Clean Energy Communities
Impact Evaluation
2016–2018

Appendix

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Appendix – High Impact Actions (HIAs)

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- Clean Energy Upgrades
- LED Street Lights
- Clean Fleets
- Solarize
- Unified Solar Permit
- Energy Code Enforcement Training
- Climate Smart Communities Certification
- Community Choice Aggregation
- Property Assessed Clean Energy Financing

Summary of Evaluation Objectives

Table A-1 summarizes the Clean Energy Communities evaluation study objectives and defines results indicators used throughout this document. The evaluation terms and indicators are defined in the New York State Department of Public Service Gross Savings Verification Guidance (CE-08).[1]

Table A-1. Evaluation objectives

Evaluation objectives	Indicator
What is the ratio, or realization rate, of the gross program energy impacts to the verified gross annual impacts?	Verified gross impact realization rate (percent)
What are the normalized verified gross energy impacts[2] and realization rates achieved for each HIA considering the variation across communities (e.g., population)?	Normalized verified gross impact (MWh, MMBtu, MW); Normalized verified gross impact realization rate (percent)
What are the first-year verified gross energy impacts for the ten HIAs completed between 2016 and December 2018 for the Clean Energy Communities initiative?	First-year verified gross impact (MWh, MMBtu, and MW); First year verified gross impact realization rate (percent)
What are the indirect impacts associated with each HIA and for the Clean Energy Communities initiative overall?	Indirect impact (MWh, MMBtu, MW)

[1] The evaluation terms used here are defined in the New York State Department of Public Service Gross Savings Verification Guidance (CE-08) Version 1, August 23, 2019.

[2] If normalized savings could not be estimated, average or median savings were accepted.

Evaluation objectives	Indicator
Produce sample designs that meet 90% confidence and 10% precision for the bottom-up estimates of verified gross energy impacts for the initiative.	Final confidence/precision of verified gross impact and realization rates

1 Benchmarking

1.1 Description and Eligibility

The Benchmarking HIA is an energy management strategy implemented by local governments that requires annual accounting and reporting of energy consumption in municipal buildings. In large communities, local governments may also require the annual disclosure of energy used in large private buildings. Benchmarking can play a role in driving energy efficiency in buildings, which account for over 60% of New York State's energy consumption.[3]

The act of benchmarking does not create energy savings in itself. Rather, owners of buildings can use the results of benchmarking to understand their building's energy use and identify poorly performing buildings. To save energy, the building owner must identify and implement energy-saving measures such as capital projects, retro-commissioning, or energy management.

1.2 Methods

To calculate verified gross annual impacts, a billing analysis of energy consumption data was used to compare the first year of benchmarking to subsequent years to identify energy consumption trends on a random sample of benchmarking communities. Information on the number of buildings benchmarked for each community and source Portfolio Manager data was not included with the HIA project data uploaded to Salesforce.[4] In these cases, Portfolio Manager data were collected for each year data were available during the interview, and interviewees were asked about changes to building operations. If identified during the interview, non-routine events were accounted for in the analysis. To keep the interviews short, a maximum of 8 buildings per community were analyzed. For communities that benchmarked more than 8 buildings, the buildings were chosen randomly.

1.2.1 Target Population and Sample Design

The impact evaluation team conducted data collection and interviews with a random sample of participants stratified by community size as defined by the Clean Energy Communities Program. Table 1-1 provides the target population, target, and actual sample.

[3] NYSERDA Clean Energy Communities Program Guidance Document, Program Opportunity Notice (PON) 3298, revised September 15, 2019

[4] EPA's ENERGY STAR® Portfolio Manager is an online tool that can be used to measure and track energy and water consumption, as well as greenhouse gas emissions. Users enter consumption data for a single or group of buildings and Portfolio Manager assigns ratings against national performance data.

Table 1-1. Population, target sample size and actual sample–Benchmarking

Community Size (Stratum)[5]	Number of HIA Communities	Target Sample Size	Actual Sample Size
Small	155	4	4
Medium	119	5	5
Large	21	15	15
New York City	1	1	1
Total	**296**	**25**	**25**

1.3 Available Data, Forecasting and Planning, and Gross Impact Methods

Table 1-2 lists impact methodologies, data submission requirements, and recommendations for determining Investment Plan impact estimates, and gross impacts for Benchmarking.

Table 1-2. Ex ante impact calculation methods, data requirements, and recommendations

	Current Practice	Recommended Practice
Investment Plan Forecasting and Estimating Impact Methodology	Investment Plan impact estimates were calculated based on an estimated quantity and size of efficiency projects per community.	Investment Plan impact estimates should be estimated by applying per-capita or per-community verified gross annual impacts for small, medium, and large communities from this evaluation.
Program Reported Gross Annual Impact Methodology	Program-reported gross annual impacts were based on an estimated quantity and size of efficiency projects per community.	Following HIA approval, record installed project data into Salesforce instead of impacts from the Investment Plan.
Data Submission Requirements	A copy of an executed local law that requires energy use information for each municipal building larger than 1,000 square feet to be publicly available on the internet.	Enforce HIA data submission requirements for posting annual energy use information for each municipal building that is 1,000 square feet or larger.

[5] Strata followed the Program's designations for community sizing: small (<5,000), medium (<40,000), and large (≥40,000). New York City was placed into a census stratum due to its high contribution to planned savings.

2 Clean Energy Upgrades

2.1 Description and Eligibility

Clean Energy Upgrades are energy efficiency and renewable generation projects in municipal buildings and facilities such as municipal office buildings and public works facilities. By replacing outdated equipment with more efficient technology or adding solar generation capacity, municipalities can save energy and increase renewable generation. To receive credit for a Clean Energy Upgrade, participating municipalities are required to submit a benchmarking report that includes energy use information for all municipal buildings larger than 1,000 sq. ft., documentation that demonstrates the community achieved a minimum 10% reduction in greenhouse gas emissions, and a completed Clean Energy Upgrades calculator.[6]

2.2 Methods

Project data submitted to Salesforce were reviewed to identify sites with enough data to perform high-level desk reviews. Project data included purchase agreements, invoices, code inspections, energy audits, engineering analyses, and solar site reports. The project verified gross realization rate was developed by comparing verified gross impacts or generation to NYSERDA's tracked impacts from Salesforce using standard engineering methods. The calculated verified gross realization rate was the average of the verified gross impacts and the verified gross impacts as if the sample were random.[7]

2.2.1 Target Population and Sample Design

Twenty-five municipalities participated in the Clean Energy Upgrade HIA during the 2016–2018 program years. Fourteen of the 25 communities submitted enough documentation to conduct desk reviews. As a result, the final sample was not stratified by size or affected fuel as planned. All communities with available data underwent desk reviews.

