Commission directed the SWE to split the annual generation capacity DRIPE value from its study evenly between summer and winter. The Commission proposes that these values be used by each EDC/Rate District for TRC Benefit calculations in Phase V of Act 129.

11. End-Use Adjustments

In Section B.2 of this Tentative Order, the Commission lays out a time-differentiated approach to valuing the avoided cost of electric energy. That valuation approach aligns with Table 1-3 (Periods for Energy Savings) in the proposed 2026 TRM in defining six mutually exclusive costing periods.[48] The six periods are summer on-peak, summer off-peak, winter on-peak, winter off-peak, shoulder on-peak, and shoulder off-peak. The Commission proposes continued use of end-use profiles, when available, for EE&C technologies or programs using a time-differentiated format consistent with the avoided energy costs. EDCs and their evaluation CSPs can use end-use profiles to partition the annual kWh savings from EE&C measures into the six energy savings periods. EDCs can then apply period-specific avoided energy cost projections or compute a weighted average avoided cost of energy specific to the measure type when estimating TRC benefits.

[48] *See* the Proposed 2026 Technical Refence Manual, Volume 1, Docket No. M-2023-3044491 (Entered May 9, 2024) https://www.puc.pa.gov/pcdocs/1829634.docx, Page 10.

To support the EDCs and their CSPs in applying end-use profiles, the proposed Phase V ACC includes a tab named ”Six Period Load Shapes” containing profiles organized by sector, building type, and end use. Each profile contains six values that sum to 100%. Profiles for the lighting end use come from the Act 129 SWE Commercial and Residential Light Metering Study.[49] Other end use profiles were developed using load shape data produced by the National Renewable Energy Laboratory (NREL) and organized in its ResStock and ComStock datasets.[50] The Commission leveraged the NREL load shapes in development of summer and winter demand savings assumptions for the proposed 2026 TRM so the application of end-use profiles in the TRC Test promotes consistency between the TRM and TRC Test.

The NREL ComStock dataset has a slightly different roster of commercial building types from the proposed 2026 TRM. For ease of use, the SWE mapped the NREL building types to the business types in the TRM. The Commission proposes to include a ”Composite Commercial” building type that is a floorspace-weighted average of all commercial building types for use when building type is unknown or for planning purposes when the distribution of business types is unknown. Similarly, the NREL ResStock dataset includes load shapes for five distinct residential building types. The Commission proposes to simplify this in the ACC and include profiles for Single Family, Multi Family, and a ”Composite Residential” building type that is a floorspace-weighted average of the five underlying residential building types.

[49] See *Act 129 SWE Commercial and Residential Light Metering Study*, at Docket M-2014-2424864, entered February 4, 2015. Appendix A and Appendix B display 8760 load shapes for the residential and commercial sectors, respectively.
[50] See https://www.nrel.gov/buildings/end-use-load-profiles.html.

The Commission proposes the end-use load shapes in the ACC be considered optional resources for the EDCs and their evaluation CSPs. EDCs and their CSPs should exercise professional judgement in cases where they believe alternative end-use profiles are more relevant or accurate. Where primary data collection from impact evaluations returns project or measure-specific profiles, that data is clearly preferred. When end-use profiles are not available or the EE&C measure savings are not expected to follow an end-use profile, the use of class average premise loads will continue to be acceptable.

12. Reductions In Arrearages And Collection Costs

In the 2021 TRC Test Order, stakeholders pointed out that the arrearages and uncollected debt were a cost of supplying electricity and suggested the Commission quantify potential reductions of these costs as benefits in the TRC Test for low-income programs. In its disposition, the Commission stated:

> Therefore, we determined that PA-EEFA's comments regarding reduced arrearages and uncollected debt merit further investigation, particularly for programs offered to the low-income sector, and will direct the Phase IV SWE to study the impacts of EDC low-income programs on collections. We will make, at a later time, recommendations regarding the appropriateness and magnitude of such a benefit for consideration in future TRC Test Orders. [51]

Utilities can realize financial savings from their low-income EE programs. Energy-efficient technologies installed by EE programs often result in reduced energy bills for participants, which can decrease the likelihood that customers will experience difficulties paying their utility bills. In turn, utilities may realize reduced costs associated with arrearages and late payments, uncollectible bills and bad debt write-offs, service

[51] See *2021 TRC Test Final Order*, at Docket No. M-2019-3006868, entered December 19, 2019. Page 73.

terminations and reconnections, bill-related customer calls, and the bill collections process.

The SWE conducted a study to quantify and monetize EDC financial savings through an analysis of EDC data on customer arrearages, shutoffs, and collections actions for Act 129 low-income program participants. The Commission proposes to incorporate the benefit of EDC's financial savings from their Act 129 low-income EE programs, quantified in the SWE's study, into Phase V avoided cost forecasts. The SWE recommends adopting EDC-specific results for PECO, PPL Utilities, and Duquesne and the statewide average values for the FirstEnergy (FE) rate districts (Met-Ed, Penelec, Penn Power and West Penn Power). The benefits apply for the EUL of the installed measures.

The SWE's recommendation, shown in Table 1, presents the per MWh values in 2026 dollars, adjusted for line losses and inflation, for each EDC/Rate District.

Table 1: EDC/Rate District Financial Savings From Their Low-Income EE Programs

EDC / Rate District	Total Annual Benefit Per MWh, $2026
PECO	$58.14
PPL	$44.87
Duquesne	$18.67
FE: Met-Ed	$18.10
FE: Penelec	$18.10
FE: Penn Power	$18.10
FE: West Penn Power	$18.10

C. Other TRC Benefits

While the focus of Act 129 programming is the reduction of electric consumption and peak demand, EE&C measures often impact homes and businesses in other ways as well. One way is fossil fuels or water usage. Fossil fuel and water impacts can be both positive and negative. For example, attic insulation upgrades to a home with central air conditioning and a natural gas furnace will conserve natural gas during the winter heating season in addition to the reduced electric consumption during the summer cooling season. Conversely, a combined heat and power project will reduce electricity use on-site, but it will increase the amount of fossil fuel consumed on-site by a business. EE&C measures can also reduce or increase the operation and maintenance costs for a participating customer. Lastly, EE&C measures can create societal benefits such as reduced greenhouse gas emissions.

This section addresses each category of potential non-electric TRC benefits. Previous Act 129 TRC Test Orders limited inclusion of non-electric benefits to reasonably quantifiable impacts. Guidance and clarification regarding impacts that are reasonably quantifiable or not are provided below. In each area, the Commission proposes symmetric handling of increases and decreases in other resource types.

1. Quantifying Water Impacts

Several common EE&C measures achieve reductions in electricity consumption from the domestic hot water end use by reducing the volume of hot water used for various tasks. For a potential Phase V TRC Test, the Commission proposes that any measure whose TRM algorithm relies on a calculated change in gallons has reasonably quantifiable water savings that EDCs should include in their calculation of TRC benefits. The algorithms for measures 2.3.6 (Low-Flow Faucet Aerators), 2.3.7 (Low-Flow Showerheads), and 2.3.8 (Thermostatic Shower Restriction Valves) of the proposed 2026 TRM include estimation of water volume savings as an intermediate step in the

energy savings calculations. Other TRM measures that provide enough information for an EDC or its evaluation contractor to estimate annual water savings with some basic secondary assumptions include 2.4.8 (ENERGY STAR Clothes Washers), 2.4.10 (ENERGY STAR Dishwashers), and 3.4.2 (Low-Flow Pre-Rinse Sprayers for Retrofit Programs and Time of Sale Programs). If a custom project scope includes annual water impacts developed by the participant or contractor, the Commission proposes that it is reasonable for EDCs to include those estimates in the calculation of TRC benefits.

2. Monetizing Water Impacts

In the first two years of Phase IV (PY13 and PY14), water benefits accounted for approximately $80 million of the $972 million (8.2%) in TRC benefits statewide.[52,53] Based on the relative importance of water savings in the Phase IV TRC Test results, it is important that EDCs continue to monetize changes in water consumption in the TRC Test for a potential Phase V of Act 129.

