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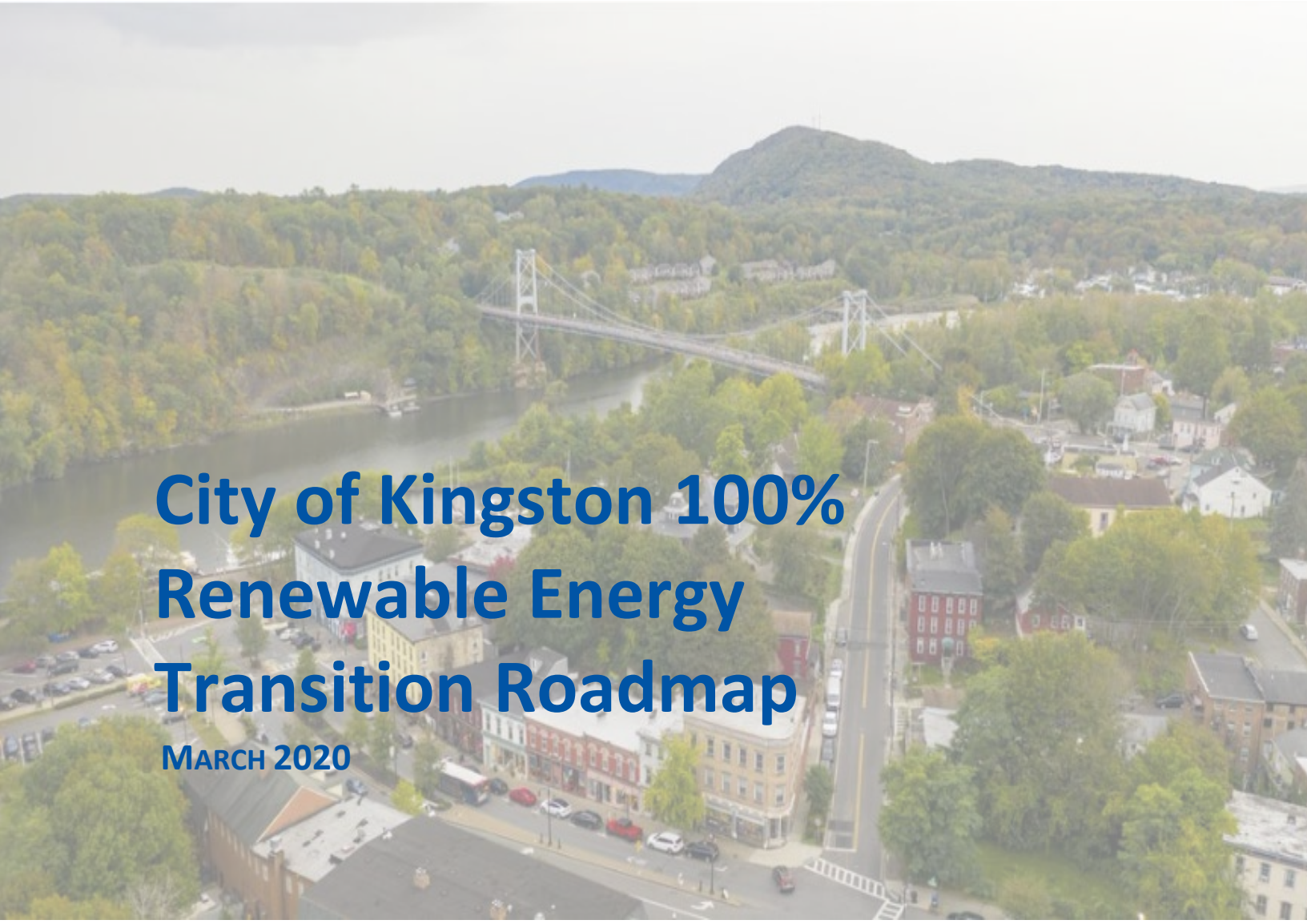

City of Kingston 100% Renewable Energy Transition Roadmap

MARCH 2020

Prepared for:
The City of Kingston

Supported by:
The NoVo Foundation

Acknowledgements

The Cadmus Group developed this resource in collaboration with the City of Kingston and the NoVo Foundation. Key project participants are listed below:

City of Kingston

- Steve Noble, Mayor
- Julie Noble, Environmental Education and Sustainability Coordinator
- Sean Koester, Environmental Specialist, Office of the City Engineer
- Brenna Robinson, Director, Office of Community Development

The NoVo Foundation

- Martin Kirk

Citizens for Local Power

- Susan Gillespie

Cadmus

- Farrah Andersen
- Megan Lynch
- Aurora Edington
- Divij Rajesh
- Jamie Daudon
- Chad Laurent

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Executive Summary

The City of Kingston aspires to a future based in sustainable, resilient, and independent socioeconomic systems. Foundational to this goal is the development of a renewable energy strategy that ensures the city's electricity supply is sourced from local and renewable resources. Based on its history of sustainability leadership, the City aims to advance more ambitious renewable energy goals and realize the numerous benefits of local clean energy. It also hopes to pilot innovative models that can be replicated and scaled by other jurisdictions throughout the country. In 2019, in partnership with the NoVo Foundation, the City of Kingston hired Cadmus and the National Renewable Energy Laboratory (NREL)[1] to develop a long-term roadmap for the City to achieve 100% renewable and resilience community-wide electricity supply.

The City of Kingston can employ a wide range of strategies to support the transition to renewable energy (RE). The context for the City's action, along with highest priority strategies, is shaped by state-level policy and renewable energy goals, utility regulation, and additional local factors. The purpose of this report is to provide the City of Kingston with actionable strategies, given its specific policy and regulatory context, to achieve its renewable energy and broader social goals. The Cadmus Team's process for identifying these strategies included developing a Clean Energy Program Strategy Framework to articulate the principles around which each strategy component should align. Following development of this framework, the team analyzed policies and strategies to identify those most aligned with the City's long-term goals. The team also conducted baseline modeling of energy supply and usage, along with modeling the energy and economic impact of various strategies, to understand the potential for the City to achieve its ambitious goals.

Research revealed a pathway for the City of Kingston to achieve its 100% RE goal by simultaneously pursuing multiple strategies that can be categorized into four key pillars, outlined below:

- **Pillar One: Foundational Policies and Programs** that enable and support Kingston's energy transition by ensuring alignment with current and future renewable energy technologies in order to reduce costs and policy barriers associated with renewable energy integration. These strategies include (1) Reducing Permitting, Zoning, and Inspection Processes; (2) Adopting Solar-Ready Guidelines; (3) Engaging the Community in Setting Energy Goals; (4) Establishing Formal City-Utility Partnerships; and (5) working with the distribution utility to Streamline Interconnection Processes. Collectively, these strategies do not have a significant impact on renewable energy supply but do enable the City of Kingston to take more ambitious steps in the future.

[1] The National Renewable Energy Laboratory (NREL) conducted detailed modeling to identify optimized building energy efficiency measures and photovoltaic (PV) potential for a subset of residential, commercial, and city buildings in Kingston, New York. NREL then extrapolated findings to model efficiency savings potential at a larger set of city-owned buildings and conducted modeling of energy consumption and PV potential in the Franklin Street Revitalization District and Midtown District. NREL's analysis can be found in the final chapter of this report.

- **Pillar Two: Municipal Supply Mix Strategies** which allow the City to lead by example by taking direct action to increase the renewable share of the municipal electricity supply mix. These strategies include (1) Purchasing Renewable Energy On-Site to Supply Operations; (2) Procuring Renewable Energy from Retail Electricity Providers; (3) Entering into an Offsite Power Purchasing Agreements; and (4) Virtual Power Purchasing Agreements. The City of Kingston will review and select a subset of these strategies to supply its municipal operations. While municipal operations comprise only a limited proportion of the total community electricity demand, it is an area directly within the City's control and therefore can be addressed in the near-term through City action. Additionally, action by the City of Kingston may also make active partners from other entities in the commercial and industrial sector to pursue similar strategies to supply their electricity demand with renewable resources.
- **Pillar Three: Community Choice Aggregation** involves the City of Kingston implementing a community choice aggregation (CCA) program. A CCA program enables local governments to pool the electricity load of residents and businesses within the community and procure electricity on their behalf. This will provide City of Kingston residents with greater control over their energy mix and the opportunity to increase the percentage of renewables within the mix at potentially lower energy prices. Additionally, a CCA program provides the platform for increasingly advanced methods for supplying customers with renewable electricity and investing in local distributed energy projects.
- **Pillar Four: Scaling Local Generation** includes strategies that encourage the deployment of local distributed energy resources within the City of Kingston. These strategies include (1) Local Requirements for RE Production; (2) Increasing Participation in Community Solar; (3) Establishing and/or Participating in Group Purchasing Programs; (4) Establishing Non-Financial Incentives for Renewable Energy; and (5) Providing Local Renewable Energy Financial Incentives. Both individually and collectively, these strategies will enable the City of Kingston to more rapidly scale local renewable energy generation to achieve City goals.

Based on the assumptions of this analysis**, Kingston can achieve 100% renewable electricity community-wide by 2036** by pursuing all these four pillars concurrently under a conservative set of baseline assumptions. The figure below demonstrates the impact that implementation of all available strategies will have on the City of Kingston's renewable electricity supply.

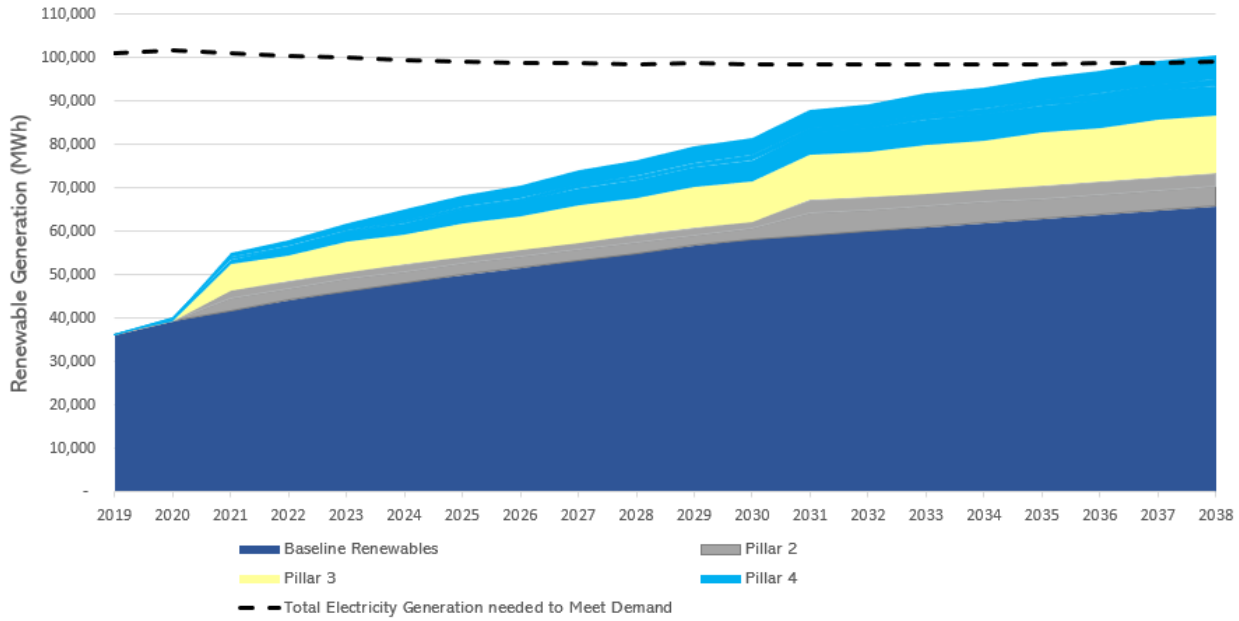

Figure 1: Projected Power Mix by Year: Effect on Renewable Share – All Pillars

Pillar 1 provides the city with a foundational base of renewable electricity policies to enable more widespread deployment[2]; Pillar 2 transitions municipal electricity supply to renewable resources; Pillar 3 creates a Community Choice Aggregation (CCA) program that will increase consumer choice over renewable energy supply and provide the platform for more ambitious long-term action; and finally Pillar 4 pursues more ambitious strategies to advance local renewable generation. If the City acts in the near-term to implement each of these four pillars, it will be poised to achieve 100% renewable electricity supply within the next 20 years.

By implementing strategies within each of these pillars, the City can not only achieve 100% renewable energy, but also become a leader in pursuing and achieving ambitious climate commitments. In particular, through implementing an advanced CCA program, the City of Kingston can develop and pioneer CCA strategies that can be replicated by other jurisdictions throughout the state and country. The advanced CCA program can also incorporate expanded local generation and serve as a basis for providing additional services to community members over time.

In the near-term, to advance this renewable energy transition, the City of Kingston should further scope the implementation needs for each of the pillars and begin pursuing the capacities, structures, and next steps required for implementation. Actively pursuing these steps will put the City of Kingston on its course toward a resilient renewable energy future.

[2] Pillar 1 plays an important role enabling widespread deployment of renewable energy, but is not expected to have direct impacts in increasing the share of renewable energy. As such, the strategies within this pillar were not modeled and are not represented in Figure 1.

Introduction

Project Background and Goals

The City of Kingston aspires to a future with sustainable, resilient, and independent socioeconomic systems. Its energy supply is a chief component of this vision. Building on its history of sustainability leadership, the City aims to realize the co-benefits of local clean energy and pilot models that can be replicated and scaled across the country. In 2019, the City of Kingston and its partner, the NoVo Foundation, hired Cadmus to evaluate options for the City to achieve a 100% renewable and resilient community-wide electricity supply and create a long-term, actionable roadmap to achieving this objective. Specifically, the project launched with the aim to support the City in realizing the following goals:

1. Identify and define new limits for a "gold standard" of **locally owned clean, reliable, and resilient energy**, creating benefits with local impacts and replicable national implications;
2. Quantify the potential **impact** of various project, program, and policy pathways that could enable Kingston to **rapidly transition** to high levels of energy efficiency in the built environment, 100% renewable supply, and resilient energy infrastructure;
3. Identify efficient **near-term strategies** that help Kingston achieve 100% RE;
4. Establish strategies for **supporting local jobs and economic development** as an integral part to achieving Kingston's clean energy future;
5. Coordinate across parallel initiatives focused on food, economic, and social systems, including by creating an **aligned strategic framework** for the **clean energy program** work.