Table 2-1. Population, target sample size, and actual sample–Clean Energy Upgrades

Total Clean Energy Communities participants 2016–2018	Target Sample Size	Actual Sample size
25	10	14

[6] Clean Energy Communities Program, Clean Energy Upgrades Calculator

[7] In a random sample the realization rate is applied to all participants.

2.3 Available Data, Forecasting and Planning, and Gross Impact Methods

Table 2-2 lists impact methodologies, data submission requirements, and recommendations for determining Investment Plan impact estimates and gross impacts for Clean Energy Upgrades.

Table 2-2. Ex ante impact calculation methods, data requirements, and recommendations

	Current Practice	Recommended Practice
Investment Plan Forecast and Planning Methodology	The NYSERDA Investment Plan impact estimates for Clean Energy Upgrades assume that municipal energy consumption is 2% of community consumption, 60% of which is attributable to buildings. Building upgrades were assumed to result in 10% savings of municipal consumption, which is split 50/50 between fuels and renewables.	Future forecasting/planning efforts should adopt the per-capita verified gross annual impacts resulting from this evaluation. Use the verified 2016–2018 measure mix to increase the accuracy of fuel-based estimates.
Program Reported Gross Annual Impact Methodology	Program-reported gross annual impacts were based on community reported savings from the Clean Energy Upgrades calculator.	Following project completion, program-reported gross annual impacts should be based on implemented measures rather than the Investment Plan forecast/planning estimates.
Data Submission Requirements	Submit the Portfolio Manager benchmarking report, measure-level energy audit by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), engineering study, contracts, and the Clean Energy Upgrades Calculator.	To improve documentation, consider increasing the level of detail in the post-installation documentation submitted to NYSERDA and for the key impact parameters used to claim gross annual impacts. Priority should be given to HIAs that produce the highest future anticipated contribution of savings for the program overall.

3 LED Street Lights

3.1 Description and Eligibility

The LED Street Lights HIA incentivizes municipalities to convert at least half of the municipal cobra-head style street lights to energy-efficient light-emitting diode (LED) technology.

3.2 Methods

The LED street light calculators downloaded from Salesforce provided the pre- and post-retrofit fixture counts.[8] Verified gross annual impacts were calculated using standard engineering equations derived from the New York State Technical Reference Manual and independent research.[9] The evaluation assumed that existing 175 W high-pressure sodium lamps were replaced with 88 W LED lamps over 4,380 annual operating hours.

3.2.1 Target Population and Sample Design

Forty-seven communities participated in LED Street Lights HIA. Verified gross annual impacts were calculated for 18 communities (Table 3-1). The verified gross realization rate for the sampled communities was calculated from the sample and applied to all participants.

Table 3-1. Population, target sample size, and actual sample—LED Street Lights

Total Clean Energy Communities participants 2016–2018	Target Sample Size	Actual Sample size
47	10	18

3.3 Available Data, Forecasting and Planning, and Gross Impact Methods

Table 3-2 lists impact methodologies, data submission requirements, and recommendations for determining Investment Plan impact estimates and gross impacts for LED Street Lights. This evaluation found that the population-based forecasting approach was well-founded and was confirmed to be valid in other jurisdictions by the U.S. DOE.[10] NYSERDA's data submission requirements are sufficient for verifying program reported gross annual impacts, and most communities met NYSERDA's data requirements.

[8] Clean Energy Community Program, LED Street Lights Calculator

[9] New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs–Residential, Multi-Family, and Commercial/Industrial Measures, Version 6.1 (January 31, 2019), p 437; K. Herbert, Street Lighting Retrofit Implementation Guide, SPEER (2017).

[10] Public Street and Area Lighting Inventory: Phase I Survey Results, Report Number E-AC05-76RL01830 (2014), U.S. Department of Energy.

Table 3-2. Ex ante impact calculation methods, data requirements, and recommendations

	Current Practice	Recommended Practice
Investment Plan Forecasting and Estimating Impact Methodology	Investment Plan impact estimates are scaled to the population. For example, communities with <100,000 are assumed to have 0.08 lamps per capita. Savings/lamp is estimated at 435 kWh.	Maintain the current practice of forecasting the number of streetlights per community using a population-based approach and apply savings factors from this evaluation to forecast gross annual impacts (381 kWh/lamp).[11]
Program Reported Gross Annual Impact Methodology	Program-reported gross annual impacts are calculated by multiplying the reported number of lamps in the project by 435 kWh.	Apply savings factors from this evaluation (381 kWh/lamp) to calculate gross impacts.
Data Submission Requirements	Submit a completed LED Street Light Certification Form or comparable information, including the number of street lights converted.	No changes are recommended.

[11] 175 W high-pressure sodium lamps replace with 88 W LED lamps over 4,380 annual operating hours (381 kWh).

4 Clean Fleets

4.1 Description and Eligibility

Clean Fleets is an effort by local governments to invest in alternative fuel vehicles and infrastructure while increasing opportunities for constituents to access electric vehicle charging stations. Communities may follow one of two (or both) compliance pathways: alternative fuel vehicles or alternative fueling infrastructure. Electric and compressed natural gas (CNG) fuels are eligible.

4.2 Methods

This study confirmed the acquisition of the alternate fuel vehicles or infrastructure deployed through the HIA (from the Program HIA documentation in Salesforce) through interviews with members of the participating communities. The interviews were also used to collect data on equipment use, including vehicle miles traveled, or energy provided by the fueling station. These data were used to quantify the gasoline miles traveled (and therefore gasoline use) offset by the Program. The impact evaluation team also accounted for the increased electricity and natural gas consumption of the alternative fuel infrastructure.