In the 2021 TRC Test Final Order, the Commission directed EDCs to monetize water impacts at a rate of $0.01 per gallon (2021 dollars) with a loss factor of 24.5% (1.32 multiplier). The value of $0.01 per gallon was based on an estimated marginal cost to treat and pump an extra gallon of water. Adjusted for inflation, this translates to approximately $0.011 per gallon (2026 dollars).

[52] *See Act 129 SWE Phase IV Program Year 13 Final Annual Report*. Submitted to the Commission on December 5, 2022, https://www.puc.pa.gov/media/2152/py13_swe_annual_report120522final.pdf, Table 21 on page 48.
[53] *See Act 129 SWE Phase IV Program Year 14 Final Annual Report*. Submitted to the Commission on December 1, 2023, https://www.puc.pa.gov/media/2688/swe_py14_final_annual_report120123.pdf, Table 21 on page 46.

In preparation for this Tentative Order, Commission Staff conducted an analysis of the retail rates of the Class A water utilities over which the PUC has jurisdiction. These include Aqua PA, Pennsylvania American Water, Audubon Water, Columbia Water, Community Utilities, Newtown Artesian, York Water Company and Pittsburgh Water and Sewer Authority. The analysis also included some water utilities that the PUC does not have jurisdiction over, specifically Philadelphia Water Department, Lancaster City Water Authority, and Lehigh County Authority.

Many of the water utilities included in the analysis offer declining block rates where the cost per gallon is lower for billing cycles that exceed a specific volume. The Commission's analysis uses the second block in such cases, assuming that it better approximates the marginal cost of an additional gallon to the system. Once compiled, the price per gallon was averaged across the residential, commercial, and industrial classes for each water utility. After assigning an approximate number of customers to each utility, Commission Staff computed a weighted average for the Commonwealth of 1.057 cents per gallon. Adjusted for inflation, this exercise also returns an estimate of $0.011 per gallon in 2026 dollars.

Based on the consistency of these results with prior orders and Phase IV TRC testing, the Commission proposes that EDCs monetize water savings at a rate of 1.1 cents per gallon for Phase V of Act 129. Under the proposal, this rate would be increased yearly with the same inflation rate assumed throughout the TRC model and adjusted by a loss factor of 24.5% (1.32 multiplier).

3. Quantifying Fossil Fuel Impacts

In the 2021 TRC Test Order, the Commission directed the EDCs to quantify the fossil fuel impacts of EE&C measures for inclusion in the calculation of TRC benefits. This was consistent with the 2016 TRC Test Order and a 2018 SWE guidance memo. The Commission noted that specific instructions regarding fossil fuel impact calculations for all Act 129 EE&C measures is not practical given the diversity of measures, program delivery models, and data collection practices. Accordingly, the EDC evaluation contractors are expected to use professional judgement when developing estimates. Considering this, the Commission proposes the following general guidance be used in a potential Phase V for certain measure categories.

- For building shell, whole home, or heating, ventilation, and air conditioning (HVAC) measures that reduce space heating consumption in homes with fossil fuel heat, the proposed 2026 TRM generally provides adequate information to estimate fossil fuel savings for homes with non-electric space heating. EDCs should assume a natural gas furnace with thermal efficiency of 88% and capacity of 78,000 BTU/hour in the calculations based on the results of the 2023 Residential Baseline Study.[54]
- Faucet aerators, low-flow showerheads, and thermostatic shower restriction valves reduce fossil fuel use when they are implemented in homes with non-electric water heating. The proposed 2026 TRM assumes 47% of homes have electric water heat, indicating the remaining 53% have natural gas, propane, or fuel oil. Consistent with prior TRC Test Orders, the Commission proposes a simplified assumption that all non-electric domestic hot water savings be monetized using natural gas avoided costs for a potential Phase V at an assumed 80% recovery efficiency.

[54] *See* NMR Group for the Pennsylvania Public Utility Commission. *2023 Pennsylvania Statewide Act 129 Residential Baseline Study*. Submitted March 25, 2024, at Docket No: M-2023-304490. https://www.puc.pa.gov/media/2883/2023_pa_residential_baseline_study.pdf.

4. Interactive Effects

Lighting interactive effects are a specific form of fossil fuel impacts that the TRC Test must consider. Installation of light emitting diode (LED) lighting reduces the amount of waste heat produced by the lighting end-use. TRM protocols quantify the impacts on electric HVAC systems, so the electric interactive effects are reflected in the calculation of TRC benefits. In the case of homes or businesses with fossil fuel heating systems, the increased heating fuel consumption should continue to be treated as a negative benefit in the TRC.

As part of the proposed 2026 TRM, the SWE developed residential and non-residential lighting interactive effects calculators. The outputs of these Microsoft Excel tools were the basis of the proposed electric interactive effects in the 2026 TRM Tentative Order.[55] That modeling effort also included estimates of fossil fuel heating penalties on a MMBtu per kWh of lighting savings basis. Table 2 shows proposed default residential lighting interactive effects by EDC/Rate District, considering the weather patterns of each service territory and the heating fuel saturations from the 2023 Residential Baseline Study.

Table 2: Residential Interactive Effects By EDC/Rate District

EDC / Rate District	$IF_{fossil\ fuel}$
PECO	-0.0009
PPL	-0.0006
Duquesne	-0.0012
FE: Met-Ed	-0.0007
FE: Penelec	-0.0009
FE: Penn Power	-0.0010
FE: West Penn Power	-0.0007

[55] *See* 2026 TRM Tentative Order, Docket No. M-2023-304491 (entered May 9, 2024), Page 15, https://www.puc.pa.gov/pcdocs/1828766.pdf.

The Act 129 Lighting Audit & Design Tool for Commercial and Industrial Projects (proposed 2026 TRM Appendix C) collects HVAC configuration so heating fuel is known for most retrofit lighting projects. Table 3 shows proposed default non-residential lighting interactive effects by HVAC configuration based on the SWE's modeling efforts.

Table 3: Non-Residential Interactive Effects By HVAC Configuration

HVAC Scenario	$IF_{fossil\ fuel}$
AC with Fossil Fuel Heat	-0.0010
AC with Electric Heat	0.0000
Fossil Fuel Heat Only	-0.0010
Electric Heat Only	0.0000
Unknown - Use Market Average	-0.0008

The Commission proposes to simplify the approach of monetizing all fossil fuel impacts. As discussed in the following section and consistent with prior TRC Test Orders, the Commission proposes using the avoided cost of natural gas rather than requiring a separate avoided cost forecast for fuel oil and propane and tracking heating fuel distributions among EE&C plan participants with fossil fuel heat.

5. Monetizing Fossil Fuel Impacts

The Commission proposes that all resources be monetized using a marginal cost to reflect what is reduced (or increased) by an EE&C measure. Other fixed costs embedded in retail rates will still be recovered. The marginal cost of natural gas is used as an input to the avoided cost of electricity forecast, as described in section B.2 of this Tentative Order. The Commission proposes that EDCs use the natural gas values in this forecast, collapsed to a single annual value, to monetize changes in fossil fuel consumption due to installation of EE&C measures.

The proposed methodology entails the use of a 20-year period for calculating avoided natural gas costs and is dissected into three segments.

a. **The first segment, years one through four:** The methodology for segment one should utilize short-term market-based NYMEX natural gas futures prices.

i. Use NYMEX natural gas futures prices at Henry Hub for years one through four. The prompt month for NYMEX futures is established as three months prior to the filing date.

ii. Use the differential between the Henry Hub as the source and TETCO M-3 as the destination for the locational basis adjustment to the natural gas prices for EDC\Rate Districts west of the Susquehanna River. The locational basis adjustment to the natural gas prices for EDC\Rate Districts east of the Susquehanna River uses the basis differential between the Henry Hub as the source and Transco Zone 6 non-New York as the destination.

iii. Average monthly NYMEX natural gas prices to create a single annual value.

b. **The second segment, years five through ten:** The methodology for segment two should be based on NYMEX natural gas futures. Medium-term NYMEX natural gas futures should be blended with the longer-term US EIA AEO projected natural gas costs across the segment two period to shift from market-based conditions to a more stable model that is public and transparent.

i. Gather NYMEX natural gas futures at Henry Hub for years five through ten. The prompt month for NYMEX futures is established as three months prior to the filing date. Monthly NYMEX natural gas prices shall be averaged to create a single annual value.

ii. Use the differential between the Henry Hub as the source and TETCO M-3 as the destination for the locational basis adjustment to the natural gas prices for EDC\Rate Districts west of the Susquehanna River. The locational basis adjustment to the natural gas prices for EDC\Rate Districts east of the Susquehanna River uses the differential between the Henry Hub as the source and Transco Zone 6 non-New York as the destination. For EDCs that have service territory on both sides of the river, such as PPL Utilities and FirstEnergy, the location shall be based where the majority of the electric load is present.

iii. Gather annual forecasted natural gas costs from the 2025 EIA AEO projected costs for Electric Power Users in the Mid-Atlantic region using real dollars.

iv. Derive final natural gas costs by blending NYMEX natural gas futures and EIA AEO projected natural costs over the segment two horizon. The Commission proposes that this shall be calculated by adding one-seventh of the differential between EIA AEO natural gas costs and locational adjusted NYMEX natural gas futures for each segment year starting in year five to the zone location adjusted NYMEX natural gas futures.

c. The third segment, years eleven through twenty: The methodology for segment three should utilize long-term market-based EIA AEO projected natural gas costs.