Objective and Approach

Local governments across the United States currently employ a wide range of strategies to support the transition to renewable energy (RE). The viability and impact of these strategies varies depending on contextual factors, such as state-level regulation, utility type, and local factors. The purpose of this report is to provide the City of Kingston with actionable strategies, given its specific policy and regulatory context, to achieve its renewable energy and broader social goals. The Cadmus Team's process for identifying these strategies is summarized in Figure 2 below:

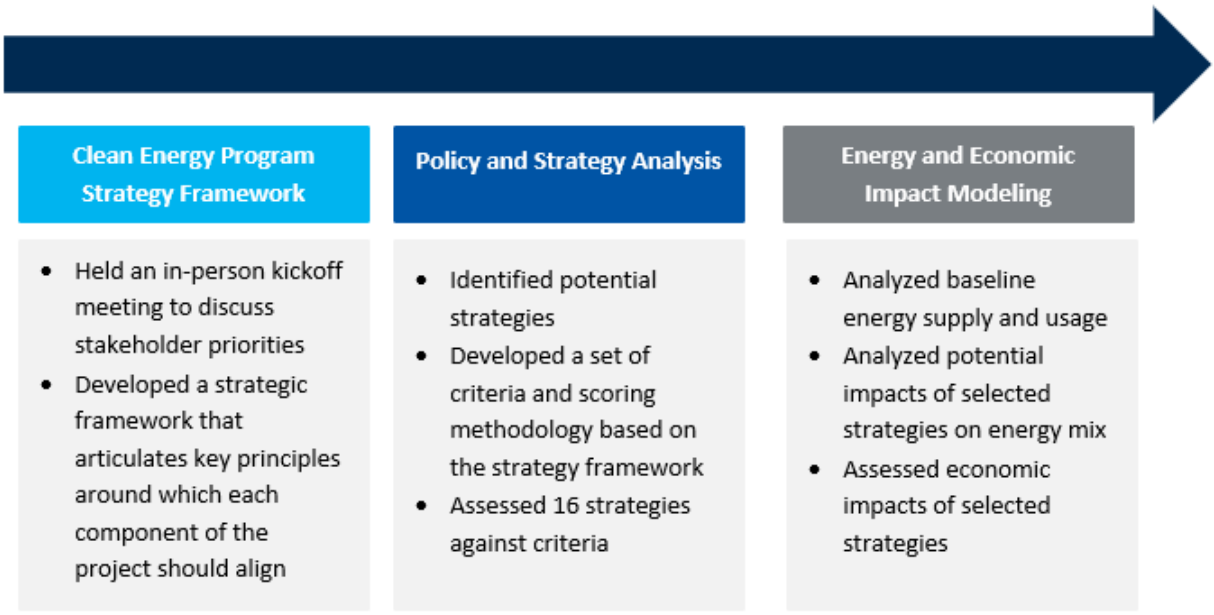

Figure 2: Summary of Cadmus Process

1. **Clean Energy Program Strategy Framework.** Based on input from stakeholders collected during a three-hour kick-off meeting in Kingston and subsequent conversations with Kingston and the NoVo Foundation, the Cadmus Team developed a guiding strategic framework document that articulates a holistic set of priorities around which each component of the project is aligned. Further details on this framework can be found in the Clean Energy Program Strategy Framework section. High-level priorities within the framework include deployment of local renewable energy, inclusion and social equity, local environmental and social goals, and feasibility.
2. **Policy and Strategy Analysis**. The Cadmus Team first compiled a list of 16 strategies that could be leveraged to achieve Kingston's renewable energy goals. Strategies were selected based on discussions with the City and the NoVo Foundation, a review of Kingston's existing sustainability-related planning documents, the Cadmus Team's prior work with municipal governments nationwide, and desk research on Kingston's state, utility, and local context. The Cadmus Team then developed a scoring methodology and qualitatively ranked each strategy on a scale of one (low) to three (high) against ten criteria adapted from the Clean Energy Program Strategy Framework. Further details on the results of this analysis can be found in the Policy and Strategy Analysis section.
3. **Energy and Economic Impact Modeling.** The Cadmus Team first conducted research on the current mix of electric power sources for the City of Kingston and developed both a conservative and moderate business-as-usual forecast of likely changes in the electric power mix during the planning period (present-2038). Next, the Cadmus Team assessed the likely energy impacts of each selected strategy on the share of renewable energy in the City of Kingston's supply mix, as well as the potential economic impacts associated with each strategy or policy. To complete the impact modeling of each strategy, the Cadmus Team drew on its existing database of local government policy impacts and experience in conducting energy sector modeling for cities,

conducted research on local and state context, and tailored model inputs to reflect this local and state context. Cadmus also consulted with the City to refine the model inputs and ensure that local perspectives were centered in the modeling. Further details on the modeling results can be found in the Energy and Economic Impact Modeling section.

Electricity Landscape

The renewable energy strategies that the City of Kingston can pursue, as well as its ability to achieve its RE goals, is influenced by its current electricity landscape. This section details relevant information about Kingston's state, utility, and local context as it relates to renewable energy deployment.

State Context

There are several state policies and programs that are relevant to renewable energy deployment in New York. Key state policies are listed below:

- **Deregulated Market**. New York has a deregulated electricity market.[3] In deregulated electricity markets, investor-owned utilities are not permitted to own and operate power plants that generate electricity. Instead, retail customers are free to purchase electricity from a competitive supplier, and the utility continues to provide transmission and distribution services. In Kingston, Central Hudson is the electric utility. There are several competitive electricity suppliers active in New York State offering retail customers a range of supply options that include different electricity sources and prices.[4]
- **Reforming the Energy Vision (REV)**. REV is Governor Cuomo's comprehensive energy strategy for the state of New York, which aims to build a cleaner, more resilient, and more affordable energy system through policy and regulatory action and innovation.[5,6] New York has already begun its transition to a clean energy future, pursuing ambitious targets that include drastically cutting greenhouse gas (GHG) emissions, modernizing the grid, and prioritizing major investments in distributed energy resources. Comprised of more than 40 initiatives focused on key areas such as renewable energy and infrastructure, energy efficiency, clean energy financing, and transportation; REV exemplifies a wholescale and cross-sectoral approach to addressing climate change.[7]
- **Clean Energy Standard (CES).** New York's CES requires all load serving entities (LSEs)[8] to procure at least 70% of electricity consumed in the state from renewable sources by 2030.[9] Prior to the CES, New York State had a Renewable Portfolio Standard (RPS) that expired in 2015. In 2016, the New York Public Service Commission issued an order adopting a CES for 50% of electricity to come from renewable sources by 2030. However, the CES was expanded in 2019 under the Climate

[3] Cadmus. Pathways to 100. https://cadmusgroup.com/papers-reports/pathways-to-100-an-energy-supply-transformation-primer-for-u-s-cities/

[4] New York State Power to Choose. http://documents.dps.ny.gov/PTC/zipcode/12401

[5] New York State. About REV. https://rev.ny.gov/about

[6] New York State DPS. About the REV Initiative. http://www3.dps.ny.gov/W/PSCWeb.nsf/All/CC4F2EFA3A23551585257DEA007DCFE2?OpenDocument

[7] New York State. REV Initiatives. https://rev.ny.gov/rev-initiatives

[8] NYSERDA defines LSEs as follows: "These are often called utilities or electric companies, but LSEs include any entity or organization: utilities, municipal electric systems and electric cooperatives, authorized or required to supply energy or energy-related services to retail customers." https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard

[9] NYSERDA. Clean Energy Standard. https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard

Leadership and Community Protection Act.[10] The CES establishes two mechanisms to ensure compliance, including the Renewable Energy Standard (RES), which requires LSEs to procure Tier 1 renewable energy certificates (RECs)[11] for their retail customers or make alternative compliance payments; and the Zero Emissions Credit (ZEC)[12] requirement, which requires LSEs to procure a number of ZECs that is proportionate to annual energy demand.[13]

- **Net Energy Metering.** New York's original net metering plan requires investor-owned utilities to allow certain customers to net meter excess electricity that is produced by eligible systems.[14] Eligible technologies include solar photovoltaics, wind, biomass, combined heat & power, fuel cells, small hydroelectric, and anaerobic digestion with system capacity limits varying by technology and sector. For most technologies, such as residential solar PV which is the most relevant to the City of Kingston's context, net excess generation is credited to the customer's next bill at the retail rate and reconciled annually at the avoided-cost rate.[15] However, in March 2017, the PSC published an order to gradually transition the method of valuing and compensating distributed energy resources (DERs) from net energy metering to Value of Distributed Energy Resources (VDER) tariffs. Under VDER, customers receive a monetary credit for excess electricity that can be rolled over into future billing cycles. The rate customers receive is known as the Value Stack Tariff, which changes depending on factors such as when and where the electricity is being sent to the grid.[16] This variability results in a less predictable value for excess generation than under traditional net metering, which was simply a credit equal to the retail value of the electricity generated.[17] NYSERDA provides a free Value Stack Tariff calculator[18] to help customers and installers understand the expected value of a solar project.
- **Third Party Ownership.** The state of New York permits third party ownership in the form of leases and power purchase agreements (PPAs). Both structures allow a third-party, such as a RE developer, to build, own, and operate a RE system on behalf of a host customer. This model enables customers to avoid the upfront costs of distributed RE installation and it allows tax-exempt entities (e.g., governments and non-profits) that do not have direct access to federal and state tax credits to leverage these incentives.

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[10] NYSERDA. Green New Deal Factsheet. https://www.nyserda.ny.gov/-/media/Files/About/Clean-Energy-Fund/Green-New-Deal-Fact-Sheet.pdf

[11] Tier 1 RECs can be purchased by LSEs at a $/MW rate from NYSERDA or a qualifying third-party on a quarterly basis or procured by the LSE itself. Resources eligible to produce RECs include solar, wind, hydro, and biomass energy generation facilities that have come into operation after January 1, 2015.

[12] ZECs must be purchased by LSEs at a $/MW rate calculated by NYSERDA, which is based on the LSEs proportion of overall NY state load and NYSERDA's annual ZEC purchases. ZEC purchase requirements were put in place as part of the CES in 2015 to serve as a mechanism to support at-risk nuclear zero-emissions generation facilities. A new ZEC compliance payment approach will come into effect April 1, 2020, making wholesale load the primary metric determining an LSEs required payment.

[13] NYSERDA. Clean Energy Standard. https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard

[14] DSIRE. January 2019. Net Metering. https://programs.dsireusa.org/system/program/detail/453

[15] DSIRE. January 2019. Net Metering. https://programs.dsireusa.org/system/program/detail/453

[16] NYSERDA. The Value Stack. https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Contractors/Value-of-Distributed-Energy-Resources

[17] EnergySage. VDER: NY's Replacement to Net Metering. https://news.energysage.com/vder-ny-replacement-net-metering/

[18] NYSERDA. Solar Value Stack Calculator. https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Contractors/Value-of-Distributed-Energy-Resources/Solar-Value-Stack-Calculator

- **Community Choice Aggregation**. New York State municipalities are permitted to participate in a Community Choice Aggregation (CCA) program subject to local authorization. This option enables local governments to pool their electricity load and procure electricity on behalf of residents and small businesses within the community. This provides New York communities with greater control over their electricity mix and provides the opportunity to increase the percentage of renewables within the mix at potentially lower energy prices. Municipalities can also partner with neighboring towns and cities to form a CCA. For example, Westchester Power is currently made up of 27 municipalities serving 110,000 homes and small businesses.[19]
- **Electrification of Heating and Transportation.** New York State has a variety of policies and programs that are focused on the electrification of heating and transportation including the Clean Heating and Cooling Communities program focusing on building electrification, the Make Ready initiative to support electric vehicle supply equipment and infrastructure, and the Drive Clean Rebate to support electric car purchases or leases through a point-of-sale rebate. [20,21,22] These programs will reduce New York State's use of fossil fuels, increase electricity load over time, and increase the need for renewable energy sources.

Utility Context

The City of Kingston is located within Central Hudson's service territory for electricity supply. Central Hudson is an investor-owned transmission and distribution utility that provides electricity and natural gas service to approximately 300,000 electric customers and 79,000 natural gas customers.[23] Central Hudson supports renewable energy in New York by offering net metering, as required by state policy, and by providing information on key renewable energy topics, including New York State distributed generation (DG) programs and incentives[24] and options for purchasing green power via energy service companies (ESCOs), renewable energy certificates (RECs), or community choice aggregation (CCA).[25] Central Hudson also offers several residential and business incentives for energy efficiency measures, HVAC improvements, and equipment upgrades.[26,27]

[19] Westchester Power. https://westchesterpower.org/

[20] NYSERDA. Clean Heating and Cooling Communities. https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Heating-and-Cooling-Communities

[21] NYSERDA. Governor Cuomo Announces "Make-Ready" Program for Electric Vehicles. https://www.governor.ny.gov/news/governor-cuomo-announces-make-ready-program-electric-vehicles

[22] NYSERDA. Drive Clean Rebate for Electric Cars. https://www.nyserda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate

[23] Central Hudson. Central Hudson Service Territory. https://www.cenhud.com/about-us/our-service-territory/

[24] Central Hudson. Programs and Incentives. https://www.cenhud.com/my-energy/distributed-generation/programs-and-incentives/

[25] Central Hudson. Green Power. https://www.cenhud.com/my-energy/my-energy-options/energy-choice/green-power/

[26] Central Hudson. Residential Incentives. https://www.cenhud.com/my-energy/save-energy-money/residential-incentives/.

[27] Central Hudson. Business Incentives. https://www.cenhud.com/my-energy/save-energy-money/business-incentives/

Local Policies and Initiatives

In addition to state-level policies, the City of Kingston has taken steps locally to support the deployment of renewable energy. In addition to committing to 100% clean energy,[28], selected highlights of ambitious action include:

- Achieving Bronze (2014) and Silver (2018) Climate Smart Community certification by completing a variety of adaptation and mitigation strategies. Highlights include conducting a GHG inventory and developing a climate action plan (CAP) that identifies strategies the City can take to reduce GHG emissions. The CAP also sets a target of reducing energy usage and GHG emissions 20% by 2020.[29,30]
- Becoming the first city in New York to achieve Clean Energy Community designation by completing a number of high-impact actions. Key actions include:
    - Adding electric vehicles (EVs) to the municipal fleet through NYSERDA's Clean Fleets program.[31]
    - Implementing an energy use benchmarking program in municipal buildings that identifies opportunities to reduce energy waste. The City's benchmarking assessment used the Environmental Protection Agency's Energy Star Portfolio Manager[32] program to conduct their benchmarking exercise, which will allow for easy data integration across sectors in the future as well.
    - Establishing an Energize NY Finance program. An iteration of C-PACE financing, the Energize NY Finance program is an increasingly popular tool that helps commercial and non-profit property owners pay for their energy upgrades and renewable energy projects.[33]
    - Participating in the 2015 solarize Hudson Valley campaign, a group-purchasing partnership that enables more residents and small-business owners to install solar by taking advantage of reduced prices.
- Retrofitting existing streetlights and multiple municipal buildings with energy efficient LED lighting.

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[28] City of Kingston. Energy. https://kingston-ny.gov/content/8399/22301/22336/default.aspx

[29] City of Kingston. Energy. https://kingston-ny.gov/content/8399/22301/22336/default.aspx

[30] City of Kingston. Climate Action Plan. https://www.kingston-ny.gov/filestorage/8463/10432/10440/10458/CAP_-_Updated_for_PS_9-27-12_(1).pdf

[31] NYSERDA. Clean Fleets. https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Communities/Clean-Energy-Communities-Program-High-Impact-Action-Toolkits/Clean-Fleets

[32] EPA. Energy Star Portfolio Manager. https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

[33] NYSERDA. Energy Improvement Corporation Open C-PACE program. https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Communities/Clean-Energy-Communities-Program-High-Impact-Action-Toolkits/Energize-NY-Finance

Clean Energy Program Strategy Framework

Overview

While there are dozens of strategies technically available to the City of Kingston to support its achievement of 100% renewable electricity (RE) supply, there is a more limited set of strategies that are most contextually appropriate and likely to be effective locally. The strategies that are selected should align with Kingston's broader goals, and existing RE efforts, among other considerations. At the outset of the project, the Cadmus Team developed a Clean Energy Program Strategy Framework, with input from the City and the NoVo Foundation, that aims to articulate a set of holistic priorities relevant to RE planning. Based on these priorities, the Cadmus Team identified 10 relevant criteria to evaluate potential renewable energy strategies in order to highlight tradeoffs between emphasizing certain priorities over others.