4.2.1 Target Population and Sample Design

Interviews were conducted with a random sample of participants of each pathway (vehicles and fueling infrastructure) stratified by the number of pieces of procured equipment. Table 4-1 provides the sample targets and results.

A sample was developed for each pathway: alternative fuel vehicles and fueling infrastructure, to ensure metrics could be developed for each compliance method (i.e., fueling port and vehicle savings). The Program Team provided a list of communities and the number of vehicles and ports acquired by each. Three strata were created for each pathway: vehicles (i.e., 1 or 2 or more vehicles, and a census stratum) and fueling infrastructure (i.e., 1, 2, or 3 or more ports, and a census stratum). The stratum and sample sizes are shown in Table 4-1.

Table 4-1. Population, target sample size, and actual sample—Clean Fleets

Vehicle Pathway				Fueling Infrastructure Pathway			
Number of Vehicles (Stratum)	Number of HIA Communities	Target Sample Size	Actual Sample Size	Number of Fueling Ports (Stratum)	Number of HIA Communities	Target Sample Size	Actual Sample Size
1 vehicle	25	3	3	2 or less	124	3	3
2 or more	8	3	3	3 or more	14	3	3

Vehicle Pathway				Fueling Infrastructure Pathway			
Number of Vehicles (Stratum)	**Number of HIA Communities**	**Target Sample Size**	**Actual Sample Size**	**Number of Fueling Ports (Stratum)**	**Number of HIA Communities**	**Target Sample Size**	**Actual Sample Size**
NYC (census)[12]	1	1	0	NYC (census)	1	1	0
Totals[13]	**34**	**7**	**6**	**Totals**	**139**	**7**	**6**

4.3 Available Data, Forecasting and Planning, and Gross Impact Methods

Table 4-2 lists impact methodologies, data submission requirements, and recommendations for determining Investment Plan impact estimates and gross impacts for Clean Fleets. Communities submit program forms to demonstrate either 1) at least one installed electric vehicle charging station or CNG fueling station or 2) deployment of at least one alternative fuel vehicle in the municipal fleet. Qualifying alternative fuel vehicles include plug-in hybrid vehicles (PHEV), battery-electric vehicles (BEV), and CNG vehicles.

Table 4-2. Ex ante impact calculation methods, data requirements, and recommendations

	Current Practice	Recommended Practice
Investment Plan Forecasting and Estimating Impact Methodology	Impact estimates were developed for two paths: alternative fuel vehicles and alternative fuel charging infrastructure. NYSERDA estimated gas saved for vehicles based on vehicle miles traveled and beneficial electrification per port for infrastructure projects.	Verified gross annual impacts from this evaluation can be leveraged to estimate per-vehicle and per-port impacts for future planning efforts.
Program Reported Gross Annual Impact Methodology	Program-reported gross annual impacts were based on the numbers of installed charging ports, deployed vehicles, reported vehicle mileage data, and charger energy data.	Maintain current practice.
Data Submission Requirements	Submit a completed clean fleets certification form or comparable information to demonstrate municipal provision of at least one EV charging station or CNG supply.	NYSERDA should consider tracking the baseline of the vehicle being replaced, and track vehicle type acquired (e.g., BEV, PHEV, or CNG).

[12] New York City was in a census stratum without an eligible replacement. Although New York City officials were recruited, they were unable to participate due to COVID-19.

[13] The total pathways are greater than the number of participating communities because some communities completed both pathways.

5 Solarize

5.1 Description and Eligibility

The Solarize HIA incentivizes communities to adopt the existing NYSERDA "Solarize, Clean Heating and Cooling," or "Solar for All" campaigns to increase the number of New York State residents that benefit from clean energy. Eligible Clean Heating and Cooling technologies include ground source heat pumps, air source heat pumps, solar heating and cooling, and biomass.

5.2 Methods

For Solarize, reported impacts for renewable generation were verified using customer and tracking data collected from Salesforce and summed to the community level. The analysis used a capacity factor of 11.93% which was taken from the 2018 NYSERDA Solar Photovoltaic Program Impact Evaluation.[14]

5.2.1 Target Population and Sample Design

The Solarize analysis used the customer lists from the census of communities that submitted lists to Salesforce. The customer lists are Excel spreadsheets containing customer-level information corresponding to Solarize projects. The customer lists included contract dates, but not the contracts or verification of project installations.

The study was able to derive project system sizes for 11 of the 18 participating communities using the customer lists (Table 5-1).

Table 5-1. Population, target sample size, and actual sample—Solarize

Total Clean Energy Communities participants 2016–2018	Target Sample Size	Actual Sample Size
18	≥10	11

Random sampling was not possible given the limited number of communities that submitted project data. The verified gross realization rate across communities is the average of the verified gross annual impacts in the sample and the verified gross annual impacts as if the sample were random.[15]

[14] NYSERDA Solar Photovoltaic Program Impact Evaluation for 2008 and 2011–2016 (2018).

[15] In a random sample the realization rate is applied to all participants.

5.3 Available Data, Forecasting and Planning, and Gross Impact Methods

Table 5-2 lists impact methodologies, data submission requirements, and recommendations for determining Investment Plan impact estimates and gross impacts for Solarize.

Table 5-2. Ex ante impact calculation methods, data requirements, and recommendations

	Current Practice	Recommended
Investment Plan Forecasting and Estimating Impact Methodology	Number of installations per campaign is based on early program data and community size.	There are approximately 15 installations per community, regardless of community size. Recommend decreasing the assumption for the number of projects per community from 46 to 15.
Program Reported Gross Annual Impact Methodology	The number of systems installed is sourced from project documents and multiplied by the default or actual generation capacity. Estimated total capacity is multiplied by a capacity factor.	Generation capacity is not reported. Apply verified gross annual impact factors for small, medium, and large communities to estimate capacity. Use the capacity factor from most recent NYSERDA Solar Photovoltaic Impact Evaluations for the appropriate sector.
Data Submission Requirements	Documentation that demonstrates municipal participation and a completed customer list that includes the required number of rooftop solar customers, location, name of installer, and date that the contract was signed.	Include installed system size on customer lists and require verification of installation beyond the contract signing date such as the contract or invoices.