The proposed 2026 TRM does not include loss rates for natural gas; however, natural gas companies also experience losses in their distribution networks. The Commission proposes EDCs use a natural gas loss factor of 4% (1.04167) based on the SWE's calculations from data provided by the Pipeline and Hazardous Materials Safety Administration.

6. O&M Benefits

The Commission's position on operation and maintenance (O&M) benefits has been largely unchanged since Phase I. O&M benefits, including avoided future replacement costs and labor, should be included as TRC benefits where such benefits are quantifiable and material. In cases where such costs were challenging to quantify, or unquantifiable, the Commission permitted EDCs to omit such costs from TRC calculations.

O&M benefits can be positive or negative. Combined Heat and Power (CHP) and solar photovoltaic (PV) systems, for example, will often have negative O&M benefits. If a project has ongoing maintenance costs relative to the baseline equipment, those costs should continue to be included as negative O&M benefits. For some measures, the SWE provides default O&M assumptions in its incremental cost database (Exhibit 5 to this Tentative Order). In previous versions of the incremental cost database, the SWE proposed default O&M assumptions for LED lighting measures to reflect the longer rated lifetime of LED products compared to inefficient lighting equipment. Based on the rapid transformation of lighting markets and uncertainty in the availability of non-LED products for certain equipment categories, the SWE did not provide default O&M values for LED lighting measures in the proposed incremental cost database. EDCs may still assign O&M benefits to LED lighting measures if market conditions suggest that avoided future replacement costs are appropriate to include in the TRC benefits ledger.

7. Societal Benefits

In the 2021 TRC Test Order, the Commission concluded, consistent with prior TRC Test Orders, that the TRC Test would not include societal benefits such as greenhouse gas emissions reductions, other environmental benefits, or any other non-energy impacts (NEIs) beyond the quantifiable fossil fuel, water, and O&M impacts detailed elsewhere in this section.

Pennsylvania's participation in the Regional Greenhouse Gas Initiative (RGGI) is currently on hold. The Commonwealth Court declared Pennsylvania's involvement in RGGI to be unconstitutional in a decision issued on November 1, 2023.[56] While there are still ongoing appeals in the state judicial system on the matter, it is not likely that the Commonwealth will become involved with the initiative absent new legislation. If, in the future, the state legislature moves towards enacting legislation that would allow for involvement in RGGI or a similar initiative focused on greenhouse gas emissions reductions, or other environmental goals, the Commission reserves the right to revisit the position of societal benefits and their inclusion in cost effectiveness testing in Phase V of Act 129.

The TRC test, traditionally, does not include explicit accounting of general societal benefits. Where societal benefits are embedded in the cost of supplying energy, such as compliance with the AEPS Act or reduced arrearages and collection costs, those benefits are included in the TRC calculations. The Commission proposes to continue to omit the explicit accounting of additional societal benefits in the TRC Test in Phase V of Act 129.

[56] *See* https://www.pacourts.us/assets/opinions/Commonwealth/out/247MD22_11-1-23.pdf?cb=1 at page 2-10.

D. TRC Costs

As shown in Appendix A of this Tentative Order, there are fewer categories of TRC costs than TRC benefits. Almost all TRC costs can be classified as either program administration and overhead or IMCs. However, complications arise with respect to classification of different cost components based on EE&C program delivery mechanism and which party incurs the costs. In this section, guidance is proposed for the calculation and the reporting of TRC costs that largely align with the 2021 TRC Test Order.

1. Program Administration and Overhead

The administration and overhead costs of delivering an EE&C plan are costs in the TRC Test, on both a net and gross basis, as the costs would not occur absent the program. These costs should be carefully tracked for cost recovery purposes and straightforward to report. The Commission proposes that all program administration and overhead costs continue to be treated as a TRC cost regardless of whether they are incurred by EDCs, CSPs, or the evaluation contractor. Common categories of administration cost are program design, management, technical assistance, marketing, program delivery, and evaluation. The SWE audit costs should also be considered program administration and overhead cost. CSP contracts and EDC cost tracking should be structured in a way to provide maximum stakeholder visibility into non-incentive cost elements.

Some administrative costs, like a program tracking system or legal counsel, are challenging to allocate to specific programs. EDCs will continue to have the flexibility to incorporate these cross-cutting costs at the portfolio level or allocate them across programs using energy savings, budget, or some other logical allocation method. The treatment of cross-cutting costs, as well as a breakdown of cross-cutting cost components, will continue to be included in the EDC EE&C plans and final annual reports.

In the 2021 TRC Test Order, the Commission reconsidered its perspective on the categorization of equipment costs for direct installation programs relative to previous phases. The Commission directly addressed the handling of kit measures in the 2021 TRC Test Order. While the treatment of kit and directly installed equipment costs does not affect the TRC calculation because the incremental cost is unaffected, the Commission recognized that categorization of costs is a common area of interest for stakeholders. The share of costs used for administration rather than incentives was so important that the Commission required at least 50% of Phase IV EE&C plan spending to come from incentives and less than 50% to be attributed to non-incentive cost categories. *See Phase IV Implementation Order* at 126-127. For Phase IV of Act 129, kit and directly installed equipment costs were to be treated as IMCs and incentives rather than program administration costs. *See 2021 TRC Test Order* at 75. To maintain the requested visibility into the share of program expenses devoted to administration versus incentives, the Commission proposes to continue this handling of kit and directly installed equipment costs for a potential Phase V of Act 129. The shipping cost of the kits would still be treated as a non-incentive program delivery cost. The labor cost to directly install equipment would be included in the IMC and categorized as a participant incentive.

2. Incremental Costs

The IMC of an EE&C plan measure varies by measure type and the assumptions about the baseline – or what costs the participant would have incurred absent program participation. Table 4, below, is adapted from the Pennsylvania Evaluation Framework[57] and provides a useful summary of common measure types. It is important that the methodology EDCs use to compute incremental costs continues to be aligned with the methodology used to calculate energy savings.

[57] *See* https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf at page 86.

Table 4: Incremental Cost By Measure Type

Type of Measure	IMC ($/Unit)	Impact Measurement (kWh/yr/Unit)
New Construction	Cost of efficient device minus cost of baseline device.	Consumption of baseline device minus consumption of efficient device.
Replace on Burnout (ROB)	Cost of efficient device minus cost of baseline device.	Consumption of baseline device minus consumption of efficient device.
Retrofit: An additional piece of equipment or process is *retrofit* to an existing system. (e.g., additional insulation or duct sealing)	Cost of efficient device plus installation costs.	Consumption of old device minus consumption of efficient device.
*Early Replacement: Replacement of existing functional equipment with new efficient equipment	Present value of efficient device (plus installation costs). If a dual baseline is used, subtract the present value of baseline device assumed to be installed in at the end of remaining useful life of the existing equipment (plus installation costs).	*During remaining life of old device:* Consumption of old device minus consumption of efficient device. *After remaining life of old device:* Consumption of baseline device minus consumption of efficient device.
Early Retirement (No Replacement)	Cost of removing old device.	Consumption of old device
*The early replacement case is essentially a combination of the simple retrofit treatment (for the time period during which the existing measure would have otherwise remained in service) and the failure replacement treatment for the years after the existing device would have been replaced.		

