# DCSEU FY2020 Performance Benchmarks Report

FINAL

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SUBMITTED TO:
District of Columbia Department of Energy and Environment

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# Glossary

| Term | Definition |
|---|---|
| Gross electric savings (MWh) | The electric savings that the customer is expected to receive at the meter. |
| Modified gross electric savings (MWh) | The modified gross generator-level savings are calculated by increasing all gross meter-level electric savings to adjust for line losses. Modified gross savings are used to assess progress towards the performance benchmarks. |
| Gross gas savings (Therms) | Gross gas savings includes both cross-fuel and like-fuel interactive effects. Interactive effects reflect the increase or decrease in energy usage due to the installation of an energy-efficiency measure. A common example is an LED bulb installed in conditioned space that produces less waste heat than an incandescent bulb. This reduces the energy consumption from cooling equipment (a like-fuel interactive effect) but increases consumption from gas-fired heating equipment (a cross-fuel interactive effect). |
| Modified gross gas savings (Therms) | The modified gross gas savings excludes cross-fuel interactive effects. Modified gross savings are used to assess progress towards the performance benchmarks. |
| Energy savings (MMBtu) | Cumulative energy savings reflecting both electricity savings and gas savings. |
| Peak demand savings | Demand savings that occur during the summer peak demand period of 2:00 PM and 6:00 PM from June through September. |
| First-year savings | Estimated energy savings achieved during the first year after the installation of energy-efficient equipment or other measure. |
| Lifetime savings | Estimated energy savings achieved over the course of the full lifetime of the installed energy-efficient equipment or other measure. |
| Tracked savings | Savings values reported by DCSEU from their program tracking database. |
| Evaluated or verified savings | Tracked savings values from DCSEU that have been verified by the NMR team. |
| Realization rate | The realization rate equals the ratio of evaluated savings to tracked savings. |
| Impact evaluation | Component of the evaluation that verifies the tracked savings reported by DCSEU. |
| Free-ridership | The portion of program savings that would have occurred in the absence of the program. |
| Participant spillover | Participant spillover can manifest in participants who take actions beyond the tracked program savings and without financial assistance from the program. |
| Net-to-gross ratio | NTG ratio = 1 – Free-ridership % + Participant Spillover % |
| Avoided costs | System costs avoided due to reductions in energy and capacity requirements. |
| Average emissions rate | Average greenhouse gas emissions rate (CO2 per MWh) among all electricity production. |
| Marginal emissions rate | Greenhouse gas emissions rate (CO2 per MWh) for the marginal electric generation unit, which is the final unit committed to match supply and demand. |

# Key Highlights

This report presents the results of an independent assessment of the performance of the District of Columbia Sustainable Energy Utility (DCSEU) energy programs against established benchmarks for Fiscal Year 2020 (FY2020). In FY2020, the DCSEU achieved the minimum target for all five annual benchmarks and the maximum target for four annual benchmarks. DCSEU also achieved the minimum target for the five-year cumulative leveraged funds benchmark (Table 1).

**Table 1: FY2020 Performance Benchmarks Summary**

| Benchmark Type | Benchmark | | Minimum Target | Maximum Target |
|---|---|---|---|---|
| **Annual Cumulative Target** | 1. Reduce Electricity Consumption | | ✓ | ✓ |
| | 2. Reduce Natural Gas Consumption | | ✓ | ✓ |
| | 3. Increase Renewable Energy Generating Capacity | | ✓ | ✓ |
| **Annual Target** | 4. Improve Energy-efficiency of Low-income Properties | a. Expenditures | ✓ | *n/a* |
| | | b. Savings | ✓ | X |
| | 5. Increase Green-collar Jobs | | ✓ | ✓ |
| **Five-year Cumulative Target** | 6. Leverage External Funds | | ✓ | 61% |

While the cost of first-year energy savings for DCSEU programs increased in FY2020, the cost has still declined by up to 10% since FY2017. In addition, the cost of first-year energy savings for the DCSEU in FY2020 is less than that of nearby Baltimore Gas & Electric, PECO Energy and Philadelphia Gas Works. This indicates that the DCSEU is delivering programs at a cost that is lower than neighboring utilities, though there may be other factors in these jurisdictions that affect both costs and savings. Lastly, cost-effectiveness testing found that the DCSEU portfolio was cost-effective as a whole.

## Executive Summary

NMR Group, Inc., EcoMetric Consulting, Demand Side Analytics, BluePath Labs, and Setty – collectively referred to as *the NMR team* – were contracted by the District of Columbia Department of Energy and Environment (DOEE) to evaluate the energy-efficiency and renewable energy programs implemented by the District of Columbia Sustainable Energy Utility (DCSEU). This report presents the results of our independent assessment of the DCSEU's Fiscal Year 2020 (FY2020) programs, including performance against established benchmarks. The DCSEU FY2020 programs began on October 1, 2019, and ended on September 30, 2020.

Unlike the previous DCSEU contract, which involved a series of one-year renewals, the current DCSEU contract has a five-year base period, with an option to extend for an additional five years. The DCSEU officially began working under the current multiyear contract in April 2017. The DCSEU's performance against established benchmark targets is based on all results attained against performance benchmarks under Option Year 6 of Contract No. DDOE-2010-SEU-001, combined with results achieved under the current multiyear contract.

Due to the uncertainty surrounding the COVID-19 pandemic's impact on DC energy usage and savings, the DOEE elected to maintain the contracted FY2020 saving goals for DCSEU. While several DCSEU performance benchmarks are measured by first-year energy savings, a single year's impact is relatively small compared to the lifetime energy savings for equipment that participants may install for many years. Therefore, our evaluation approach for FY2020 estimates energy savings assuming a typical year under normal operating conditions.

For more details on our evaluation methodology and findings for each of the DCSEU residential and commercial programs selected for evaluation in FY2020, please review the *Evaluation of DC Sustainable Energy Utility FY2020 Programs* report. In addition, Appendix A provides descriptions for each of the program tracks offered by the DCSEU in FY2020.

## PERFORMANCE BENCHMARK AND TRACKING GOALS ASSESSMENT

The DCSEU contract specifies performance benchmarks related to energy savings, renewable energy generation capacity, expenditures, leveraging funds, and job creation that the DCSEU is responsible for achieving, as outlined in Table 2. Three of the benchmarks provide performance incentives associated with meeting or exceeding the minimum performance targets on an annual basis and a cumulative basis. The leveraging external funds benchmark provides an incentive at the end of the five-year contract period. Additionally, the low-income and green jobs benchmarks only provide incentives for meeting or exceeding the targets on an annual basis. Likewise, penalties will be assessed on an annual basis if the DCSEU fails to achieve the minimum targets for the low-income and green jobs benchmarks, while penalties for the electric, gas, renewable energy, and leveraging funds benchmarks will be assessed at the end of the five-year contract period if the DCSEU fails to achieve the cumulative minimum targets.

In FY2020, the DCSEU achieved the minimum target for each of the first five benchmarks (Table 2). In addition, the DCSEU achieved the maximum target for four benchmarks, only falling short of the low-income savings target. After the fourth year of the contract, the DCSEU has already exceeded the minimum target for the five-year external funds benchmark, yet remains behind pace on the maximum target (at 61%), which should be about 80% assuming equal 20% progress each year.

**Table 2: FY2020 Performance Benchmarks Summary**

| Benchmark Type | Benchmark | | Verified Results | Minimum Benchmark | | Maximum Benchmark | |
|---|---|---|---|---|---|---|---|
| | | | | Target | Achieved | Target | Achieved |
| **Annual Cumulative Target** | 1. Reduce Electricity Consumption (MWh) | | 488,103 | 345,891 | ✓ | 403,539 | ✓ |
| | 2. Reduce Natural Gas Consumption (Therms) | | 9,016,963 | 5,797,438 | ✓ | 6,820,516 | ✓ |
| | 3. Increase Renewable Energy Generating Capacity (kW) | | 12,561 | 3,400 | ✓ | 4,000 | ✓ |
| **Annual Target** | 4. Improve Energy-efficiency of Low-income Properties | a. Expenditures | $4,776,441 | $3,818,320 | ✓ | *n/a* | *n/a* |
| | | b. Savings (MMbtu) | 37,995 | 23,278 | ✓ | 46,556 | X |
| | 5. Increase Green-collar Jobs | | 88.0 | 66 | ✓ | 88 | ✓ |
| **Five-year Cumulative Target** | 6. Leverage External Funds | | $3.0M | $2.5M | ✓ | $5.0M | 61% |

Figure 1 illustrates the percentage progress towards each of the five annual benchmarks. The DCSEU exceeded all of the minimum targets by a substantial degree – ranging from 125% for low-income spend to 369% for renewable energy capacity. In addition, the DCSEU exceeded the maximum target for each of the first three benchmarks by a substantial degree – with achievements of 121% for electric savings, 132% for gas savings, and 314% for renewable energy capacity. The DCSEU also achieved the maximum green jobs benchmark (100%) for the first time. However, the DCSEU fell short of the maximum target for the low-income savings benchmark (82%).

**Figure 1: FY2020 Achievement of Annual Performance Benchmarks**

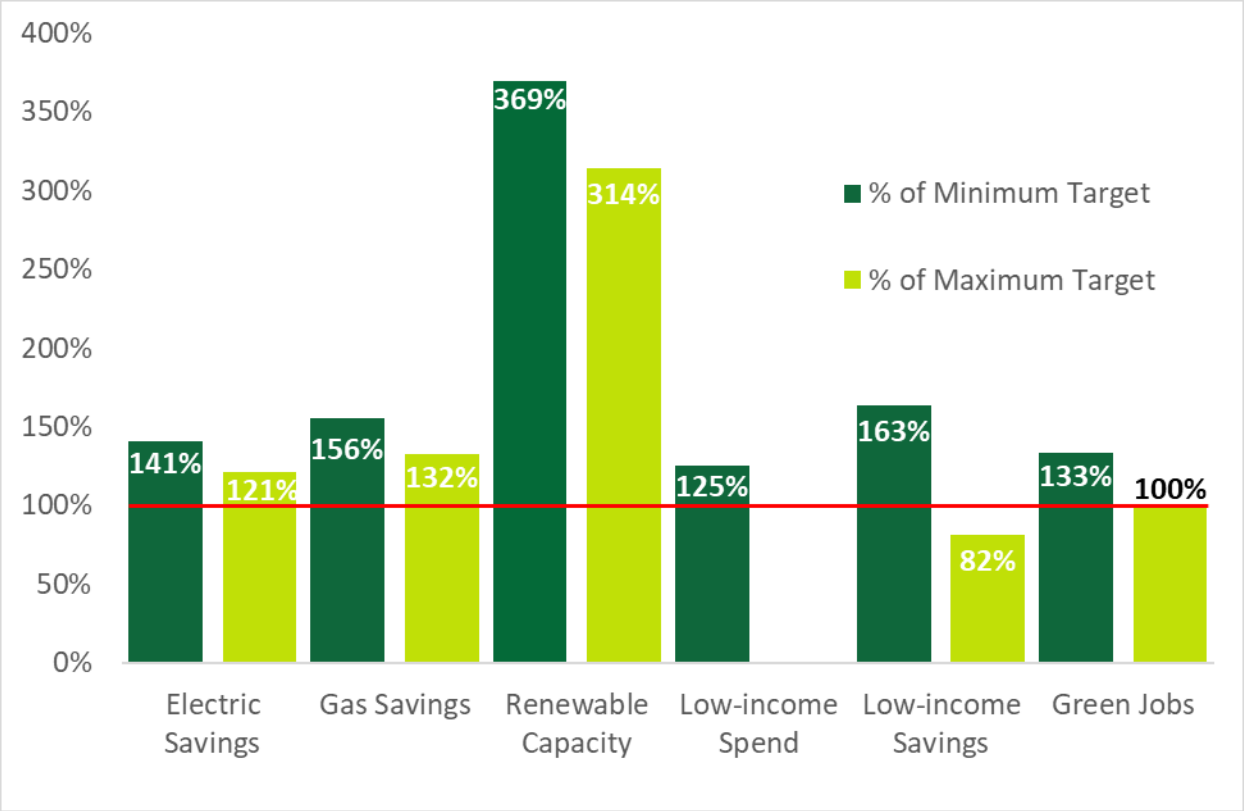


Figure 2 displays progress towards the five-year cumulative performance benchmarks. A red line shown at the 80% level illustrates the fourth-year goal, assuming constant linear progress.[1] The DCSEU has already achieved the minimum target for all four cumulative benchmarks and the maximum target for renewable generation capacity. The DCSEU is ahead of pace on the electric savings (85%) and gas savings (88%) maximum benchmarks, yet remains behind pace on the leveraging external funds benchmark (61%).

**Figure 2: Progress towards Five-Year Cumulative Performance Benchmarks**

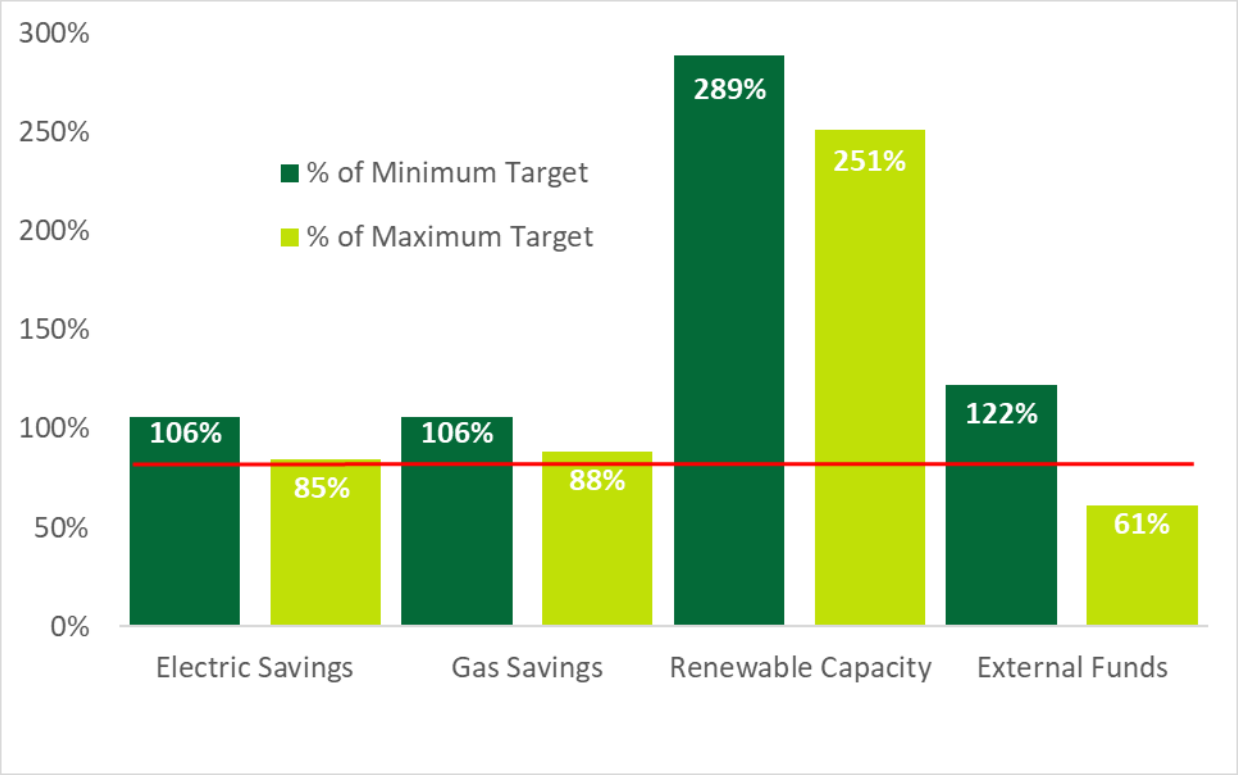



Table 3 displays the DCSEU's progress towards its two tracking goals. The DCSEU achieved 15.3 MW of summer peak demand savings, which represents nearly 1% of District peak demand usage in 2020. In addition, DCSEU completed 165 projects with Large Energy Users in FY2020.

**Table 3: FY2020 Progress Towards Tracking Goals**

| Tracking Goal | Evaluated Number |
|---|---|
| Reduce Growth in Peak Demand | 15.3 MW |
| Reduce Growth in Energy Demand of Largest Energy Users | 165 projects |

[1] The electricity savings and gas savings benchmarks generally have larger incremental annual savings goals during the latter years of the five-year contract.

The CO2 emissions reductions are calculated using two methodologies – one based on average greenhouse gas (GHG) emissions rates and one based on marginal emissions rates. Since FY2017, the DCSEU programs are estimated to have saved a combined 203,919 metric tons of annual CO2 emissions based on average GHG emissions rates and 341,640 metric tons based on marginal emission rates. The FY2020 avoided emissions of 44,602 metric tons based on average emissions rates and 74,772 metric tons based on marginal emissions rates represent 0.6% and 1.0%, respectively, of the estimated District-wide emissions of 7,552,734 metric tons in 2016.

We estimate the DCSEU programs yielded about 594,280 MMBtu in annual energy (electric plus gas) savings in FY2020 and 2,567,101 MMBtu since FY2017. In addition, since FY2017, the DCSEU programs are projected to yield about 5,520,212 MWh in lifetime electricity savings and 82,189,859 therms in lifetime natural gas savings over the full life of the measures.

## Cost-effectiveness Assessment

The NMR team calculated the costs of saved energy and conducted cost-effectiveness testing for the DCSEU's FY2020 programs.

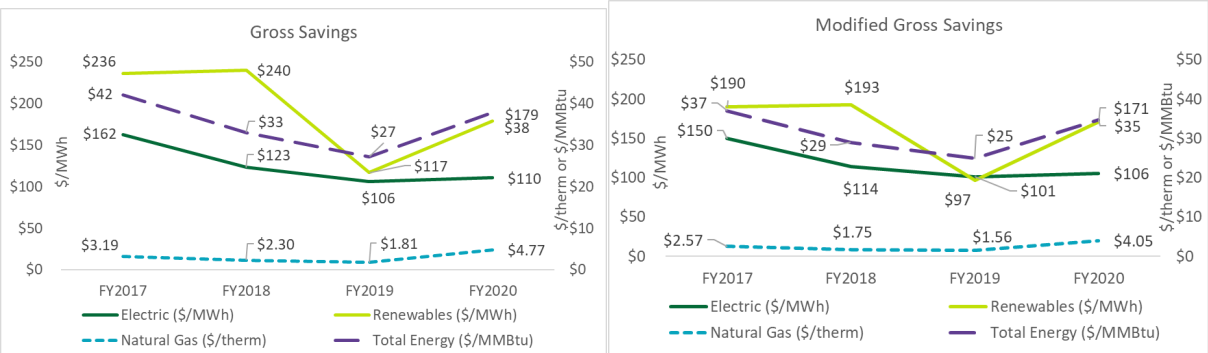
### Costs of Saved Energy

To inform future planning of budgets and savings goals, we calculated the DCSEU's cost of acquiring the verified energy savings. The cost of FY2020 gross and modified gross first-year electricity savings,[2] excluding the DCSEU's renewables programs, was $110 per megawatt hour ($110/MWh) and $106/MWh, respectively (Figure 3). In addition, we calculated that the DCSEU's cost for gross and modified gross electricity savings from renewables programs was $179/MWh and $171/MWh, respectively. For natural gas savings, the DCSEU's cost of gross and modified gross savings[3] was $4.77/therm and $4.05/therm, respectively.