6 Unified Solar Permit

6.1 Description and Eligibility

To qualify for the Unified Solar Permit, municipalities adopt the existing New York State Unified Solar Permit to reduce costs and delays for solar projects less than 25 kW. The Unified Solar Permit is a standardized permit application designed to streamline the solar system permitting approval process.[16]

6.2 Methods

To determine the effects of adopting the Unified Solar Permit, this study cross-referenced Unified Solar Permit and non-Unified Solar Permit communities with the NY-Sun database to collect installed system size and capacity. The analysis required that the Unified Solar Permit communities have NY-Sun data for the 12 months before and the 15 months following the implementation of the Unified Solar Permit. The 15-month post-adoption period included a 3-month blackout period to account for permits in the pipeline at the time of Unified Solar Permit adoption. The rate of solar installations, installed capacity, and generation was compared between Unified Solar Permit and non-Unified Solar Permit communities. The non-Unified Solar Permit comparison communities track the ongoing trend in installation for those not in Unified Solar Permit, allowing an estimate of the increase in activity due to Unified Solar Permit relative to those trends.[17] The analysis used a capacity factor taken from the 2018 NYSERDA Solar Photovoltaic Program Impact Evaluation.[18]

6.2.1 Target Population and Sample Design

230 communities participated in Unified Solar Permit HIA. Verified gross annual impacts were calculated for 33 communities (Table 6-1) where the Unified Solar Permit was in place by March 2017 and where NY-SUN data spanned 12 months preceding and 15 months following the implementation of the permit. The verified gross realization rate for the 33 communities was applied to all Unified Solar Permit communities.

Table 6-1. Population, target sample size, and actual sample—Unified Solar Permit

Total Clean Energy Communities participants 2016–2018	Target Sample Size	Actual Sample Size
230	10	33

[16] Unified Solar Permit description

[17] Due to the variation between participating communities' infrastructure and that of New York City, NY-Sun data corresponding to New York City was not included in this analysis

[18] NYSERDA Solar Photovoltaic Program Impact Evaluation for 2008 and 2011–2016 (2018).

6.3 Available Data, Forecasting and Planning, and Gross Impact Methods

Table 6-2 lists impact methodologies, data submission requirements, and recommendations for determining Investment Plan impact estimates and gross impacts for Unified Solar Permit.

Table 6-2. Ex ante impact calculation methods, data requirements, and recommendations

	Current Practice	Recommended Practice
Investment Plan Forecasting and Estimating Impact Methodology	Uses average yearly percentages derived from Open NY data, 2000–2016 for installations in non-permit and permitted communities.[19]	Investment Plan impacts can be estimated by applying per capita or per-community verified gross annual impacts.
Program Reported Gross Annual Impact Methodology	Program-reported gross annual impacts were based on Investment Plan impacts.	Gross impacts should be reported by applying impact factors for small, medium, and large communities for each participating community.
Data Submission Requirements	Participating communities complete the Unified Solar Permit by submitting documentation verifying adoption of the permit on the NYSERDA Salesforce database.	Requiring communities to report on the number of issued permits may be impractical. Therefore, in the near to mid-term, NY-Sun data will continue to be the best source to track the number of permits issued in participating and non-participating communities.

[19] Solar Electric Programs Reported by NYSERDA: Beginning 2000 | State of New York.

7 Energy Code Enforcement Training

7.1 Description and Eligibility

To qualify for the Energy Code Enforcement Training HIA, municipalities train code compliance officers and other municipal officials in best practices in energy code enforcement through trainings, collaborative plans reviews, and joint onsite inspections of local construction projects.

7.2 Methods

The objective of the evaluation for the Energy Code Enforcement Training HIA was to assess the verified gross annual impacts achieved by participating in the HIA. The evaluation for this HIA included the following research activities:

1. Review of NYSERDA's Investment Plan impact estimates. Several different market sizing and HIA Investment Plan impact estimates were provided for review and analysis.
2. Interviews with participating and nonparticipating communities to learn about the benefits of the training as well as differences between participating and nonparticipating communities in terms of enforcement practices, and to identify instances of non-compliance in code enforcement official reviews.
3. Development of a top-down model. Because a bottom-up analysis proved challenging, a top-down approach was used to verify gross annual impacts, leveraging data from NYSERDA market sizing assumptions, code enforcement interviews, and similar energy code training and evaluation studies conducted in similar jurisdictions.

7.2.1 Target Population and Sample Design

The impact evaluation team conducted interviews with a random sample of participants and nonparticipants, stratified by size to include both large and small communities as defined by this HIA. Table 7-1 provides the sample targets and results.

Table 7-1. Population, target sample size, and actual sample—Energy Code Enforcement Training

Stratum[20]	Number of Communities	Target Sample Size	Actual Sample Size
New York City (Census)	1	1	1
Large participants	24	9	6

[20] The program size designations in this table match the program design except for New York City, which was singled out into a census stratum due to its high contribution to savings. Large communities are communities with population greater than or equal to 40,000 and small communities are communities with population less than 40,000.

Stratum[20]	Number of Communities	Target Sample Size	Actual Sample Size
Small participants	385	5	6
Large nonparticipants	75	10	10
Small nonparticipants	1,071	5	4
Totals	**1,556**	**30**	**27**

7.3 Available Data, Forecasting and Planning, and Gross Impact Methods

Table 7-2 lists impact methodologies, data submission requirements, and recommendations for determining Investment Planned impact estimates and gross impacts for Energy Code Enforcement Training.