In preparation for Phase II, the Commission directed the Phase I SWE to complete an incremental cost database by December 31, 2012, to support EE&C plan development and uniform calculation of TRC costs across EDCs. *See 2013 TRC Test Order* at 25. The Commission also recognized that an EDC's EE&C plan may include measures that are not adequately addressed by the SWE incremental cost database or other industry resources. Since the initial development of the SWE's incremental cost database, the SWE has conducted research to update cost assumptions for various measures.

The Phase IV SWE is currently working on the EE Market Potential Study (MPS) for a potential Phase V of Act 129. IMC assumptions for EE&C measures are a key part of the economic screening step of the EE MPS. Since the timing of this Tentative Order falls at approximately the same time that the SWE plans to begin economic screening, the Commission directed the SWE to complete its updates to the incremental cost

database for inclusion as an exhibit. As listed in Section H, Exhibit 5, is version 5.0 of the incremental cost database. Measure information is organized to align with the proposed 2026 TRM. The Commission invites stakeholders to present recommendations for alternative measure cost assumptions via comments if they have better data on equipment and labor costs in the Commonwealth.

As in prior phases, the Commission proposes that the SWE incremental cost database remain an optional resource for EDCs and their evaluation contractors. EDCs may elect to use the cost assumptions in the incremental cost database or other reputable industry sources in their EE&C plans and annual TRC reporting. The source of all IMC assumptions should be documented. EDCs should use actual project costs where available and practical (*e.g.*, retrofit projects).

3. Act 129 Incentives

Incentives to program participants are a transfer payment intended to offset the IMC of efficient equipment. They are a cost to the EDC and a benefit to the participant, so they are neither a cost nor a benefit in the TRC Test. An exception to this rule occurs when the incentive amount is greater than the IMC. If the incentive amount is greater than the IMC, the incentive amount should be used as the TRC cost instead of the IMC. Incentives may be greater than the IMC when an EDC elects to make the efficient option the lowest cost option for participants. Incentives can also exceed incremental cost when there is no clear measure cost, such as for Appliance Recycling programs.

Consistent with the 2021 TRC Test Order, the Commission proposes to categorize the cost of kits and directly installed equipment as an incentive to program participants. The labor cost to directly install equipment in homes and businesses should also be categorized as an incentive. Prior to the 2021 TRC Test Order, the Commission defined an incentive as "a payment made to a program participant by an EDC to encourage the

customer to participate in an energy efficiency program and to help offset some, or all, of the participant's costs to purchase and install an energy efficiency measure." *See 2013 TRC Test Order* at 16. It is the Commission's position that kits and directly installed equipment encourage customers to participate in programs and offset some or all the cost to install energy efficiency equipment. Kits and direct install programs do not require the participant to pay the upfront cost and then recover a portion of that cost via a second financial transaction with the EDC. This does not affect the underlying program mechanism whereby an EDC program reduces the participant cost for measure installation.

In summary, the Commission proposes that the EDCs continue to treat incentive costs as neither a cost nor a benefit in the TRC Test, except when the incentive amount is greater than the IMC, in which case the incentive amount should be used as the TRC cost instead of the IMC. In addition, the Commission proposes that EDCs continue to categorize the cost of kits and directly installed equipment as an incentive to program participants.

4. Incentives From Outside Of Act 129

In the TRC Test formulae for Phases I, II, and III, outside incentives appeared as the factor "TC_t" or tax credits in year *t*. This term was counted towards the program benefits. In Phase IV, the Commission proposed treating incentives from outside of Act 129 as a reduction in costs, not as a benefit of the program, and proposed using the term "OI_t" or outside incentives in year *t* in the formulae. The Commission proposes to continue to treat incentives from outside of Act 129 as a reduction in costs.

As noted in Section A.8 above, EDCs only needed to factor in, as reductions to cost, the non-Act 129 incentives that are reasonably quantifiable by the EDC. The Commission interprets "reasonably quantifiable" to include any non-Act 129 incentive, such as a rebate, tax credit, or grant, where the EDC has direct data on the amount of the incentive and the fact that the customer made use of the funds. For example, if a participant completes a $500,000 retrofit project and receives a $100,000 grant from outside funding sources, the EDC should include the $100,000 as a cost reduction and use $400,000 as the IMC. Another example of reasonably quantifiable non-Act 129 incentives are energy efficiency rebates from programs administered by the Pennsylvania Department of Environmental Protection. Federal tax credits to individuals for energy-efficient equipment also supported by Act 129 incentives would be an example of an incentive that the Commission would consider not reasonably quantifiable. The EDC would not have a way of knowing if a customer claimed the credit and what the actual impact was on their ultimate tax liability.

E. Fuel Switching

1. ENERGY STAR Requirement

In Phases I, II, III, and IV EDCs have been allowed to support fuel switching measures that convert equipment from electricity to fossil fuel, but the fossil fuel equipment must meet or exceed the current US Environmental Protection Agency (EPA) minimum ENERGY STAR performance standard. The ENERGY STAR status of some fossil fuel equipment, such as gas furnaces, are in a state of uncertainty as they were being considered for removal from the ENERGY STAR specification for furnaces, but the EPA recently announced a proposal to update rather than sunset the ENERGY STAR specification for furnaces. The proposed new specifications are still in development.[58]

[58] US EPA. (2023, May 18). ENERGY STAR Furnaces and Central Air Conditioners: Sunset Proposal Memo, Weblink US EPA (2024, April 16), ENERGY STAR Version 5.0 Furnaces Draft 1 Cover Letter. Weblink.

If an EDC wishes to incentivize a fuel switching measure in Phase V, the Commission proposes that the EE&C plan should state a proposed minimum standard and provide justification for the threshold. For example, if an EE&C plan includes CHP systems as a measure, the EE&C plan should specify the minimum system efficiency to receive program support.

2. Increased Fuel Consumption

For Phase IV of Act 129, the Commission directed the EDCs to treat increased fuel consumption from fuel switching as a negative TRC benefit. *See 2021 TRC Test Order* at 82. In previous phases increased fuel consumption from fuel switching was considered a TRC cost. Positive costs and negative benefits lead to identical PVNB results, but different TRC ratios. Since the increased fuel consumption is an output of program efforts, the Commission believes the benefits ledger is more appropriate. Monetizing increased fuel consumption from fuel switching measures as TRC benefits alongside reductions in fossil fuel consumption from measures that reduce fossil fuel consumption promotes symmetry in TRC Tests and allows EDCs to report overall impacts on fuel consumption. For a potential Phase V of Act 129, the Commission proposes that EDCs treat any increased fuel consumption from fuel switching measures as a negative TRC benefit.

CHP projects both increase fuel consumption to power the electricity generation equipment and offset fuel consumption by recovering useful heat from the generation process. The fuel consumption offset by CHP should be estimated to calculate the net change in fuel consumption from fuel switching.

The Commission proposes to continue using the marginal system cost of the fuel to monetize the projected fuel consumption over time if the fuel consumed is natural gas. The forecast methodology for natural gas is outlined in Section C.5, above. A forecast of projected retail cost from the US EIA, or similar reputable industry source, should be used for delivered fuels such as gasoline or propane. For on-site fuels, such as biogas, the Commissions proposes that EDCs use the estimated production cost over the EUL of the measure.

F. Net-To-Gross (NTG) Issues

1. Use Of NTG Research

In the 2016 TRC Test Order, the Commission required that EDCs report TRC ratios in EE&C plans in two ways: (1) based on projected gross savings and (2) based on projected net savings. *See 2016 TRC Test Order* at 46-47. The Commission proposed no changes to this requirement for Phase IV, and the Commission proposes no changes to this requirement for Phase V. EDC evaluation contractors shall continue to conduct NTG research, use the results for program planning purposes, report net verified savings, and calculate the TRC Test results on a net basis.