While the costs of saved energy increased from FY2019 to FY2020, the portfolio-wide gross energy costs still declined by 10% since FY2017. In addition, the cost of gross electric savings declined by 32% for energy efficiency and by 24% for renewables since FY2017. In contrast, the cost of gas savings have risen by 49% since FY2017 due largely to the launch of the Income Qualified Gas Efficiency Fund program in FY2020. The costs of low-income energy savings declined substantially in FY2018 but have increased since then, with the costs rising by up to 19% since FY2017.

[2] Modified gross electricity savings exceed gross electricity savings due to adjustments for line losses (see Section 1.1.1 for more detail).
[3] Modified gross natural gas savings exceed gross natural gas savings due to the exclusion of cross-fuel interactive effects (see Section 1.1.2 for more detail).

**Figure 3: DCSEU Trends for Costs of First-year Energy Savings**




At $110/MWh, the DCSEU's cost for gross electricity savings in FY2020 is less than the cost of Baltimore Gas & Electric ($229/MWh) for 2019 and PECO Energy ($144/MWh) for June 2019 to May 2020. DCSEU's cost of saved energy has been lower than both PECO and BG&E each year since FY2017. In addition, the DCSEU's FY2020 cost for gross gas savings ($4.77/therm) is less than the cost for Philadelphia Gas Works ($5.96/therm) from September 2019 to August 2020. While these comparisons are useful, it is important to understand that these jurisdictions have different markets, savings goals, regulatory requirements, cost-effectiveness tests, program maturity, and delivery systems, which may affect both costs and savings.

### Cost-effectiveness Testing

The NMR team conducted a benefit-cost analysis of the DCSEU's FY2020 offerings at the program and portfolio level using a Societal Cost Test (SCT). The SCT examines cost-effectiveness from the perspective of the utility, program participants, and non-participants. The NMR team primarily took model inputs from DCSEU tracking data, which were then adjusted using the results of the FY2020 evaluation. The mechanics of the DCSEU tracking database are well-organized to facilitate benefit cost modeling, and their application was well-documented. Therefore, the NMR team considered three scenarios for the FY2020 benefit-cost analysis:

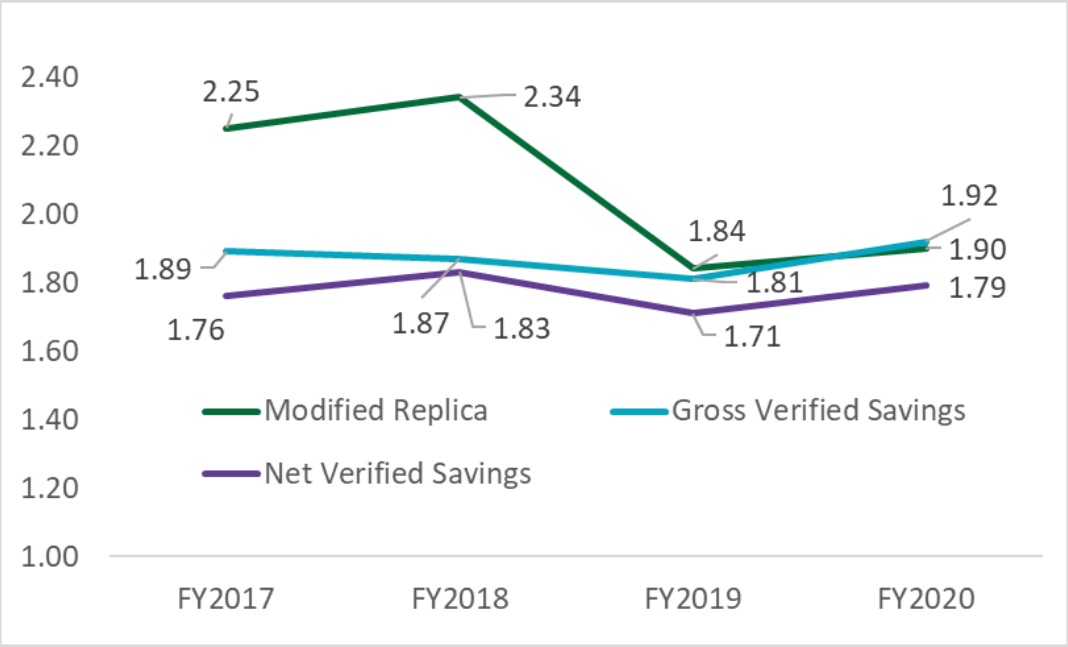
- **Modified Replica**: This scenario replicated the DCSEU cost-effectiveness calculations to ensure that our model returned comparable results to the DCSEU model. Once we confirmed that our model produced similar results with the same data, we implemented some corrections to inputs and formulas.
- **Gross Verified Savings**: This scenario incorporated the realization rates as determined by the impact evaluation.
- **Net Verified Savings**: This scenario adjusted the tracked savings by both the realization rate and the net-to-gross ratio. Incremental measure costs are discounted by the applicable free-ridership rate.

Figure 4 displays the DCSEU portfolio-level cost-effectiveness ratios under each scenario for FY2017 through FY2020. The NMR team found that the DCSEU program portfolio, when taken as a whole, was cost-effective under each of the three scenarios in FY2020. To interpret these results, from a SCT perspective, for every $1.00 spent, the District realized about $1.90 return on

its investment in the Modified Replica Scenario, $1.92 return in the Gross Verified Scenario, and $1.79 in the Net Verified Scenario.

Since FY2017, the benefit/cost ratios have remained fairly stable, with the exception of the modified replica scenario, which declined in FY2019 after DCSEU incorporated updated avoided cost assumptions.

**Figure 4: DCSEU Societal Cost Test Ratio Trends**




In Section 2.2.3, we offer recommendations to improve the accuracy of future cost-effectiveness testing.

## CONCLUSIONS

Our assessment of DCSEU's progress towards its FY2020 benchmarks found that the DCSEU succeeded in meeting the minimum targets for all five annual benchmarks. In addition, the DCSEU achieved maximum targets for four annual benchmarks, including the green jobs benchmark for the first time. However, the DCSEU missed the maximum target for the low-income savings annual benchmark, which has not yet been achieved during the first four years of the current five-year contract. Nonetheless, these achievements are notable in light of the COVID-19 pandemic that disrupted the latter half of FY2020.

DCSEU obtained a substantial amount of outside funding in FY2020, allowing it to meet the minimum target for the five-year cumulative leveraged funds benchmark. However, DCSEU still remains behind pace on the maximum target, assuming equal progress is intended each year. Because the full array of benchmarks reflects diverse and sometimes competing objectives, achieving the benchmarks requires constant monitoring on the part of the DCSEU.

DCSEU's cost of energy savings increased in FY2020, partially due to the impacts of COVID-19. However the cost of electricity savings in FY2020 remained lower than in FY2017, though the cost of gas savings are higher than FY2017 largely due to the launch of the Income Qualified Gas Efficiency Fund program in FY2020. In addition, the cost of energy savings for the DCSEU continues to be lower than that of neighboring utilities.

The cost-effectiveness testing found that the DCSEU portfolio was cost-effective as a whole, with benefit-cost ratios in line with previous years.

For detailed recommendations regarding specific DCSEU programs, please see Appendix B.

# Section 1 Assessment of Performance Benchmarks and Tracking Goals

In this section, we assess the District of Columbia Sustainable Energy Utility's (DCSEU's) Fiscal Year 2020 (FY2020) progress towards its performance benchmarks and tracking goals. We also provide information regarding cumulative energy savings, lifetime energy savings and reductions in greenhouse gas (GHG) emissions.

## 1.1 Performance Benchmarks

In this section, we assess the DCSEU's FY2020 progress towards each of the following performance benchmarks:

1. Reduce Electricity Consumption
2. Reduce Natural Gas Consumption
3. Increase Renewable Energy Generating Capacity
4. Improve the Energy-efficiency of Low-income Properties
5. Increase the Number of Green-collar Jobs
6. Leverage External Funds

### 1.1.1 Reduce Electricity Consumption

The enumerated benchmark for reductions in electricity consumption states that DCSEU shall develop and implement energy-efficiency programs that directly lead to annual reductions of weather-normalized total electricity consumption, measured as a percentage of the total consumption of electricity in the District in 2014. The contract requires that DCSEU achieve a minimum of 345,891 MWh savings across the first four years, which represents 3.0% of 2014 weather-normalized consumption in the District. The maximum target equals 403,539 MWh savings, which represents 3.5% of 2014 weather-normalized consumption in the District.

The DCSEU tracks electric savings in two ways: gross meter-level savings and modified gross generator-level savings. The gross meter-level savings reflect the annual electric savings that the customer is expected to receive at the meter. The modified gross generator-level savings are calculated by increasing all gross meter-level electric savings by 4.6% to adjust for line losses. The formula is displayed below.

*Modified gross electric savings = Gross electric savings * 1.04599*

Modified gross generator-level savings are used to assess progress towards this performance benchmark.

Table 5 displays the modified gross generator-level electric savings as tracked by DCSEU, our calculated portfolio-level realization rate, and the evaluated savings. The realization rate equals the ratio of evaluated savings to tracked savings (i.e., DCSEU savings recorded in their tracking database). The NMR team estimates that the actual portfolio electric savings equals 109,368

MWh for FY2020, which is 103% of the DCSEU reported tracked electric savings. The cumulative evaluated savings from FY2017 through FY2020 equals 488,103 MWh.

**Table 4: Modified Gross Electric Savings Verification**

| Year | Tracked Modified Gross Savings (MWh) | Realization Rate | Evaluated Modified Gross Savings (MWh) |
|---|---|---|---|
| FY2020 | 106,183 | 103% | 109,368 |
| FY2019 | 155,799 | 97% | 151,321 |
| FY2018 | 135,898 | 99% | 134,728 |
| FY2017 | 93,958 | 99% | 92,686 |
| **Total** | **491,838** | **99%** | **488,103** |

Our gross savings verification of the FY2020 programs found that DCSEU expended the appropriate amount of rigor on their savings calculations. In general, the documentation provided was sufficient, and the methods and assumptions were suitable. The NMR team believes the DCSEU calculated energy savings with a reasonable degree of accuracy.

Table 6 displays our assessment of the DCSEU's progress towards the electric savings benchmark. Our evaluation found that the DCSEU achieved 488,103 MWh in electric savings from FY2017 through FY2020, which represents 141% of the minimum cumulative benchmark and 121% of the maximum cumulative benchmark for the fourth year of the contract. The 488,103 MWh figure represents 106% of the minimum five-year cumulative benchmark and 85% of the maximum benchmark.

**Table 5: Reduce Electricity Consumption Benchmark Performance**

| Modified Gross Annual Electric Savings | Minimum Target (MWh) | Maximum Target (MWh) | Evaluated Savings (MWh) | Percent of Minimum Target | Percent of Maximum Target |
|---|---|---|---|---|---|
| Year Four Cumulative Progress | 345,891 | 403,539 | 488,103 | 141% | 121% |
| Five-year Cumulative Progress | 461,188 | 576,485 | 488,103 | 106% | 85% |

### 1.1.2 Reduce Natural Gas Consumption

The contract requires that DCSEU achieve a minimum of 5,797,438 therms of natural gas savings across the first four years, which represents 1.7% of 2014 weather-normalized consumption in the District. The maximum target equals 6,820,516 therms of natural gas reductions, which represents 2.0% of 2014 weather-normalized consumption in the District.

The DCSEU tracks natural gas savings in two ways: gross savings and modified gross savings. The gross savings reflect the estimated annual savings, including both cross-fuel and like-fuel interactive effects. Per the contract, DCSEU calculates modified gross savings by excluding cross-fuel interactive effects. The modified gross savings are used to assess progress towards this performance benchmark.

Interactive effects reflect the increase or decrease in energy usage due to the installation of an energy-efficiency measure. A common example is energy-efficient lighting: an LED bulb installed in conditioned space produces less waste heat than an incandescent bulb, which then reduces

the energy consumption from cooling equipment but increases consumption from heating equipment. In this case, the cooling savings is a like-fuel interactive effect (the lighting and cooling equipment both use electricity), while the heating penalty could be a cross-fuel interactive effect (the lighting uses electricity, while the heating equipment could use gas).

The NMR team converted the gas savings, which the DCSEU tracks in MMBtu, to therms by multiplying by a factor of 10.

Table 7 displays the modified gross gas savings as tracked by the DCSEU, the NMR team's calculated portfolio-level realization rate, and the evaluated savings. The realization rate equals the ratio of evaluated savings to tracked savings. The NMR team estimates that the actual portfolio gas savings equals 2,211,174 therms in FY2020, which is 100% of the DCSEU tracked gas savings of 2,203,353 therms.

**Table 6: Modified Gross Gas Savings Verification**

| Year | Tracked Modified Gross Savings (Therms) | Realization Rate | Evaluated Modified Gross Savings (Therms) |
|---|---|---|---|
| FY2020 | 2,203,353 | 100% | 2,211,174 |
| FY2019 | 2,718,547 | 95% | 2,569,795 |
| FY2018 | 2,300,391 | 97% | 2,237,961 |
| FY2017 | 2,114,138 | 95% | 1,998,033 |
| **Total** | **9,336,429** | **97%** | **9,016,963** |

Table 8 displays our assessment of the DCSEU's progress towards the gas savings benchmark. Our evaluation found that the DCSEU achieved 9,016,963 therms in gas savings since FY2017, which represents 156% of the minimum cumulative benchmark and 132% of the maximum cumulative benchmark for the fourth year of the contract. The 9,016,963 therms figure represents 106% of the minimum five-year cumulative benchmark and 88% of the maximum benchmark.

**Table 7: Reduce Gas Consumption Benchmark Performance**

| Modified Gross Annual Gas Savings | Minimum Target (Therms) | Maximum Target (Therms) | Evaluated Savings (Therms) | Percent of Minimum Target | Percent of Maximum Target |
|---|---|---|---|---|---|
| Year Four Cumulative Progress | 5,797,438 | 6,820,516 | 9,016,963 | 156% | 132% |
| Five-year Cumulative Progress | 8,525,645 | 10,230,774 | 9,016,963 | 106% | 88% |

In order to compare gas savings to electricity savings, we converted the gas savings from therms to MWh.[4] At the equivalent of 264,272 MWh, the cumulative FY2017-FY2020 evaluated gas savings represent about 54% of the comparable electricity savings.

[4] We converted therms to MWh by first dividing by 10 therms per MMBtu then dividing by 3.412 MMBtu per MWh.

### 1.1.3 Increase Renewable Energy Generation Capacity

The DCSEU is tasked with increasing the renewable energy generation capacity in the District, primarily through the installation of solar photovoltaic (PV) and solar thermal systems. The contract requires that the DCSEU provide incentives to fund the installation of a minimum of 3,400 kW of renewable energy generating capacity across the first four years. The maximum target is 4,000 kW.

According to the DCSEU tracking database, solar PV systems were installed at 14 sites during FY2020. These installations spanned five programs, as illustrated in Table 9.

**Table 8: FY2020 Solar System Summary**

| Program Name | Track Number | Number of Sites | Tracked Solar Capacity (kW) | Verified Solar Capacity (kW) |
|---|---|---|---|---|
| Solar PV Market Rate | 7101PVMR | 6 | 3,979 | 1,131 |
| Low-income Solar Renewable Energy Credit | 7107SREC | 4 | 15 | 15 |
| New Construction - Comm Custom | 7520NEWC | 2 | 40 | 40 |
| Low-income Multifamily Comprehensive | 7612LICP | 2 | 165 | 165 |
| **Total** | | **14** | **4,200** | **1,352** |

For these 14 sites, we summed the renewable energy capacity of solar PV or solar thermal systems using the *KWLoad* variable[5] included in the DCSEU tracking database. The NMR team evaluated three FY2020 projects from the Solar PV Market Rate track and found that the generation capacity was entered erroneously for one large project. Therefore, we estimate that the actual FY2020 renewable energy generation capacity equals 1,352 kW, rather than the tracked capacity of 4,200 kW.

Table 10 displays the tracked and verified solar generation capacity for FY2017 through FY2020. Overall, a total of 12,561 kW in solar generation capacity has been installed.

**Table 9: Renewable Energy Capacity Verification**

| Year | Tracked Solar Capacity (kW) | Realization Rate | Verified Solar Capacity (kW) |
|---|---|---|---|
| FY2020 | 4,200 | 32% | 1,352 |
| FY2019 | 7,129 | 100% | 7,129 |
| FY2018 | 1,836 | 100% | 1,836 |
| FY2017 | 2,244 | 100% | 2,244 |
| **Total** | **15,409** | **82%** | **12,561** |

[5] The *KWLoad* variable reflects the electric generation capacity of solar PV systems in Alternating Current kilowatts.

Table 11 displays our assessment of the DCSEU's progress towards the renewable energy generating capacity benchmark. Our evaluation found that the DCSEU incentivized 12,561 kW of renewable generation capacity since FY2017, which represents 369% of the minimum cumulative benchmark and 314% of the maximum cumulative benchmark for the fourth year of the contract. The 12,561 kW figure represents 289% of the minimum five-year cumulative benchmark and 251% of the maximum benchmark.

**Table 10: Renewable Energy Capacity Benchmark Performance**

| Electric Generation Capacity from Solar PV and Solar Thermal Sources | Minimum Target (kW) | Maximum Target (kW) | Evaluated Capacity (kW) | Percent of Minimum Target | Percent of Maximum Target |
|---|---|---|---|---|---|
| Year Four Cumulative Target | 3,400 | 4,000 | 12,561 | 369% | 314% |
| Five-year Cumulative Progress | 4,350 | 5,000 | 12,561 | 289% | 251% |

### 1.1.4 Improve the Energy-efficiency and Renewable Energy Generating Capacity at Low-income Properties

Per the DCSEU contract, the low-income benchmark includes two separate metrics that must be met on an annual basis:

1. Spend 20% of the Sustainable Energy Trust Fund (SETF) funds on low-income housing, shelters, clinics, or other buildings serving low-income residents in the District.
2. Achieve 46,556 MMBtu in electricity and natural gas savings from low-income programs.