Priority Areas

The City of Kingston's policy priorities areas are outlined in the section below. Associated criteria used to evaluate the renewable energy strategies can be found in the Policy and Strategy Analysis section.

1. **Deployment of Local Renewable Energy**. The City of Kingston has a goal of reaching 100% renewable electricity for municipal operations by 2050 and eventually 100% renewable electricity community wide. In achieving these goals, the city has emphasized the importance of developing and supporting additional, local renewable energy projects, specifically within the boundaries of the City or neighboring communities. This analysis also prioritizes strategies that foster resilience to shocks to the energy system and support increased self-sufficiency from the grid.
2. **Inclusion and Social Equity.** The City of Kingston expressed a strong interest in inclusivity and access to renewable energy for all its residents. For the purposes of this analysis, social equity includes the extent to which a strategy fosters inclusivity by engaging the community, educating the public, and supporting underserved community members that do not readily have access to information and services related to energy efficiency and renewable energy. Key underserved population segments include the Latino community, senior citizens, low-income households, and renters.
3. **Local Environmental and Social Goals**. The City of Kingston identified a number of environmental and social priorities to achieve in parallel to reaching 100% RE. These priorities include reducing greenhouse gas emissions and energy use, improving energy efficiency, benefiting public health, and creating long-term green jobs.
4. **Affordability and Electricity Cost Reductions.** The City of Kingston indicated the importance of fostering a renewable energy transition that is affordable—meaning it does not increase electricity costs for its citizens—and ideally reduces electricity costs. Additionally, affordability also considers the propensity of a RE strategy to provide RE at affordable rates for residents at many income levels.
5. **Feasibility of Proposed Strategy.** The City of Kingston is uniquely positioned with strong funding prospects and a supportive political and public environment. Still, some strategies may be more

straightforward or more difficult to implement than others. As such, this analysis focuses on the technical, political, and financial feasibility of each strategy.

Note that at the outset of project, independence had been a potential priority area flagged for review. Over the development of the strategy framework, and through discussions with the City and other stakeholders, the areas outlined above emerged as being the highest priority areas instead. In emphasizing strategies that align with these priorities, independence has become less of a direct focus in this report. That said, independence is addressed indirectly in the framework. Specifically, self-sufficiency is one aspect of resilience, which is included under the first priority area (deployment of local renewable energy).

Current Energy Consumption and Baseline Projections

Overview and Methodology

To understand the scale of change necessary to achieve the City of Kingston's 100% renewable electricity goals, it is important to understand the current breakdown of generation sources, utility projections for future electricity generation, and the baseline forecast of electricity generation and supply. This analysis outlines the current electricity landscape for the City of Kingston and the projected potential changes to its electricity supply through 2038.

To determine the amount of electricity consumed by the City of Kingston, the Cadmus Team began by aggregating data on electricity use in the building and transportation sectors.[34] Next, the electricity mix for the region was disaggregated into its composite sources. Figure 3 illustrates the data collection methodology.

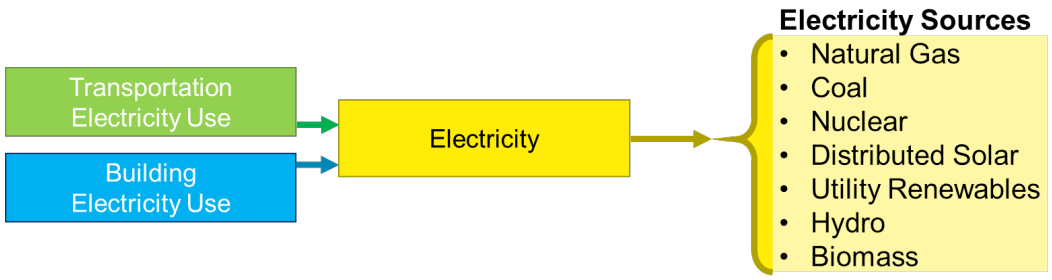

Figure 3: Data Collection Methodology

Current Electricity Landscape

Kingston consumed 103,000 MWh of electricity across its buildings and transportation sectors in 2018. As shown in Figure 4A, Kingston has a relatively low-carbon electricity mix, with more than one-third of its electricity being provided by renewable energy sources, and another third coming from nuclear. Of the renewables share, hydroelectric is the largest contributor, providing 23% of all electricity. The second largest source of renewable energy is distributed solar, which provides 5% of the electricity. In terms of non-renewable sources, natural gas supplies 35% of the electricity, more than any other energy source. Coal has been almost entirely phased out and makes up 1% of the current electricity mix.

[34] Data sources used to figure the current consumption in the building sector was derived primarily from the City of Kingston and NYSERDA's Community Energy Use Data, and Central Hudson's list of Building Accounts. Data for the transportation sector are mainly sourced from U.S. Census data and Energy Information Administration (EIA).

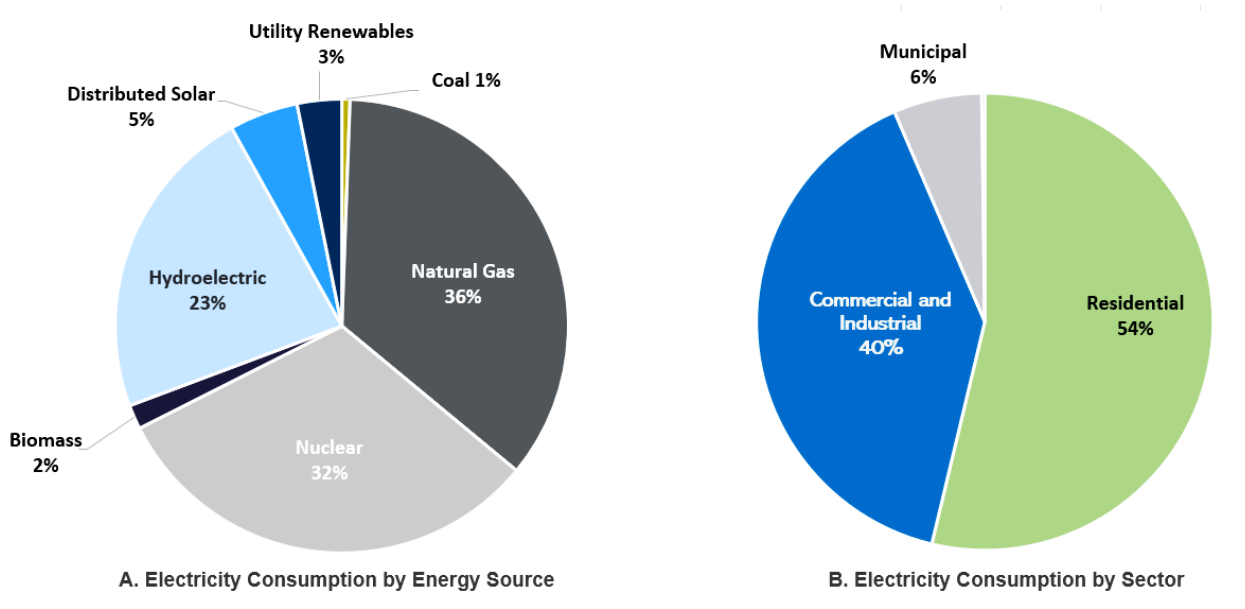

Figure 4: Electricity Consumption by Energy Source and Sector (2018)

Figure 4B captures the breakdown of electricity consumption in Kingston by sector. The residential sector consumes 54% of electricity in the city, followed by commercial and industrial buildings, which consume 40%. Municipal buildings consume the remaining electricity within the buildings sector. While there are electric vehicles registered in Kingston, their current electricity consumption is minimal (approximately 0.2% of total consumption), and is not visible in Figure 4B.

Baseline Scenarios

A baseline, or business-as-usual, scenario forecasts how Kingston's electricity mix could evolve if no additional policy action is taken. To account for potential policy or technology changes that may occur in the modeling period, the Cadmus Team developed two parallel forecasts: a conservative growth scenario and a moderate growth scenario. The two scenarios have differing projections for distributed solar generation, electrification of the transportation sector, and achievement of clean energy goals. Table 1 outlines the specific assumptions for each scenario. Note that both scenarios account for the phase out of nuclear power plants based on the anticipated retirement of Indian Point Plant 2 and Plant 3 in the short-term, with additional retirements expected in the long-term around 2030.[35]

[35] Nuclear retirement projections are based on data from the U.S. Energy Information Administration and can be viewed further on Table 55.8 of the 2019 Annual Energy Outlook report.

Table 1: Overview of Assumptions for Modeling Conservative and Moderate Growth Baselines.[36]

	Conservative Growth Baseline	Moderate Growth Baseline
Distributed Generation	Uses the NYISO Zone G Distributed Generation Forecast increase in DG from ~8,000 MWh in 2018 to ~19,800 MWh to project by 2038.	Uses 30% of City of Kingston rooftop solar technical potential by 2038 to forecast an increase in DG from ~8,000 MWh in 2018 to ~31,200 MWh by 2038.
Transportation Electricity Consumption	Uses the NREL Electrification Futures Study Reference Case, a national level study, to extrapolate and forecast the number of electric vehicles in the City increasing from 77 to 702 between 2018 and 2038.	Uses the NREL Electrification Futures Study Medium Case, a national level study, to extrapolate and forecast the number of electric vehicles in the City rising from 77 to 2,826 between 2018 and 2038.
Electricity Generation	Assumes the 50% Renewable Portfolio Standard is met by 2030	Assumes the 70% Clean Energy Standard is met by 2030
Building Electricity Consumption	Uses the EIA Annual Energy Outlook Middle Atlantic Consumption Forecast to project a 93% and 90% reduction in electricity demand for residential and C&I (commercial & industrial) buildings, respectively, between 2018 and 2038.	

Figure 5 shows the forecasted electricity mix required to meet the Kingston community's demand for the **conservative growth scenario** where renewable energy makes up 66% of the electricity mix by 2038.[37] The growth in renewables is primarily driven by the growth in distributed solar and utility renewables. Total electricity generation needed to meet demand stays approximately the same, with a slight decrease due to building energy efficiency gains exceeding increased electricity consumption from minimal adoption of electrification technologies in the building and transportation sectors.

[36] The underlying sources of data for these assumptions can be found as follows:

- NYISO Zone G Distributed Generation Forecast, https://www.nyiso.com/documents/20142/2226333/2019-Gold-Book-Final-Public.pdf/
- City of Kingston rooftop solar technical potential, https://www.google.com/get/sunroof/data-explorer/place/ChIJJ4HJLQEP3YkRE8kyWFqJ10E/
- NREL Electrification Futures Study, https://www.nrel.gov/docs/fy18osti/71500.pdf
- EIA Annual Energy Outlook Middle Atlantic Consumption Forecast, https://www.eia.gov/outlooks/aeo/tables_ref.php.

[37] Renewable energy is an umbrella term that includes hydroelectric, biomass, wind, solar, and distributed generation.

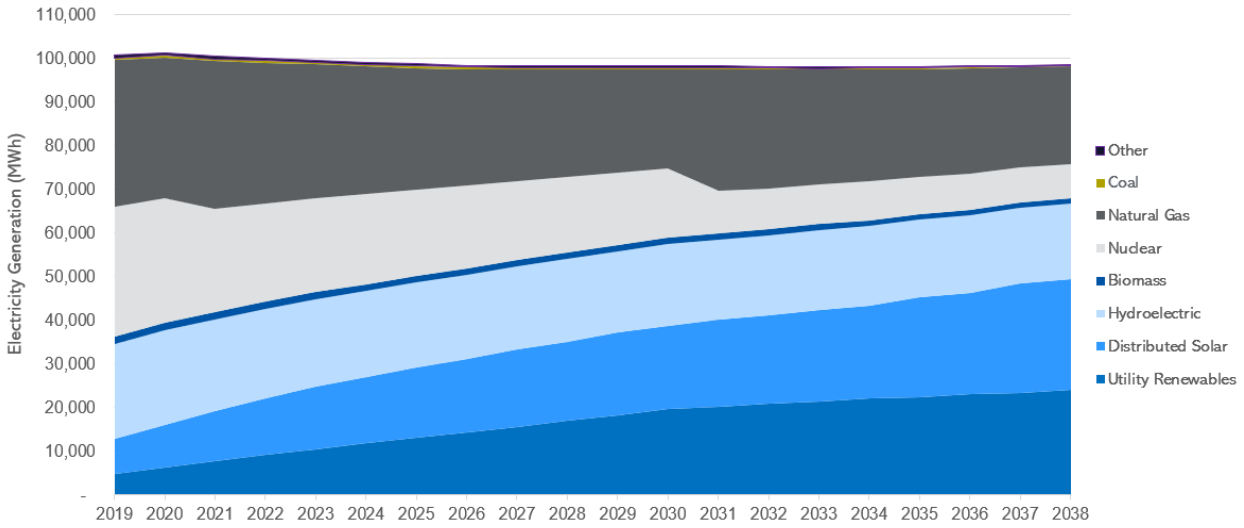

Figure 5: Electricity Generation by Energy Source to Meet Community Demand (Conservative Scenario)

Figure 6 shows the projected electricity mix in the **moderate growth scenario**. By 2038, renewables provide 84% of the electricity mix with distributed solar and utility renewables contributing the largest share. The increase in renewable energy is largely due to meeting the New York Clean Energy Standard targets. The total electricity needed to meet demand has increased noticeably due to a higher projected adoption rate for electric vehicles.

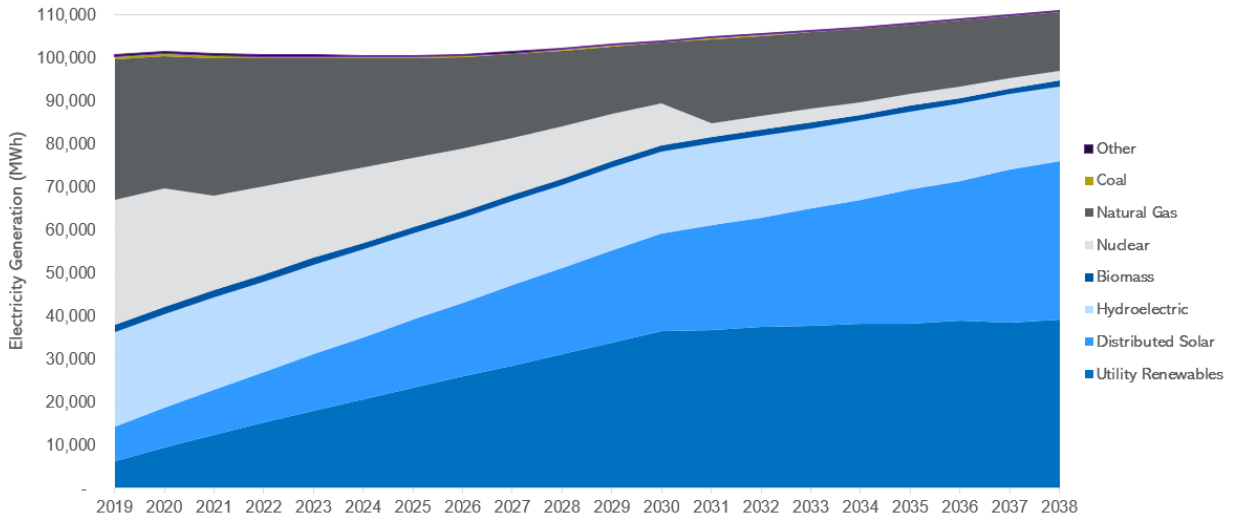

Figure 6: Electricity Generation by Energy Source to Meet Community Demand (Moderate Scenario)

Key Takeaways from the Baseline Scenario

The modeling conducted on the City of Kingston's baseline electricity consumption and supply yields the following primary takeaways that can guide the City's climate planning efforts:

- **Kingston should monitor market development and be prepared to meet a higher level of electricity demand with renewable resources.** Kingston's required electricity consumption will vary based on the pace of electrification, which will influence the amount of renewable electricity the City must procure. The baseline model outlined two different electricity demand pathways for the City of Kingston. In the conservative scenario, overall electricity consumption decreases by 4.3% due to assumed efficiencies in building electricity consumption. However, in the moderate growth scenario, overall electricity demand *increases* by 7.8% due to transportation electrification (e.g. via electric vehicles). If transportation electrification markets develop at rates more aligned with NREL's Medium Case (see Table 1), then the City of Kingston should be prepared to meet the corresponding need for increased renewable electricity.
- **New York State's ambitious renewable electricity policies provide a strong basis for the City of Kingston to achieve its energy goals.** New York is advancing an ambitious policy framework to support renewable electricity development within the state. This means that renewables (which include hydroelectric, biomass, wind, solar, and distributed generation) are projected to provide 50% of the electricity demand by 2025 in the conservative scenario, and by 2023 in the moderate scenario. Additionally, renewables are estimated to comprise 66% of the electricity mix by the end of the planning period in the conservative scenario and 84% in the moderate scenario. While the scenarios vary, in both cases New York's accelerated statewide targets provide a platform for the City of Kingston to achieve its even more ambitious clean energy goals.