2. Treatment Of Incentives To Free-Riders

The Commission proposes to maintain the current Phase IV position on the treatment of incentives for free-riders for Phase V, which is that free-rider incentives shall not be included as an additional program cost when considering a net TRC Test perspective. NTG research shall be applied to the TRC Test only for the purposes of program planning. Free-rider participant costs would have occurred even in the absence of a program and are not part of net program costs. Spillover, the opposite of the free-rider effect, occurs when customers adopt measures because they are influenced by program-related information and marketing efforts, but they do not actually participate in the program. Consequently, the participant costs shall be reduced by the NTG value.

The Commission is aware that the inclusion of costs for incentives for free-riders in the calculation of a TRC test was addressed by the California Public Utilities Commission in the 2007 Clarification Memo. However, in prior TRC Test Orders, this clarification to include free-rider incentives as a program cost was rejected as it was determined to overstate TRC costs and contradict the underlying rationale of the TRC test perspective, which ignores incentive payments as they are a transfer between the program administrator and participant.

3. Treatment of NTG for TRC Benefits

The Commission proposes no changes to the treatment of NTG for TRC benefits for a potential Phase V, but reminds EDCs that NTG ratios shall be applied to all benefits in the TRC Test. The benefits include, but are not limited to, avoided energy and capacity costs, O&M, interactive effects, and secondary resource impacts such as fossil fuel and water. NTG research shall only be applied to the TRC Test for the purposes of reporting and program planning. EE&C plans are not required to be cost-effective on a net basis.

G. Demand Response

1. DR Testing If DR Is Included In Phase V

The Commission has not yet determined DR (or EE) targets for a potential Phase V of Act 129. Currently, the Commission expects to release the Phase IV SWE's DR MPS in early 2025. The results of that analysis will inform the decision relative to a potential Phase V. If it is determined to proceed with a Phase V, the Commission anticipates a Phase V Implementation Tentative Order in spring 2025 and a Final Implementation Order in summer 2025. Additionally, the Commission has made no determination regarding the frequency, duration, or notification time of DR events. The Commission expects the SWE's DR MPS to include a recommendation on these

issues as these parameters have significant impacts on the amount of DR potential in an EDC service territory and the cost to acquire it.

This docket will not address issues related to whether DR should be included in or excluded from a potential Phase V. Stakeholders are invited to comment on the proposed cost-effectiveness methodology for DR in this proceeding. Our discussion and proposal herein, as well as any stakeholder comments at this docket, merely presumes for discussion and comment purposes that a potential Phase V will include DR.
The Commission proposes guidance on how to calculate the TRC costs and benefits for DR in this Tentative Order if Phase V EE&C plans include DR programming.

2. Calculation Of TRC Benefits

DR programs are designed to reduce peak demand, so the dominant benefit streams are the avoided cost of generation, transmission, and distribution capacity on a $/kW-year basis. For the 2026 TRC Test, the Commission proposes that EDCs average the gross verified demand reductions over each hour of performance and apply a line loss adjustment factor to estimate the magnitude of the peak demand reduced. The calculation should be performed separately for summer and winter peak given the proposed transition to seasonal capacity values described in Sections B.7 and B.8 of this Tentative Order. The seasonal demand reduction value(s) would be multiplied by either two or three avoided cost of capacity values, depending on the participating customer sector. The notable exception, consistent with our proposal in Section B.8 of this Tentative Order, is that no avoided distribution capacity benefits should be calculated for peak demand reductions at facilities that take electric service directly from the transmission or sub-transmission system (generally, Large C&I accounts that take service at primary voltage). These sites are not served by the EDCs' distribution systems so reductions in their peak loads should not avoid or defer investments to distribution system infrastructure. *See 2016 TRC Test Order* at 53.

In Phase III, peak demand reductions from dispatchable DR programs were monetized in the TRC Test using the full avoided cost of capacity. For Phase IV of Act 129, the Commission revisited the assumption that dispatchable DR programs create a 1:1 reduction in generation capacity requirements and directed the EDCs to use a set of derate factors when calculating TRC benefits. *See 2021 TRC Test Order* at 96-97. The Commission based the derate factors on modeling results from PJM for a hypothetical program design that the Phase III SWE expected to result in approximately 24 event hours per summer. *See 2021 TRC Test Order* at 94-95. The average derate factor statewide was approximately 60% so the Commission directed the EDCs to use a 60% derate factor for T&D benefits along with the EDC-specific derate values for avoided generation capacity. Ultimately, the Commission set no dispatchable DR targets for Phase IV or Act 129, and no EDC EE&C plans included dispatchable DR programs so the guidance in the 2021 TRC Test Order has been unused to date in Phase IV TRC modeling.

The Commission maintains its position from the 2021 TRC Test Order that dispatchable DR programs that are only activated on a limited number of days merit a derate factor unless they are formally recognized as capacity resources at the wholesale level. The Phase V DR MPS is currently underway, and the Commission expects any event-based DR programs identified by the SWE will have a derate factor based on the expected frequency and duration of calls associated with the event trigger. If the Commission chooses to propose dispatchable DR targets based on one or more program designs identified by the SWE in the DR MPS, the Commission will specify the associated derate factor(s) in the Tentative Implementation Order.

In its work plan for the Phase V DR MPS, the SWE presented a "daily load shifting" DR program design (rather than event-based) that the Commission believes has promise for Act 129. One of the historic policy challenges with Act 129 DR is the interaction with DR options at PJM and concerns about dual enrollment or "double-dipping." A daily load shifting program that is active each weekday during the summer and/or winter peak season is fundamentally different from the event-based DR options at PJM. This type of DR program design could complement existing PJM DR offerings rather than compete with them by targeting solutions capable of more frequent, but likely less aggressive, curtailment methods. The SWE plans to model electric vehicle managed charging, daily water heater control, thermostat optimization, behind-the-meter battery storage, and select commercial auto-DR options under a daily load shifting design.

Peak demand impacts from a daily load shifting program are much like coincident demand reductions from energy efficiency because they are in place each day of the Act 129 peak demand definition. In fact, it may be possible to have a single peak demand reduction goal that could be satisfied by either coincident demand reductions from EE or daily load shifting DR programs. Given the similarity of a daily load shifting program to coincident demand reductions from EE, the Commission proposes no derate factor be applied to peak demand reductions from daily load shifting programs. Rather, the guidance presented in Sections B.6 through B.8 for calculation of capacity benefits from coincident demand reductions from EE apply to any daily load shifting programs offered by the EDCs in a potential Phase V of Act 129. The verified demand reduction scaled for losses from the daily load shifting program during the summer season would be applied to summer avoided capacity costs and the verified demand reduction scaled for losses from the daily load shifting program during the winter season would be applied to winter avoided capacity costs.

3. Participant Cost Assumption

As established in Phase I, customer incentives in a DR program are intended to compensate participants for the sacrifices they make to consume less electricity during peak periods. Such sacrifices can take the form of being less comfortable in the case of a residential Direct Load Control (DLC) program or a disruption in production for a business that shuts down a manufacturing process. In recognition of these sacrifices, the Commission directed EDCs in Phase I to include the full incentive payment amount as a cost to the participant as a monetary proxy for participant costs. *See 2011 TRC Test Order* at 13-14. There were no DR requirements in Phase II.

In the 2016 TRC Test Order, the Commission revisited the participant cost issue. Setting participant cost equal to the incentive amount implies a break-even arrangement for the participant, where the benefits are identical to the costs. The Commission rejected the break-even assumption, instead adopting the perspective that customers are generally rational and would likely only participate in a DR program if they felt the benefits of participation outweighed the costs. As a result, for Phase III, the Commission adopted the 75% participant cost assumption set forth in California's 2016 DR Cost-Effectiveness Protocols[59] as a solution. Under this protocol, 75% of the customer incentive payment is used as a proxy for the participant cost when calculating the TRC ratio for DR programs. The Commission recognizes that many EDCs would elect to use CSPs to implement DR programs and that the exact incentive payment from the CSP to the participant might therefore be unknown. The Commission, therefore, directed EDCs to use 75% of the payment amount to the CSPs as a cost in the 2016 TRC Test for Phase III.

[59] *See* https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/demand-response/cost-effectiveness/2016-dr-cost-effectiveness-protocols---clean.docx. California refers to this component as the "value of service lost."