In order to verify that tracked low-income program expenditures and savings were accrued to eligible low-income projects, we reviewed the 23 low-income multifamily projects that we sampled for the FY2020 evaluation to ensure that they met the low-income program requirements. For FY2020, *low-income households* are defined as those with annual incomes equal to or below 80% of the Area Median Income (AMI) or 60% of the State Median Income (SMI). Affordable, low-income housing in the District is defined as one of the following:

1. A single home where the owner or occupant meets the definition of *low-income household*;
2. A multifamily building where at least 66% of the households meet the definition of *low-income household;*
3. Buildings owned by non-profit organizations or the government that meet the definition of *low-income households*; or
4. Buildings where there are contracts or other legal instruments in place that assure that at least 66% of the housing units will be occupied by *low-income households*.[6]

[6] "Low-income – Income Qualification FY17."

In addition to low-income housing, the DCSEU contract allows low-income programs to target shelters, clinics, or other buildings serving low-income residents in the District. After reviewing supporting documentation and third-party sources, the NMR team was able to verify that all 23 sampled low-income multifamily projects met at least one of these low-income criteria. Table 12 displays these 23 sites and notes the verification category or categories they met to achieve low-income status.

**Table 11: FY2020 Low-income Site Verification**

| Program Track | Site ID | Project ID | Site Name | Verified (Y/N) | Verification Criteria |
|---|---|---|---|---|---|
| Income Qualified Efficiency Fund (7610IQEF) | 209 | 16889 | Southern Homes and Gardens | Y | Listed on DCHA website as affordable housing site; 100% low-income units. |
| | 25110 | 19186 | 3500 Minnesota Gardens LLC | Y | Listed as affordable housing through DCHA. |
| | 24936 | 19192 | Artifex Terra LLC | Y | Low-income Housing Development. |
| | 27414 | 19194 | Artifex Terra – Stanton Park Wagner | Y | Listed as Low-income Housing Tax Credit. |
| | 24962 | 19342 | Glenwood Partnership | Y | Eligible for rental housing assistance by the District/federal government. |
| | 16147 | 14080 | City View Apartments[7] | Y | Listed as affordable housing through DHCD. |
| | 6664 | 15148 | Mass Place Apartments[8,10] | Y | Listed on HUD Affordable Housing site as LIHTC. One hundred and sixty units are affordable housing units. |
| Low-income Multifamily Comprehensive (7612LICP) | 26988 | 17934 | Fort Lincoln[9] | Y | Listed as DCHA Public Housing Property. |
| | 29477, 29478, 31230 | 18482 | Minnesota Gardens Cooperative[10] | Y | Listed as affordable housing; funded through HPTF. |
| | 26987 | 18877 | James Apartments[9] | Y | Listed as DCHA Public Housing Property. |
| | 32027 | 18895 | The Solstice | Y | Listed as affordable housing by DCHA. |
| | 2432 | 18990 | LeDroit Apartments[9] | Y | Listed as DCHA Public Housing Property. |
| | 23899 | 19274 | Kelly Miller Apartments[11] | Y | Listed as a Public Housing Community Development operated by the DCHA. |

[7] https://dhcd.dc.gov/page/mayor-bowser-directs-108-million-produce-and-preserve-nearly-1200-affordable-housing-units
[8] https://resources.hud.gov/#
[9] https://www.dchousing.org/vue/customer/properties_view.aspx
[10] https://mocrs.dc.gov/release/mayor-bowser-makes-historic-investment-138-million-affordable-housing
[11] https://www.publichousing.com/details/kelly_miller_dc_public_housing_apartments

| Program Track | Site ID | Project ID | Site Name | Verified (Y/N) | Verification Criteria |
|---|---|---|---|---|---|
| Low-income Prescriptive Rebate (7613LIRX) | 4763 | 20775 | Marbury Plaza Garden Apartments | Y | For the entire Marbury Plaza complex, at least 96% of leased units listed as low-income units. |
| | 16498 | 20796 | 2 Forrester St SE | Y | Eligible for rental housing assistance by the District/federal government. |
| | 23898 | 21009 | Horizon House[12] | Y | Listed as Public Housing Unit by DCHA. |
| | 6322 | 19285 | Lotus Square Apartments[8] | Y | Listed on HUD Affordable Housing site as LIHTC. |
| | 30184 | 19791 | 32 Thirty-Two Apartments[8] | Y | Listed on HUD Affordable Housing site as LIHTC. |
| | 1581 | 19864 | 1330 7th St NW[13,8] | Y | Listed on HUD Affordable Housing as Low-income, Elderly, and Special Needs Housing. Listed on DCH Affordable and Subsidized Housing Resource Guide. |
| | 1772 | 19112 | Manor Village Apartments8 | Y | Listed on HUD Affordable Housing site as LIHTC. |
| | 36549 | 21133 | Worthington Woods Apartments[8] | Y | Listed on HUD Affordable Housing site as LIHTC. |
| | 33054 | 21306 | Belmont Crossing Apartments[8] | Y | Listed on HUD Affordable Housing site as LIHTC. |

Based on our review of the 23 sampled projects, we assume that all program costs and savings allocated to low-income programs were accrued by eligible low-income properties.

Next, we assessed progress towards the expenditure benchmark, followed by the savings benchmark.

12 https://apia.dc.gov/sites/default/files/dc/sites/apia/page_content/attachments/MOAPIA_DCHA%20Public%20Housing%20Units%202019.pdf

13 http://www.dchousing.org/docs/housing_resources.pdf

#### 1.1.4.1 Spend 20% of SETF funds at Low-income Housing, Shelters, Clinics, or Other Buildings

The DCSEU contract specifies that the calculation of the low-income spend percentage include portfolio-wide administrative and support costs in the denominator but not the numerator. Therefore, the NMR team applied the following equation:

$$\textit{Low-income spend \%} = \frac{\textit{Low-income program costs}}{\textit{Cumulative program costs + Portfolio administrative \& support costs}}$$

Table 13 displays our assessment of DCSEU's progress towards the low-income expenditure benchmark. Based on the total FY2020 portfolio expenditures of $19,091,599, the contract requires that DCSEU spend a minimum of $3,818,320 (20%) on low-income programs. There is no maximum target for low-income expenditures.

DCSEU reported spending $4,776,441 across seven low-income programs, which represents 125% of the target.

**Table 12: FY2020 Low-income Expenditure Benchmark Performance**

| Measurement | Minimum Target | Evaluated Number | Percent of Minimum Target |
|---|---|---|---|
| Dollars spent on low-income properties | $3,818,320 | $4,776,441 | 125% |

#### 1.1.4.2 Achieve 46,556 MMBtu in Electricity and Gas Savings from Low-income Programs

In Table 14, we list the tracked energy (electric plus gas) savings and evaluated savings for each of the seven low-income programs offered by the DCSEU with claimed savings in FY2020. Overall, the DCSEU tracking database reported 37,784 MMBtu in savings, and we verified 37,995 MMBtu.[14]

**Table 13: FY2020 Low-income Energy Savings by Program**

| Program | Track | Tracked Modified Gross Savings (MMBtu) | Evaluated Modified Gross Savings (MMBtu) |
|---|---|---|---|
| Income Qualified Gas Efficiency Fund | 4335IGEF | 2,485 | 2,484 |
| Low-income Solar Renewable Credit | 7107SREC | 71 | 74 |
| Income Qualified Efficiency Fund | 7610IQEF | 5,947 | 5,986 |
| Low-income Multifamily Comprehensive | 7612LICP | 19,779 | 19,516 |
| Low-income Prescriptive Rebate | 7613LIRX | 3,752 | 4,186 |
| Retail Lighting Food Bank | 7717FBNK | 2,894 | 2,894 |
| Low-income Home Energy Conservation Kit | 7717HEKT | 2,855 | 2,855 |
| **Total** | | **37,784** | **37,995** |

Table 15 displays our assessment of DCSEU's progress towards the low-income savings benchmark. The contract requires that the DCSEU achieve a minimum of 23,278 MMBtu savings from low-income programs. The maximum target equals 46,556 MMBtu.

Our evaluation found that DCSEU achieved 37,995 MMBtu in energy savings from low-income programs, which represents 163% of the minimum target and 82% of the maximum target. This result is almost identical to FY2019, when 81% of the maximum target was achieved. As discussed in more detail in Section 2.1, the cost of saved energy for low-income programs is typically multiple times greater than for other types of programs.

**Table 14: FY2020 Low-income Savings Benchmark Performance**

| Measurement | Minimum Target | Maximum Target | Evaluated Number | Percent of Minimum Target | Percent of Maximum Target |
|---|---|---|---|---|---|
| Modified gross electric savings plus modified gross gas savings from low-income programs (MMBtu) | 23,278 | 46,556 | 37,995 | 163% | 82% |

[14] The DCSEU tracking database reports natural gas savings in MMBtu and electricity savings in kWh. The NMR team converted kWh electricity savings to MMBtu by multiplying by a factor of 0.003412.

### 1.1.5 Increase the Number of Green-collar Jobs

This benchmark requires that the DCSEU create green jobs in the District during each year of the contract. The contract requires that the DCSEU create a minimum of 66 full-time equivalent (FTE) jobs each year. The maximum annual target is 88 jobs.

In order to calculate the number of FTE jobs created, the contract specifies the following criteria:

- One FTE green job equals 1,950 hours worked by DCSEU staff and subcontractors.
- One FTE green job equals $200,000 worth of DCSEU incentives provided to customers or manufacturers.
- Only direct jobs are to be considered. Indirect jobs and induced jobs are not counted.

In order to calculate the number of green jobs created by the DCSEU staff and subcontractors, DOEE provided a spreadsheet of payroll hours worked by the DCSEU staff and subcontractors during FY2020. The NMR team divided the total number of hours worked by 1,950 to yield the number of green jobs created by the DCSEU (Table 16).

In addition, the DCSEU provided a spreadsheet with the total incentive amount distributed in FY2020, which equaled $8,762,772. However, a portion of these incentives flowed through DCSEU subcontractors, whose created jobs were already counted under the payroll hours calculation. Therefore, we excluded a total of $2,069,854 in subcontractor incentives and used the remaining $6,692,919 in customer incentives as the basis for the calculation of jobs created due to incentives (Table 16).

**Table 15: FY2020 Green Jobs Calculation**

| Category | Total Hours or Dollars (A) | Assumed Hours or Dollars per Job (B) | Number of Green Jobs Created (A / B) |
|---|---|---|---|
| DCSEU Staff Hours | 59,549 hours | 1,950 annual hours | 30.5 |
| DCSEU Subcontractor Hours | 46,832 hours | 1,950 annual hours | 24.0 |
| Incentive Dollars | $6,692,919 | $200,000 | 33.5 |
| **Total Green Jobs Created** | | | **88.0** |

Table 17 displays our assessment of the DCSEU's progress towards the green jobs benchmark. We calculated that the DCSEU created 88.0 jobs, which represents 133% of the 66 jobs minimum target and 100% of the 88 jobs maximum target.

**Table 16: FY2020 Green Jobs Benchmark Performance**

| Measurement | Minimum Target | Maximum Target | Evaluated Number | Percent of Minimum Target | Percent of Maximum Target |
|---|---|---|---|---|---|
| Number of FTE jobs created by the DCSEU | 66 | 88 | 88.0 | 133% | 100% |

### 1.1.6 Leverage External Funds

The contract requires the DCSEU to secure outside funds, excluding SETF funds or other District government funds, to support the energy programs implemented by the DCSEU. The DCSEU is required to obtain a total of $5,000,000 of outside funds over the five-year period of the base contract. There is no annual target for this benchmark; there is only a cumulative five-year goal. Therefore, we tracked the DCSEU's annual progress towards the $5,000,000 five-year benchmark.

The DCSEU provided the NMR team with a spreadsheet listing details regarding the outside funds received during FY2020. The DCSEU reported obtaining a total of $2.0 million in outside funds during FY2020, mostly from delivering a low-income multifamily gas program for Washington Gas and participating in the PJM forward capacity market (Table 18).

**Table 17: FY2020 Leveraged Funds Calculation**

| Funding Source | Description | Amount |
|---|---|---|
| PJM | Forward Capacity Market Credits | $426,343 |
| Dynamic Concepts | Safety Kits Donation | $4,000 |
| Miscellaneous | Donation | $608 |
| Washington Gas | Low-Income Multifamily Gas Program Delivery | $1,588,811 |
| **Total** | | **$2,019,762** |

The NMR team calculates that the DCSEU has secured a total of $3.0 million since FY2017, including the reported outside funding of $439,111 from FY2017, $268,881 from FY2018, and $317,131 from FY2019 (Table 19).

**Table 18: Leveraged Funds Annual Summary**

| Year | Amount |
|---|---|
| FY2020 | $2,019,762 |
| FY2019 | $317,131 |
| FY2018 | $268,881 |
| FY2017 | $439,111 |
| **Total** | **$3,044,885** |

The $3.0 million figure represents 122% of the $2.5 million minimum target and 61% of the $5.0 million maximum target (Table 20). DCSEU has already exceeded the minimum target, though progress towards the maximum target should equal about 80% in the fourth year of a five-year contract, assuming a linear progression towards the target. However, the DCSEU anticipates spending most of the remaining Washington Gas funds in FY2021.

**Table 19: Cumulative Leveraged Funds Benchmark Performance**

| Measurement | Minimum Target | Maximum Target | Evaluated Number | Percent of Minimum Target | Percent of Maximum Target |
|---|---|---|---|---|---|
| Dollars received from external sources | $2,500,000 | $5,000,000 | $3,044,885 | 122% | 61% |

## 1.2 Tracking Goals and Other Metrics

In this section, we assess the DCSEU's FY2020 progress towards its two tracking goals:

1. Reduce Growth in Peak Demand
2. Reduce Growth in Energy Demand of Largest Energy Users

In addition, we present data on GHG reductions, net energy savings, and cumulative and lifetime energy savings.

### 1.2.1 Reduce Growth in Peak Demand

While the DCSEU is not required to offer programs to exclusively reduce peak demand, demand savings result from the electric savings programs, and the DCSEU is required to report on demand savings. Because the peak demand savings goal is for tracking purposes only, it does not have a contractual performance target.

The DCSEU tracks peak demand savings in two ways: gross meter-level savings and modified gross generator-level savings. The contract requires that modified gross generator-level peak demand savings be used to assess progress towards this tracking goal.

The gross meter-level savings reflect the annual peak demand savings that the customer is expected to receive at the meter. The modified gross generator-level savings are calculated by increasing all gross meter-level peak demand savings by 7.7% to adjust for line losses. The formula is displayed below.

*Modified gross peak demand savings = Gross peak demand savings * 1.077076*

The peak demand period occurs between 2:00 PM and 6:00 PM from June through September. In 2020, the peak load usage for DC was 2,033 MW.[15]

Table 21 displays the modified gross peak demand savings as tracked by the DCSEU, our calculated portfolio-level realization rate, and the evaluated modified gross peak demand savings. The realization rate equals the ratio of evaluated savings to tracked savings. The NMR team

[15] 2021 Consolidated Report. Potomac Electric Power Company. April 2021. Table 1.2-B.

estimates that the actual portfolio peak demand savings equals 15.3 MW, which is 95% of the DCSEU tracked peak demand savings of 16.1 MW. The 15.3 MW figure represents 0.8% of the estimated peak load usage of 2,033 MW.

**Table 20: Modified Gross Summer Peak Demand Savings Verification**

| Measurement | Tracked Savings (MW) | Realization Rate | Evaluated Savings (MW) |
|---|---|---|---|
| Modified gross electric demand savings during summer peak period | 16.1 | 95% | 15.3 |

The evaluated peak demand savings of 15.3 MW for FY2020 is less than FY2018 and FY2019, but higher than FY2017 (Table 22). Because electric savings lead to demand savings, the lower electric savings in FY2020 yielded lower demand savings.

**Table 21: Evaluated Modified Gross Summer Peak Demand Savings Trends**

| Measurement | FY2017 | FY2018 | FY2019 | FY2020 |
|---|---|---|---|---|
| Evaluated modified gross electric demand savings during summer peak period (MW) | 12.4 | 21.4 | 22.4 | 15.3 |

### 1.2.2 Reduce Growth in Energy Demand Of Largest Energy Users

While the DCSEU is not required to offer programs aimed exclusively at reducing the energy usage of Large Energy Users, they are required to track projects with large users. Because the large user goal is for tracking purposes only, it does not have any contractual performance targets.

The DCSEU contract's definition of a Large Energy User is as follows:

> *Large energy users are defined as organizations, individuals, or government entities that own a building with more than 200,000 square feet of gross floor area or own a campus of buildings in a contiguous geographic area that share building systems or at least one common energy meter without separate metering or sub-metering, such that their energy use cannot be individually tracked. Gross floor area includes infrastructure that contain heated and unheated space that is connected to a qualifying building. Energy-efficiency or renewable energy measures must be installed in a qualified building or an infrastructure connected to a qualified building in order to qualify as a large energy user project.*

The DCSEU provided a spreadsheet that lists potential FY2020 Large Energy Users, titled Largest_Energy_Users. The spreadsheet divided the Large Energy Users into two categories: Divisions with SPECLEU Identifier and Divisions where Parent Company has SPECLEU Identifier. Some companies appeared in both lists. Using the addresses listed in this spreadsheet or listed with the given company ID in the tracking database, we evaluated the Large Energy User status of the project sites listed for these companies.

Some projects included multiple site listings. Additionally, some sites participated in multiple projects and project tracks. The number of unique site IDs participating in each track are listed in Table 23.

**Table 22: FY2020 Large Energy User Sites**

| Program | Track | Number of Unique Sites |
|---|---|---|
| CI RX – Equipment Replacement | 7511 CIRX | 49 |
| Market Transformation Value | 7512MTV | 6 |
| Commercial Upstream | 7513UPLT | 176 |
| Retrofit – Custom | 7520CUST | 83 |
| Market Opportunities – Custom | 7520MARO | 17 |
| New Construction – Custom | 7520NEWC | 5 |
| Pay for Performance (P4P) | 7520P4PX | 10 |
| Low-Income Multifamily Comprehensive | 7612LICP | 29 |
| Residential Upstream | 7725RSUP | 5 |
| **Total** | | **380** |

To confirm that the company sites met these specifications, the NMR team reviewed the building size reported by the DCSEU for these companies' project sites, when available. However, some sites were listed with a square footage of zero. To confirm building size for sites where the area is not provided, the NMR team consulted the DOEE Covered Building List for 2020, which lists buildings over 50,000 gross square feet in the DC tax records. For locations not listed in this document, we sought external verification through institution websites, news articles, or government documents. Based on input from DCSEU, the NMR team analyzed Large Energy Users at the site level. Sites that only participated in the Commercial Upstream track were not counted as Large Energy Users since there is no verification activity for these projects. The Commercial Upstream/Midstream Lighting Program provides customers with point-of-purchase discounts when they buy qualified lighting products from participating distributors. Instead, each Commercial Upstream company is counted as a single Large Energy User. There was sufficient data to confirm that 64 of the associated site IDs were not Large Energy Users as they did not meet the 200,000 $ft^2$ threshold. The NMR team was unable to verify 151 site IDs due to insufficient data, but we were able to verify that 165 of the 380 site IDs were Large Energy Users exclusive of the Commercial Upstream Program.