Table 7-2. Ex ante impact calculation methods, data requirements, and recommendations

	Current Practice	Recommended Practice
Investment Plan Forecasting and Estimating Impact Methodology	Several different market sizing and Investment Plan impact estimates methods were provided for review and analysis. NYSERDA documentation states that impacts were derived from bottom-up estimates and per-capita impacts were estimated for small, medium, medium-large, large communities, and New York City. However, the study team found that the impact estimates for medium-sized communities were applied across all participating communities regardless of size. Program delivery changed in April 2018 for small communities, but changes were not made to the estimation approach.	The energy code is triggered by new construction and renovation permits rather than by population. Recommend forecasting impacts using historical or actual permit applications in lieu of population. Leveraging the NYS permit database (reported annually for each municipality) would enable impact estimates based on construction activity. If the existing method is used in the future, impacts should be based on the estimates of community size, rather than only medium-sized communities.
Program Reported Gross Annual Impact Methodology	Program-reported gross annual impacts were based on Investment Plan impacts.	Gather project-specific data for the four projects included in the required training to quantify impacts and the scope and magnitude of achievable energy impacts.
Data Submission Requirements	Communities submit email documentation showing that they participated in the energy code enforcement training. Confirmation that project reviews were completed was not submitted to Salesforce.	Supplement the email confirmation with additional data about the buildings reviewed during the training as well as the average number of permits issued per community per year.

7.4 Improving Evaluability of Energy Code Enforcement Training

Estimating savings from energy code training is challenging under any circumstance, as the enforcement of energy code requirements relies on jurisdictions, and the consistent application of training cannot be assured. Investment Plan impact estimates therefore require assumptions about participant behavior and resulting project impacts. Implementing one or more of the following options could improve Investment Plan impact estimates:

1. Utilize community-specific permit data to estimate gross annual impacts. The current estimation methodology is based on per-capita energy savings applied to participating communities. The energy code, however, is triggered by applications and reviews of new construction and renovation permits, not community population. Therefore, any estimate of savings should be scaled to the quantity of permits and square footage under construction rather than community population.
2. Leverage existing studies, such as any state-specific baseline studies or assessments of energy code compliance. There is a Delphi study underway to estimate energy code compliance, but the results of this study were not available during the analysis for this evaluation.

8 Climate Smart Communities Certification

8.1 Description and Eligibility

Municipalities earn Climate Smart Communities certification for adopting actions within the Climate Smart Communities framework that encourages communities to reduce greenhouse gas emissions and adapt to a changing climate.[21] The following 6 New York State agencies jointly sponsor the Climate Smart Communities program: Department of Environmental Conservation (DEC); NYSERDA; Department of Public Service; Department of State; Department of Transportation; Department of Health and the Power Authority (NYPA). DEC acts as the main administrator of the program.

8.2 Methods

DNV and NYSERDA chose to pursue a top-down model followed by a bottom-up analysis for evaluating the Climate Smart Communities HIA. The top-down approach was chosen due to the expected magnitude of gross impacts (2% of community consumption per year) and NYSERDA's expectations for broad community-wide impacts described during the evaluation planning phase. The bottom-up evaluation was conducted in an attempt to further quantify savings from CSC.

8.2.1 Top-Down Modelling

8.2.1.1 Modelling approach

The top-down models compared energy consumption trends of 13 Climate Smart Communities that completed HIAs with communities that did not complete HIAs over 3.5 years. The separate gas and electric top-down models include a monthly estimate of baseline non-participant load, controlling for seasonable variability. They also include an energy demand index constructed from employment data with differential energy intensities for goods-producing and service-providing industries in each community. This index adds an additional trend element to the non-participant baseline component and controls for electric and gas consumption growth related to changes in the industry mix.

Participants are entered into the model at two different levels on a magnitude and trend basis. This evaluation separates participants into two groups: those that completed up to 3 HIAs, and those that completed 4 or more HIAs. Participant trends are calculated as a percentage of the group's consumption level and compared to the baseline trend of the non-participants.

[21] Climate Smart Communities certification portal, certification actions.

8.2.1.2 Challenges and Limitations

A key challenge of any evaluation analysis, particularly a top-down analysis such as this, is defining the counterfactual against which a treatment is assessed. The ideal counterfactual would be the same participant population existing without the Climate Smart Communities program. If such a counterfactual were available, changes in energy consumption trends due to the program could be directly quantified. However, since this counterfactual population is not available, this study had to make do with the counterfactual population of non-participants. While it is possible to control for different starting levels of participants and non-participants, it is not possible to distinguish between trends that already existed prior to the program and changes that occurred due to the program. There are several limitations of the model:

- The model analyzes aggregate energy consumption at the community level and impacts are smaller relative to total community consumption than originally estimated.
- Although the Climate Smart Communities HIA completion date occurs during the evaluation period, program rules only require that two HIAs be completed after August 1, 2016, potentially creating energy impacts that pre-date the evaluation and therefore cannot be captured in the model.
- Differences in trends may also be natural to the self-selected participants rather than causally related to the Climate Smart Communities participation.
- The model is unable to control for load-building program activities such as support for EVs and beneficial electrification.
- Many of the actions taken by the communities were not energy impact actions and others take longer than the evaluation period to realize energy impacts.

The top-down model could not detect energy impacts associated with incremental impacts beyond what is already quantified in the bottom-up estimates for the individual HIAs. As a result, the evaluation realization rate was zero for this set of communities. The subsequent bottom-up evaluation is described below.

8.2.2 Bottom-Up Analysis

8.2.2.1 Analysis Approach

A bottom-up evaluation method was developed to estimate the gross annual energy impacts (energy use reductions, efficiency savings, renewable generation) in an attempt to quantify savings from CSC. Evaluating specific action types for these communities was believed to have the potential for demonstrating immediate or future energy impacts. For the bottom-up analysis, the same 13 communities

were identified as having been certified from the program start (2016) through 2018. Fifty-four CSC Certification action types were identified as most likely to demonstrate immediate or future energy impacts. Among the 13 identified communities, there were 207 individual likely energy savings actions documented and listed in Table 8-2.