The Commission proposed no changes in the 2021 TRC Test Tentative Order regarding the use of DR incentive amounts to estimate participant costs for Phase IV and received no stakeholder comments on the issue. Given the lack of dissenting perspectives or alternative suggestions in that docket, the Commission proposes that EDCs continue to use the 75% participant cost assumption for any potential Phase V DR programming.

4. Measure Life

DR is a broad category of programs and measures that may or may not involve equipment installed at the participating customer's location. For load curtailment programs, participation involves a financial incentive between the EDC, or its CSP, and the program participant. As specified in the proposed 2026 TRM, the measure life for load curtailment programs is one year. The proposed 2026 TRM provides that the measure life of behavioral DR programs, which include neither incentives nor equipment, will be assumed to be one year.

For DR programs where the utility pays some or all the cost of DR equipment, the proposed 2026 TRM provides an 11-year default measure life.[60] Examples of DR equipment include a Wi-Fi-connected "smart" thermostat, a water heater or air conditioner cycling switch, a battery, an electric vehicle charger that the EDC can control, and other similar equipment that the EDC (or CSP) can control. For this class of DR programs, the Commission proposes an adjusted measure life shorter than the mechanical life of the equipment equivalent to the remaining years of Phase V. This approach is consistent with our disposition on the issue in the 2021 TRC Test Order and recognizes that DR equipment typically won't generate load reductions without program incentives or administration and there is no guarantee the Commission will establish DR targets for future phases of Act 129.

[60] *See* Proposed 2026 TRM Volume 2, Docket No. M-2023-304491 (entered May 9, 2024), Page 227. https://www.puc.pa.gov/pcdocs/1829635.docx https://www.puc.pa.gov/pcdocs/1829635.docx.

When a multi-year measure life is assumed for DR, consistent with prior TRC Test requirements, the Commission proposes that EDCs also account for expected incentive costs over the remainder of the phase. For example, in a traditional air conditioner cycling program, where the EDC (1) purchases and installs the DLC equipment and (2) pays the participant $50 per summer in exchange for continued participation in the program, the recurring annual $50 incentive cost must be factored in. To realize the multi-year benefits of the equipment, annual costs are incurred. If a measure life equal to the five-year phase length is applied to the load control equipment when calculating benefits, five years of assumed incentive costs should also be factored in.

The Commission reminds the EDCs that any DR equipment purchased in a previous phase cannot be included in the TRC Test for a potential Phase V. Those expenses were accounted for as costs in a previous TRC Test and to consider them as TRC costs again would be "double-counting."

H. Exhibits

1. Avoided Cost Calculator (ACC)

The proposed Avoided Costs Calculator is available at the Public Utility Commission's website at: https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/total-resource-cost-test/.

2. Arrearages

The *Impact of Act 129 Low-income Programs on Arrearages and Collections Study* is available at the Public Utility Commission's website at: https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/total-resource-cost-test/.

3. DRIPE

The *Pennsylvania Demand Reduction Induced Price Effects Study* is available at the Public Utility Commission's website at: https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/total-resource-cost-test/.

4. T&D Study

The *Avoided Cost of Transmission and Distribution Capacity Study* is available at the Public Utility Commission's website at: https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/total-resource-cost-test/.

5. Incremental Cost Database

The proposed incremental cost database is available at the Public Utility Commission's website at: https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/total-resource-cost-test/.

CONCLUSION

With this Tentative Order, the Commission seeks comments and reply comments on the proposed 2026 TRC Test intended for use in the potential Phase V of Act 129. This Tentative Order represents the Commission's continuing efforts to establish a comprehensive TRC Test, with the purpose of evaluating the EE&C programs pursuant to Act 129 during the potential Phase V.

Comments and reply comments to this Tentative Order should reflect the topical numbering references as used herein. If your comments or reply comments do not address each specific topic from this Tentative Order, please include the notation that you are not commenting on a particular topic. If you are raising new topics, please do so after you have addressed the topics raised in this Tentative Order.

This Tentative Order and all filed comments and reply comments related to this Tentative Order will be made available to the public on the Commission's Act 129 Information web page[61]; **THEREFORE,**

IT IS ORDERED:

1. That a copy of this Tentative Order be served on the Office of Consumer Advocate, the Office of Small Business Advocate, the Commission's Bureau of Investigation and Enforcement, the jurisdictional electric distribution companies subject to the Energy Efficiency and Conservation Program requirements, all parties who commented on the *2021 TRC Test Order* at Docket No. M-2019-3006868, all parties to *Implementation of the AEPS Act of 2004: Standards for the Participation of*

[61] *See* http://www.puc.pa.gov/filing_resources/issues_laws_regulations/act_129_information/total_resource_cost_test.aspx.

DSM Resources – TRM 2026 Update at Docket No. M-2023-3044491, and *Release of the Act 129 [Phase IV SWE] Energy Efficiency Baseline Studies*, Docket No. M-2023-3044490 (potential Phase V docket).

2. That the Secretary shall deposit a notice of this Tentative Order with the Legislative Reference Bureau for publication in the *Pennsylvania Bulletin*.

3. That interested parties shall have twenty (20) days from the date notice of this Tentative Order is published in the *Pennsylvania Bulletin* to file comments and thirty (30) days from the date notice of this Tentative Order is published in the *Pennsylvania Bulletin* to file reply comments at Docket No. M-2024-3048998.

4. That comments and reply comments may be filed either electronically or in hard copy with the Pennsylvania Public Utility Commission, Attn: Secretary Rosemary Chiavetta, Commonwealth Keystone Building, Second Floor, 400 North Street, Harrisburg, Pennsylvania 17120.[62]

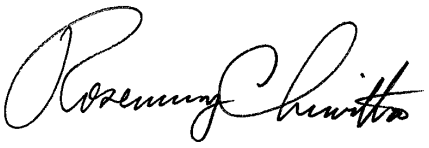
5. That this Tentative Order and all filed comments and reply comments related to this Tentative Order be published on the Commission's website at http://www.puc.pa.gov/filing_resources/issues_laws_regulations/act_129_information/total_resource_cost_test.aspx.

6. That a Word-formatted copy of all comments and reply comments shall be electronically mailed to David Edinger at dedinger@pa.gov and to Tiffany Tran at tiftran@pa.gov. Attachments may not exceed three (3) megabytes.

[62] *See* http://www.puc.pa.gov/filing_resources.aspx for filing instructions.

7. That the contact person for technical issues related to this Tentative Order and the proposed 2026 Total Resource Cost Test for a potential Phase V of Act 129 is David Edinger, Bureau of Technical Utility Services, 717-787-3512 or dedinger@pa.gov. The contact person for legal and process issues related to this Tentative Order and the proposed 2026 Total Resource Cost Test for a potential Phase V of Act 129 is Tiffany Tran, Law Bureau, 717-772-7777 or tiftran@pa.gov.

BY THE COMMISSION



Rosemary Chiavetta
Secretary

(SEAL)

ORDER ADOPTED: August 1, 2024

ORDER ENTERED: August 1, 2024

Appendix A

The definitions and formulae to be used for the
Pennsylvania-specific 2026 TRC Test, consistent with Act 129 of 2008,
are set forth in this Appendix A.

TRC Formulae, Calculations, and their Definitions

Table 5 below lists electricity supply avoided costs, other TRC benefits, TRC costs, and other assumptions, and it summarizes TRC guidance for each TRC element. Formulae are detailed for each TRC element in the algorithms section. These are split into primary and supporting algorithms, where the supporting algorithms assist with the calculation of input values required for implementing the primary algorithms.