There are more completed projects with Large Energy Users in FY2020 than in previous years (Table 24).

**Table 23: Evaluated Large Energy User Trends**

| Measurement | FY2017 | FY2018 | FY2019 | FY2020 |
|---|---|---|---|---|
| Number of Large Energy Users with completed projects | 104 | 127 | 89 | 165 |

### 1.2.3 Greenhouse Gas Reductions

Table 25 displays the avoided CO2 equivalent emissions in annual metric tons since FY2017 based on the evaluated gross savings, including line losses to reflect electric savings at the generator rather than the customer. The NMR team utilized a GHG emissions calculator spreadsheet from DOEE to calculate the avoided annual GHG emissions assuming 695 lbs. of CO2 per MWh, which we understand reflects an average emissions rate across the fleet of electric generators. Overall, we estimate the DCSEU's programs saved an estimated 203,919 metric tons of annual CO2 emissions since FY2017 using the average emission rates. The FY2020 avoided emissions of 44,602 metric tons represents about 0.6% of the estimated District-wide emissions of 7,552,734 metric tons from 2016.

We also calculated GHG reductions based on marginal emission rates because they more accurately reflect the impact of energy-efficiency and renewable energy programs on displacing generation across the fleet. Energy-efficiency and renewable energy programs "are not generally assumed to affect baseload power plants that run all the time, but rather marginal power plants that are brought online as necessary to meet demand."[16] We estimated an annual weighted average marginal emissions rate based on the savings accumulated during each of the four seasonal costing periods.[17] This calculation yielded an annual marginal emissions rate of 1,271 to 1,393 lbs. of CO2 per MWh, which is almost double the average emissions rate. The FY2020 avoided emissions of 74,772 metric tons represents about 1.0% of the estimated District-wide emissions of 7,552,734 metric tons from 2016.

**Table 24: Greenhouse Gas Emission Reductions**

| Year | Avoided CO2 Equivalent Emissions (Metric Tons) | |
|---|---|---|
| | Average Emission Rates | Marginal Emission Rates |
| FY2020 | 44,602 | 74,772 |
| FY2019 | 63,450 | 107,758 |
| FY2018 | 55,478 | 92,963 |
| FY2017 | 40,389 | 66,147 |
| **Total** | **203,919** | **341,640** |

### 1.2.4 Net Energy Savings

Table 26 displays the net energy savings for FY2020, which adjusts the gross savings for both free-ridership and participant spillover. Free-ridership reflects the portion of program savings that would have occurred in the absence of the program. Participant spillover manifests in participating customers who take actions that lead to additional savings beyond the tracked program savings and without financial assistance.

Overall, the net modified savings represent 63% of the gross modified savings for electricity, 55% for gas, and 60% across both fuels. The NTG ratio is lower for gas than electric because most

[16] https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references
[17] The four costing periods are summer on peak, summer off peak, winter on peak, and winter off peak. Each of these periods has a different marginal emissions rate and energy cost, and the single weighted average marginal emissions rate reflects the relative prevalence of energy savings among each period.

gas savings derive from the Custom Retrofit program, which has one of the lowest NTG ratios among the DCSEU commercial programs.

**Table 25: FY2020 Net Modified Energy Savings**

| | Electric Savings (MWh) | Gas Savings (Therms) | Total Energy Savings (MMBtu) |
|---|---|---|---|
| Gross Modified Savings | 109,368 | 2,211,174 | 594,280 |
| Net Modified Savings | 68,845 | 1,222,943 | 357,193 |
| Net-to-Gross Ratio (Net / Gross) | 63% | 55% | 60% |

The estimated portfolio NTG value for DCSEU equaled 61% in FY2019 and 56% in FY2018. In comparison, the most recent portfolio NTG values for PECO[18] and BG&E[19] are 69% and 68%, respectively.

### 1.2.5 Cumulative Annual Energy Savings

Table 27 displays the annual modified gross energy (electric plus gas) savings. We estimate the DCSEU programs yielded energy savings of about 594,280 MMBtu in FY2020 and 2,567,101 MMBtu since FY2017.

**Table 26: Annual Modified Gross Energy Savings**

| Year | Tracked Modified Gross Savings (MMBtu) | Realization Rate | Evaluated Modified Gross Savings (MMBtu) |
|---|---|---|---|
| FY2020 | 582,633 | 102% | 594,280 |
| FY2019 | 803,441 | 96% | 773,286 |
| FY2018 | 693,722 | 99% | 683,487 |
| FY2017 | 531,997 | 97% | 516,047 |
| **Total** | **2,611,793** | 98% | **2,567,101** |

[18] Pennsylvania SWE Annual Report Act 129 Program Year 11. NMR Group, Demand Side Analytics, BrightLine Group. May 25, 2021. http://www.puc.state.pa.us/filing_resources/issues_laws_regulations/act_129_information/act_129_statewide_evaluator_swe_.aspx

[19] *Verification of the 2019 Empower Maryland Energy Efficiency Program Impact and Cost Effectiveness Evaluations*. Itron. October 2, 2020.

### 1.2.6 Lifetime Energy Savings

Table 27 displays the modified gross electric savings projected over the lifetime of the measures. Since FY2017, the DCSEU programs are projected to save about 5.5 million MWh in lifetime electric savings. The NMR team calculated the lifetime savings for each measure by multiplying the first-year energy savings by its expected lifetime. Because certain measures are subject to increased efficiency standards in the future, the lifetime savings may be adjusted to reflect this situation.

**Table 27: Lifetime Modified Gross Electric Savings**

| Year | Tracked Lifetime Modified Gross Savings (MWh) | Realization Rate | Evaluated Lifetime Modified Gross Savings (MWh) |
|---|---|---|---|
| FY2020 | 1,100,670 | 102% | 1,118,104 |
| FY2019 | 1,807,714 | 99% | 1,784,211 |
| FY2018 | 1,507,610 | 99% | 1,496,844 |
| FY2017 | 1,140,086 | 98% | 1,121,053 |
| **Total** | **5,556,080** | **99%** | **5,520,212** |

Table 28 displays the lifetime modified gross gas savings. Overall, the FY2017 through FY2020 programs are projected to save about 82 million therms in lifetime gas savings. The NMR team calculated lifetime savings for each measure by multiplying the first-year energy savings by its expected lifetime. Because certain measures are subject to increased efficiency standards in the future, the lifetime savings may be adjusted to reflect this situation.

**Table 28: Lifetime Modified Gross Gas Savings**

| Year | Tracked Lifetime Modified Gross Savings (Therms) | Realization Rate | Evaluated Lifetime Modified Gross Savings (Therms) |
|---|---|---|---|
| FY2020 | 21,100,023 | 101% | 21,220,847 |
| FY2019 | 24,817,702 | 96% | 23,813,001 |
| FY2018 | 18,562,650 | 102% | 18,850,804 |
| FY2017 | 20,298,108 | 90% | 18,305,207 |
| **Total** | **84,778,483** | **97%** | **82,189,859** |

# Section 2 Cost-effectiveness Assessment

In this section, we describe our evaluation efforts to assess the cost of saved energy and the cost-effectiveness of the DCSEU programs.

## 2.1 Cost of Saved Energy

To inform future planning of budgets and savings goals, we calculated the DCSEU's cost of first-year verified energy savings in FY2020. In order to calculate the cost of saved energy, the DCSEU provided the NMR team with program-specific incentive costs for electric and natural gas measures, as well as portfolio-wide administrative and support costs for FY2020. In order to calculate total electric and natural gas costs, we allocated the portfolio-wide administrative and support costs to each program and fuel type based on its program-specific incentive cost. We then summed the total costs by fuel type and program. To calculate the cost of saved energy, we divide reported annual costs by evaluated annual savings.

Because renewable energy projects typically cost more per unit of savings than energy-efficiency projects, we calculated costs separately for energy-efficiency vs. renewable energy. Therefore, we provide the costs for three categories of savings:

1. Electric savings, excluding renewables programs
2. Electric savings from renewables programs only
3. Natural gas savings

As described in Section 1.1.1, modified gross electricity savings exceed gross electricity savings due to adjustments for line losses. In addition, as described in Section 1.1.2, modified gross gas savings exceed gross gas savings due to the exclusion of cross-fuel interactive effects. Therefore, the DCSEU's costs for modified gross energy savings are less than the costs for gross energy savings. We calculate costs for both types of savings because gross savings are more directly comparable to other jurisdictions, while the performance benchmarks are based on modified gross savings.

We calculated that the DCSEU's FY2020 cost for first-year gross and modified gross electricity savings excluding renewables programs was $110/MWh and $106/MWh, respectively (Figure 4 and Figure 5). In addition, we calculated that the DCSEU's cost for gross and modified gross electricity savings from renewables programs was $179/MWh and $171/MWh, respectively. For natural gas savings, we calculated that the DCSEU's cost of gross and modified gross savings was $4.77/therm and $4.05/therm, respectively.

While the costs of savings increased from FY2019 to FY2020, the portfolio-wide gross energy costs have still declined by 10% since FY2017 – from $42/MMBtu to $38/MMBtu (Figure 4). Since FY2017, the cost of gross electric savings declined by 32% for energy efficiency and by 24% for renewables. In contrast, the cost of gas savings have risen by 49% since FY2017 largely due to the launch of the Income Qualified Gas Efficiency Fund program in FY2020.

**Figure 5: DCSEU Trends for Costs of First-year Gross Energy Savings**

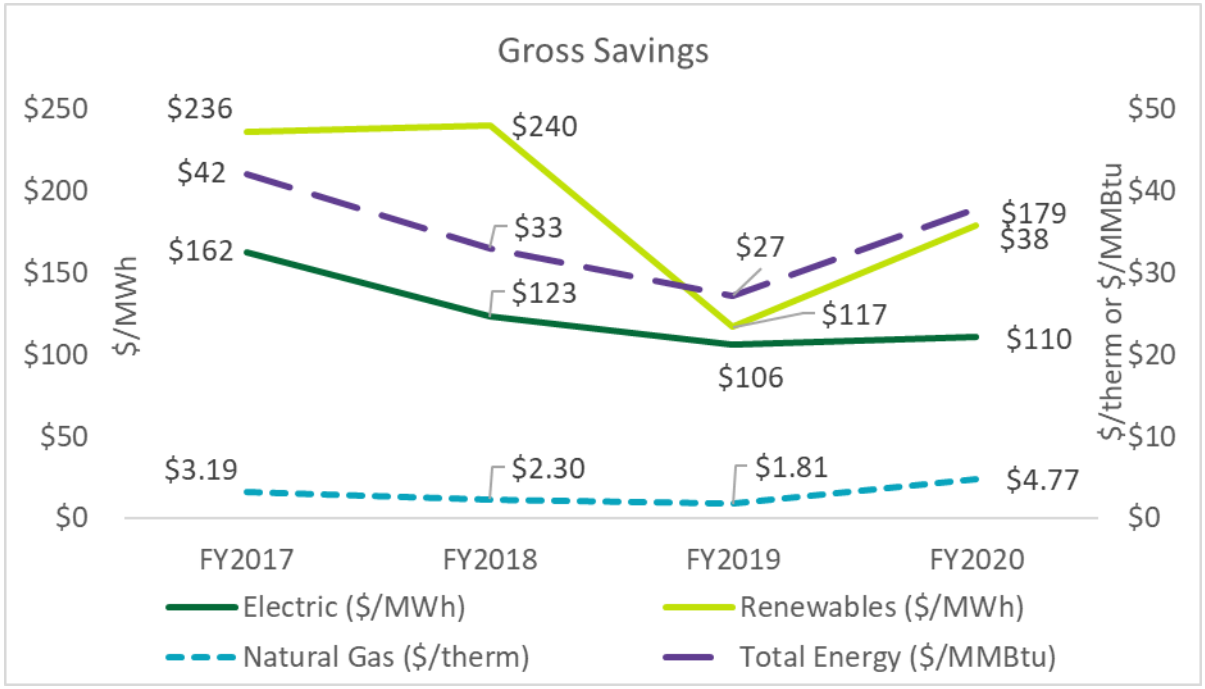
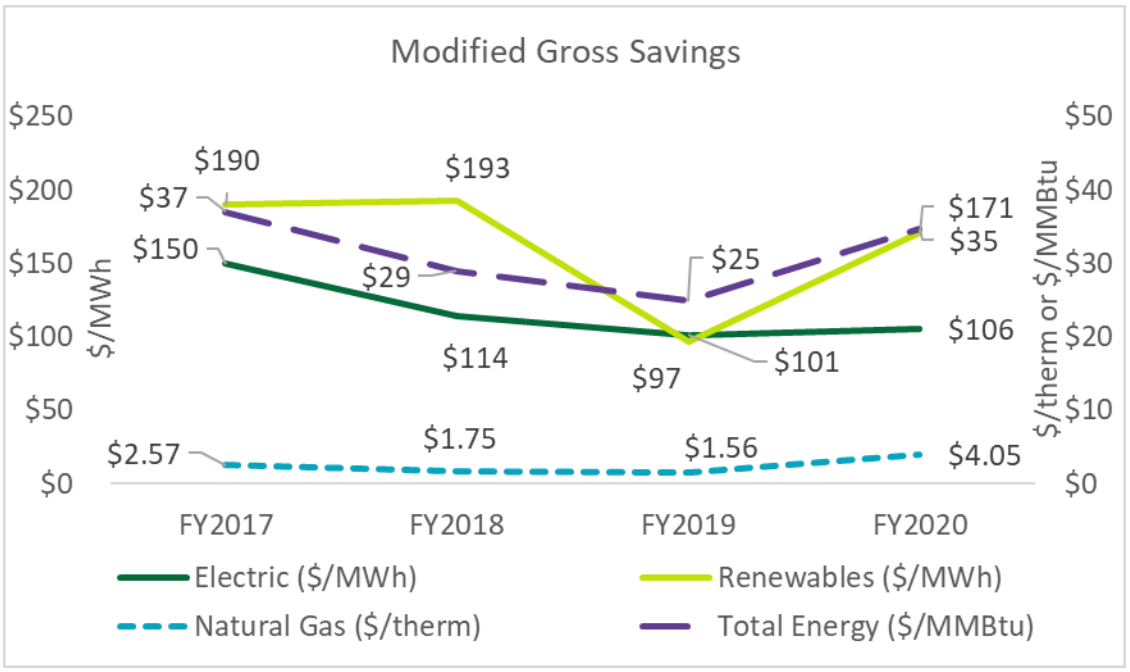



**Figure 6: DCSEU Trends for Costs of First-year Modified Gross Energy Savings**



In order to compare the cost of saved electricity to the cost of saved gas, we converted the gas savings from therms to a MWh equivalent.[20] The cost of gross gas savings has been less than the cost of gross electricity savings each year, ranging from 58% to 67%, with the exception of FY2020, when the ratio increased to 147%.

**Table 29: DCSEU Comparison of Costs of First-year Gross Energy Savings**

| Fuel Savings Type | FY2020 | FY2019 | FY2018 | FY2017 |
|---|---|---|---|---|
| Electric savings, excluding renewables programs | $110/MWh | $106/MWh | $123/MWh | $162/MWh |
| Gas savings equivalent | $163/MWh | $62/MWh | $78/MWh | $109/MWh |
| Ratio of Gas Cost to Electric Cost | 147% | 58% | 63% | 67% |

Due to the similar geographic location and climate, we compare the DCSEU's costs of first-year electricity savings to those from two nearby utilities: PECO Energy in Pennsylvania and Baltimore Gas & Electric (BG&E) in Maryland. In addition, we compare DCSEU's costs of first-year gas savings to the costs for Philadelphia Gas Works (PGW), which serves the city of Philadelphia. While these comparisons are useful, it is important to understand that these jurisdictions have different markets, savings goals, regulatory requirements, cost-effectiveness tests, program maturity, and delivery systems, which may affect both costs and savings.

PECO Energy serves the city of Philadelphia and surrounding counties, which are less urban than DC. PECO is subject to Pennsylvania's Act 129, which requires that energy-efficiency programs achieve nearly a 4% cumulative reduction in annual electricity use (or approximately 0.8% per year) over the five-year period of the Phase III programs that launched in 2016. In addition, at least 5.5% of savings must come from programs solely directed at low-income customers in multifamily housing and at least 3.5% from government, non-profit, and institutional organizations. Pennsylvania Act 129 requires the portfolio of programs offered by each electric distribution company to be cost-effective using a modified version of the Total Resource Cost (TRC) test. The TRC typically includes a more limited range of benefits than the Societal Cost Test (SCT) employed by DC.

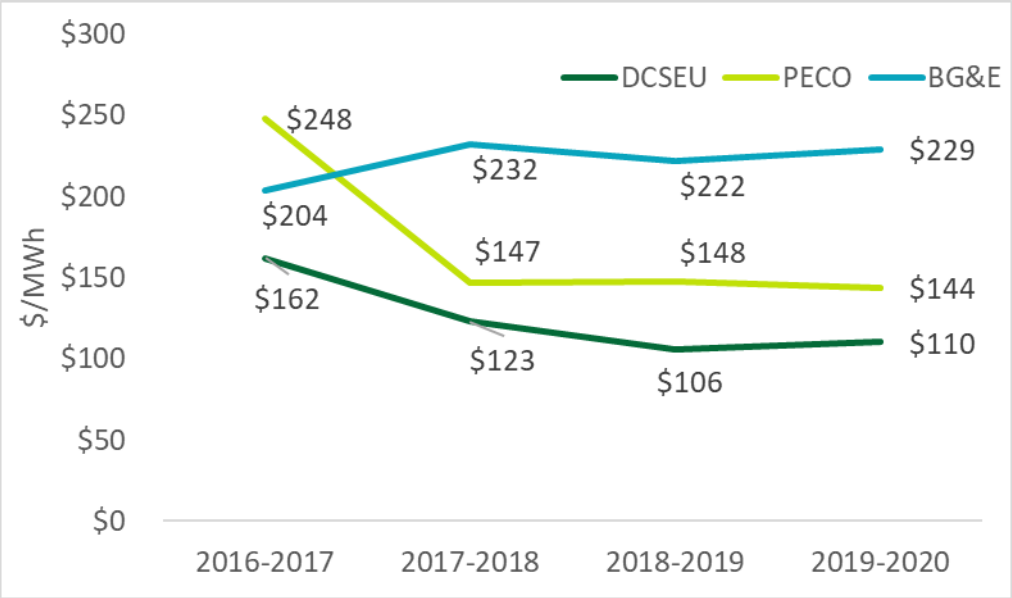
BG&E services the city of Baltimore, as well as surrounding counties, which are less urban than DC. Beginning with the 2016 program year, the Maryland EmPOWER programs are designed to achieve an annual incremental gross energy savings equivalent of 2.0% of the weather normalized gross retail sales baseline, with a ramp-up rate of 0.2% per year. The programs are screened on four factors: cost-effectiveness, impact on the rates of each ratepayer class, impact on jobs, and impact on the environment. Maryland requires that each utility's programs be cost-effective at both the residential and commercial sector-level using the TRC test.