- The evaluation was planned in two stages, with a stage-gate to review initial findings and implement any identified changes to methods or approach. The first stage aimed to evaluate 3 of the 13 communities, with the remaining 10 communities identified for the second stage. In each stage, evaluation activities included: Data collection and in-depth interviews: Interviews were attempted with each of the 13 communities, starting with the designated CSC contact identified in the Climate Smart Communities Certification Report.[22] Available project documentation was reviewed, prepared, and included in an advance email to each contact, explaining the intention of the interview, preview the areas of inquiry, and identify the action types or projects of interest.
- Desk analysis: Some actions require a desk review of documentation for verification of energy impacts, performed by evaluation engineers.
- Literature review: For some measure types it was unlikely that there would be sufficient documentation available to directly verify energy impacts. A literature review was performed to identify means of estimating energy impacts for these cases.

8.2.2.2 Challenges and Limitations

Challenges evident in the pursuit of this bottom-up evaluation included interview availability, data collection and data availability, and sample validity. Evaluators needed to conduct interviews with communities and secure data and information to allow for calculations of energy impacts. Identifying and accessing this data was a key anticipated challenge that was realized.

First, one of three communities identified for stage one was unavailable for an initial interview, and thereby also unable to identify needs for subsequent community interviews and data requests; it was determined that in this community's case, the inability to provide time for interview was due to stresses, workload, and staffing issues due to the COVID pandemic.

Second, when interviews were possible records that allow for the calculation of energy impacts were not consistently available. The Climate Smart Communities program was designed to promote actions with generally positive climate impacts and not specifically to measure energy impacts. As a result, it was

[22] The designated CSC contact and program documentation is available at the CCSC portal.

often difficult for communities to identify records that could provide evidence for the calculation of energy impacts; in other instances, no records were kept at all.

The major limitation of this study actually supported the findings from the top-down model of very limited or no energy impacts. Interviews as part of the bottom-up work found that the 13 communities were early adopters of the CSC program, CSC certification, and CSC certification as a CEC high-impact action, and completed energy-saving projects before the start (and potential influence of) the CEC program. The13 early adopters certified in the 2016–2018 time frame began working with the CSC program as early as 2009, with some actions preceding the 2009 CSC start date, and with the vast majority of measures relevant to CSC certification prior to commencement of the CEC program. For these communities, the CEC-associated savings were near zero, but this finding is not necessarily applicable to future program participants.

The early adopters in the CSC HIA acted as "loss leaders" – communities encouraged to complete CSC certification to provide evidence of success that would encourage additional communities to take actions toward certification in both the CSC and CEC programs. The 13 communities studied were known to be leaders in taking climate action –as identified in interviews with both CEC and CSC program staff and the communities themselves. As a result, while the finding of very low applicable energy impacts was identified for these communities, this evaluation can only say that these results indicate a lack of CEC-associated energy savings for these early adopters; this finding should not be applied to later communities. It would be expected that communities that began participation in CSC after the CEC program start would be inspired in part by the available funding and support of CEC to take actions that led to more energy impacts than those whose climate focus pre-dated the program. Additional research is required to estimate impacts for communities participating after 2018.

8.2.3 Target Population and Sample Design

Table 8-1. Population, target sample size, and actual sample—Climate Smart Communities

Total Clean Energy Communities HIA participants 2016–2018	Target Sample Size	Actual Sample Size
13	10	13

8.2.4 Climate Smart Actions

Table 8-2 lists the Climate Smart Actions undertaken by the certified Climate Smart Communities.

Table 8-2. Certification actions taken by Climate Smart Communities 2016–2018.

Certification	%	Geneva City	Ithaca City	Ithaca Town	Madison County	Mamaroneck Town	Rochester City	Schenectady County	Southampton Town	Sullivan County	Tompkins County	Tusten Town	Ulster County	Ulysses Town
Pass a Resolution Adopting the CSC Pledge	100%	1	1	1	1	1	1	1	1	1	1	1	1	1
CSC Task Force	62%	1				1	1		1		1	1	1	1
CSC Coordinator	100%	1	1	1	1	1	1	1	1	1	1	1	1	1
Green Team Focused on Climate Change Mitigation and Adaptation	23%	1							1				1	
Regional Climate Program	77%		1	1			1	1	1	1	1	1	1	1
Partnerships with Other Entities	69%		1	1		1		1	1	1	1		1	1
Government Operations GHG Inventory	100%	1	1	1	1	1	1	1	1	1	1	1	1	1
Community GHG Inventory	69%		1	1	1		1	1	1		1	1	1	
Government Operations Emissions Reduction Target	62%		1	1			1	1		1	1	1	1	
Government Operations Climate Action Plan	54%		1	1	1		1	1		1	1			
Community Climate Action Plan	31%		1		1			1			1			
Community Emissions Reduction Target	8%										1			
Govt. Building Energy Audits	69%	1		1	1		1	1	1	1			1	1
Interior Lighting Upgrades	54%	1			1	1	1	1				1	1	
HVAC Upgrades	15%	1						1						
Building EMS	23%	1						1					1	

Certification	%	Geneva City	Ithaca City	Ithaca Town	Madison County	Mamaroneck Town	Rochester City	Schenectady County	Southampton Town	Sullivan County	Tompkins County	Tusten Town	Ulster County	Ulysses Town
Energy Benchmarking for Govt. Buildings	46%	1	1					1		1		1		1
LED Traffic Signals	23%	1						1	1					
Provide E-waste Collection in Local Govt. Buildings	38%	1			1				1			1	1	
Environmentally Preferable Purchasing Policy	31%		1	1				1					1	
Incentives for Employee Carpooling & Transit	31%		1								1		1	1
Outdoor Lighting Upgrades	15%				1								1	
Fleet Efficiency Policy	31%					1				1	1		1	
LED Street Lights	8%					1								
Financing Mechanism for Govt. Energy Projects	8%						1							
Green Building Standard for Govt. Buildings	23%							1			1		1	
Implement a Car-sharing Program for Local Govt. Staff	15%								1				1	
Outdoor Lighting Reduction	8%								1					
Adopt an Anti-idling Policy for Govt. Vehicles	15%									1			1	
Advanced Vehicles	15%										1		1	