While baseline conditions are subject to change based on market developments and changing policies outside of the City's direct control, the forecasts prepared for this report provide helpful parameters to guide the City of Kingston's efforts. Over the 20-year planning period, the buildings sector is assumed to implement energy efficiency measures and the transportation sector is assumed to electrify. This occurs alongside an increased focus on renewable energy procurement to reduce the proportion of electricity supplied by nuclear and natural gas. Given these baseline conditions, Kingston is well-positioned to achieve 100% renewable electricity by enacting policies and strategies to further advance renewable development in the City.

Policy & Strategy Analysis

Methodology

There are numerous strategies that the City of Kingston could pursue in an effort to achieve its renewable electricity goals. To identify a subset of strategies that would be appropriate and effective in the City of Kingston, the Cadmus Team compiled a list of 16 strategy options informed by discussions with the City and the NoVo Foundation, the Clean Energy Program Strategy Framework, and the Cadmus Team's prior work with municipal governments nationwide. The full list of strategies can be found below in Table 2.

Table 2: List of Analyzed Strategies

#	Strategy	Description
1	**Reduce Permitting, Zoning, and Inspection Processes**	The City streamlines the permitting, zoning, and inspection processes so that processing time and expenses are reduced. This may include streamlining permitting processes for specific technologies that meet certain standards, and eliminating redundancies from inspection protocols.
2	**Adopt Solar Ready Guidelines**	The City encourages or requires new buildings to be built in a way that accommodates future solar installations.
3	**Local Requirements for Local RE Production**	The City requires renewable energy development in certain cases, such as new construction of residential and/or commercial buildings of a certain size.
4	**Increase Local Participation in Community Solar**	The City acts as an organizer, site host, or anchor customer in a community solar project.
5	**Purchase Renewable Energy On-site to Supply City Operations**	The City installs renewable energy projects on city-owned facilities and lands.
6	**Engage the Community in Setting Energy Goals**	The City convenes, facilitates, and/or supports public discussions with the community on the City's energy goals.
7	**Establish and/or Participate in Group Purchasing Programs**	The City hosts or supports group purchasing programs for renewable energy (e.g., Solarize campaigns) to reduce costs and support market development.
8	**Establish Local Non-Financial Incentives for Renewable Energy**	The City establishes programs to incentivize renewable energy for residents and businesses within Kingston. These programs could include creating local competitions where the primary incentive would be public recognition of achievement.
9	**Local Renewable Energy Financial Incentives Program**	The City establishes programs to incentivize renewable energy for residents and businesses. Such programs could include local tax rebates for renewable energy installations, tax credits, exemptions from property taxes, and zero interest and forgivable loans.

10	**Procure Renewable Energy from Retail Electricity Providers**	The City purchases electricity from a competitive supplier to supply municipal operations with renewable energy.
11	**Offsite PPA: Partner with a Third Party to Procure Renewable Energy**	The City partners with an independent power producer (IPP) within the Central Hudson service territory to directly procure renewable electricity for municipal operations though a power purchase agreement.
12	**Virtual Power Purchase Agreements**	The City enters into a VPPA[38] to procure renewable energy for municipal operations. Municipal action is expected to encourage commercial and industrial (C&I) customers to pursue a VPPA as well.
13	**Municipalize the Local Electric Grid**	The City establishes a municipal utility by purchasing the local grid infrastructure from the utility.
14	**Establish a Community Choice Aggregation Program**	The City establishes a local community choice aggregation program to support the bulk purchasing of renewable energy for residents and businesses within the community.
15	**Establish Formal City-Utility Partnership**	Kingston and Central Hudson jointly set goals and develop programs for implementation locally.
16	**Work with Utility to Streamline Interconnection Processes**	Collaborate with Central Hudson to simplify utility interconnection procedures.

After finalizing the list of strategies with input from the broader project team, Cadmus qualitatively assessed and ranked each strategy on a scale of one (low) to three (high) against the criteria adapted from the Clean Energy Program Strategy Framework. Descriptions for each of the criteria can be found below in Table 3.

[38] The Environmental Protection Agency defines a VPPA as a financial agreement between a buyer and a generator (or seller) of renewable energy that enables both parties to hedge against electricity market price volatility. In this kind of agreement, both parties will agree to a strike price that the seller is guaranteed to receive for the delivery of electricity into the wholesale market. Any difference between the strike price and the wholesale price will be exchanged between the two parties so that the seller always receives the strike price. The renewable energy certificates (RECs) associated with the renewable energy are typically conveyed to the buyer.

Table 3: Policy Analysis Criteria and Descriptions

Priority	Criteria	Description
Deployment of Local RE	**Potential Scale of Impact**	Extent to which a strategy is expected to increase the level of RE in the City's energy mix.
	Potential Local Impacts	Extent to which the strategy is expected to have a positive impact on renewable energy supply locally, including by contributing to additional renewable generation (particularly generation within the City limits and in neighboring jurisdictions), and the potential for the strategy to improve the City's position as a leader for RE in NY
	Potential Resilience Impacts	Extent to which a strategy has the propensity to increase resiliency to shocks to the energy system and supports independence from the grid.
Inclusion and Social Equity	**Potential Equity Impacts**	Extent to which the benefits associated with the strategy are expected to be distributed equitably. Benefits include access to renewable energy and associated cost savings, local public health improvements, and workforce development opportunities.
	Affordability (Residents/Businesses)	Extent to which a strategy is expected to be affordable and cost-effective for residents and businesses of all income levels within Kingston, including through utilization of incentive support
Local Environmental and Social Goals	**Potential Emissions Impact**	Extent to which a strategy is expected to have an impact on greenhouse gas emissions reductions associated with City and community-wide energy use.
	Potential Economic Impact	Extent to which a strategy is expected to contribute to local job growth.
Feasibility	**Potential Financial Impact (City)**	Extent to which the City will incur costs to implement the strategy. This rating includes the availability of existing funding sources and incentives.
	Technical Feasibility	Extent to which a strategy is feasible in an appropriate timeframe considering potential technical barriers (e.g. technology or policy).
	Political Feasibility	Extent to which a strategy is feasible considering local and state political barriers and social acceptability among stakeholders.

Results

The results of the policy analysis exercise showed that there are trade-offs across strategies, with most strategies displaying a combination of high rankings against some criteria and lower rankings against other criteria. These results were used to inform the development of the 100% renewable energy pathway outlined in the Findings section. For more information on the full details of the policy analysis, please see the attached spreadsheet.

Energy and Economic Impact Modeling

In addition to the qualitative policy analysis, the strategies were also evaluated quantitatively by modeling energy and economic impacts. This section provides a high-level summary of the modeling approach and key results. Of the 16 strategies, 11 are expected to have direct energy impacts. The Cadmus Team modeled the likely energy impacts of each of these 11 strategies toward increasing renewable energy in the City of Kingston's supply mix. Additionally, the Cadmus Team modeled the economic impacts of selected strategies by updating and using NREL's Jobs and Economic Development Impact (JEDI) model. The remainder of this section outlines the non-modeled strategies, the results of the energy impact modeling, and the results of the economic modeling. Appendix A provides additional detail regarding the methodology and assumptions underlying both the energy and economic modeling processes.

Enabling (Non-Modeled) Strategies

Four of the sixteen strategies are considered "enabling strategies." These enabling strategies are included in the policy analysis because they are anticipated to play an important role in setting the stage for some of the other strategies examined in this study as well as other potential strategies that Kingston may undertake in the future. However; these strategies are not quantitatively modeled given that they are anticipated to have a minimal direct impact on Kingston's energy supply. Table 4 summarizes these strategies.

Table 4: Overview and Description of Enabling Strategies

Strategy Name	Description
Adopt Solar Ready Guidelines	The City encourages or requires new buildings to be built in a way that accommodates future solar installations.
Engage the Community in Setting Energy Goals	The City convenes, facilitates, and/or supports public discussions with the community on the City's energy goals.
Establish Local Non-Financial Incentives for Renewable Energy	The City establishes programs to incentivize renewable energy for residents and businesses within Kingston. These programs could include creating local competitions where the primary incentive would be public recognition of achievement.
Establish Formal City-Utility Partnership	Kingston and Central Hudson jointly set goals and develop programs for implementation locally.

In addition to the above enabling strategies, municipalization was also not quantitatively modeled. Given that New York state's electricity market is deregulated, it is unclear what benefits would be modeled under this scenario.

Strategy Name	Description
Municipalize the Local Electric Grid	The City establishes a municipal utility by purchasing the local grid infrastructure from the utility.

Energy Impact Results

The remaining 11 strategies with measurable impacts on energy supply were modeled within both the conservative growth and moderate growth baseline. This section summarizes both the cumulative and individual impact of strategies within each of these scenarios, along with key modeling results.

Potential Strategy Impacts Against Conservative Growth Baseline

Figure 7 below outlines the City of Kingston's projected electricity demand through 2038 and the anticipated impact of the modeled strategies on the amount of renewable energy within the electricity supply. The dotted line represents the City of Kingston's electricity demand and the colored wedges represent renewable generation spurred by high-impact strategies. High-impact strategies are those that are projected to add more than 1,000 MWh of renewable generation. They are further summarized in Figure 8.

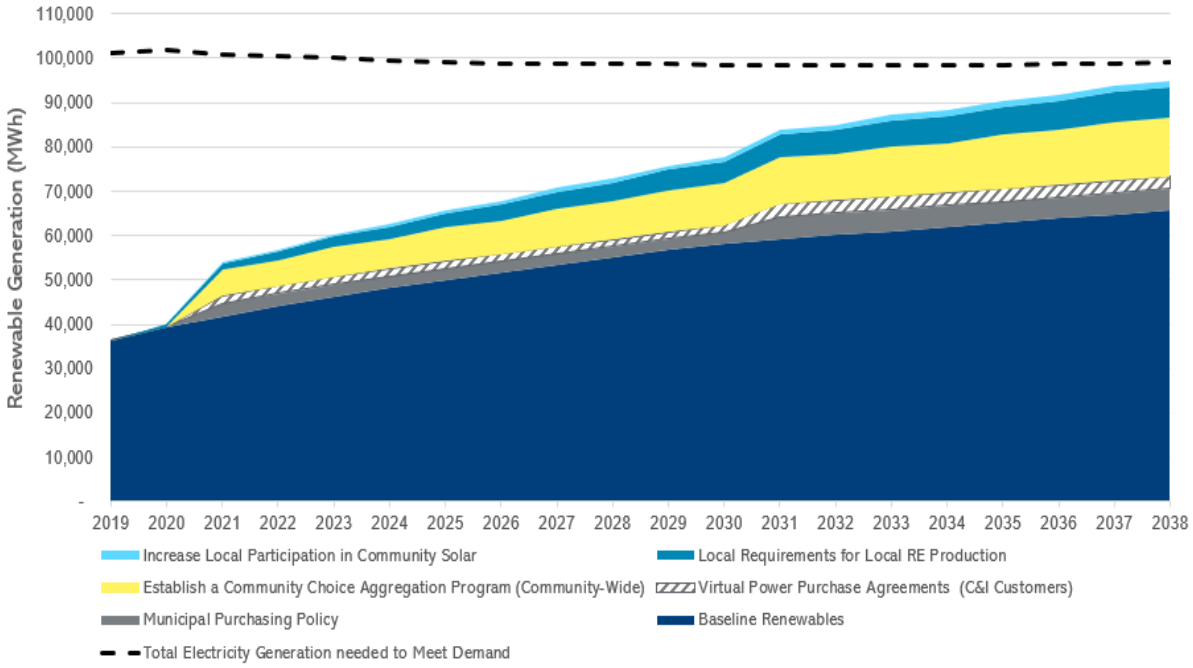

Figure 7: Effect of Strategies on Meeting Projected Community-Wide Electricity Demand with Renewable Generation (modeled against conservative growth baseline)

Figure 8 provides a snapshot view of the effect that each strategy has on increasing the level of renewable electricity in 2030. Note that there are two bar plots separating high-impact strategies (greater than 1,000 MWh) and additional strategies (less than 1,000 MWh) into two categories. The additional strategies are also shown in Figure 8A as an aggregate value named "B: Additional Strategies".

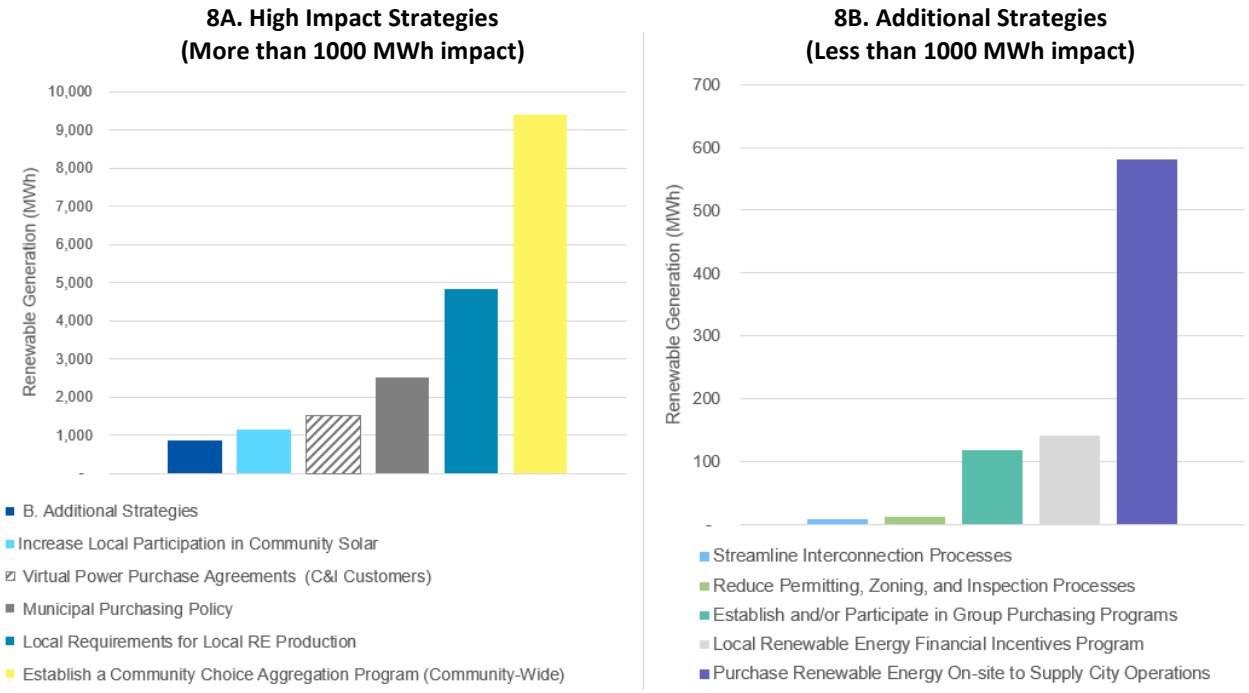

Figure 8: Renewable Energy Generation by Strategy in 2030 (modeled against conservative growth baseline)

Potential Strategy Impacts Against Moderate Growth Baseline

In addition to the conservative baseline scenario, the Cadmus Team also developed a moderate baseline scenario, in which certain underlying projections were changed. The distributed generation and transportation electrification forecasts are more aggressive, and the 70% Clean Energy Standard is met. Under this new scenario, the impacts of the same strategies are modeled as in the conservative scenario. Figure 9 shows the impacts on renewable energy due to these strategies.