In comparison, the DCSEU has multiple benchmarks – in particular low-income and green jobs – that may impact costs. In addition, the DCSEU budget and goals are a fraction of those for either PECO or BG&E, although substantially greater than for PGW.

[20] We converted therms to MWh by first dividing by 10 therms per MMBtu then dividing by 3.412 MMBtu per MWh.

At $110/MWh, the DCSEU's FY2020 cost for gross electricity savings is less than PECO's cost ($144/MWh) and about one-half of BG&E's cost at $229/MWh (Figure 6).[21] DCSEU's cost of saved energy has been lower than both PECO and BG&E each year.[22] Because PECO and BG&E only offer electric energy-efficiency programs, we only compare the costs to save electricity.

**Figure 7: Comparison of Costs of First-year Gross Electricity Savings**




[21] *Verification of the 2019 Empower Maryland Energy Efficiency Program Impact and Cost Effectiveness Evaluations*. Itron. October 2, 2020.
*The Empower Maryland Energy Efficiency Act Report of 2020 With Data for Compliance Year 2019*. Maryland Public Service Commission. April 2020.

[22] Pennsylvania SWE Annual Report Act 129 Program Year 11. NMR Group, Demand Side Analytics, BrightLine Group. May 25, 2021.
http://www.puc.state.pa.us/filing_resources/issues_laws_regulations/act_129_information/act_129_statewide_evaluator_swe_.aspx

At $4.77/therm, the DCSEU's FY2020 cost for gross gas savings is less than the cost for PGW ($5.96/therm) for September 2019 to August 2020 (Figure 7).[23] A similar trend occurred in prior years.

**Figure 8: Comparison of Costs of First-year Gross Gas Savings**

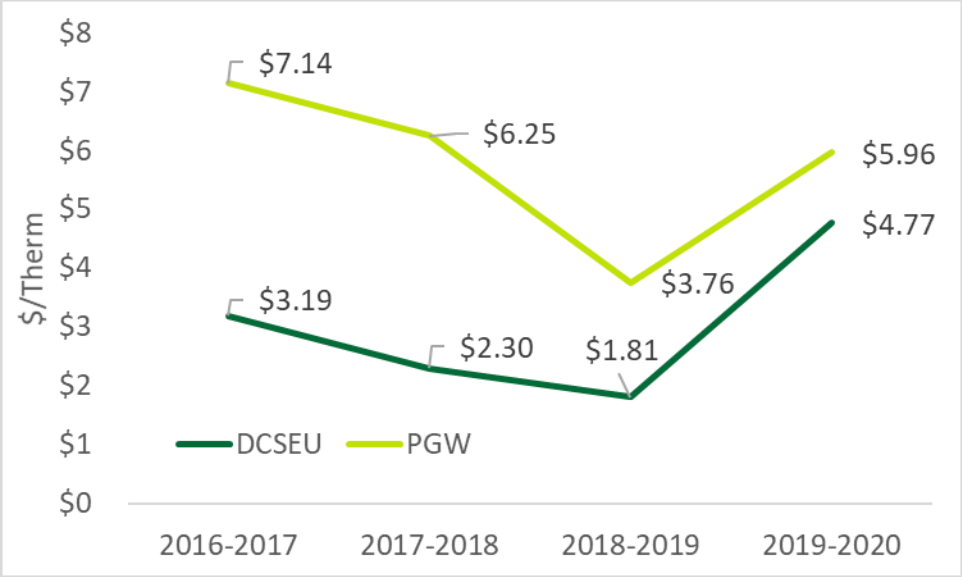
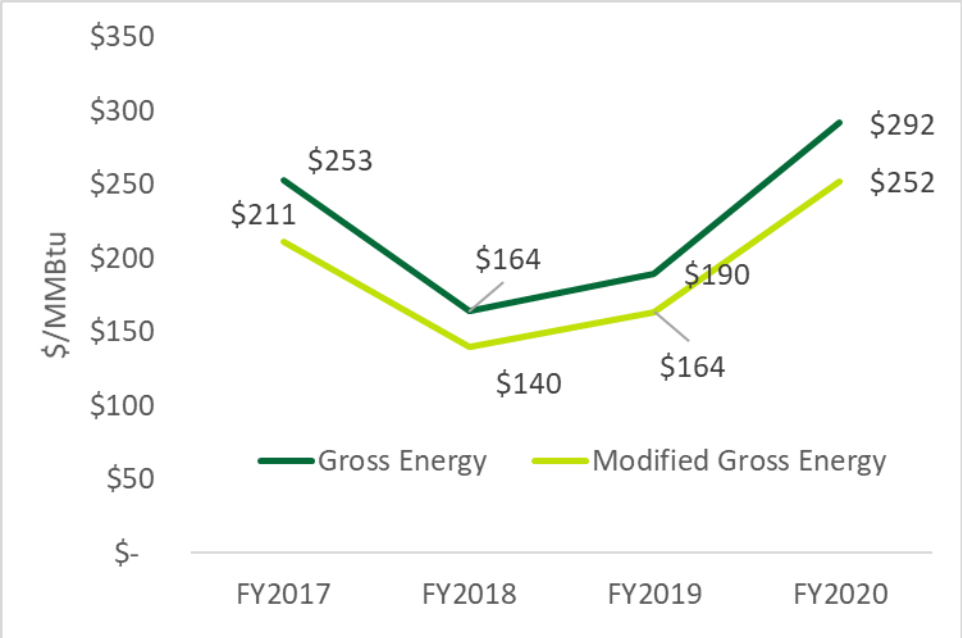



Figure 8 displays the costs of saved energy across all seven DCSEU low-income programs listed in Table 14. The costs of gross and modified gross energy savings declined substantially in FY2018 but have risen since then. Overall, the costs have increased by 15% to 19% since FY2017.

[23] *Demand Side Management Program Annual Report, FY 2020 Results.* Philadelphia Gas Works. December 2020.

**Figure 9: Costs of First-year Gross Energy Savings for Low-income Programs**




Because low-income projects typically require greater levels of program investment, the costs of saved energy are higher than for other types of programs. We calculated the cost of saved electricity for DCSEU's low-income programs to be about 6.5 times greater than the cost of non-low-income programs. This is similar to the findings from a national study that estimated the cost of saved electricity for low-income programs as approximately four times greater than for other types of programs.[24]

[24] *The Cost of Saving Electricity Through Energy Efficiency Programs Funded by Utility Customers: 2009–2015.* Lawrence Berkeley National Laboratory. June 2018.

## 2.2 COST-EFFECTIVENESS ASSESSMENT

The NMR team modeled the cost-effectiveness of the DCSEU FY2020 program offerings at the portfolio level and for each of the programs that were active in FY2020. In this section, we report results for the core SETF programs. Appendix C contains results for the two Solar for All (SFA) programs, which are funded separately from the SETF. We did all of our modeling using a SCT perspective. The SCT is a variant of the TRC Test, which includes various externalities and a lower societal discount rate than the discount rate based on the utility weighted average cost of capital used in the TRC. The discount rate determines the net present value of future resource savings. Table 30 lists the cost and benefit elements included in the SCT Test.

**Table 30: Societal Cost Test – Costs and Benefits**

| SCT Costs | SCT Benefits |
|---|---|
| Incremental Measure Cost | Avoided Energy Costs (kWh, MMBtu) |
| Other Financial or Technical Support Costs | Avoided Generating Capacity Costs |
| Program Administration Costs | Avoided T&D Capacity Costs |
| NMR Evaluation, Measurement, & Verification (EM&V) Costs | Avoided Water Costs |
| DOEE Oversight Costs | Reduced Risk/Increased Reliability |
| | Avoided Solar Alternative Compliance Payment Costs |
| | Reduced Operation and Maintenance (O&M) Costs |
| | Benefits from reducing environmental externalities, including air and water pollution, GHG emissions, and cooling water use. |
| | Non-energy Benefits (NEBs), including comfort, noise reduction, aesthetics, health and safety, ease of selling/leasing home or building, improved occupant productivity, reduced work absences due to illness, ability to stay in home/avoided moves, and macroeconomic benefits. |

The primary data sources that the NMR team used for the cost-effectiveness assessment were as follows:

- Measure-level energy savings, effective useful life (EUL) assumptions, incremental measure cost values, incentive amounts, and projections of O&M savings from the DCSEU tracking database.
- Non-incentive expenditures for program administration and delivery, as provided by the DCSEU. This includes both costs that were allocated to specific tracks and common costs for support services that are assigned at the portfolio level.
- Avoided cost assumptions, as documented in a series of memos and workbooks that outline the latest values. These values are provided in Section 2.2.1.
- Realization rates and net-to-gross ratios, as determined by the FY2020 impact evaluation.

In addition to the detailed information contained in the DCSEU program tracking database, the DCSEU provided the NMR team with its own cost-effectiveness findings for FY2020. The DCSEU calculated a portfolio SCT ratio of 1.87 with $74.7 million of net benefits at the portfolio level for FY2020. As a first step in the analysis, the NMR team developed a parallel set of calculations using DCSEU inputs, assumptions, and formulas. This analysis returned a portfolio SCT ratio of 1.88 and $74.4 million in net benefits. After closely replicating the DC model, the NMR team made a few adjustments to address different assumptions. Section 2.2.2 provides additional details about the differences observed between models. The NMR team produced three additional cost-effectiveness scenarios using different inputs and assumptions. The additional scenarios are described below. The results are summarized in Table 31 and presented in detail in Section 2.2.2.

- ***Scenario #1 – Modified Replica:*** Replicates the DCSEU calculations with corrections to inputs and formulas. The first modification in Scenario #1 was formulaic and was also noted in the FY2017, FY2018, and FY2019 evaluation reports. Some measures have interactive effects on other fuels. For example, installation of cooler LED lighting increases the consumption of fossil fuel heating systems because there is less waste heat in the space. The DCSEU treated this heating *penalty* as a cost for fossil fuels and a benefit for electricity and water. The NMR team standardized the accounting across resources and treated all interactive penalties (and associated externalities) as a negative benefit. This does not affect the Present Value of Net Benefits (PVNB) calculation, but does change the SCT ratios because dollars are moved from the denominator to the numerator. The modified replica model also reduces the demand savings for a single Solar PV Market Rate project (ID 18485) that the NMR team believes were overstated by a factor of ten.[25] The DCSEU model also redefines the *present* for costs by inflating costs by half a year. The modified replica model assumes all costs occur in the present, in current dollars, and does not apply a cost adjustment.
- ***Scenario #2 – Gross Verified Savings****:* This scenario incorporates the realization rates as determined by the impact evaluation. Realization rates are applied to the first-year savings and future adjusted savings (in the case of measures with dual baselines [26]) equally.
- ***Scenario #3 – Net Verified Savings****:* This scenario adjusts the reported savings in the DCSEU system by both the realization rate and net-to-gross ratio. Regardless of program delivery mechanism (incentive vs. direct install), incremental measure costs are discounted by the applicable free-ridership rate.

[25] We changed the ex-ante demand savings for this project to correct a tracking system error and match the verified demand savings. In addition, the replica model uses the kW impacts stored in the program tracking data to calculate capacity benefits. However, when site-specific hours of operation are utilized, DCSEU does not adjust the peak demand impacts stored in the program tracking data, but instead scales capacity benefits using the ratio of the site-specific operating hours to the TRM characterization.

[26] Dual baselines are used to calculate savings when the minimum efficiency of the baseline unit (the unit that would have been installed, such as an inefficient lightbulb) is expected to change over the study horizon, usually due to efficiency standards becoming more stringent. Annual savings are higher before the more stringent standard is enforced because the baseline unit is less efficient, and lower after the standard is enforced because the baseline unit is more efficient.

Appendix A provides descriptions for each of the program tracks offered by the DCSEU in FY2020. The program groupings shown in Table 31 and subsequent tables are a function of the way DCSEU reports direct costs. DCSEU provided direct costs at the four-digit *job* level and some jobs include multiple tracks. For example, job number 7520 includes four Commercial Custom tracks: Retrofit (7520CUST), Market Opportunities (7520MARO), New Construction (7520NEWC), and Pay for Performance (7520P4PX).

## Table 31: Societal Cost Test Ratios by Scenario

| Program | DCSEU | Modified Replica Scenario #1 | Gross Verified Savings Scenario #2 | Net Verified Savings Scenario #3 |
|---|---|---|---|---|
| Income Qualified Gas Efficiency Fund[27] | 0.20 | 0.20 | 0.20 | 0.20 |
| Solar PV Market Rate | 2.90 | 1.94 | 2.00 | 1.96 |
| Low-income Solar Renewable Energy Credit | 1.05 | 1.00 | 1.03 | 0.81 |
| Refresh the District Low-income Single-family[28] | 0.00 | 0.00 | 0.00 | 0.00 |
| C& I RX - Equipment Replacement/Small & Medium Business Rebates | 5.87 | 6.81 | 7.35 | 7.07 |
| Market Transformation Value | 4.65 | 5.01 | 5.43 | 5.17 |
| Commercial Upstream - Lighting | 5.43 | 6.35 | 7.17 | 7.02 |
| Retrofit/Market Opp/New Constr/Pay for Perform - Commercial Custom | 1.79 | 1.84 | 1.81 | 1.79 |
| Income Qualified Efficiency Fund | 0.84 | 0.85 | 0.86 | 0.86 |
| Low-income Multifamily Comprehensive | 1.20 | 1.22 | 1.23 | 1.23 |
| Low-income Prescriptive Rebate | 6.36 | 8.22 | 8.97 | 8.97 |
| Retail Efficient Appliances/Heating and Cooling/Lighting/Seasonal Savings | 2.52 | 2.90 | 2.90 | 2.64 |
| Retail Lighting Food Bank/Home Energy Conservation Kit - Low-income | 2.63 | 3.15 | 3.15 | 3.15 |
| Residential Upstream/Midstream | 2.84 | 3.63 | 3.63 | 3.43 |
| Innovation - Low-income[29] | 0.00 | 0.00 | 0.00 | 0.00 |
| Innovation - Market Rate | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total Portfolio Level** | **1.87** | **1.90** | **1.92** | **1.79** |
| **Portfolio Level with EM&V and DOEE Oversight Costs** | **1.84** | **1.86** | **1.89** | **1.74** |

[27] This program was launched in FY2020, and so the low SCT ratio is driven by high program startup costs.
[28] Impacts for this program were not tracked and therefore SCT results appear as zero.
[29] The two Innovation programs are intended to support other programs and/or pilots and savings are zero because they are allocated to other programs.

Incentives are neither a cost nor a benefit in the SCT Test. The incremental cost of the efficient measure is included in the SCT regardless of the proportion paid by the participant and program administrator. Program administration costs are treated as a cost in the SCT and include planning, IT, marketing, customer service, and all other non-incentive costs. Table 32 provides a breakdown of the FY2020 cost elements after moving increased fuel consumption to the benefits side of the ledger (increased fuel consumption is treated as a negative benefit). These costs are only for the core SETF programs; a similar table of SFA-specific costs is presented in Appendix C.

**Table 32: FY2020 Cost Summary**

| Parameter | Cost Component | FY2020 Portfolio Total |
|---|---|---|
| A | Incentive Payments | $10,205,145 |
| B | Participant Cost (Net of Incentives) | $64,493,673 |
| C | Incremental Measure Cost (A + B) | $74,698,818 |
| D | Track-specific Administrative Costs (Non-incentive) | $3,617,957 |
| E | Portfolio Administrative Costs | $7,057,095 |
| F | Total Program Administration Cost (D+E) | $10,675,052 |
| G | **Total SCT Costs (C+F)** | **$85,373,870** |
| H | DOEE Oversight and NMR EM&V Costs | $1,402,468 |
| I | **Total SCT Costs with Oversight and EM&V (C+F+H)** | **$86,776,339** |

There are two different bins of administrative costs listed in Table 32. The track-specific administrative costs (Parameter D) are allocated to a specific program track, and therefore are included as a cost in the track-level SCT results, presented in Section 1. The portfolio-level results presented in this report include both the track-specific administrative costs and the portfolio administrative costs (Parameter E). This is the same approach used by the DCSEU to calculate cost-effectiveness, and is commonly used by other states and utilities. The implication of this methodology is that each of the track-level results is slightly overstated because the SCT ratio does not reflect its share of costs allocated to the portfolio as a whole. If track-level cost-effectiveness results are important to DOEE, we could work with the DCSEU to develop an allocation method. Possible allocation approaches could include kWh contribution, MMBtu contribution, or spending (Parameters A + D). Parameter H includes costs of oversight from DOEE and the NMR team's EM&V costs for the core SETF programs. The total SCT costs with oversight are presented in Parameter I. As in prior years' reports, all references to SCT ratios do not include the DOEE Oversight and NMR EM&V costs contained in Parameter H unless otherwise noted.