Certification	%	Geneva City	Ithaca City	Ithaca Town	Madison County	Mamaroneck Town	Rochester City	Schenectady County	Southampton Town	Sullivan County	Tompkins County	Tusten Town	Ulster County	Ulysses Town
Adopt a Waste Management Strategy for Govt. Hosted and Permitted Events	15%												1	1
Renewable Energy Credits	38%	1	1	1							1		1	
Renewable Energy Feasibility Studies	46%		1	1					1	1	1		1	
Green Power Procurement Policy	38%			1		1				1	1		1	
Solar Energy Installation	62%				1		1		1	1	1	1	1	1
Power Purchase Agreement for Renewables	54%				1		1	1		1	1	1	1	
Recycling Bins in Govt. Buildings	77%	1		1		1		1	1	1	1	1	1	1
Residential Organic Waste Program	69%	1	1	1	1	1		1	1		1		1	
Implement a Pay-as-you-throw or Similar Unit Pricing Program	54%		1		1	1			1	1	1		1	
Recycling Program for Public Places & Events	46%		1		1	1		1			1		1	
Organic Waste Program for Govt. Buildings	23%			1									1	1
Govt. Solid Waste Audit	8%			1										
Resource Recovery Center	23%				1	1					1			
Offer Recycling to Residents	54%				1	1	1	1	1	1			1	
Offer or Require Recycling in Commercial Entities	46%				1	1	1		1	1			1	

Certification	%	Geneva City	Ithaca City	Ithaca Town	Madison County	Mamaroneck Town	Rochester City	Schenectady County	Southampton Town	Sullivan County	Tompkins County	Tusten Town	Ulster County	Ulysses Town
Compost Bins for Residents	23%				1						1		1	
Host Household Hazardous Waste Collection Days	46%				1	1		1	1	1			1	
Waste Reduction Education Campaign	38%								1	1	1	1	1	
Construction & Demolition Waste Policy	8%										1			
Adopt a Renewable Energy Ordinance	46%	1		1		1			1			1		1
Incentivize Renewable Energy and Energy Efficiency Projects	38%	1			1				1	1			1	
Planning & Infrastructure for Bicycling & Walking	62%	1	1			1	1	1	1		1		1	
Develop a Local Forestry or Tree Planting Project or Program	23%	1	1			1								
Incorporate Smart Growth Principles into Land-use Policies and Regulations	8%		1											
Implement a Safe Routes to School Program	31%		1			1							1	1
Adopt and Enforce an Anti-idling Ordinance	15%		1			1								
Preserve Natural Areas Through Zoning or Other Regulations	31%		1			1			1					1

Certification	%	Geneva City	Ithaca City	Ithaca Town	Madison County	Mamaroneck Town	Rochester City	Schenectady County	Southampton Town	Sullivan County	Tompkins County	Tusten Town	Ulster County	Ulysses Town
Alternative-fuel Infrastructure	31%						1	1					1	1
Implement Strategies That Increase Public Transit Ridership and Alternative Transport Modes	23%							1	1				1	
Establish Green Building Codes	8%								1					
Adopt Land-use Policies That Support or Incentivize Farmers' Markets, Community Gardens and Urban and Rural Agriculture	31%								1	1			1	1
Adopt Green Parking Lot Standards	8%								1					
Comprehensive Plan with Sustainability Elements	15%										1			1
Natural Resources Inventory	8%													1
Shade Structures Policy	8%													1
Watershed Assessment	31%	1							1				1	1
Use Green Infrastructure to Manage Stormwater in Developed Areas	23%	1						1					1	
Hazard Mitigation Plan Updates	38%		1	1				1			1		1	

Certification	%	Geneva City	Ithaca City	Ithaca Town	Madison County	Mamaroneck Town	Rochester City	Schenectady County	Southampton Town	Sullivan County	Tompkins County	Tusten Town	Ulster County	Ulysses Town
Incorporate Climate Resiliency Vision, Goals, and Strategies into Local Plans and Projects	23%			1					1		1			
Restoration of Floodplains & Riparian Buffers	8%			1										
Climate Vulnerability Assessment	31%				1			1			1		1	
Climate Adaptation Strategies	15%				1						1			
Climate Resilience Vision	23%					1			1		1			
Adopt a Floodplain Management and Protection Ordinance to Reduce Vulnerability to Flooding and Erosion	8%					1								
Conserve Wetlands and Forests to Manage Stormwater, Recharge Groundwater and Mitigate Flooding	31%					1			1				1	1
Implement a Water Conservation and Reuse Program	8%					1								
Develop or Enhance Early Warning Systems and Community Evacuation Plans	15%							1					1	

Certification	%	Geneva City	Ithaca City	Ithaca Town	Madison County	Mamaroneck Town	Rochester City	Schenectady County	Southampton Town	Sullivan County	Tompkins County	Tusten Town	Ulster County	Ulysses Town
Conservation of Natural Habitats	23%								1		1		1	
Encourage Xeriscaping	15%								1				1	
Farmers' Markets	54%	1					1	1	1	1		1	1	
Brownfield Clean-up & Redevelopment	31%	1					1		1				1	
Green Vendor Fairs	15%					1							1	
Green Jobs Training	8%										1			
Buy Local/Buy Green Campaign	15%										1		1	
Incentives for Green Businesses	8%										1			
Financing Program for Building Energy Efficiency	8%										1			
Local Climate Action Website	62%	1	1	1		1			1	1			1	1
Social Media	69%	1	1	1		1	1	1		1			1	1
Climate Change Education & Engagement	8%					1								
Climate-related Public Events	31%					1			1				1	1
Energy Reduction Campaign	23%								1		1			1
Engage in an evolving process of climate action	8%	1												
GHG Tracking System	15%					1							1	
Annual Progress Report	23%					1				1			1	
Updates to Strategies & Plans	8%												1	
New Innovative Actions	31%			1	1			1	1					

Certification	%	Geneva City	Ithaca City	Ithaca Town	Madison County	Mamaroneck Town	Rochester City	Schenectady County	Southampton Town	Sullivan County	Tompkins County	Tusten Town	Ulster County	Ulysses Town
Innovative Approaches to Existing CSC Actions	23%					1				1			1	
Reduce GHGs from Govt. Facilities	23%		1								1	1		
Increase Use of Renewables for Local Govt. Operations	31%		1	1						1			1	
Reduce GHGs from Govt. Vehicles	15%								1		1			
Reduce Community-wide GHG Emissions from Buildings	8%										1			

9 Community Choice Aggregation

9.1 Description and Eligibility

For Community Choice Aggregation (CCA), municipalities transition to a cleaner, more affordable energy supply by passing an ordinance to allow for the aggregated purchase of electricity for residential and small commercial customers.