Table 5: Definition of Terms

TRC Category	TRC Element	Units	Symbol	Guidance Summary
Avoided Costs of Supplying Electricity	Line losses	Unitless	LLF	Table 1-5 of the proposed 2026 TRM Volume 1 provides line loss factors by EDC/Rate District and customer class.
	Electric energy (quantity)	kWh/year	E	Gross verified annual kWh.
	Electric energy (price)	$/kWh (nominal)	MCE	Twenty-year forecast divided into years 1-4, 5-10, 11-20. *See* supporting MS-Excel spreadsheet calculation model. Inclusive of 4 years of energy DRIPE.
	Compliance with RPS/AEPS	$/kWh (nominal)	$AEPS$	Electricity cost adder to reflect avoided compliance costs.
	Reduction in Arrearages and Collection Costs	$/kWh (nominal)	$RACC$	Electricity cost adder for low-income customers to reflect avoided arrearages and collection costs
	G, T, D capacity (quantity)	kW/year	D	Gross or net verified peak demand savings (kW). Calculated separately for summer and winter.
	Generation capacity (price)	$/kW-year	MCD	Actual and escalated PJM BRA clearing prices. Apply a derate factor for dispatchable DR programs. Inclusive of 4 years of capacity DRIPE. Separate values for summer and winter.
	Transmission capacity (price)			*See* supporting MS-Excel spreadsheet calculation model. Apply a derate factor for DR programs. Separate values for summer and winter.
	Distribution capacity (price)			*See* supporting MS-Excel spreadsheet calculation model. Apply a derate factor for DR programs. Does not apply to Large C&I. Separate values for summer and winter.
Other TRC Benefits	Water impacts (quantity)	Gallons	$H2O$	Savings are positive. Increased water consumption is negative.

TRC Category	TRC Element	Units	Symbol	Guidance Summary
	Marginal cost of water (price)	$/gallon (nominal)	$MCH2O$	$0.011 / gal (2026 dollars), adjusted for inflation over forecast horizon.
	Fossil Fuel Impacts (quantity)	MMBTU/year	F_{impact}	Direct changes in fuel usage. Savings are positive, increases in fuel usage are negative.
	Marginal cost of fuel (price)	$/MMBTU (nominal)	MCF	Twenty-year forecast divided into years 1-4, 5-10, 11-20. *See* supporting MS-Excel spreadsheet calculation model. Apply natural gas loss factor.
	Interactive Fuel Effects (Waste Heat)	MMBTU/year	F_{waste}	Secondary fuel impacts due to reduced waste heat from efficient lighting. Increased fuel usage recorded as a positive value.
	Societal Benefits			Do not include.
	O&M Benefits	$ or $/year (nominal)	$O\&M$	Incremental relative to baseline equipment. Note some measures (CHP) can produce negative O&M benefits.
TRC Costs	Program Admin & Overhead	$(nominal)	PA	Allocated to specific programs where applicable. Common costs can be allocated to programs or incorporated at the portfolio level.
	Incremental costs	$(nominal)	IMC	Maximum of IMC (relative to baseline) and incentive. IMC for DR programs assumed to be 75% of incentives.
	Incentives from Outside Act 129	$(nominal)	OI	Incentives from outside of Act 129 considered as a reduction in costs, not as a benefit of the program.
Other Assumptions	Real discount rate	Unitless	r	3%
	Nominal discount rate	Unitless	d	5%
	Inflation rate	Unitless	inf	2%
	Escalation rate	Unitless		Growth in real dollars. Based on CAGR of BLS GTD sector price index (NAICS 221110).
	Electric Line Loss Factor	Unitless	LLF_{elec}	Varies by EDC/Rate District and sector. *See* Table 1-5 of the proposed 2026 TRM Volume 1
	Gas Loss Factor	Unitless	LLF_{gas}	1.04167
	Water Loss Factor	Unitless	LLF_{H2O}	1.32
	Measure life	Years	N	Maximum 15 years. For DR programs, lifetime of hardware. One-year lifetime for behavioral DR and load curtailment.
	Free-ridership	Unitless	FR	Determined by evaluation contractor.

TRC Category	TRC Element	Units	Symbol	Guidance Summary
	Spillover	Unitless	SO	Determined by evaluation contractor.
	Market Effects (ME)	Unitless	ME	Determined by evaluation contractor.
	Low-Income Indicator	Unitless	LI	Indicator for low-income programs. Used to include the added value of reduction in arrearages and collection costs only for low-income program savings.
Calculated Inputs	NTG Ratio	Unitless	NTGR	*See* Table 7.
	Gross TRC benefits	$	$TRC\ Benefits_{gross}$	*See* Table 7.
	Gross TRC costs		$TRC\ Costs_{gross}$	*See* Table 7.
	Net TRC benefits		$TRC\ Benefits_{net}$	*See* Table 7.
	Net TRC costs		$TRC\ Costs_{net}$	*See* Table 7.
	Electric energy benefits		EB_t	*See* Table 7.
	Capacity benefits		DB_t	*See* Table 7.
	Fuel benefits		FB_t	*See* Table 7.
	Water benefits		$H2OB_t$	*See* Table 7.

Algorithms

TRC ratios, net benefits, and levelized costs are detailed in Table 6. While some of the inputs are available in Table 5, other inputs must be calculated. These input formulae are provided in Table 7.

Table 6: Primary Algorithms

$TRC\ Ratio_{gross}$	$= \frac{TRC\ Benefits_{gross}}{TRC\ Costs_{gross}}$
$TRC\ Ratio_{net}$	$= \frac{TRC\ Benefits_{net}}{TRC\ Costs_{net}}$
$PV\ Net\ Benefits_{gross}$	$= TRC\ Benefits_{gross} - TRC\ Costs_{gross}$
$PV\ Net\ Benefits_{net}$	$= TRC\ Benefits_{net} - TRC\ Costs_{net}$
$Levelized\ Cost\ per\ kWh_{gross}$	$= \frac{TRC\ Costs_{gross}}{\left[\sum_{t=1}^{N} \frac{\sum_{t=1}^{n} EB_t}{(1+d)^{t-1}}\right]}$

$Levelized\ Cost\ per\ kW_{gross}$	$= \frac{TRC\ Costs_{gross}}{\left[\sum_{t=1}^{N} \frac{\sum_{t=1}^{n} DB_t}{(1+d)^{t-1}}\right]}$
$Levelized\ Cost\ per\ kWh_{net}$	$= \frac{TRC\ Costs_{net}}{\left[\sum_{t=1}^{N} \frac{\sum_{t=1}^{n} EB_t * NTGR}{(1+d)^{t-1}}\right]}$
$Levelized\ Cost\ per\ kW_{net}$	$= \frac{TRC\ Costs_{net}}{\left[\sum_{t=1}^{N} \frac{\sum_{t=1}^{n} DB_t * NTGR}{(1+d)^{t-1}}\right]}$

Table 7: Supporting Algorithms

$NTGR$	$= 1 - FR + SO + ME$
$TRC\ Benefits_{gross}$	$= \sum_{t=1}^{N} \frac{EB_t + FB_t + H2OB_t + O\&M_t}{(1+d)^{t-1}}$
$TRC\ Costs_{gross}$	$= \sum_{t=1}^{N} \frac{PA_t + IMC_t - OI_t}{(1+d)^{t-1}}$
$TRC\ Benefits_{net}$	$= NTGR * (TRC\ Benefits_{gross})$
$TRC\ Costs_{net}$	$= \sum_{t=1}^{N} \frac{PA_t + (IMC_t - OI_t) * (NTGR)}{(1+d)^{t-1}}$
EB_t (Electric energy benefits in year *t* summed across *p* costing periods)	$= E_{t,p} * LLF_{elec} * (MCE_{t,p} + AEPS + (RACC * LI))$
DB_t (Capacity benefits in year *t*)	$= D_t * LLF_{elec} * MCD_t$
FB_t (Fuel benefits in year *t*)	$= \left(F_{impact_t} - F_{waste_t}\right) * LLF_{gas} * MCF_t$
$H2OB_t$ (Water benefits in year *t*)	$= H2O_t * LLF_{H2O} * MCH2O_t$