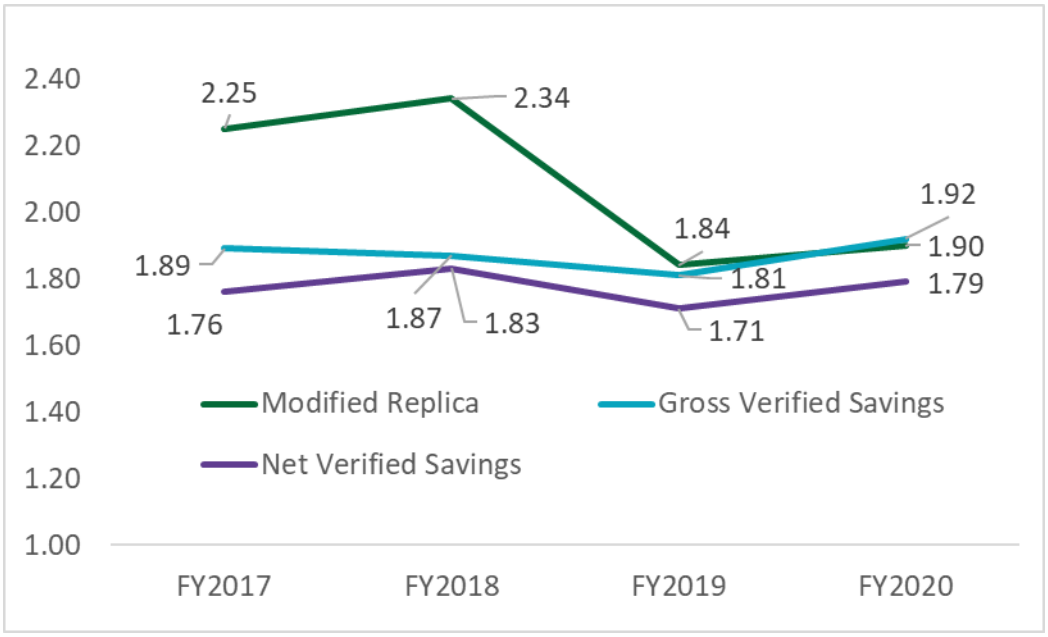
The DCSEU takes a strong position on the valuation of NEBs. In addition to a general 5% adder for the items listed in Table 30 and a 15% low-income solar adder, a $100 per short ton ($110.23 per metric ton) benefit is assigned to all avoided CO2 emissions. In our modified replica model, the NEBs (general 5% adder for select items and the 15% low-income solar adder plus $100 per short ton for CO2) account for 45% of all SCT benefits. For the remaining scenarios, NEBs represent approximately the same percent of all SCT benefits. Without NEBs, the portfolio ratios are closer to one, at 1.04, 1.05, and 0.98 for Scenarios #1, #2, and #3, respectively. Table 33 shows the estimated lifetime reduction in CO2 emissions attributable to FY2020 programs by scenario, using the marginal emissions rate assumptions (marginal emissions rates were used to calculate all SCT results).

### Table 33: Lifetime CO2 Emission Reductions – FY2020 Programs

| Scenario | Lifetime Avoided CO2 Emissions (Metric Tons) |
|---|---|
| 1 – Modified Replica | 624,331 |
| 2 – Gross Verified Savings | 634,109 |
| 3 – Net Verified Savings | 391,135 |

Figure 9 displays the SCT results from FY2017 to FY2020. Compared to prior years, the modified replica results declined starting in FY2019 because DCSEU applied our recommended updated avoided cost assumptions. However, the gross verified savings and net verified savings results are similar each year. The SCT results for FY2020 are similar to FY2019, reflecting routine annual updates to avoided costs and benefits and changes to the portfolio composition.

### Figure 10: DCSEU Societal Cost Test Ratio Trends



### 2.2.1 Avoided Costs

In FY2019, DCSEU modified their avoided cost assumptions to align with NMR's previously recommended cost assumptions. This update allowed for a streamlined review process and simplified the scenarios presented for cost-effectiveness. For FY2020, additional updates were made to reflect the latest available historical data and forecasts. The DCSEU model, as well as the three presented scenarios, use the same avoided cost assumptions. Table 34 summarizes the values and sources applied by DCSEU in their cost-effectiveness testing.

**Table 34: DCSEU FY2020 Avoided Cost Summary**

| Screening Assumption | Value | Source |
|---|---|---|
| **Future Inflation Rate** | 1.740% | Based on the past ten years of consumer price index data published by the U.S. Labor Department for the month of August. |
| **Water Avoided Cost** | $3.071/CCF | Approved_fy_2018_operating_and_capital_budgets_final.pdf, 2017 Engineering Feasibility Report WATER.pdf |
| **Real Discount Rate** | 3. 638% | Ten-year treasury rate posted in the Wall Street Journal on the first business day of October 2019 (1.638%) plus 2% (as specified in the DCSEU contract no. DOEE-2016-C-0002). |
| **Line Losses** | 1.046 (energy) 1.077 (demand) | PEPCO Zone Capacity and Transmission Peak Load Calculations for Year 2018. |
| **Natural Gas Capacity Adder** | 5% | Per Section C.40.10.3 of contract DOEE-2016-C-0002. |
| **Transmission Cost** | $31.75/kW-year | PEPCO's 2019 filing of the FERC formula transmission rate update. |
| **Distribution Cost** | $64.02/kW-year | Distribution rate deduced from the 2017 DC Public Commission order re: Pepco distribution rate increase request. |
| **Electric & Fuel Externalities** | $100 per short ton (2,000 pounds) ($110.23 per metric ton) | Avoided Energy Supply Components in New England: 2018 Report and PJM's 2013-2017 CO2, SO2, and NOx Emissions Rate Report, published in March 2018. |
| **Electric Energy Cost** | Forecast by Year and Period | Hourly real-time locational marginal prices (LMPs) for PEPCO zone from January 2015 to May 2018 are used in conjunction with hourly load data for PEPCO zone for the same period to calculate load-weighted marginal price by energy period. This establishes the 2017 value. Price escalation over the remainder of the forecast horizon (2018-2050) is calculated by averaging growth projections from a series of EIA Annual Energy Outlook forecasts for the Mid-Atlantic region. |
| **Generation Capacity** | Actual Prices for 2020-2022, $62.97/kW-yr for 2023+ | PJM Base Residual Auction clearing prices for PEPCO zone. Historic prices used for forecasting. |
| **Natural Gas Cost** | Forecast by Year and Sector | Projected prices for the industrial sector (Mid-Atlantic region) are adopted from the EIA Annual Energy Outlook 2019 supporting tables for energy price by sector and source. |
| **Other Fuels Cost** | Forecast by Year, Fuel, and Sector | Projected prices for the industrial sector (Mid-Atlantic region) (where possible, transportation sector used as a substitute for kerosene cost) are adopted from the EIA Annual Energy Outlook 2019 supporting tables for energy price by sector and source. |
| **Risk Adder** | 5% | Specified in the DCSEU contract no. DOEE-2016-C-0002. |
| **NEB Adder** | 5% | Specified in the DCSEU contract no. DOEE-2016-C-0002. |

| Screening Assumption | Value | Source |
|---|---|---|
| **Low-income Adder for Solar Measures** | 15% | Modeled on regulatory order: State of Vermont Public Service Board "Order Re Cost-Effectiveness Screening Of Heating And Process-Fuel Efficiency Measures And Modifications To State Cost-effectiveness Screening Tool," 2/7/2012. |
| **Avoided Alternative Compliance Payment Costs for Solar Measures** | $0.11/kWh for 2020-2023, $0.09/kWh for 2024-2028, $0.07/kWh for 2029-2032, zero thereafter | Applicable to solar projects, which help to reduce compliance costs for the DC Renewable Portfolio Standard (RPS). The price per kWh is based on the difference between the cost in Solar Renewable Energy Credits (SRECs) and the Alternative Compliance Payment (ACPs). For more detail, see Appendix C. |

### 2.2.2 Cost-effectiveness Results

Table 35 presents the results of the NMR team's modified replica model. This scenario utilizes the reported gross savings values as stored in the program tracking system and the same array of avoided costs as DCSEU's calculations, but incorporates a set of modifications. Of the 16 program groups, 11 are cost-effective in this scenario. The portfolio is estimated to achieve $72.6 million of net benefits (benefits minus costs). Three of the five programs that are not cost-effective have zero tracked benefits for the SCT analysis. This is not unusual for new programs or programs that are designed to support the benefits of related programs. The three programs with no SCT benefits are the Refresh the District Low-income Single-family program and the two Innovation programs: Low-income and Market Rate. There are a few key differences between this analysis (portfolio SCT ratio = 1.90) and the DCSEU analysis (portfolio SCT ratio = 1.87):

- The NMR model treats increased fossil fuel usage as a negative benefit rather than a positive cost. It is more appropriate to compare net benefit figures because the DCSEU model differed from the NMR team model in its treatment of interactive effects between space conditioning and lighting, as discussed in the Scenario #1 description.
- There were some differing cost and benefit values between the DCSEU results summary and the NMR team's replica model using the detailed program tracking data. The NMR team treated all cost data in the program tracking system as nominal 2020 dollars. DCSEU's model inflates all measure costs by a half-year, effectively assuming that costs occur in future dollars. In contrast, the NMR team's model follows the industry-standard accounting assumption that costs are incurred in the present and no temporal adjustment is made to costs. In addition, the 2020 tracking data uses a mix of 2016 and 2020 as the present value base year, and the entries with 2016 present value base year are actually in 2020 dollars. We recommend that DCSEU define *present* consistently when calculating net *present* value for future fiscal years.
- For commercial lighting projects, when site-specific hours of operation are utilized instead of TRM default assumptions, DCSEU scales the avoided capacity benefits by the ratio of the site-specific operating hours to the TRM default assumptions. The spirit of the DCSEU adjustment is correct – coincidence factors tend to be correlated with hours of operation. However, we recommend making the adjustment to the kW impacts themselves, rather than the capacity benefits. In the NMR replica model, any differences between the site-

specific assumptions and the TRM default assumption are reflected in the demand realization rate, incorporated into Scenario #2 and Scenario #3.

- The NMR model made a correction for one solar project (project ID 18485) for which the NMR team believes the ex-ante peak demand (kW) savings were entered into the tracking database incorrectly, as the verified demand savings for this project were roughly one tenth of the ex-ante value. For this project, the NMR team manually changed the ex-ante value in the tracking database to match the NMR team's verified value (changing the ex-ante value from 1,098.7 kW to 96.9 kW). The NMR team excluded this project from the realization rate calculation used for verified gross savings in Scenarios #2 and #3.

## Table 35: Scenario #1 Modified Replica – SCT Results

| Program | Sector | SCT Benefit ($1,000) | SCT Cost ($1,000) | SCT Net ($1,000) | SCT Ratio |
|---|---|---|---|---|---|
| Income Qualified Gas Efficiency Fund | Residential | $320 | $1,611 | -$1,291 | 0.20 |
| Solar PV Market Rate | Solar | $6,408 | $3,297 | $3,111 | 1.94 |
| Low-income Solar Renewable Energy Credit | Solar | $81 | $80 | $0 | 1.00 |
| Refresh the District Low-income Single-family | Residential | $0 | $44 | -$44 | 0.00 |
| C& I RX - Equipment Replacement/Small & Medium Business Rebates | Commercial | $16,522 | $2,425 | $14,096 | 6.81 |
| Market Transformation Value | Commercial | $737 | $147 | $590 | 5.01 |
| Commercial Upstream - Lighting | Commercial | $11,675 | $1,839 | $9,835 | 6.35 |
| Retrofit/Market Opp/New Constr/Pay for Perform - Commercial Custom | Commercial | $98,623 | $53,720 | $44,903 | 1.84 |
| Income Qualified Efficiency Fund | Multifamily | $1,680 | $1,975 | -$296 | 0.85 |
| Low-income MF Comprehensive | Multifamily | $6,343 | $5,193 | $1,150 | 1.22 |
| Low-income Prescriptive Rebate | Multifamily | $1,213 | $148 | $1,066 | 8.22 |
| Retail Efficient Appliances/Heating and Cooling/Lighting/Seasonal Savings | Efficient Appliances | $8,818 | $3,043 | $5,775 | 2.90 |
| Retail Lighting Food Bank/Home Energy Conservation Kit - Low-income | Efficient Appliances | $1,022 | $324 | $698 | 3.15 |
| Residential Upstream/Midstream | Efficient Appliances | $114 | $32 | $83 | 3.63 |
| Innovation - Low-income | Innovation | $0 | $22 | -$22 | 0.00 |
| Innovation - Market Rate | Innovation | $0 | $9 | -$9 | 0.00 |
| **Total Portfolio Level** | **Portfolio** | **$153,555** | **$80,967** | **$72,588** | **1.90** |
| **Portfolio Level with EM&V and DOEE Oversight Costs** | **Portfolio** | **$153,555** | **$82,370** | **$71,186** | **1.86** |

Table 36 presents the results for Scenario #2. The electric energy, peak demand, and natural gas savings realization rates developed through the FY2020 impact evaluation were generally close to 100%, so the Scenario #2 SCT results are similar to Scenario #1 at the portfolio level. Eleven of the 16 program groups are cost-effective in this scenario and five are not. The portfolio is estimated to achieve $73.1 million of net benefits (benefits minus costs). Of the five programs that are not cost-effective, three have SCT benefits of zero dollars because benefits were not tracked for these programs, as was the case in Scenario #1.

**Table 36: Scenario #2 Gross Verified Savings – SCT Results**

| Program | Sector | SCT Benefit ($1,000) | SCT Cost ($1,000) | SCT Net ($1,000) | SCT Ratio |
|---|---|---|---|---|---|
| Income Qualified Gas Efficiency Fund | Residential | $320 | $1,611 | -$1,291 | 0.20 |
| Solar PV Market Rate | Solar | $6,596 | $3,297 | $3,299 | 2.00 |
| Low-income Solar Renewable Energy Credit | Solar | $83 | $80 | $2 | 1.03 |
| Refresh the District Low-income Single-family | Residential | $0 | $44 | -$44 | 0.00 |
| C& I RX - Equipment Replacement/Small & Medium Business Rebates | Commercial | $17,825 | $2,425 | $15,400 | 7.35 |
| Market Transformation Value | Commercial | $799 | $147 | $652 | 5.43 |
| Commercial Upstream - Lighting | Commercial | $13,197 | $1,839 | $11,358 | 7.17 |
| Retrofit/Market Opp/New Constr/Pay for Perform - Commercial Custom | Commercial | $97,297 | $53,720 | $43,578 | 1.81 |
| Income Qualified Efficiency Fund | Multifamily | $1,701 | $1,975 | -$274 | 0.86 |
| Low-income Multifamily Comprehensive | Multifamily | $6,364 | $5,193 | $1,171 | 1.23 |
| Low-income Prescriptive Rebate | Multifamily | $1,324 | $148 | $1,176 | 8.97 |
| Retail Efficient Appliances/Heating and Cooling/Lighting/Seasonal Savings | Efficient Appliances | $8,835 | $3,043 | $5,792 | 2.90 |
| Retail Lighting Food Bank/Home Energy Conservation Kit - Low-income | Efficient Appliances | $1,022 | $324 | $698 | 3.15 |
| Residential Upstream/Midstream | Efficient Appliances | $114 | $32 | $83 | 3.63 |
| Innovation - Low-income | Innovation | $0 | $22 | -$22 | 0.00 |
| Innovation - Market Rate | Innovation | $0 | $9 | -$9 | 0.00 |
| **Total Portfolio Level** | **Portfolio** | **$155,478** | **$80,967** | **$74,511** | **1.92** |
| **Portfolio Level with EM&V and DOEE Oversight Costs** | **Portfolio** | **$155,478** | **$82,370** | **$73,109** | **1.89** |

Table 37 presents the results of Scenario #3. This scenario adjusts energy savings by incorporating both realization rates (from Scenario #2) and net-to-gross ratios. Ten of the 16 program groups are cost-effective in this scenario. Both the benefits and costs are reduced in this scenario because no savings (or benefits) are assigned to free riders and the incremental measure costs associated with free riders are not included as an SCT cost (because they would have purchased the efficient equipment absent the program). The portfolio SCT ratio is slightly lower in Scenario #3 (1.79) than Scenario #2 (1.92), and the net benefits are significantly lower ($41.0 million vs. $74.5 million).

**Table 37: Scenario #3 Net Verified Savings – SCT Results**

| Program | Sector | SCT Benefit ($1,000) | SCT Cost ($1,000) | SCT Net ($1,000) | SCT Ratio |
|---|---|---|---|---|---|
| Income Qualified Gas Efficiency Fund | Residential | $320 | $1,611 | -$1,291 | 0.20 |
| Solar PV Market Rate | Solar | $4,028 | $2,056 | $1,972 | 1.96 |
| Low-income Solar Renewable Energy Credit | Solar | $49 | $61 | -$11 | 0.81 |
| Refresh the District Low-income Single-family | Residential | $0 | $44 | -$44 | 0.00 |
| C& I RX - Equipment Replacement/Small & Medium Business Rebates | Commercial | $12,138 | $1,716 | $10,422 | 7.07 |
| Market Transformation Value | Commercial | $675 | $131 | $545 | 5.17 |
| Commercial Upstream - Lighting | Commercial | $9,660 | $1,375 | $8,285 | 7.02 |
| Retrofit/Market Opp/New Constr/Pay for Perform - Commercial Custom | Commercial | $51,353 | $28,704 | $22,650 | 1.79 |
| Income Qualified Efficiency Fund | Multifamily | $1,701 | $1,975 | -$274 | 0.86 |
| Low-income Multifamily Comprehensive | Multifamily | $6,364 | $5,193 | $1,171 | 1.23 |
| Low-income Prescriptive Rebate | Multifamily | $1,324 | $148 | $1,176 | 8.97 |
| Retail Efficient Appliances/Heating and Cooling/Lighting/Seasonal Savings | Efficient Appliances | $4,440 | $1,681 | $2,760 | 2.64 |
| Retail Lighting Food Bank/Home Energy Conservation Kit - Low-income | Efficient Appliances | $1,022 | $324 | $698 | 3.15 |
| Residential Upstream/Midstream | Efficient Appliances | $57 | $17 | $41 | 3.43 |
| Innovation - Low-income | Innovation | $0 | $22 | -$22 | 0.00 |
| Innovation - Market Rate | Innovation | $0 | $9 | -$9 | 0.00 |
| **Total Portfolio Level** | **Portfolio** | **$93,132** | **$52,123** | **$41,009** | **1.79** |
| **Portfolio Level with EM&V and DOEE Oversight Costs** | **Portfolio** | **$93,132** | **$53,525** | **$39,607** | **1.74** |

### 2.2.3 Cost-effectiveness Recommendations

The FY2020 cost-effectiveness analysis required the NMR team to thoroughly explore several of the energy, economic, and policy assumptions used by the DCSEU. Based on our review, we offer the following observations and recommendations:

- Although the calculation of SCT benefits and costs occurs in external workbooks, the mechanics of the DCSEU tracking system are expertly organized to facilitate benefit cost modeling. The application was well-documented and the DCSEU staff was responsive to our inquiries. The tracking database details participation in all program measures and provides costs, benefits, energy use, and savings estimates.
- Since FY2017, the NMR team has suggested various improvements to the cost-effectiveness assumptions and calculations and DOEE and DCSEU have adopted many of these, such as the avoided emissions rate (see below). However, many assumptions have remained constant or are refreshed according to a pre-defined formula established in FY2017. For instance, several of the assumptions listed in Table 34 – including the avoided cost of electricity – have not been updated since 2018 other than simple adjustments for inflation. In addition, the next four PJM capacity auctions (covering delivery years 2023/2024 to 2026/2027) will be held over the next two years, starting in June 2021, which may warrant an update to the way avoided generation capacity costs are calculated. We recommend conducting a thorough review of all assumptions for FY2022, the start of the next five-year contract period, to ensure that all assumptions reflect the most up to date information.
- DCSEU adopted the NMR team's recommendation from FY2019 to remove the 15% adder to solar projects in its SCT calculations for market rate participants (on top of another 15% low-income solar adder). For FY2020, only the 15% low-income adder is applied to solar projects.
- In FY2020, DCSEU adopted the NMR team's recommendation to include line losses in the calculation of electric externality benefits, which were not included in FY2019 or previously. This adjustment reflects the emissions associated with electricity that is generated, but lost, during transmission and distribution. This change had the effect of increasing electric externality benefits by roughly 5%.
- DCSEU applies a cost adjustment that assumes participant costs are incurred a half year in the future. Conventional accounting calculates costs as if they are incurred in the present. Investments in energy efficiency are fundamentally an upfront capital investment *today* for energy savings realized over many years. This adjustment to the timing of cost occurrence by DCSEU should be omitted.
- The handling of dual baselines was well executed in the DCSEU tracking system. The most important dual baseline measure is LED lighting. The DCSEU savings assumptions for FY2020 assume implementation of the 2020 Energy Independence and Security Act (EISA) Phase II backstop. Energy savings from screw-based LED bulbs were assigned full savings for one year and then a significantly reduced annual savings value for the remainder of their useful life.