9.2 Methods

The CCA legislation and ESCO service agreements for each participating community were verified. NYSERDA's Community Energy Use Data portal was used to access the Utility Energy Registry (EUR) to understand energy use consumption for the participating communities; however, this data set does not provide information on CCA enrollment.[23] Therefore, the impact evaluation team also interviewed the community choice administrator as well as the participating communities to obtain their quarterly reports detailing the actual clean energy provided to each community, the number of enrollees, and the number of opt-outs.

Annual delivered renewable energy was apportioned across the year to calculate a renewable capacity value and used New York State electricity generation mix data from the NYISO Gold Book to calculate the average percent of fossil fuel generation offset by the CCA.[24]

9.2.1 Target Population and Sample Design

This evaluation studied the census of CCA participants. Table 9-1 provides the sample targets and results.

Table 9-1. Population, target sample size, and actual sample–CCA

Community Size	Number of HIA Communities	Target Sample Size	Actual Sample Size
Small	1	1	1
Medium	2	2	2
Large	0	0	0
Totals	**3**	**3**	**3**

[23] Customers who chose to not participate in the CCA.

[24] 2018 Load & Capacity Data, New York Independent System Operator, "Gold Book."

9.3 Available Data, Forecasting and Planning, and Gross Impact Methods

Table 9-2 lists impact methodologies, data submission requirements, and recommendations for determining Investment Plan impact estimates and gross impacts for CCA.

Table 9-2. Ex ante impact calculation methods, data requirements, and recommendations

	Current Practice	Recommended Practice
Investment Plan Forecasting and Estimating Impact Methodology	Uses per-capita assumptions of consumption by generation fuel type taken from "Patterns and Trends" and adjusted using the Westchester CCA pilot and other sources.[25]	The results of this evaluation can be leveraged to estimate MWh and kW savings per capita or per community.
Program Reported Gross Annual Impact Methodology	Uses the total kWh contracted, the percentage of electricity sourced from renewables, and kW (if known) or estimated kW when generating impact values.	Replace MWh and kW Investment Plan impact estimates with per capita or per community verified gross annual impacts.
Data Submission Requirements	Submit a copy of the adopted legislation authorizing CCA, and a copy of an executed service agreement between the community and the energy services company.	In addition to existing requirements, NYSERDA could use the New York Generation Attribute Tracking System (NYGATS report) to track energy delivery and compliance and inform verified gross annual impacts.

[25] New York State Energy Research and Development Authority. 2015. Patterns and Trends, New York State Energy Profiles: 1999–2013.

10 Property Assessed Clean Energy Financing

10.1 Description and Eligibility

Property Assessed Clean Energy Financing (PACE) allows property owners to access secured funds from the Energize NY Finance Program, and to finance costs associated with clean energy upgrades and renewable energy projects for commercial or non-profit properties. Projects are administered by the Energy Improvement Corporation (EIC).[26]

10.2 Methods

Project files and verified gross annual impacts were examined by high-level desk reviews. Project files included purchase agreements, code inspections, FlexTech reports, solar site reports, and analyses by consulting engineers. The appropriateness of the impact model was assessed and verified gross annual impacts were calculated using standard engineering equations and documented inputs.

10.2.1 Target Population and Sample Design

The sample for the PACE communities was non-random due to the difficulty in accessing project documents. Only 2 of the 16 reported projects had enough data to perform high-level desk reviews. Early in the evaluation, the EIC provided data for two additional counties, Dutchess and Clinton. The projects ranged from small to very large and included an industrial complex, a multifamily property, and a comprehensive retrofit of an inn. PV arrays were installed at both the residential and industrial sites.

Table 10-1. Population, target sample size, and actual sample size–PACE

Total Clean Energy Communities participants 2016–2018	Target Sample Size	Actual Sample Size
18	10	4

The final non-random sample included Broome, Dutchess, Suffolk, and Clinton Counties. The calculated verified gross realization rate is the average of the verified gross annual impacts in the sample and the verified gross annual impacts that would have resulted if the sample were random.[27]

[26] Energy Improvement Corporation, is a New York State non-profit, local development corporation that operates EIC OPEN C-PACE for the benefit of its member municipalities.

[27] In a random sample the realization rate is applied to all participants.

10.3 Available Data, Forecasting and Planning, and Gross Impact Methods

Table 10-2 lists impact methodologies, data submission requirements, and recommendations for determining Investment Plan impact estimates and gross impacts for PACE projects.

Table 10-2. Ex ante impact calculation methods, data requirements, and recommendations

	Current Practice	Recommended Practice
Investment Plan Forecasting and Estimating Impact Methodology	Uses information from the EIC and assumes the community will install one project per year. Estimates of energy impacts expected for a renewable or efficiency project are calculated and then adjusted based on community population.	Consider reviewing 2016–2018 project information to capture the variation in project size and apply per capita or per community savings factors from this evaluation to forecast impacts. The number of projects has increased during the life of the program, but project size and savings vary widely from project to project.
Program Reported Gross Annual Impact Methodology	Program-reported gross annual impacts were based on Investment Plan impact estimates.	Use community reported gross impacts from project documents collected by EIC.
Data Submission Requirements	Submit a copy of the official letter from the EIC confirming the local government's EIC membership or a screenshot of EIC's participating municipalities webpage, which shows the applying jurisdiction listing as a current member.	When a PACE project is completed, the engineering analyses submitted to EIC can be uploaded to Salesforce to support Investment Plan impact estimates and gross impact estimates.