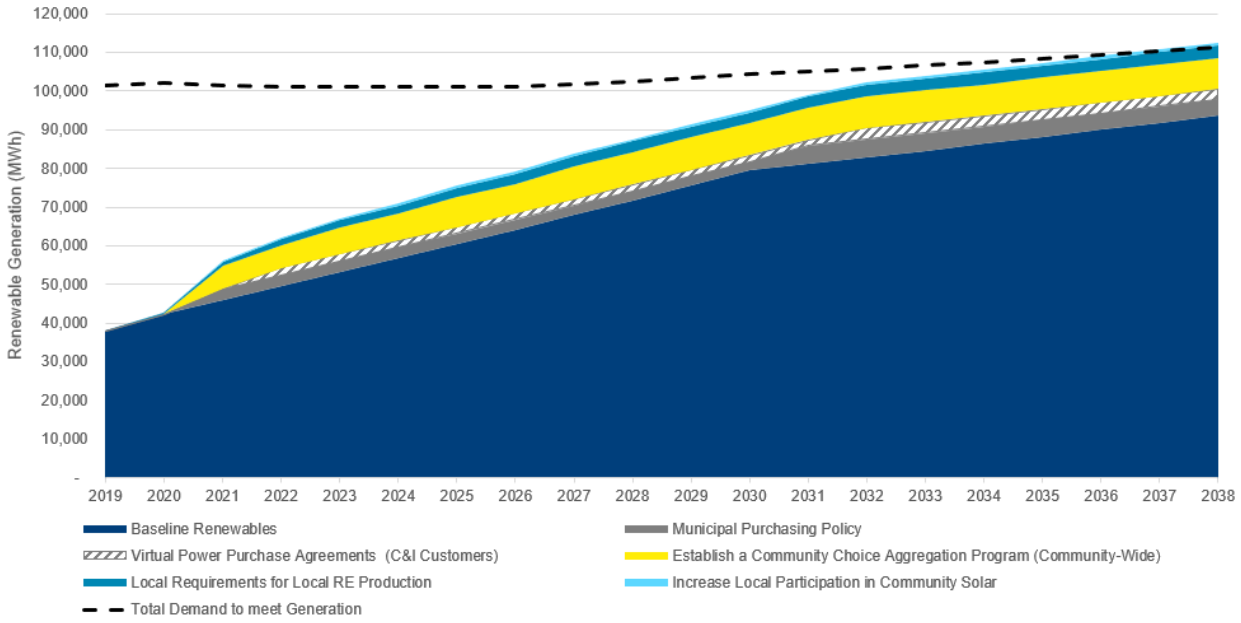

Figure 9: Effect of Strategies on Meeting Projected Community-Wide Electricity Demand with Renewable Generation (modeled against moderate growth baseline)

Figure 10 provides a snapshot view of the effect that each strategy has on increasing the level of renewable electricity as illustrated Figure 9. Note that there are two bar plots separating high-impact strategies (greater than 1,000 MWh) and additional strategies (less than 1,000 MWh) into two categories. The additional strategies are also shown in Figure 10A as an aggregate value named "B: Additional Strategies".

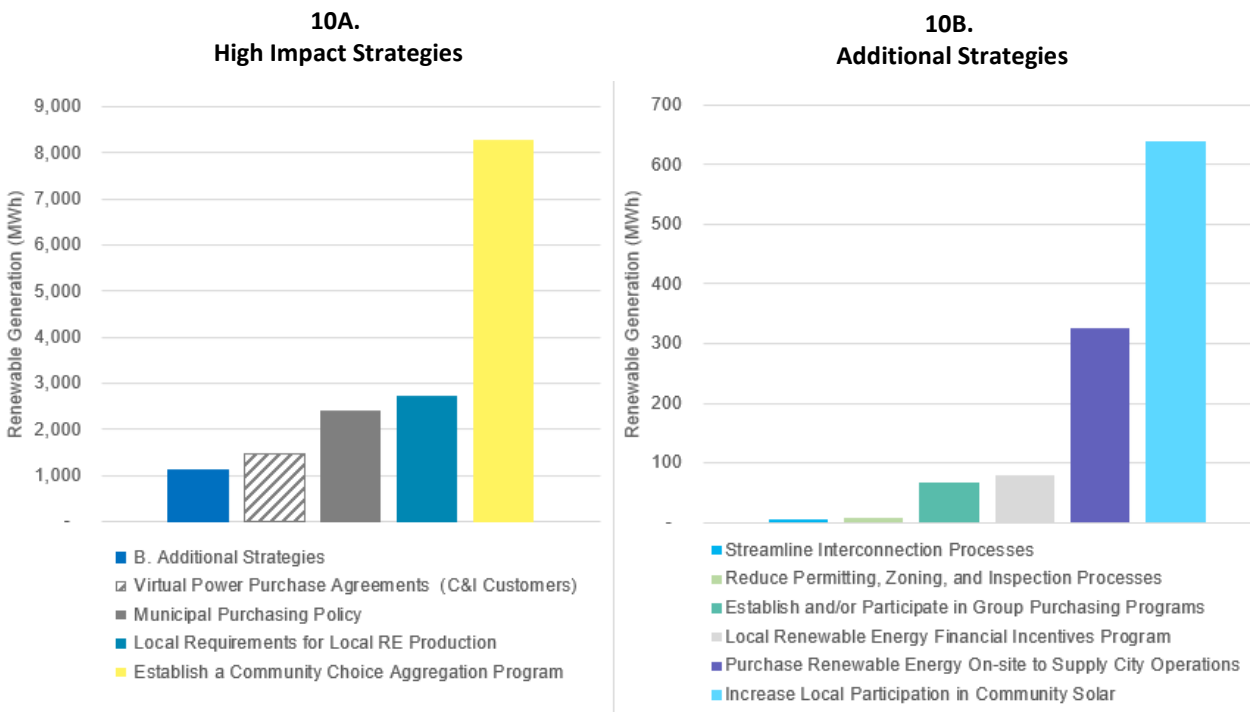

Figure 10: **Renewable Energy Generation by Strategy in 2030** (modeled against moderate growth baseline)

Key Takeaways from Modeling Results

Key takeaways based on the modeling policy outputs against the conservative and moderate growth baseline include:

- **The City of Kingston can achieve 100% renewable energy through local action over the next 20 years.** In the conservative baseline, the City of Kingston achieves 98% of energy via renewable sources by 2038, while in the moderate growth projections, Kingston achieves 100% renewable energy by 2036. By further accelerating the local generation strategies as outlined in Pillar 4 of Kingston's potential pathway to achieving 100% RE, the City of Kingston can achieve its goal by 2036 in both the conservative and moderate baselines. These outcomes indicate that the City has a pathway to achieving its ambitious clean energy goals over the next 20 years via local policy and program implementation. However, achieving this level of renewable energy will require a robust implementation plan and strong commitment to implementing all strategies in the Findings section of this report.
- **Approximately half of projected strategy-driven renewable energy installations are achieved through implementing a Community Choice Aggregation (CCA) program.** Implementing a community-wide CCA program is the highest-impact strategy analyzed in this study. The CCA accounts for 45-50% of renewable energy production spurred by local strategies in 2030 (percentage varies by baseline scenario). This indicates that this is a critical strategy for Kingston

to advance in order to realize its long-term energy goals. The specifics of a CCA program are discussed further in the Findings section below.

- **As a stand-alone strategy, establishing requirements for local renewable energy production drives new renewable energy projects, in the form of solar PV, to be built.** In the modeling assumptions this strategy requires that every newly constructed building must have solar PV installed on its roof. As a result, this strategy is responsible for a significant share of new renewable generation year over year, evident in the energy modeling results for both the conservative and moderate baselines.
- **The role of municipal clean energy purchasing is also impactful on a system level and for its role in inspiring additional action by commercial and industrial customers.** While municipal electricity accounts for only 6% of all electricity consumption in the City of Kingston, municipal clean energy purchasing is important for two reasons. First, municipal purchasing represents the third largest wedge of strategies considered in this study. Indeed, multiple purchasing mechanisms exist that may be used by the City to purchase 100% renewable electricity, including purchasing renewable energy on-site to supply city operations, procuring renewable energy from retail electricity providers, setting up an off-site PPA, and setting up a VPPA. Second, the role of municipal action could also have a broader effect in the community by inspiring other members of the Kingston community to purchase renewable electricity. In our assumptions, C&I customers supply a percentage of the electricity demand from clean energy as a result of motivation and inspiration by the City of Kingston.

Economic Impact Results

The **results of this analysis validate decisions to build local renewable energy** due to the beneficial impacts of local jobs and economic development. Modeling results indicate that investment into local distributed generation projects, as opposed to utility-scale development, provides a higher level of jobs and economic development benefits per MW built. Thus, the highest economic benefits would result from local distributed generation projects. However, the number and capacity of local projects that can be built may be limited due to space restrictions within the city's limits. For this reason, renewable energy installations nearby (but technically outside of) the city would likely provide many similar economic benefits to Kingston and offer a second practical avenue to supporting the city's renewable generation. Additionally, while the model indicates that utility-scale installations would likely have slightly lower economic benefits per MW, utility-scale installations both within and nearby Kingston are next best options. The remainder of this section outlines the jobs impacts followed by the broader economic impacts associated with the strategies.

Figure 11 below provides an overview of the cumulative jobs over the 20-year planning period due to all strategies with significant impacts for the conservative growth baseline. Strategies that created less than 1 job (FTE) total were considered insignificant in terms of economic impacts and are therefore omitted from the figures and tables in this section. These strategies include Reduce Permitting, Zoning, and Inspection Processes, Local Renewable Energy Financial Incentives, and Streamline Interconnection Processes.

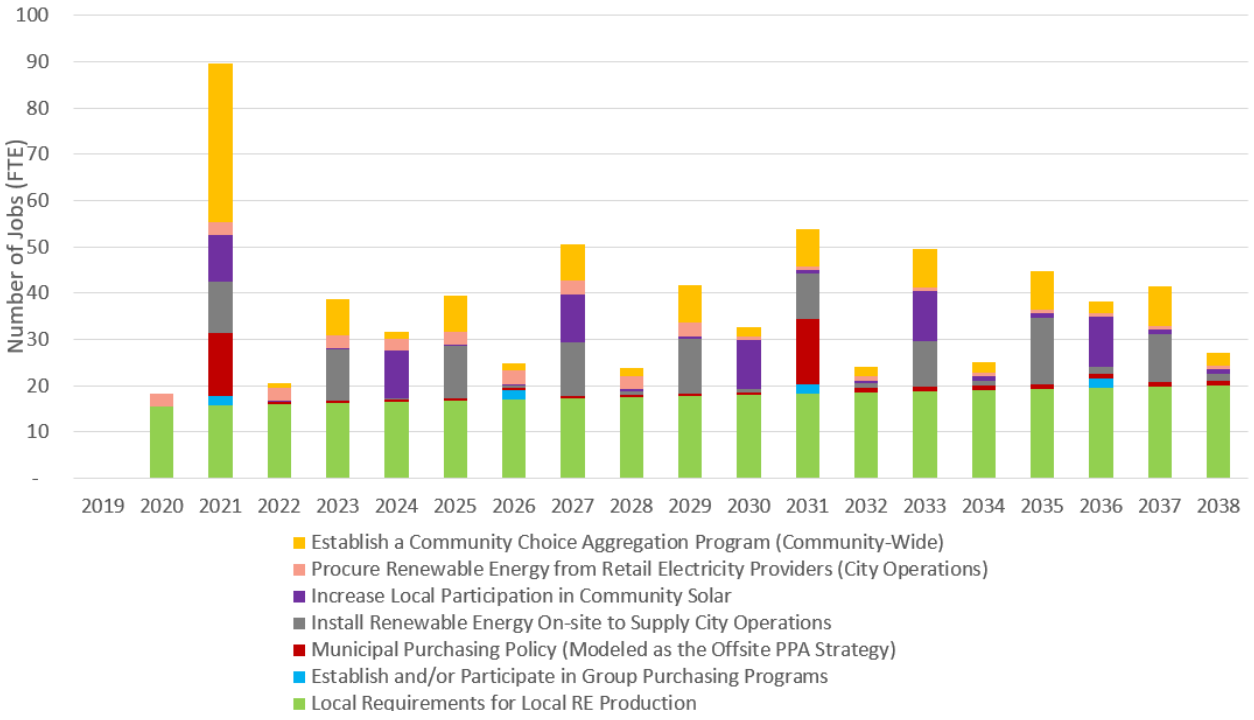

Figure 11: **Total Jobs Associated with Each Strategy Over 18-Year Planning Period (2020-2038)**

Jobs refer to full-time equivalent (FTE) employment for one year. (1 FTE = 2080 hours)

The figure shows the annual number of jobs in the local area due to building new solar installations as well as jobs due to the maintenance and operation of existing solar arrays. Summaries and selected relevant assumptions on each of the strategies visualized in Figure 11 follow below:

- The strategy which provides the most consistent source of jobs is ***Local Requirements for Local Renewable Energy Production*** (in green). The modeling assumptions for this strategy require solar to be installed on all new building stock in the Kingston community starting in 2020 and continuing through 2038. The implication of these assumptions is that new solar systems of 6 kW are installed on ~120 buildings per year.
- The blue bars represent jobs due to ***Establishing and/or Participating in Group Purchasing Programs***. New job growth is correlated with the timeframe in which a group purchasing campaign is run, i.e., every five years. The modeling assumption is that during each campaign, 20 residential 5 kW solar PV systems are installed.
- The municipal purchasing policy modeled in red is ***Offsite PPA: Partner with a Third Party to Procure Renewable Energy.*** The large spikes in jobs associated with this strategy, in 2021 and 2031, are due to the start of the offsite PPA contracting period where a new utility-scale solar installation is assumed to be built to meet municipal electricity demand.
- The gray bars represent jobs attributable to ***Installing Renewable Energy On-site to Supply City Operations*****.** The additional jobs every alternate year result from the modeling assumption that three municipal buildings (including city government buildings, hospitals, county government buildings, and schools) and one park pavilion adds solar, and one parking lot adds a parking canopy every other year.
- The purple bars signify job growth due to ***Increasing Local Participation in Community Solar.*** A community solar project, 485 kW in size, is installed every 3 years. During these installation years, 10 FTE jobs are projected to be created, and during the off-years, the operations and maintenance jobs are minimal.
- ***Establish a Community Choice Aggregation Program*****,** represented by the yellow bars, is implied by the modeling to create the most jobs in its initial year. This largest installation is assumed in the modeling to come online in 2021, followed by regular, smaller installations every other year each time the CCA is reevaluated.
- The pink bars represent jobs created as a result of the ***Procure Renewable Energy from Retail Electricity Providers for City Operations*** strategy. Job growth remains consistent from 2020 through 2030, at which point all city operations are serviced by clean energy. After this, only operating and maintenance jobs are projected for the rest of the planning period.