  - Implementation and enforcement of the 2020 backstop provision at the federal level did not happen as planned on January 1, 2020.
  - Regardless of any action, or inaction, at the federal level, the residential lighting market is rapidly transforming to majority-LED sales.
  - For FY2021, we recommend that the DCSEU carefully review the measure life assumptions of any remaining residential LED measures with the NMR team and DOEE as early as possible because of the sensitivity of SCT results to this key input.

- The cost of residential LED lighting remains overstated in the DCSEU TRM and program tracking system for the fourth consecutive year. The assumed cost of LED bulbs was between $9 and $15 for FY2020 and was similarly high in prior years. The retail cost of ENERGY STAR LED bulbs has dropped rapidly and is currently $3-$5 per bulb. Assuming a $1.50 cost for a halogen bulb means the incremental measure cost should be closer to $2-3/bulb.
  - The DCSEU tracking system has actual retail prices for all upstream bulbs, so it is unclear why the calculations rely on dated cost assumptions rather than actual values. If the actual retail prices can be leveraged for FY2021 cost-effectiveness, it will be important to carefully distinguish per-package prices from per-bulb prices.
  - Reducing the incremental cost assumptions would improve the cost-effectiveness of retail lighting measures to the extent DCSEU continues to support retail lighting.
- Reduced CO2 emissions and other NEBs represent a significant share (45%) of the SCT benefits from FY2020 programs.
  - The $100 per short ton ($110.23 per metric ton) assumption for avoided CO2 emissions should be reviewed to ensure it is consistent with the District's policy objectives and other regional research on the value of reduced carbon emissions.
    - The NMR team produced a literature review of carbon prices and emission rates in 2019 in which we summarized the carbon prices used in other jurisdictions.[30] Findings indicate that there was considerable variation in estimates of the value of CO2 emissions, but the average of the sources reviewed is approximately $45 per short ton. This average was similar to the Obama administration's Social Cost of Carbon (SCC) central estimate (using a 3% discount rate), which were used in New York, Illinois, Colorado, and Minnesota at the time. It is worth noting that the Obama SCC estimate increases from $48 per ton in 2020 to $135 per ton in 2050 (in nominal $2050). In January 2021, the Biden administration adopted the Obama SCC estimate as an interim value for rulemakings until it is able to develop an updated SCC estimate, expected in January 2022.[31] Note that the NMR team expects the Biden administration SCC will be higher than the Obama value, though the magnitude of the difference is uncertain.

[30] "Valuation of Avoided CO2 Emissions", December 13, 2019.
[31] See https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.

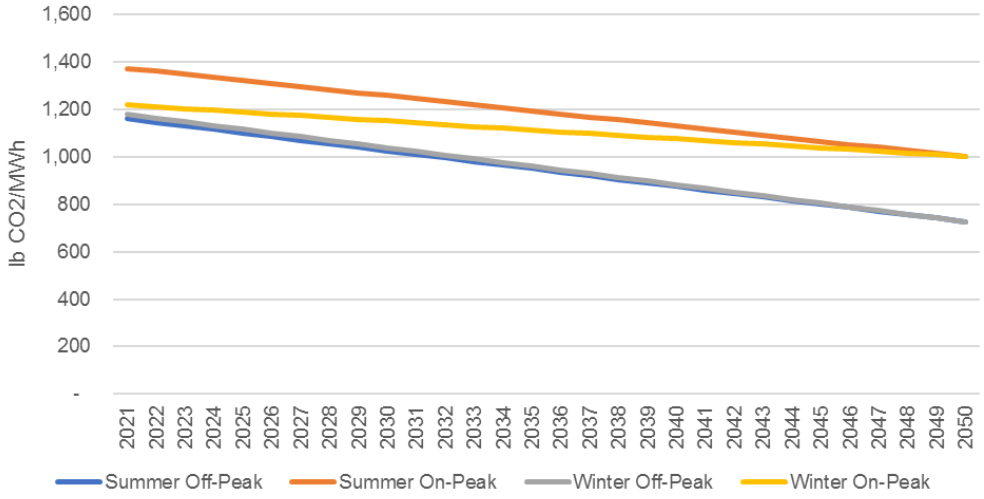
- The DCSEU assumption of $100 per short ton value was based on the 2018 Avoided Energy Supply Cost (AESC) report. An updated 2021 AESC report uses a recommended carbon price of $128 per short ton (in 2021 dollars) that is based on recent SCC guidance from New York State, which uses a 2% discount rate.[32] The 2021 AESC report provides other options for the SCC – ranging from $92 to $493 – depending on the perspective used (abatement cost vs damages) and the region.

- At $0 per short ton of CO2, but still including the 5% NEB and 15% low-income solar adders, Scenario #1 remains cost-effective with a portfolio SCT ratio of 1.09.[33] At $50 per short ton, while still including the NEB and low-income solar adders, the portfolio Level SCT ratio is 1.49 for Scenario #1. As shown in Table 35, the $100 per short ton assumption results in a portfolio SCT ratio of 1.90. While the CO2 assumption does not determine whether or not Scenario #1 is cost-effective at the portfolio level, it does have a significant impact on the magnitude of the ratio, and two programs shift from cost-effective to not cost-effective.

- The value of CO2 emissions in the SCT is the product of the avoided cost of CO2 emissions and the assumed CO2 emissions rate. The electric emission rates in the FY2020 analysis are based on the marginal emission rates for the PJM system and held constant through 2050. However, the PJM emissions rate has consistently declined over the past ten years and will likely continue to decline over the next 30 years as the grid becomes cleaner.[34] As a result, the DOEE has adopted the NMR team's recommendation for FY2021 to use declining emissions rates. These emissions rates will start at the 2019 PJM marginal emissions rates for summer and winter periods, which is the most recent year data were available before the FY2021 assumptions were finalized. Then the rates will decline to an assumed 2050 marginal emissions rate of 1,000 pounds per MWh on-peak and 725 pounds per MWh off-peak based on an assumed heat rate of 6,200 BTU/kWh for a combined cycle unit power plant and 8,550 BTU/kWh for an advanced combustion turbine power plant. This is shown in Figure 10. Note that the 2020 PJM emissions rate report released in April 2021 shows a continued decline in the marginal emissions rate, which is consistent with the FY2021 assumption.[34]

[32] See pages 172-176 of https://www.synapse-energy.com/sites/default/files/AESC%202021.pdf for a discussion of the recommended AESC value and a more detailed discussion of the SCC.
[33] As described earlier, the Portfolio SCT ratio falls to 1.04 when all NEBs are excluded.
[34] See https://www.pjm.com/-/media/library/reports-notices/special-reports/2020/2020-emissions-report.ashx for the marginal PJM emissions rates for 2016 to 2020. Values for 2015 and earlier are available in prior years' versions of the PJM emissions report.

**Figure 11: FY2021 Marginal Emissions Rate Assumption**




- The 5% adder for NEBs (other than CO2 emissions) is a proxy value to recognize tangible benefits that are challenging to directly quantify. The NMR team will continue to collaborate with DCSEU and DOEE to assess the appropriate value for the overall NEBs adder, the feasibility of supplemental health or low-income NEB adders, and the possibility of incorporating NEB research into our future evaluation activities.

# Appendix A Program Descriptions

This appendix provides a description for each of the program tracks offered by DCSEU in FY2020.

## A.1 Commercial Sector

**7520CUST – Retrofit – Commercial Custom**

The Custom Retrofit program offers incentives to owners of large buildings to install energy-efficient equipment or make operational changes to their facility that result in energy savings. The program focuses on retrofit projects where the equipment is being replaced prior to the end of its life. Incentives are offered for a variety of equipment types, including lighting, chillers, boilers, heat pumps, steam systems, insulation, refrigeration, and various building or equipment controls. Through this program, the DCSEU offers technical assistance to help decision makers design, scope, and fund their projects. Rebates are paid on a traditional per-unit of energy saved basis.

**7520MARO – Market Opportunities – Commercial Custom**

The Market Opportunity Custom program focuses on retrofit projects where equipment is at the end of its life. It offers incentives to large building owners who update equipment to energy-efficient options or update operational controls to achieve energy savings. This track includes measures in lighting, HVAC, and various commercial/residential appliances. Key objectives of the incentive are to offset the costs of adding energy-efficient equipment beyond the current energy code; provide comprehensive technical services to help decision makers design, scope, and fund their projects; and share the economic benefits with the customer. Funding is available through a traditional rebate structure where participants are paid per unit of energy saved.

**7520NEWC – New Construction – Commercial Custom**

This program focuses on construction of new buildings or facilities that exceed energy code standards. The New Construction Track covers a large range of new construction measures, including lighting; HVAC; building controls; building envelope elements, such as insulation and windows; and plug loads, such as icemakers, refrigerators, and freezers. DCSEU provides technical assistance in the design stage to help decision makers design, scope, and fund their projects. The key features of the incentive structure are to offset the incremental costs of adding more energy-efficient equipment than the current code requires, provide comprehensive technical services during design stage, and share the economic benefits with the customer.

**7520P4PX – Pay for Performance**

The P4P program launched in FY2019 to incentivize complex, multi-measure energy-efficiency projects that are not covered under existing program tracks. It focuses on existing commercial and industrial buildings, which implement multiple measures simultaneously or behavioral or operational changes where it is difficult to estimate savings. This may include re-/retro-commissioning, upgrades to the building controls, or fault detection. Incentives are paid based on

pre- and post- project metered data where actual energy saved is determined using multivariate linear regression of AMI (PEPCO) or monthly (WGL) meter data.

**7511CIRX – C&I RX – Equipment Replacement**

The Business Energy Rebate (BER) initiative provides small- to medium-sized businesses located in DC with a comprehensive set of services and financial incentives to help them transition to more energy-efficient equipment. The initiative provides prescriptive incentives for lighting, refrigeration, HVAC, compressed air, and food service and vending equipment. Rebates require written pre-approval and are given for facility improvements that result in a permanent reduction in electrical and/or natural gas energy usage persisting for a minimum of five years.

The initiative is implemented through individual contractors selected by the participant. The DCSEU Account Managers generate leads based on prior years' participation or interest. Customers can also call the DCSEU or visit the DCSEU website. Contractors are also trained on how to upsell energy-efficient equipment.

**7511SMRX – Small & Medium Business Rebates**

This track is for Small Businesses, under 10,000 square feet. The DCSEU has been offering higher incentives to them as part of an ongoing campaign. The measures offered are the same as 7511CIRX, but with slightly higher incentives.

**7512MTV – Market Transformation Value**

The T12 MTV initiative targets small- to medium-sized businesses (less than 10,000 square feet or less than 5,000 kWh/month). While larger customers can participate, they are encouraged to participate in an appropriate Custom track. MTV provides upgrades for old, inefficient equipment. The DCSEU staff interview applicants to determine incentive levels needed to move viable projects forward.

DCSEU staff and Certified Business Enterprise (CBE) contractors are responsible for outreach to potential participants. The CBE contractors install eligible equipment, and DCSEU staff inspect 100% of the projects prior to release of the financial incentive.

**7513UPLT – Commercial Upstream**

The Commercial Upstream/Midstream Lighting Program provides customers with point-of-purchase rebates when they buy qualified lighting products from participating distributors. Through this program, customers can receive rebates for ENERGY STAR 2.0 certified LED directional, omnidirectional, and decorative bulbs, as well as DLC certified linear LED tubes. This program format enables closer and more efficient tracking of product purchases. Distributors provide sales information directly to DCSEU, enabling higher levels of quality control. It also means that incentives can be adjusted more frequently "behind the scenes." In this way, the DCSEU can ensure that incentives more closely match changing conditions in the market. The DCSEU piloted this approach in FY2017 with lighting distributors.

## A.2 SOLAR SECTOR

### 7101PVMR – Solar PV Market Rate

The PV Market Rate program provides incentives to buildings that install solar panels to reduce their consumption from the electric grid. The DCSEU works directly with contractors to identify potential properties. At the start of a project, the contractor submits project information (the Interconnection Application Agreement) to Pepco and the DCSEU. Pepco reviews the form and checks for completeness, determines circuit impact and operating conditions, and requests amendments to the contractor, as needed. Upon Pepco approval of this form, Pepco sends an "Approval to Install" notification to the contractor. Concurrently, the DCSEU checks the income qualification materials, scope of work, spec sheets, and other materials, and generates a work order. With Pepco's approval and a work order from DCSEU in hand, the contractor can begin installation. Once the project is completed, the DCSEU schedules an inspection with the contractor. As of FY2015, proof of interconnection from Pepco is required for DCSEU to issue payment to the contractor.

The program contributes to electricity and natural gas savings, installed renewable energy capacity, the formation of green jobs, and low-income spending and savings. It also helps meet the DCSEU performance benchmark and address the needs of the solar market by serving as a low or no cost technical assistance center for solar installations.

### 7107SREC – Low-income Solar Renewable Credit

Through this program, DCSEU has partnered in the past with a local solar non-profit to provide upfront value for the first five years of Solar Renewable Energy Certificates (SRECs) generated by residential systems installed under the non-profit's solar program. By partnering with SREC offtakers through a competitive process along with capital providers, DCSEU was able to provide upfront value for these SRECs beyond market rates, thereby resulting in increased solar capacity beyond the status quo.

## A.3 LOW-INCOME SECTOR

### 4335IGEF – Income Qualified Gas Efficiency Fund

Washington Gas is partnering with the DCSEU to provide funding for natural gas efficiency upgrades for low- and limited-income residents of affordable multifamily housing in the District of Columbia. These projects consist of natural gas saving measures on old, inefficient equipment that can now be replaced with this available funding. These projects are classified as retrofits.

### 7415LIDP – Low-income Decarbonization Pilot

In FY2020, the DCSEU operator received funding from the DOEE to implement the Low-income Decarbonization Pilot (LIDP) program. The goal of the LIDP was to obtain data on the total costs, benefits, challenges, resident impact, and cost-effectiveness of beneficial electrification (BE) and other forms of decarbonization from installing BE measures in income-qualified homes. The DCSEU Pilot Team also sought to derive best practices – from the pilot and from its own substantial experience in delivering services to the low-income residential market – to guide building owners and other interested stakeholders considering BE. The Pilot Team also expected

the results to help the DCSEU examine consumer pros and cons from switching to BE from fossil fuel sources for HVAC equipment and appliances.

To achieve the goal, the pilot's primary purpose was to replace fossil fuel measures with high-efficiency electric equipment and appliances. A secondary purpose was to ensure the participating homes became more functional, comfortable, and safe for their occupants. Participants could be either owners or renters of single-family dwellings (detached houses or rowhouses), or renters in low-rise multifamily buildings with four or fewer units.

**7612LICP – Low-income Multifamily Comprehensive**

The Low-income Multifamily Comprehensive program is designed to support low-income multifamily housing, specifically new construction or gut-rehab, in the installation of energy-efficient measures, and allows DCSEU to provide technical expertise and funding. Each project is independently evaluated and specific energy conservation measures (ECM) are chosen depending on the project's needs. Some of these ECMs will include measures affecting the thermal envelope (air and thermal barriers, doors, and windows), domestic hot water systems, in-unit and common area lighting, appliances, and controls.

The initiatives work with developers and owners of low-income multifamily projects who are constructing, redeveloping, or rehabilitating affordable housing projects. The initiatives provide custom technical services and incentives for energy-efficiency improvements to low-income multifamily projects.

**7610IQEF – Income Qualified Efficiency Fund**

The Income Qualified Efficiency Fund program is designed to serve low-income multifamily housing, shelters, and approved clinics. Funding and priority are competitively awarded to approved contractors for energy-efficiency projects that generate significant energy savings and pass the associated financial benefits on to low-income DC residents. Efficiency measures that maximize energy savings, reach a large number of low-to-moderate income residents, and/or assist residents who face a loss of heating or air conditioning due to inoperable equipment receive priority. Supported measures include domestic hot water systems, lighting, appliances, controls, and measures improving the thermal envelope.

**7613LIRX – Low-income Prescriptive Rebate**

The Low-income Prescriptive Rebate program provides financial support for lighting installations in low-income multifamily housing and low-income shelters and clinics. Approved installations must be EnergyStar or DLC qualified. Projects tracked under 7613 LI RX are generally focused on specific end uses. 7613LIRX is focused on in-unit and common area lighting. The initiatives work with developers and owners of low-income multifamily projects who are constructing, redeveloping, or rehabilitating affordable housing projects. The initiatives provide custom technical services and incentives for energy-efficiency improvements to low-income multifamily projects.

**7717FBNK – Retail Lighting Food Bank**

The Food Bank Energy Efficient Lighting Distribution initiative provides LED lighting to low-income households in DC that receive goods from participating food banks. The DCSEU provides LEDs to these residents after verifying that their household is located in the District and conducting a short survey with the client to determine the appropriate number of bulbs needed.

**7717HEKT – Home Energy Conservation Kit – Low-income**

The Home Energy Conservation Kit – Low-income program sends energy conservation kits to low-income District residents. The only measures in this track are home energy conservation kits, which include an Advanced Power Strip, a Faucet Aerator, and six LEDs. They offer low-income DC residents a free, easy way to implement energy saving measures.