Appendix B

List of Acronyms and Definitions

ACC: Avoided Costs Calculator MS-Excel spreadsheet calculation model

AEC: Alternative Energy Credit

AEO: Annual Energy Outlook

AEPS: Alternative Energy Portfolio Standards

B/C: Benefit/Cost

BLS: Bureau of Labor Statistics

BRA: Base Residual Auction

BTU: British Thermal Unit

CAGR: Compound Annual Growth Rate

California Manual: 2002 California Standard Practice Manual

CHP: Combined Heat and Power

C&I: Commercial and Industrial

CSP: Conservation Service Provider

DLC: Direct Load Control

DR: Demand Response

DRIPE: Demand Reduction Induced Price Effects

DSM: Demand Side Management

EDC: Electric Distribution Company

EE: Energy Efficiency

EE&C: Energy Efficiency and Conservation

EIA: Energy Information Administration

EPA: Environmental Protection Agency

EUL: Expected Useful Life

FR: Free-Ridership, Free Rider

GTD: Generation, Transmission, and Distribution

IE: Low-income

IMC: Incremental Measure Cost

LED: Light Emitting Diode

LMP: Locational Marginal Price

ME: Market Effects

NAICS: North American Industry Classification System

NEI: Non-Energy Impact

NGDC: Natural Gas Distribution Company

NPV: Net Present Value

NREL: National Renewable Energy Laboratory

NTG: Net-to-Gross

NYMEX: New York Mercantile Exchange

O&M: Operation and Maintenance

Phase I: Act 129 requirements from June 1, 2009, through May 31, 2013

Phase II: Act 129 requirements from June 1, 2013, through May 31, 2016

Phase III: Act 129 requirements from June 1, 2016, through May 31, 2021

Phase IV: Act 129 requirements from June 1, 2021, through May 31, 2026

Phase V: Potential Act 129 requirements beginning June 1, 2026

PJM: The regional transmission organization (RTO) covering, *inter alia*, Pennsylvania, New Jersey, and Maryland

PUC: Public Utility Commission

PVNB: Present value of net benefits

RGGI: Regional Greenhouse Gas Initiative

RPS: Renewable Portfolio Standard

RTO: Regional Transmission Organization

RUL: Remaining Useful Life

SO: Spillover

SWE: Statewide Evaluator

T&D: Transmission and Distribution

TRC: Total Resource Cost

TRM: Technical Reference Manual

US: United States

WACC: Weighted Average Cost of Capital

Appendix C

Summary of Proposed Continuations/Changes/Clarifications/New Items

Sub-section	Subsection Name	Summary of Proposed Continuation/Change/Clarification/New Item
A - General Issues		
1	TRC Test Assumptions in Other Matters	TRC Test assumptions are used exclusively for Act 129 related matters. TRC Test assumptions are not presumed binding in other regulatory matters such as prudence, cost-of-service, etc.
2	Frequency of Review of TRC Test	TRC Test applies for entirety of Phase V. Commission reserves right to update or modify during Phase V. Commission continues to direct the Phase V SWE to review avoided cost forecast annually.
3	Level at Which to Calculate and Report TRC Test Results	Continue cost-effectiveness reporting at plan level, not program level. EDCs are required to estimate and report program level TRC ratios in each annual report.
4	Discount Rate	Continue to use discount rate of 5% nominal (3% in real terms).
5	Effective Useful Life	Continue using statutorily mandated 15-year maximum even if the mechanical life of the technology exceeds that. Continue to develop dual baselines for technologies where appropriate.
6	Low-Income Programs	Continue reporting low-income programs as previously done.
7	Basis of TRC Test Impacts	Continue reporting net savings and describe how calculated. Continue reporting retrospective TRC test ratios based on actual savings and costs.
8	Measures Supported by Act 129 Programs and Other Funding Streams	Continue tracking non-Act 129 incentives that are reasonably quantifiable.
B - Avoided Costs of Supplying Electricity		
n/a		Use Avoided Cost Calculator (ACC) to aid in implementation of proposed methodology.
1	Vintage of Avoided Costs Forecasts	Continue to develop single forecast of avoided costs for use in Phase V EE&C plans and cost-effectiveness reporting in annual reports.
2	Avoided Cost of Electric Energy	Continue forecasting avoided energy costs in a seasonal- and time-differentiated format. Continue to use 20-year period but propose that period is broken into three segments.

3	Nominal vs. Real Dollars	Continue to develop avoided costs forecasts in nominal dollars. Nominal discount rate to be used to calculate NPV.
4	Line Losses	Align assumptions with proposed 2026 TRM values.
5	Escalation Rate	Use BLS Electric Power GTD sector price index, compounded by average growth rate of average annual values of prior 5 years.
6	Allocation of Avoided Capacity Costs Between Summer and Winter Peak	Instead of allocating 100% of avoided capacity to summer, the Commission proposes to allocate avoided capacity on Phase V 50/50 between summer and winter.
7	Avoided Cost of Generation Capacity	Use actual values from Base Residual Auctions (BRA) for the years that the auctions have been completed. For all future years, use a simple average of the five most recently completed BRAs escalated using the escalation rate. This is a change from the three-year average used in the prior TRC Test Orders.
8	Avoided Cost of Transmission and Distribution Capacity	Clarify avoided costs in distribution should not be applied to EE measures for Large C&I customers taking service at primary voltage. The Commission proposes using the avoided T&D values calculated by the Phase IV SWE's T&D study.
9	Compliance with AEPS	Propose $6.88 cents per MWh for first year of Phase V and increase yearly by BLS escalation factor and inflation.
10	Price Suppression Effects	Commission proposes to include the effects of Price Suppression effects for both energy and capacity in TRC calculations in Phase V.
11	End Use Adjustments	Continue use of end-use profiles, when available.
12	Reductions in Arrearages and Collection Costs	The Commission proposes to include the value of reductions in arrearages and collection costs in the avoided costs of supplying electricity for low-income programs only.
C - Other TRC Benefits		
1	Quantifying Water Impacts	Continue to account for water impacts from EE&C measures where the impacts are reasonably quantifiable.
2	Monetizing Water Impacts	Continue to monetize water impacts from Phase V EE&C measures.

3	Quantifying Fossil Fuel Impacts	The Commissions proposes continued use of the TRM to inform fossil fuel savings by EE&C measure. Where the TRM does not provide guidance on fossil fuel savings, EDCs and their evaluation contractors should use professional judgement when estimating impacts.
4	Interactive Effects	Propose use of new default assumptions developed by the SWE for both residential and non-residential lighting measures.
5	Monetizing Fossil Fuel Impacts	Continue using natural gas values in Section B.2 (Avoided Cost of Electric Energy), collapsed into a single value. Continue to use 20-year period but propose that period is broken into three segments. Propose that EDCs use natural gas loss factor of 4%.
6	O & M Benefits	Continue to include avoided replacement costs and labor in TRC benefits.
7	Societal Benefits	Continue to exclude societal benefits from TRC.
D - TRC Costs		
1	Program Administration and Overhead	Continue to treat all program administration and overhead expenses as a TRC cost. Continue to exclude kit and direct install costs from administrative costs and classify as incentives and IMC.
2	Incremental Costs	Continue to use SWE-developed incremental cost database as an optional resource for EDCs and evaluation contractors when actual project costs are not available or appropriate.
3	Act 129 Incentives	Continue to treat kits and directly installed equipment costs as an incentive to the customer.
4	Incentives from Outside of Act 129	Continue to treat incentives from outside Act 129 as reduction in costs, not as benefit to program.
E - Fuel Switching		
1	ENERGY STAR Requirement	EDCs must propose and justify the minimum efficiency standard for any fuel switching measure they wish to include in a Phase V EE&C plan given the uncertainty in ENERGY STAR specifications for fossil fuel equipment.
2	Increased Fuel Consumption	Continue to treat increased fuel consumption as a negative TRC benefit.
F - Net-to-Gross (NTG) Issues		
1	Use of NTG Research	Continue NTG research, use results for program planning purposes, and report TRC Test ratios based on gross and net savings.

2	Treatment of Incentives to Free-Riders	Continue excluding free-rider incentives as a TRC cost when considering the net TRC perspective.
3	Treatment of NTG for TRC Benefits	Continue to apply NTG ratios to *all* benefits in 2026 TRC Test.
G - Demand Response (DR)		
1	Testing if DR is Included in Phase V	DR has not yet been determined, but proposed guidance to calculate TRC benefits and costs for DR is included. Stakeholders should comment on proposed cost-effective methodology for DR.
2	Calculation of DR Benefits	Propose that EDCs average gross verified demand reductions over each hour of performance and apply line loss adjustment factor. Propose separate calculations for summer and winter peak demand. Propose that EDCs use a derate factor based on the frequency of dispatch to monetize DR impacts.
3	Participant Cost Assumption	Continue to use 75% participant cost assumption.
4	Measure Life	Continue to apply measure life for DR equipment capped at the remaining number of years in the Phase. Clarify that DR equipment purchased in prior phase should not be counted in Phase V.