Table 5 below provides a snapshot view of the cumulative economic benefits over the 20-year planning period due to each strategy with significant impacts in the conservative growth scenario.

Table 5: Cumulative Jobs, Living Wages, and Economic Development Associated with Each Strategy Over 18-Year Planning Period (2020-2038)

Strategy[1]	Jobs[2]	Living Wages[3]	Local Economic Development[4]	Solar Added (MW)
Establish and/or Participate in Group Purchasing Programs	9.65	$770,472	$1,044,109	0.4
Procure Renewable Energy from Retail Electricity Providers (City Operations) *	35.09	$2,709,262	$3,369,785	3.67
Offsite PPA: Partner with a Third Party to Procure Renewable Energy (City Operations) *	38.3	$2,949,549	$3,666,178	4.4
Increase Local Participation in Community Solar	69.8	$5,630,694	$7,642,774	2.91
Install Renewable Energy On-site to Supply City Operations	110	$8,862,056	$12,033,827	4.6
Establish a Community Choice Aggregation Program (Community-Wide)	117	$9,034,356	$11,227,607	13.71
Local Requirements for Local RE Production	335	$26,811,676	$36,257,770	14

[1] *Strategies that created less than 1 FTE job total are omitted from table. These strategies include Reduce Permitting, Zoning, and Inspection Processes, Local Renewable Energy Financial Incentives, and Streamline Interconnection Processes.*

[2] *Jobs refer to full-time equivalent (FTE) employment for one year (1 FTE = 2080 hours).*

[3] *Living wages refer to wage and salary compensation paid to workers and benefits, in current year 2019 dollars.*

[4] *Local economic development refers to payments made to workers (wages, salaries, and benefits), proprietary income, other property type income (payments from interest, rents, royalties, dividends, and profits), indirect business taxes (excise and sales taxes paid by individuals to businesses), and taxes on production and imports less subsidies, in current year 2019 dollars.*

** These strategies install utility-scale solar while the remaining strategies are small-scale distributed generation solar installations. Accordingly, the utility-scale solar sees economies of scale in terms of economic impacts per MW installed.*

While economic analysis was not explicitly conducted for the moderate growth baseline, economic impacts can be expected to scale in a manner similar to the renewable energy impacts. For example, the CCA in the moderate growth baseline adds fewer megawatt-hours of renewable energy than in the conservative growth baseline. Accordingly, the economic impacts of the same strategy would be fewer in terms of jobs, living wages, and local economic development.

Findings

Overview

The findings from the policy analysis and energy and economic impact modeling exercises reveal a potential pathway to achieving Kingston's 100% RE goals by simultaneously pursuing multiple strategies that can be categorized into **four key pillars**, outlined in Figure 12 below:

Figure 12: Kingston's Potential Pathway to Achieving 100% RE

Based on the assumptions of this analysis, pursuing strategies across each of these pillars will enable the City of Kingston to achieve 100% renewable electricity community-wide by 2036. Within this timeline, this report's findings outlines a path forward for Kingston that is grounded in realistic assumptions as well as the priorities articulated in the Clean Energy Program Framework. The remainder of this section will detail relevant information for each pillar, including:

- A high-level **description** providing an overview of the pillar.
- A **list of strategies** included within the pillar and descriptions of each strategy.
- An **assessment of energy impacts** and the effect each pillar has on the share of renewable energy within Kingston's supply (depicted as wedges on a graph).
- An analysis of **how that pillar will enable Kingston to meet its priorities** identified in the Clean Energy Program Strategy Framework. Specific information on increasing resilience is included within the Local Social and Environmental Goals segment of this analysis.
- **Implementation steps** and associated supporting resources and examples for each strategy.
- Additional information on how to **integrate equity into each pillar**. Further information on this topic can be drawn from Urban Sustainability Directors Network: A Guidebook on Equitable Clean Energy Program Design for Local Governments and Partners

Pillar One: Foundational Policies and Programs

Description

The first pillar of Kingston's 100% RE Pathway is to pursue foundational strategies that enable and support future action. While these strategies are not expected to have a direct impact on Kingston electricity supply mix, these strategies play a key role supporting Kingston's energy transition by ensuring alignment with current and future renewable energy technologies in order to reduce costs and policy barriers associated with renewable energy integration. These strategies are typically highly local and within the direct control of the City. Key strategies within this category are listed below:

#	Strategy	Description
1.1	**Reduce Permitting, Zoning, and Inspection Processes**	The City streamlines the permitting, zoning, and inspection processes so that processing time and expenses are reduced. This may include streamlining permitting processes for specific technologies that meet certain standards, and eliminating redundancies from inspection protocols.
1.2	**Adopt Solar Ready Guidelines**	The City encourages or requires new buildings to be built in a way that accommodates future solar installations.
1.3	**Engage the Community in Setting Energy Goals**	The City convenes, facilitates, and/or supports public discussions with the community on the City's energy goals.
1.4	**Establish Formal City-Utility Partnership**	Kingston and Central Hudson jointly set goals and develop programs for implementation locally.
1.5	**Work with the Utility to Streamline Interconnection Processes**	Collaborate with Central Hudson to simplify utility interconnection procedures.

Energy Impacts

As noted in the Energy and Economic Impact Modeling section, most of these strategies are expected to have limited direct energy impacts beyond the baseline projections. As such, these strategies were not modeled. The below figure depicts the baseline increase in renewables against the total electricity generation to meet demand. Pillar one strategies are not depicted as they were not modeled.

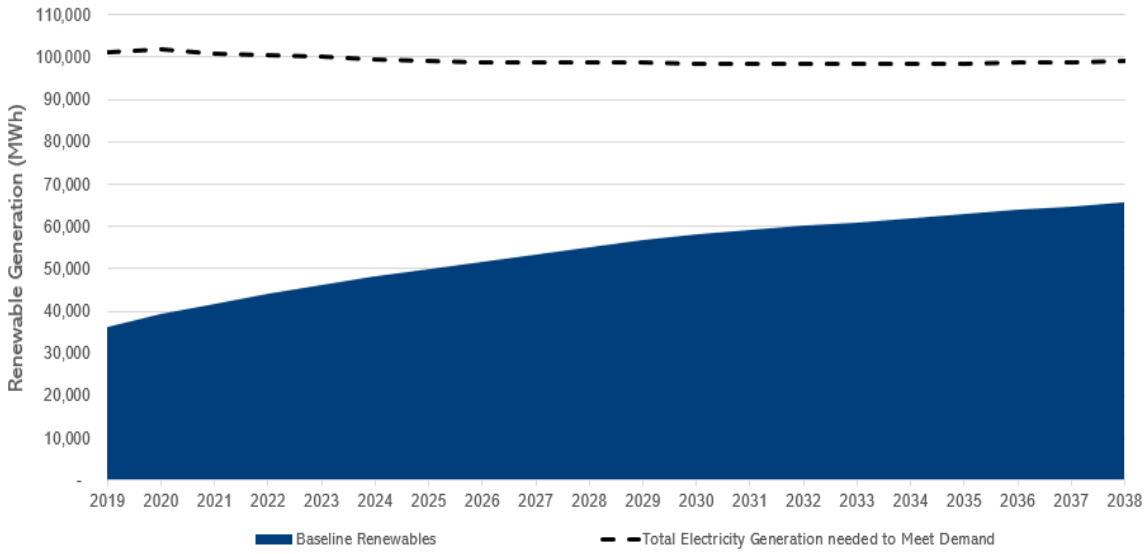

Figure 13: Projected Power Mix by Year: Effect on Renewable Share: Foundational Policies and Programs

Priorities Analysis

As these enabling actions are generally low-risk strategies, it is expected that Kingston would likely pursue several or all the Foundational Policies and Programs. The extent to which this suite of strategies is expected to help achieve Kingston's priorities identified in the Clean Energy Program Strategy Framework is summarized below:

Priority	Ranking	Rationale
Local Deployment of RE	**LOW**	These Foundational actions will not directly deploy renewable energy, but will encourage deployment of local renewable energy by ensuring alignment with current and future technologies and by reducing future costs and policy barriers related to integration.
Inclusion and Social Equity	**MEDIUM**	Kingston could make progress towards its inclusion and social equity goals with the Foundational Policies and Programs, but the extent to which to these goals are met is largely dependent on program design.
Local Environmental and Social Goals	**LOW**	Foundational Policies and Programs play an important role in helping the City make progress towards its environmental and social goals by setting the foundation for future action, but are not expected to directly generate renewable energy or its associated co-benefits. Resilience can be strengthened by emphasizing greater levels of distributed generation (as opposed to utility-scale generation) given that it is possible for distributed generation to support electricity needs during times when the grid cannot deliver supply. Additionally, when engaging the community in setting energy goals (strategy 1.3) can allow a connection point for community members and set the stage for greater social cohesion and adaptive capacity.
Feasibility	**MEDIUM**	These actions are not anticipated to face any major technical, political, or financial barriers as they have been implemented in multiple communities across the U.S. there are multiple resources available to support implementation (see implementation steps below).

Implementation Steps

High-level implementation steps and key resources for each strategy are outlined below:

1.1 Reduce Permitting, Zoning, and Inspection Processes		
Implementation Steps		**Resources and Examples**
1.	Review existing permitting, zoning, and inspection processes and identify potential gaps and/or barriers.	• SolSmart: Technical Assistance • SolSmart: Toolkit for Local Governments • SolSmart: Best Practices in Solar Planning and Zoning • Interstate Renewable Energy Council: Residential solar Permitting Best Practices Explained
2.	Review best practices and adapt to the Kington context. Consider joining SolSmart for additional technical assistance related to best practices and implementation	

1.2 Adopt Solar Ready Guidelines		
Implementation Steps		**Resources and Examples**
1.	Review template solar ready guidelines and adapt to Kingston context, as needed.	• NREL: Solar Ready: An Overview of Implementation Practices • Ohio-Kentucky-Indiana Regional Council of Governments: Solar Rooftop Ready Construction Guidelines
2.	Consider joining SolSmart for additional technical assistance related to best practices and implementation.	• SolSmart: Technical Assistance

1.3 Engage the Community in Setting Energy Goals		
Implementation Steps		**Resources and Examples**
1.	Develop a plan to optimize community engagement, drawing upon best practices on clean energy program design.	• Urban Sustainability Directors Network and Cadmus: A Guidebook on Equitable Clean Energy Program Design for Local Governments and Partners • Rocky Mountain Institute: Community Energy Resource Guide
2.	Create opportunities for public engagement throughout Kingston and clearly indicate how public engagement will be factored into final goals, plans, and policies.	
3.	Advertise the opportunities through community outreach. Incentivize and encourage ongoing community development	

1.4 Establish Formal City-Utility Partnership		
Implementation Steps		**Resources and Examples**
1.	Identify the appropriate city and utility staff to ensure a productive partnership. On the city side, this may include city leaders, as well as technical and legal staff.	• World Resources Institute and the Institute for Market Transformation. Utilizing City-Utility Partnership Agreements to Achieve Climate and Energy Goals
2.	Establish an agreement, such as a memorandum of understanding (MOU), that establishes the desired outcomes of the agreement, expectations, and/or specific goals.	

1.5 Streamline Interconnection Procedures		
Implementation Steps		**Resources and Examples**
1.	Review interconnection best practices; identify challenges and concerns regarding the existing interconnection process	• Interstate Renewable Energy Council: Model Interconnection Procedures • DVRPC & SolSmart: Addressing Solar PV Interconnection Challenges: Lessons for Local Governments and Utilities • SolSmart Toolkit for Local Governments: Utility Engagement • SolSmart: Technical Assistance
2.	Engage Central Hudson and hold a collaborative discussion to discuss concerns and potential solutions. Set up a process for ongoing communication between Central Hudson and the City of Kingston.	
3.	Consider joining SolSmart for additional technical assistance related to best practices and implementation.	

Integrating Equity

ID	Strategy	Equity Context and Considerations
1.1	**Reduce Permitting, Zoning, and Inspection Processes**	• Streamlining permitting, zoning, and inspection processes helps eliminate barriers to participation in clean energy programs by decreasing transaction costs for customers (e.g., time, cost). • Ensure that the abbreviated process is clear to the average consumer and reduces time and paperwork demands to the customer as well as on the side of the processing entity, and that an equitable cost share is implemented, where applicable.
1.2	**Adopt Solar Ready Guidelines**	• Ensure guidelines or accompanying ordinances consider the unique needs of multifamily affordable housing to ensure that requirements match development and financing timelines • Consider implications for smaller property owners, where solar readiness may impose additional costs. The City may wish to consider grants to mitigate costs of additional solar-ready infrastructure.
1.3	**Engage the Community in Setting Energy Goals**	• Community outreach and engagement should be designed to be inclusive of the widest possible segment of the population. Be mindful of barriers to participation in meetings and other community engagement events, such as time and location. For example, events held in the evenings or on the weekends draw the widest groups of people. • It is important to use images and language that is accessible to the whole community. This includes ensuring that the images of people included in materials reflect local demographics as well as that materials are written clearly and supplied in the languages spoken by the community. • The USDN Guidebook on Equitable Clean Energy Program Design for Local Governments and Partners provides further guidance on how to integrate equity into community energy goal-setting.
1.4	**Establish Formal City-Utility Partnership**	• Incorporate community engagement in the goal-setting process, ensuring stated goals align with community needs and interests. The goalsetting process and subsequent work to achieve goals should take a targeted universalist approach in which the stated goal is universal, but programs and processes designed to meet this goal provide targeted support to those who need it.
1.5	**Streamline Interconnection Processes**	• Ensure that the streamlined process is clear to the average consumer and reduces time and paperwork demands to the customer as well as on the side of the processing entity, and that an equitable cost share is implemented, where applicable.

Pillar Two: Municipal Supply Mix Strategies

Description

Strategies within the second pillar of the pathway allow the City to lead by example by taking direct action to increase the renewable share of the municipal electricity supply mix. Strategies within this category are listed below:

#	Strategy	Description
2.1	**Purchase Renewable Energy On-Site to Supply City Operations**	The City installs renewable energy projects on city-owned facilities and lands.
2.2	**Procure Renewable Energy from Retail Electricity Providers**	The City purchases electricity from a competitive supplier to supply municipal operations with renewable energy.
2.3	**Offsite PPA: Partner with a Third Party to Procure Renewable Energy**	The City partners with an independent power producer (IPP) within the Central Hudson service territory to directly procure renewable electricity for municipal operations though a power purchase agreement.
2.4	**Virtual Power Purchase Agreements (VPPAs)**	The City enters into a VPPA[39] to procure renewable energy for municipal operations. Municipal action is expected to encourage commercial and industrial (C&I) customers to pursue a VPPA as well. This strategy provides the City access to renewable electricity for a fixed price.