## A.4 Residential Sector

**7710APPL – Retail Efficient Appliances**

The Retail Efficient Appliances program offers mail-in and online rebates for qualifying refrigerators, clothes washers, clothes dryers, heat pumps, air conditioners, boilers, furnaces, thermostats, and other products. Under this initiative, DCSEU partners with local retailers and contractors to promote these rebates, providing rebate forms in retail stores when possible.

**7710LITE – Retail Lighting**

The Retail Efficient Lighting program coordinates with lighting retailers and manufacturers to increase the availability of LEDs and offer them at lower prices for District residents and small businesses. This initiative works to educate customers on the benefit of LED lights and increase awareness as LEDs are less familiar to residents than CFLs or incandescent bulbs. Retailers and manufacturers are provided incentives on a per-bulb basis. The initiative is implemented by DCSEU with EFI providing support for incentive payment and data tracking. EFI is responsible for compiling and verifying manufacturer invoices and processing payments. Manufacturers submit invoices to EFI for payment and work with stores to gather sales reports that they submit along with the invoice requests.

**7710HTCL – Retail Heating and Cooling**

The Retail Heating and Cooling program works with contractors in the District to install heating and cooling equipment in residential applications. Measures include advanced and programmable thermostats (not smart thermostats), central air conditioners, domestic hot water heaters, boilers, furnaces, and ductless and air-source heat pumps. The only measure that does not require a contractor to install is a smart thermostat. Smart thermostats have their install verification through a confirmation with the manufacturer that the thermostat is connected to the internet and actively working.

**7710STAT – Nest Seasonal Savings**

Residents who install Nest thermostats can enroll in the Nest Thermostat Seasonal Savings program to garner additional energy savings.

### 7725RSUP – Residential Upstream

The Residential Upstream program is used to track residential, efficient lighting projects purchased through electrical distributors. Participating electrical distributors buy down the price of the lighting products and offer a point-of-sale rebate to their customers. After sale, they submit documentation to the DCSEU for reimbursement on the products.

## A.5 SOLAR FOR ALL

### 7109LISF – Solar for All Low-income Single-family PV

The SFA program aims to provide the benefits of solar electricity to 100,000 low-income eligible households in DC and to reduce residents' energy bills by 50%. The SFA program was established by the Renewable Portfolio Standard (RPS) act of 2016, which is funded by the Renewable Energy Development Fund (REDF). By enrolling in the SFA program, the installed system will offset the homeowner electricity costs by about $500.00 per year or more while providing a portion of the homeowner electricity from the grid. Renters who meet the income requirements as outlined are eligible for the program if the homeowner agrees to the terms and conditions of the program. Once a homeowner is qualified, the system is then installed at no cost and is fully funded by the DCSEU through the SFA program. Note that applying for the SFA program does not guarantee that the homeowner will receive a solar system. The SFA program operates on a first-come, first-served basis and fulfillment is dependent upon funding availability.

### 7108CREF – Solar for All Community Renewable PV

In addition to installing solar directly on income-qualified single-family homes, the DCSEU is also working with solar developers to install large community renewable energy facilities (CREFs), or community solar, on structures around the District as part of the SFA program. Once installed and operational, these systems can provide electricity bill credits to income-qualified District residents that will reduce electricity bills by approximately $500 each year for 15 years. This allows any resident that pays an electricity bill—including, residents in multifamily buildings, renters, or residents whose roofs are not suitable for solar, to access savings from SFA.

# Appendix B Detailed Program Recommendations

This section contains detailed program recommendations from the *Evaluation of DC Sustainable Energy Utility FY2020 Programs* report.

Our evaluation of the FY2020 programs found that DCSEU expended the appropriate amount of effort and rigor on their savings calculations. In general, the documentation provided was sufficient, and the methods and assumptions were suitable. The NMR team believes the DCSEU calculated energy savings with a reasonable degree of accuracy.

However, our evaluation yielded specific recommendations for most programs, as described below. While DCSEU prescriptive savings estimates were reasonable, in aggregate, for the FY2020 programs, the NMR team believes the DCSEU can continue to improve calculation methods and should prioritize improvements that offer the most cost-effective outcomes. The NMR team provides one recommendation that applies to most prescriptive programs.

- Apply project-specific efficiency levels and other inputs to improve the accuracy of tracked savings when feasible. DCSEU applied deemed values or ranges for efficiency levels, wattages, and other inputs to savings algorithms when site specific information was available. This issue was most prominent for commercial and low-income lighting projects where the DCSEU used default energy-efficient wattage assumptions when the actual wattage values were available. For PV systems, default values for inverter efficiency and locations were input rather than available site-specific data. In these cases, project-specific input values were available, which would improve the accuracy of tracked savings. DCSEU should examine how integrating site-specific information within the tracking system can be done efficiently when these data are already collected from customers.

For the Custom Retrofit program, we offer the following recommendations:

- Ensure that all references, assumptions, details, and baseline conditions for each project are provided and clearly laid out in project documentation.
- Each project should contain a narrative specifically related to baseline determination and associated inputs. This is particularly critical for projects where the baseline equipment is aged and/or performing significantly worse than originally designed.
- For large multi-measure projects, especially lighting, consider organizing the projects by measure type. This could involve creating subfolders within the main project directory for each individual measure analysis and for all relevant documentation used to perform the analysis.
- Consider requiring use of standard savings calculator tools for as many efficiency measures as possible. Customer-provided calculators do not always utilize appropriate algorithms or assumptions, nor do they always provide a clear indication of how the final ex-ante values were calculated. Employing standard calculators will yield clearer, more-reliable results and streamline SEU's processing of projects.

- For projects that employ energy modeling software to estimate savings, provide a narrative within the project documentation that indicates how the output summaries from the modeling software were used to calculate ex-ante savings values.
- Require that applicants submit any calculations used to estimate annual hours-of-use for custom lighting measures. Applicants should also submit supporting documentation or other sources that indicate how the estimates were developed.
- Post-installation inspection reports should be more detailed, especially in situations where discrepancies were observed during the inspection. All information that is collected or confirmed during the site inspection should be clearly linked to the respective measure.

For the Commercial New Construction program, we offer the following recommendations:

- Ensure that the savings from the Energy Summary Report document align with the final claimed savings.
- Consider requiring the Energy Summary Report to include an explanation describing which energy model output file(s) and documents contributed to the final claimed savings.
- Consider adding input variables in the DCSEU tracker to include both baseline and proposed energy usage. The savings should simply be the difference between the two scenarios with clear reference to the modeling output file.
- Consider undertaking further quality control regarding peak electric demand savings as some projects referenced total demand reduction instead of summer peak demand savings.
- Consider ways to expedite processing times for application pre-approval and rebate delivery and streamline application processes, where possible.

For the Market Opportunities program, we offer the following recommendations:

- Continue to include site-specific calculators for each project that show how ex-ante savings were estimated. The calculators could be improved by adding explanations regarding the workings of the calculators and the reasoning behind certain assumptions.
- Ensure that all references, assumptions, details, and baseline conditions for each project are provided and clearly laid out in project documentation. Each project should contain a narrative specifically related to baseline determination and associated inputs, particularly for efficiency measures involving HVAC equipment and heating/cooling plants.
- For lighting measures, consider developing a lighting workbook with assumptions referencing an index table. Referencing an index table would provide more consistency across projects and provide a clear itemized list of the lighting measures to reference against project documents.
- Consider including additional detail in the DCSEU tracker related to the various inputs used to calculate ex-ante savings values for lighting projects. In particular, we recommend providing more information on each facility's HVAC system in order to apply the appropriate waste heat factors within the lighting savings calculations. Additionally, unless there is substantial operating data indicating a site-specific lighting controls factor, energy

savings resulting from lighting controls should be based on the deemed values found in the DC TRM.

For the CI RX Equipment Replacement program, we offer the following additional recommendation:

- To account for peak demand savings, the TRM should include a formula that calculates the summer peak demand coincidence factor based on load shapes recorded in the tracker. This adjustment could improve savings calculations for all measure types.

For the Commercial Upstream Lighting program, we offer the following additional recommendations:

- Collect additional information at the time of purchase, including contact information and building type. Rather than relying solely on fixture type to determine hours of operation, including the building type could improve the accuracy of estimated hours of operation. In addition, collect contact information for the end-use customers to facilitate follow-up outreach and evaluation.
- Consider conducting post-installation inspections or requesting that customers provide photos for a sample of projects to estimate in-service rates more accurately. Due to the upstream nature of the program, we understand that inspections are not currently performed.
- Ensure all projects have specification sheets provided for each unique lamp and fixture that is installed as part of the project.
- Consider offering upstream incentives for additional equipment types, such as HVAC equipment, VFDs, and motors.

For the P4P program, we offer the following recommendations:

- The NMR team recommends that the SEU continue to utilize the Temperature and Time of the Week (TTOW) modeling algorithm whenever possible. The TTOW model is well supported by the literature and has been found to be a very accurate energy predictor when weather data is the only available independent variable.
- The effects of the COVID pandemic will continue to impact the P4P program for the next two or three years. Depending on when customers enter the program, their baseline or performance periods will include the 2020 calendar year. DCSEU properly handled the effects of the pandemic by examining data periods that were unaffected by the pandemic, or by including indicator variables to account for the impacts. DCSEU should continue to be mindful of the pandemic time periods as the P4P program continues.

For the Solar PV Market Rate program, we offer the following additional recommendation:

- Consider adding an automated check in the tracking database to flag projects where the peak demand savings are unusually high. One potential flag could be to identify projects where the peak demand savings exceeds 300% of the average demand savings. This will alert SEU staff to potential data entry issues during the data entry process.

For the Low-income Multifamily Comprehensive program, we offer the following additional recommendations:

- Ensure that lighting installation locations and heating fuel types are recorded correctly so the appropriate hours-of-use and waste heat factors are applied.
- Calculate cooling and peak demand savings for projects with heat pumps where air sealing was performed.

For the Low-income Prescriptive Rebate program, we offer the following additional recommendations:

- Ensure that deemed prescriptive savings are rounded to the same decimal place across item codes.
- Ensure that the appropriate coincidence factors are utilized based on the location in which lighting measures are installed (multifamily in-unit versus common area).

For the Income Qualified Efficiency Fund program, we offer the following recommendation:

- Ensure that measures are accurately characterized in the tracking data.

For the Retail Heating & Cooling program, we offer the following recommendations:

- Ensure that home and product information from the rebate data, such as home type, heating/cooling type, and system size, are accurately recorded in the tracking data so the correct deemed savings are applied.
- Review program materials to identify opportunities to improve clarity on the application process, particularly for measures that are more likely to be self-installed.

In addition, based on feedback from the survey with participating commercial customers, we recommend that DCSEU continue to engage prior commercial participants with ongoing outreach, as engaged participants are more likely to undertake additional projects. In particular, 35% of commercial participants surveyed would like DCSEU to provide them with information on all available rebates, 28% would like to be notified when programs change, and 16% would like DCSEU to conduct an energy audit of their facility.

Detailed results and recommendations can be found in each of the individual program sections.

# Appendix C Solar For All Cost Effectiveness Results

This appendix presents results for two Solar For All (SFA) programs that the DCSEU tracks performance for but that are not funded through the core Sustainable Energy Trust Fund (SETF). The two programs are Solar for All Community Renewable PV Energy and Solar for All Low-income Single-family PV. These programs seek to provide disadvantaged DC communities with access to affordable renewable energy.

Because a portion of the SFA projects were missing information about energy savings, the evaluation team had to take several additional steps to produce SCT results. These projects had data on annual energy savings (solar production) and the nameplate solar capacity but were missing the allocation of energy savings to the four costing periods as well as the coincident demand savings used for calculating benefits associated with avoided capacity costs. To divide the total annual energy savings among the four costing periods for these projects, the NMR team assessed how energy savings were split among the four periods for the projects not missing any data and applied these ratios to the total energy savings at the program level.[35] Likewise, to determine the coincident demand savings for projects missing this data, the NMR team calculated the capacity-weighted average ratio of coincident demand savings to nameplate capacity for projects not missing any data and applied this ratio to the projects missing the coincident demand savings.[36] Table 38 shows the SCT results for each scenario, similar to Table 31 in the main section of the report. Both programs have SCT ratios well above 1.0, and the SFA portfolio have a higher SCT ratio than the core SETF portfolio. This is driven in part by a solar benefit stream equal to the difference in cost between Solar Renewable Energy Certificate (SREC) and the Solar Alternative Compliance Payment (SACP) equal to roughly $0.11 per kWh.[37] Note that the realization rates for both programs are above 100%, so the SCT ratio in Scenario #2 is higher than in Scenario #1. In addition, Scenario #3 is exactly the same as Scenario #2 because we applied a default NTG ratio of 100% for these programs.

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[35] Savings were divided for Community Renewable Energy/Low-income Single Family PV for the four costing periods as follows: on-peak winter 41%/39%, off-peak winter 17%/19%, on-peak summer 29%/28%, off-peak summer 13%/14%. The fraction of savings is highest in the winter because the winter period has eight months while the summer period has four.

[36] This ratio was approximately 30% for both programs.

[37] This is because each MWh of solar energy (electric or thermal) qualifies as one SREC, which can be traded on the DC SREC market to satisfy renewable energy generation requirements of the DC Renewable Portfolio Standard (RPS). Electricity suppliers must acquire, on an annual basis, the appropriate number of SRECs as required by the RPS, or make Solar Alternative Compliance Payments (SACP) for any SREC not acquired. The SACP price is set at $500 through 2023, or $0.50 per kWh. It is reasonable to assume that every SREC created eliminates the need for one SACP purchase. Therefore, the avoided costs attributable to renewable measures will include the value of the SREC creation (the difference between SACP price and SREC price), which will be added to the standard avoided costs. The latest year's average SREC trading price for the DC market is used to establish the SREC value for the subsequent program year. For FY2020, the weighted average SREC price from November 26, 2018 through November 18, 2019 ($390.41 per MWh, or $0.39 per kWh) is used as a basis to calculate the value of avoided compliance payments. In 2024, the SACP begins an annual decline and therefore the SREC price is taken to be 78.08% of the SACP (ratio of $390.41 to $500.oo) until the RPS expires at the end of 2032. Beginning in 2033, this additional benefit stream drops to zero.

**Table 38: Cost Test Ratios by Scenario – SFA Programs**

| Program | DCSEU | Modified Replica Scenario #1 | Gross Verified Savings Scenario #2 | Net Verified Savings Scenario #3 |
|---|---|---|---|---|
| Solar for All Community Renewable PV Energy | 3.76 | 3.96 | 4.13 | 4.13 |
| Solar for All Low-income Single-family PV | 1.32 | 1.64 | 2.01 | 2.01 |
| **Total** | **3.20** | **3.55** | **3.75** | **3.75** |
| **Total with EM&V and DOEE Oversight Costs** | **2.95** | **3.12** | **3.30** | **3.30** |

Table 39 shows the costs for the SFA programs, which is similar to Table 32 in the main section of the report. In Parameter E, we assume that the SFA programs do not account for any additional portfolio costs. The value for Parameter H – $1.2 million – represents an estimate of the DOEE oversight costs dedicated to SFA programs. All NMR EM&V costs are assigned to the SETF portfolio and none are assigned to the SFA programs. The total SCT costs without oversight and EM&V are roughly $10.0 million, compared with $85.4 million in SCT costs for core SETF programs.

**Table 39: FY2020 Cost Summary – SFA Programs**

| Parameter | Cost Component | FY2020 Portfolio Total |
|---|---|---|
| A | Incentive Payments | $7,794,754 |
| B | External Funding | $959,444 |
| C | Incremental Measure Cost (A + B) | $8,754,197 |
| D | Track-specific Administrative Costs (Non-incentive) | $0 |
| E | Portfolio Administrative Costs | $0 |
| F | Total Program Administration Cost (D+E) | $0 |
| G | **Total SCT Costs (C+F)** | **$8,754,197** |
| H | DOEE Oversight and NMR EM&V Costs | $1,200,000 |
| I | **Total SCT Costs with Oversight and EM&V (C+F+H)** | **$9,954,197** |

The avoided cost assumptions for SFA programs are the same as shown in Table 34. Table 40 shows the lifetime avoided CO2 emissions associated with the SFA programs (similar to Table 33 in the main report). Avoided CO2 emissions are approximately 104,000 metric tons for SFA programs compared to 624,000 for core SETF programs.

**Table 40: Lifetime CO2 Emission Reductions – FY2020 SFA Programs**

| Scenario | Lifetime Avoided CO2 Emissions (Metric Tons) |
|---|---|
| 1 – Modified Replica | 103,894 |
| 2 – Gross Verified Savings | 110,078 |
| 3 – Net Verified Savings | 110,078 |

Table 41 shows detailed SCT results for Scenario #1 and Table 42 shows detailed results for Scenarios #2 and #3. Because the realization rate is slightly above 100% and the net-to-gross ratio is assumed to be 100%, the results are similar for all three scenarios. Figure 12 shows how benefits are divided among different categories for Scenario #1. Environmental benefits (avoided CO2) comprise the highest share of benefits, followed by avoided RPS compliance costs and avoided energy costs.

**Table 41: Scenario #1 Modified Replica – SCT Results**

| Program | Sector | SCT Benefit ($1,000) | SCT Cost ($1,000) | SCT Net ($1,000) | SCT Ratio |
|---|---|---|---|---|---|
| Solar for All Community Renewable PV Energy | Solar For All | $28,530 | $7,207 | $21,323 | 3.96 |
| Solar for All Low-income Single-family PV | Solar For All | $2,540 | $1,547 | $993 | 1.64 |
| **Total Portfolio Level** | **SFA Portfolio** | **$31,070** | **$8,754** | **$22,315** | **3.55** |
| **Portfolio Level with EM&V and DOEE Oversight Costs** | **SFA Portfolio** | **$31,070** | **$9,954** | **$21,115** | **3.12** |

**Table 42: Scenarios #2 and #3 Modified Replica – SCT Results**

| Program | Sector | SCT Benefit ($1,000) | SCT Cost ($1,000) | SCT Net ($1,000) | SCT Ratio |
|---|---|---|---|---|---|
| Solar for All Community Renewable PV Energy | Solar For All | $29,730 | $7,207 | $22,523 | 4.13 |
| Solar for All Low-income Single-family PV | Solar For All | $3,110 | $1,547 | $1,563 | 2.01 |
| **Total Portfolio Level** | **SFA Portfolio** | **$32,840** | **$8,754** | **$24,085** | **3.75** |
| **Portfolio Level with EM&V and DOEE Oversight Costs** | **SFA Portfolio** | **$32,840** | **$9,954** | **$22,885** | **3.30** |

**Figure 12: SCT Benefits by Category –Scenario #1**