[39] The Environmental Protection Agency defines a VPPA as a financial agreement between a buyer and a generator (or seller) of renewable energy that enables both parties to hedge against electricity market price volatility. In this kind of agreement, both parties will agree to a strike price that the seller is guaranteed to receive for the delivery of electricity into the wholesale market. Any difference between the strike price and the wholesale price will be exchanged between the two parties so that the seller always receives the strike price. The renewable energy certificates (RECs) associated with the renewable energy are typically conveyed to the buyer.

Energy Impacts

Municipal electricity use comprises approximately 6% of Kingston's total community-wide demand and could be met through any individual or combination of strategies within this pillar. Additionally, this analysis assumes that municipal actions could make active partners from commercial and industrial (C&I) customers to meet 5% of their demand with renewable energy via the above strategies in 2021, and 10% by 2031.[40]

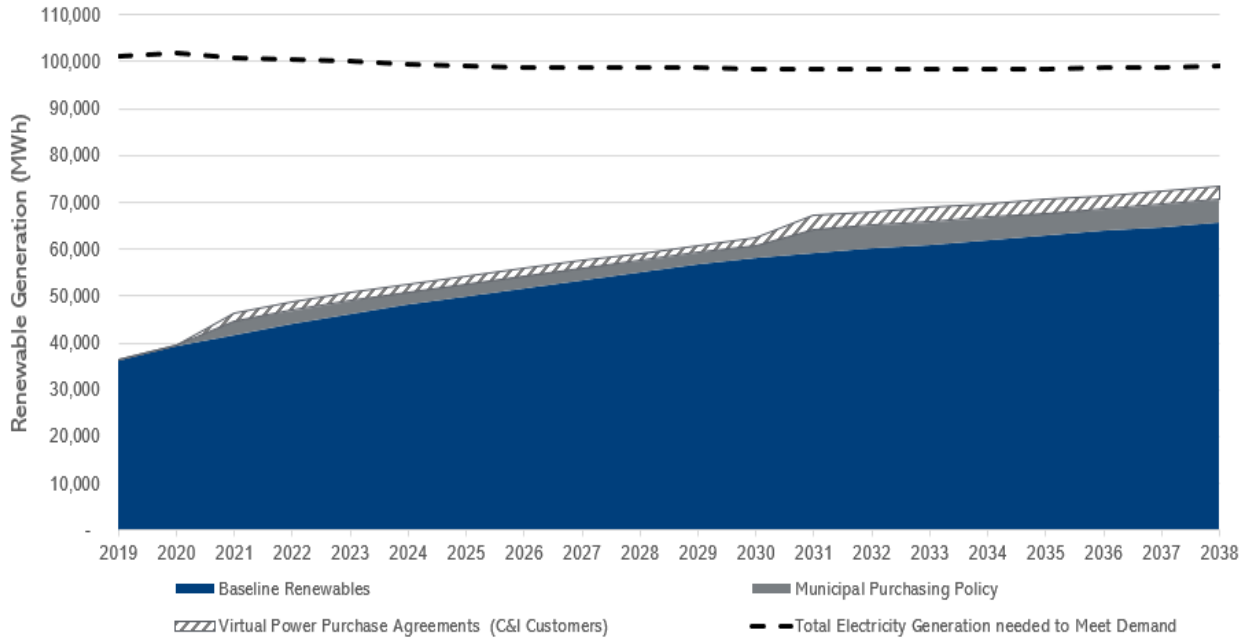

Figure 14: Projected Power Mix by Year Effect on Renewable Share: Municipal Strategies

Priorities Analysis

Municipal operations account for approximately 6% of Kingston's electricity demand. This demand can be met through any combination of the Municipal Supply Mix Strategies, and it is expected that the City will select an individual or combination of some strategies that best meets their priorities. The extent to which this suite of strategies is expected to help Kingston achieve the priorities identified in the Clean Energy Program Strategy Framework is summarized below. Note that the rankings will vary depending on the balance in emphasis between the suite of strategies selected for implementation.

[40] The commercial and industrial participation rate assumptions were determined through discussion with the City. These rates are not predictive. Instead, these rates illustrate the order of magnitude of renewable energy generation associated with a given level of C&I engagement.

Priority	Ranking	Rationale
Local Deployment of RE	**MEDIUM**	The impact of municipal renewable energy purchasing on local renewable energy production depends on the procurement pathway pursued. For example, onsite renewables will support local generation, while a VPPA will not spur local generation. This medium ranking reflects the varying extent to which the strategies within the pillar will contribute to local deployment of renewable energy.
Inclusion and Social Equity	**MEDIUM**	Municipal Supply Mix strategies are expected to have an equitable distribution of benefits and burdens because public facilities benefit all community members, but are not expected to actively address inequities in energy costs and burdens.
Local Environmental and Social Goals	**MEDIUM**	As noted previously, municipal energy demand accounts for approximately 6% of all Kingston electricity consumption. Therefore, while this pillar does not drive widespread renewables development, it is one of the more significant local-level actions available that is within direct control of the City. In terms of strengthening resilience, the City can consider utilizing higher levels of on-site renewable energy generation. On-site generation increases resilience by providing back-up power generation in the case of an emergency or outage. Considering placing this on-site generation on locations that can also be considered as resilience hubs or places that offer targeted support during stressor events can further enhance the resilience benefits of these strategies.
Feasibility	**MEDIUM**	The City of Kingston will need to weigh cost implications of various procurement pathways, and some may not be “cost-effective” for the city to pursue. More information on expected cost implications for each strategy can be found in the full details of the policy analysis located in Appendix A. However, there are no major technical or financial barriers preventing strategy implementation.

Implementation Steps

High-level implementation steps and key resources for each strategy are outlined below:

2.1 Install Renewable Energy On-Site for City Operations		
Implementation Steps		**Resources and Examples**
1.	Identify potential sites for solar installation.	• SolSmart: Guide to Implementing Solar PV for Local Governments • US Environmental Protection Agency (EPA): Solar Project Development Pathway and Resources
2.	Conduct technical and economic feasibility analysis for each site, considering financing options and available incentives, and select a site.	
3.	Determine preferred ownership model and issue an RFP or contact solar installers directly to receive proposals.	
4.	Review proposals, award bid, and construct systems.	

2.2 Procure Renewable Energy from Retail Electricity Providers		
Implementation Steps		**Resources and Examples**
1.	Identify electricity suppliers serving the Kingston area and research their renewable energy offerings.	• New York State: NYS Power to Choose
2.	Compare supplier offerings, noting the pricing, fees, contract length, and percentage of renewable energy.	
3.	Select a supplier and contact to enroll in their retail program offering.	

2.3 Offsite PPA: Partner with a Third Party to Procure Renewable Energy		
Implementation Steps		**Resources and Examples**
1.	Identify independent power producers (IPPs) within Central Hudson territory.	• Environmental Protection Agency: Physical Power Purchase Agreements • NREL: Power Purchase Agreement Checklist for State and Local Governments • Center for Climate and Energy Solutions: How Cities Benefit from Power Purchase Agreements
2.	Negotiate and enter contract with the IPP, ensuring RECs will be conveyed to the participating municipalities.	
3.	IPP builds, maintains, and continues to operate the RE system, while the City of Kingston receive title to the electricity and RECs.	

2.4 Virtual Power Purchase Agreements		
Implementation Steps		**Resources and Examples**
1.	Identify generators within New York or a different power market.	• Environmental Protection Agency: Financial Power Purchase Agreements • Rocky Mountain Institute: Introduction to the Virtual Power Purchase Agreement
2.	Negotiate strike price and enter contract with the generator, ensuring RECs will be conveyed to the participating municipalities.	
3.	The generator sells the null electricity into the wholesale market, while the City of Kingston receives title to the RECs.	
4.	The IPP and the City settle any difference between the strike price and the wholesale price. In the case that the wholesale price is above the strike price, the generator pays the difference to the City; and in the case that the wholesale price is below the strike price, the City pays the difference to the generator.	

Integrating Equity

ID	Strategy	Equity Context and Considerations
2.1	**Purchase Renewable Energy On-Site to Supply City Operations**	• For on-site energy installation, consider if there are local, women, or minority-owned businesses that can perform required design or installation services. • Also consider if a procurement requirement involving businesses owned by the groups listed above address equity needs, or if there are other underrepresented groups that should be considered in procurement processes • Where possible, investigate if there are equipment or materials that can be sourced from local suppliers.
2.2	**Procure Renewable Energy from Retail Electricity Providers**	• When selecting energy providers, the city should consider how different companies factor diversity and equity in their internal policies through measures such as diversity or inclusion goals for recruiting and retaining members of the workplace or internal equity training.
2.3	**Offsite PPA: Partner with a Third Party to Procure Renewable Energy**	
2.4	**Virtual Power Purchase Agreements (VPPAs)**	• A large aggregation of power is necessary to make projects cost competitive. The City should evaluate the feasibility of public-private VPPA aggregation and, if viable, include small- and minority-owned businesses in outreach to aggregate their energy use and provide an opportunity for them to receive renewable power.

Pillar Three: Community Choice Aggregation

Description:

This pillar involves the City of Kingston implementing an advanced community choice aggregation[41] (CCA) program that employs increasingly advanced methods for sourcing renewable electricity, investing in local distributed energy projects and, ultimately, supporting programs that increase deployment of other clean energy technologies in the community. Strategies included within this category are listed below:

#	Strategy	Description
3.1	**Establish a Community Choice Aggregation Program**	The City establishes a local community choice aggregation program to support the bulk purchasing of renewable energy for residents and businesses within the community.

Most CCA programs in New York State follow a basic program model that relies on purchasing in-state renewable energy certificates (RECs) to provide 100% RE products. Kingston's CCA program could advance beyond this program model to support local renewable energy development and other social goals. **This section outlines steps that Kingston could take to progress towards this advanced model given its context and priorities.** This process could potentially be accelerated with additional resources and potential changes to the regulatory landscape. While the advanced model would be a strong ultimate objective for Kingston, the stepped-approach below allows Kingston to feasibly demonstrate progress, connect with its stakeholders about the potential changes and benefits to the CCA approach, and thereby deliver on the priorities outlined in the Clean Energy Program Framework.

[41] CCA enables local governments to pool the electricity load of residents and businesses within the community and procure electricity on their behalf. This provides New York communities with greater control over their energy mix and provides the opportunity to increase the percentage of renewables within the mix at potentially lower energy prices.

Figure 15 below outlines a potential path for progressing from a basic to an advanced CCA program model.

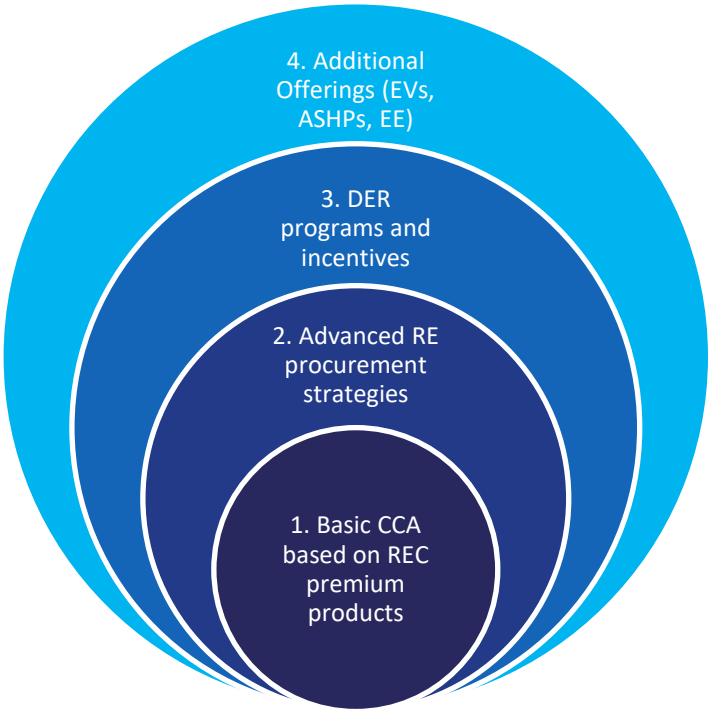

Figure 15: Progression from Basic to Advanced CCA Program Model

Understanding the Difference Between "Unbundled" and "Bundled" Renewable Energy Credits (RECs) in the Context of Community Choice Aggregation (CCA):

Renewable energy credits are tradeable, market-based instruments that represent the legal rights to one megawatt-hour (MWh) of renewable electricity generation. There are two main types of RECs:

Unbundled RECs: Unbundled RECs are those that are sold, delivered, or purchased separately from physical electricity. Many CCAs, both in New York and across the country, rely on unbundled RECs as the primary means of increasing the renewable percentage of the electricity product delivered to customers. For example, if a CCA purchased 1,000 MW of non-renewable electricity on the wholesale market, they could purchase 1,000 MW of unbundled RECs to supply a 100% renewable electricity product to their customers.

- **Key advantage:** Unbundled RECs can be sourced from renewable energy projects across the state, are relatively low cost and simple to procure.
- **Key disadvantage:** Unbundled RECs are often criticized in New York for capitalizing on the presence of existing hydropower plants and not driving the development of new renewable energy projects.

Bundled RECs: In contrast to unbundled RECs, bundled RECs are sold together with the physical electricity generated by a specific renewable energy project. Bundled RECs, and their associated clean electricity, are typically procured by CCAs through PPAs or VPPAs.

- **Key advantage:** Bundled RECs are tied to the purchase of electricity from a specific renewable energy project and, because of this, drive development of new renewable energy projects that would not have otherwise been built.
- **Key disadvantage:** Identifying and contracting electricity that is bundled with RECs can often be more administratively burdensome, and sometimes more expensive, for CCAs.

For all four steps of CCA development outlined below, Kingston's efforts will be more effective and impactful if the community identifies other nearby communities to partner with in the formation of a CCA. By partnering with neighboring communities, Kingston's CCA will be able to aggregate a larger load, increase revenue as a result, and reduce overall administrative burden.

Step 1: Basic CCA Based on REC Premium Products:

As Figure 15 depicts, Kingston could begin by establishing a basic CCA program that offers residents and businesses a 100% renewable product comprised of unbundled RECs. The majority of CCAs in New York are currently taking this approach. In addition to increasing the percentage of residential electricity that is procured from renewable sources, the establishment of a CCA in this first step has the potential to reduce residential and small business energy costs and create new revenue opportunities for Kingston.

Step 2: Advance Renewable Energy Procurement Strategies:

Over time, the CCA can reduce its reliance on RECs and support the creation of additional renewable energy by entering into long-term contracts with renewable energy generators in the form of a Purchase Power Agreement (PPA) or Virtual Purchase Power Agreement (VPPA).

- A **PPA** is a contract between two parties, one which generates electricity and one which is looking to purchase electricity. Traditional PPAs are "physical", the buyer of electricity takes ownership of the electrons produced by the renewable energy project.
- A **VPPA**, in contrast, is a purely a financial transaction. The buyer does not own and is not responsible for the physical electrons generated by the energy project.

One key benefit of a PPA or VPAA over unbundled RECs (Step 1) is that they meet "additionality" criteria, meaning that the PPA or VPPA has the direct effect of adding new renewable energy generation to the grid in New York that, in the absence of the PPA or VPPA, would not have been built. There are some potential challenges and barriers to a CCA committing to PPAs or VPPAs:

- By locking into a long-term contract, the CCA would be subjecting itself to the risk of price fluctuations, and the chance that the CCA price will be higher than the cost of basic supply. This risk can be somewhat offset by the structure of the PPA or VPPA. VPPAs, in particular, can be set up in such a way to provide a financial hedge against future energy price fluctuations.
- The commitment of a small CCA program to purchase the energy may not be sufficient to cover the financing of a project.
- By committing revenue to a long-term project, the CCA is limiting its ability to implement other initiatives in that timeframe.

Step 3: Distributed Energy Resources (DER) Programs and Incentives

As the CCA continues to generate revenue, it can begin to offer distributed energy resources (DER) programs and incentives to its customers to support the deployment of local renewables. DERs, including community solar, are often preferable to PPAs or VPPAs because they directly lead to additional renewable energy projects being established in the local community. Community solar is a local solar photovoltaic (PV) system installed in a location that receives adequate sun. Anyone in the area who signs up for the program can access the clean energy produced by these solar panels and receive credits toward their electricity bill. Key benefits include little to no upfront costs, electricity bill cost savings, supporting local renewable energy and the ability to go solar without installing physical panels on your roof. Community solar is an excellent option for residents and small businesses who would not be eligible for a traditional rooftop solar photovoltaic (PV) system. For example, residents that rent an apartment or own a house with a roof that is shaded by trees can still enjoy the benefits of solar through community solar programs.

CCAs can work as a centralized hub that promotes participation in community solar through marketing and serving as a centralized hub of information. For example, Westchester Power offers customers the opportunity to subscribe to community solar projects directly through their website.[42]. There are also CCA administrators, including Joule Community Power, that partner with local communities to administer CCAs and promote community solar participation through streamlined marketing materials. For example, the Hudson Valley Community Power CCA – which is made up of nine participating municipalities in the Hudson Valley region - was formed in partnership with Joule Community Power and offers customers the ability to easily sign up for community solar and save up to 10% annually on electricity bills. The cost savings is due in large part to credits derived from NY State incentives for clean energy generation.[43] One potential disadvantage of community solar is that, depending on the size of the solar PV project, it can sometimes be difficult to find space for the project in the local community. However, for Kingston, this potential issue could be offset by working with a CCA administrator that is experienced in identifying suitable locations for community solar projects.

Step 4: Additional Offerings

CCAs are relatively new and the regulatory landscape in New York as it relates to CCAs is constantly evolving. As regulatory conditions continue to change, CCAs in New York could find themselves in a position with significant amounts of revenue that could be deployed to fund innovative initiatives including developing and administering programs that pilot and incentivize technologies including air source heat pumps, electric vehicles (EVs), and EV charging stations. To date, due to regulatory barriers and market structure in New York, CCAs have not pursued these types of programs, but CCAs in California and Massachusetts offer a glimpse of what is possible.

[42] Westchester Power. https://westchesterpower.org/community-solar/

[43] Hudson Valley Community Power. https://www.hudsonvalleycommunitypower.com/solar

As it currently stands, the market pricing for energy in New York makes it difficult for CCAs in New York to provide significant savings compared to default utility rates. For this reason, it is challenging for CCAs in New York to generate the level of revenue generated by CCAs in other states, including California. Additionally, regulatory conditions are such that large commercial and industrial customers are not defaulted to participating in CCA programs and must actively opt in to CCAs. The lack of large commercial and industrial customers opting in to CCA participation in New York can impact the economics of the CCA. If CCAs in New York were able to aggregate residential load with the load of large commercial and industrial customers, it would put them in a position to increase aggregated load, negotiate lower rates and generate more revenue to fund innovative programs. Peninsula Clean Energy (PCE), a CCA launched collaboratively by the County of San Mateo in California and all 20 of its cities, has offered a number of cutting-edge programs to its customers.

- Dedicating $12 million of CCA funds to incentivize publicly available EV charging infrastructure;[44]
- Dedicating $10 million to fund clean backup power for medically vulnerable residents and essential community surveys;[45]
- Providing incentives to customers towards the purchase of used EVs of up to $4,000 through their DriveForward Electric Program;[46]
- Partnering with neighboring Bay Area CCAs to issue a joint solicitation for the installation of over 30 MW of battery storage for over 6,000 homes and hundreds of businesses;[47]
- Partnering with a neighboring CCA and the San Mateo County Office of Sustainability to support local cities in adopting building codes that promote building electrification, increase electric vehicle charging infrastructure, and reduce carbon footprint;[48]
- Launching a pilot to help five residents replace some or all of their natural gas appliances with electric versions through their Peninsula Climate Comfort Pilot. Support includes free design assistance services, financial analysis, permitting assistance, contractor identification, and $2,000 from PCE to defray installation costs.[49]

While the level of funding that California, and to a lesser extent Massachusetts, CCAs can currently put towards such innovative efforts is not currently replicable in New York, future regulatory changes could open the door to enable these types of programs to be administered by CCAs.

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[44] Peninsula Clean Energy. https://www.peninsulacleanenergy.com/ev-charging-incentives/

[45] Peninsula Clean Energy. Energy Resiliency. https://www.peninsulacleanenergy.com/resilience/

[46] Peninsula Clean Energy. DriveForward Electric. https://www.peninsulacleanenergy.com/driveforwardelectric/

[47] Peninsula Clean Energy. Four Bay Area Community Energy Agencies Kick Off New Program to Provide Local Resiliency. https://www.peninsulacleanenergy.com/wp-content/uploads/2019/11/Joint-CCA-Resilience-RFP-Press-Release-FINAL.pdf

[48] Peninsula Clean Energy. Reach Codes. https://www.peninsulacleanenergy.com/reach-codes/

[49] Peninsula Clean Energy. Community Pilot Programs. https://www.peninsulacleanenergy.com/community-pilots/

Energy Impacts

This analysis assumes that approximately 90% of Kingston's residents will participate in a CCA program that offers multiple products with varying percentages of renewable energy. Based on this analysis, forming a CCA will increase the renewable share of Kingston's supply to close to 90% by 2038.

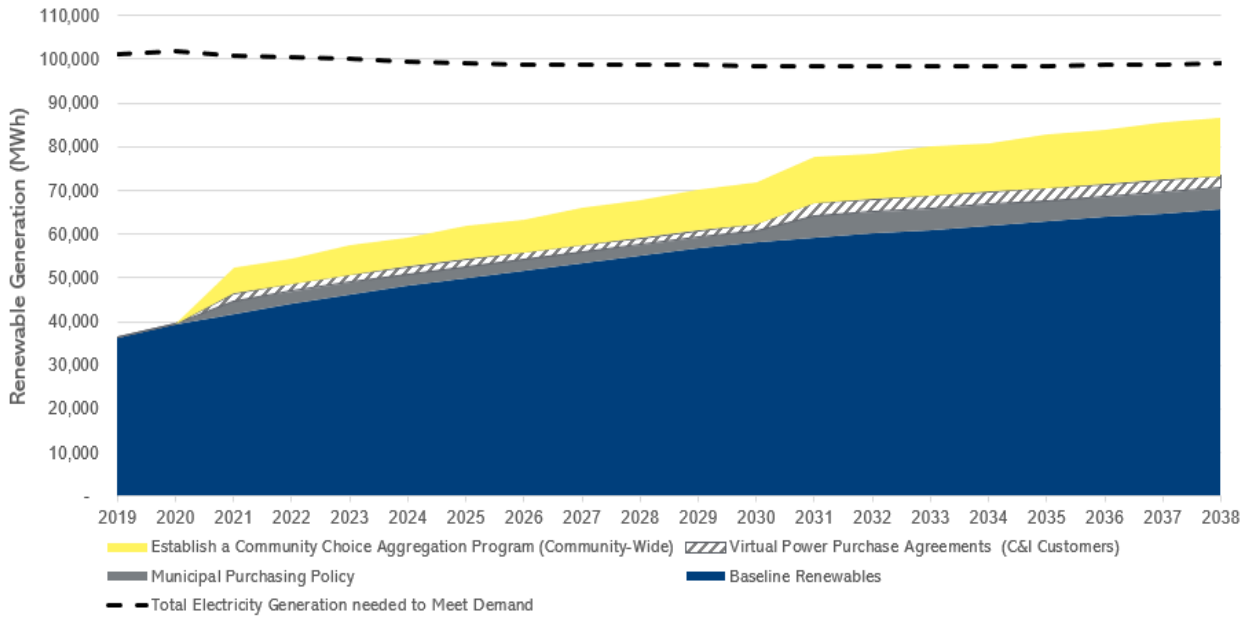

Figure 16: Projected Power Mix by Year: Effect on Renewable Share: Community Choice Aggregation

Priorities Analysis

The extent to which a CCA program model is expected to help achieve Kingston's priorities identified in the Clean Energy Program Strategy Framework is summarized below. Note that while the initial form of a CCA that Kingston may start with may not score as highly, **over time as the CCA advances through the steps outlined earlier in this section, the ratings are likely to increase to the levels outlined below**.

Priority	Ranking	Rationale
Local Deployment of RE	**MEDIUM**	A CCA program has the potential to increase the deployment of additional, local renewable energy as it progresses towards the more advanced program model. However, in the near-term when the CCA is operating with a more basic program model, this impact will likely be limited.
Inclusion and Social Equity	**MEDIUM**	Depending on the products offered, CCA has the potential to reduce the cost of electricity for Kingston residents while also increasing access to renewable energy. However, it is possible that a highly renewable product would be more expensive than basic supply.

Priority	Ranking	Rationale
Local Environmental and Social Goals	**MEDIUM**	CCA can play a key role in Kingston achieving it's 100% RE goals by providing an opportunity for the City to determine the community-wide energy mix. Additionally, CCA has the potential to stimulate development of local generation and associated jobs as the program model becomes more advanced. Resilience can be strengthened by increasing the level of electricity supply to the CCA that derives from distributed generation.
Feasibility	**MEDIUM**	Establishing a basic CCA is highly feasible and has been done in other New York communities. However, progressing to a more advanced CCA that meets Kingston's objectives more broadly will require innovating on technical and legal CCA structural features.

Implementation Steps

High-level implementation steps and key resources for this strategy are outlined below. Note that these are more near-term steps that Kingston can take to get a CCA program established.

3.1 Establish a Community Choice Aggregation Program		
Implementation Steps		**Resources and Examples**
1.	Conduct background research on CCA and identify/connect with other New York communities that Kingston could potentially partner with.	• NYSERDA: CCA Toolkit • NYSERDA: CCA Administrator Template RFP
2.	Conduct public education and outreach and gain local approval to authorize CCA.	
3.	Develop a CCA administrator RFP that clearly outlines Kingston's CCA objectives and select an administrator.	

Integrating Equity

ID	Strategy	Equity Context and Considerations
3.1	**Establish a Community Choice Aggregation Program**	• While the CCA model is designed to make renewable energy more accessible by lowering barriers, an advanced CCA model offers further opportunities to increase equity by providing the greatest number of offerings to the greatest number of people at the lowest price point. • The CCA should maintain or reduce energy burden to customers, and if 100% renewable energy options are provided at a premium, these options would be opt-in with a clear articulation of the difference in price in tiers between consumers. • The CCA should be designed in such a way that customers are able to maintain any discounts they were receiving from their utility. • The advanced CCA model provides residents with increased autonomy over their energy supply and intentional municipal procurement can further improve equity as outlined in Pillar Two.

Pillar Four: Scaling Local Generation

Description

This pillar includes strategies that encourage the deployment of local distributed energy resources within the City of Kingston. Key strategies within this pillar are listed below:

ID	Strategy	Description
4.1	**Local Requirements for Local RE Production**	The City requires or encourages renewable energy development in certain cases, such as new construction of residential and/or commercial buildings of a certain size.
4.2	**Increase Participation in Community Solar**	The City acts as an organizer, site host, or anchor customer in a community solar project.
4.3	**Establish and/or Participate in Group Purchasing Programs**	The City hosts or supports group purchasing programs for renewable energy (e.g., Solarize campaigns) to reduce costs and support market development.
4.4	**Establish Non-Financial Incentives for Renewable Energy**	The City establishes programs to incentivize renewable energy for residents and businesses within Kingston. These programs could include creating local competitions where the primary incentive would be public recognition of achievement.
4.5	**Local Renewable Energy Financial Incentives Program**	The City establishes programs to incentivize renewable energy for residents and businesses. Such programs could include local tax rebates for renewable energy installations, tax credits, exemptions from property taxes, and zero interest and forgivable loans.

Energy Impacts

Local generation strategies are shown by the teal wedges in Figure 17 below. The dark teal wedge represents the impacts of strategy 4.1: Local Requirements for Local RE Production, while the lighter blue wedge represents the impacts of strategy 4.2: Increase Participation in Community Solar. Based on the assumptions of this analysis, pursuing local generation strategies will increase the renewable share of Kingston's supply to approximately 95%. Note that only local generation strategies that add more than 1,000 MWh of renewable generation to the system are visualized, i.e., strategies 4.1 and 4.2.

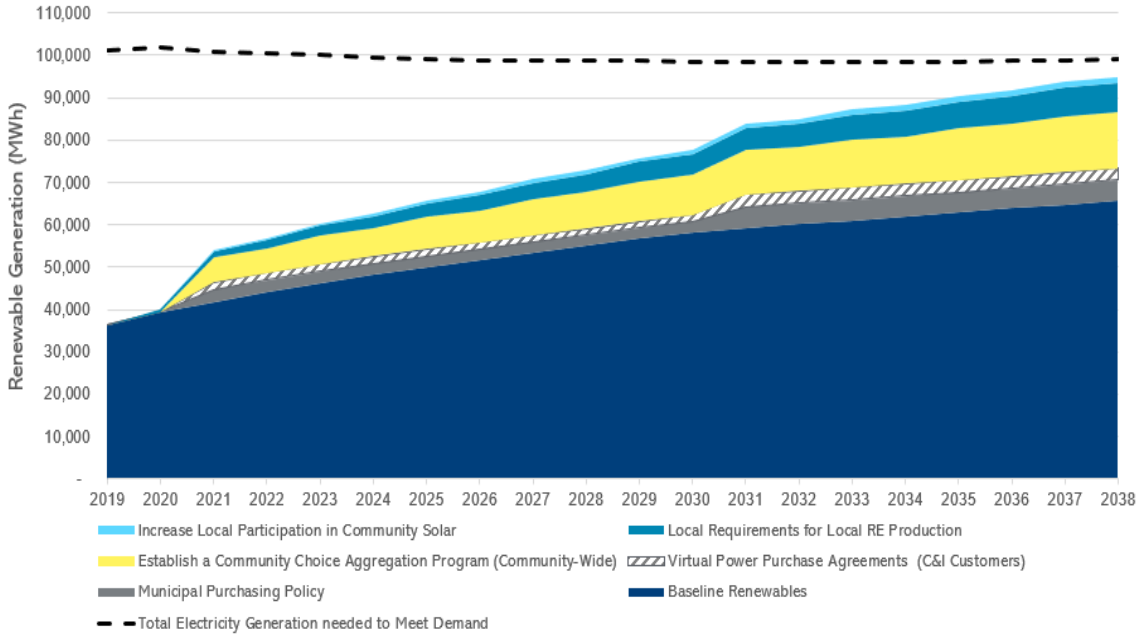

Figure 17: Projected Power Mix by Year: Effect on Renewable Share – Local Generation Strategies

With additional resources, it is possible for Kingston to scale the impacts of the local generation strategies, as seen in Figure 18 below. The dotted teal wedge represents the potential of additional local generation action. The size of the wedge is the result of specific assumptions outlined in the Appendix of this report. However, it is possible that the energy impacts of scaling local generation could be further increased depending on the level of resources and staff time that the City of Kingston is able to commit to these strategies. Indeed, scaling these strategies could result in Kingston achieving 100% renewable electricity by 2036.

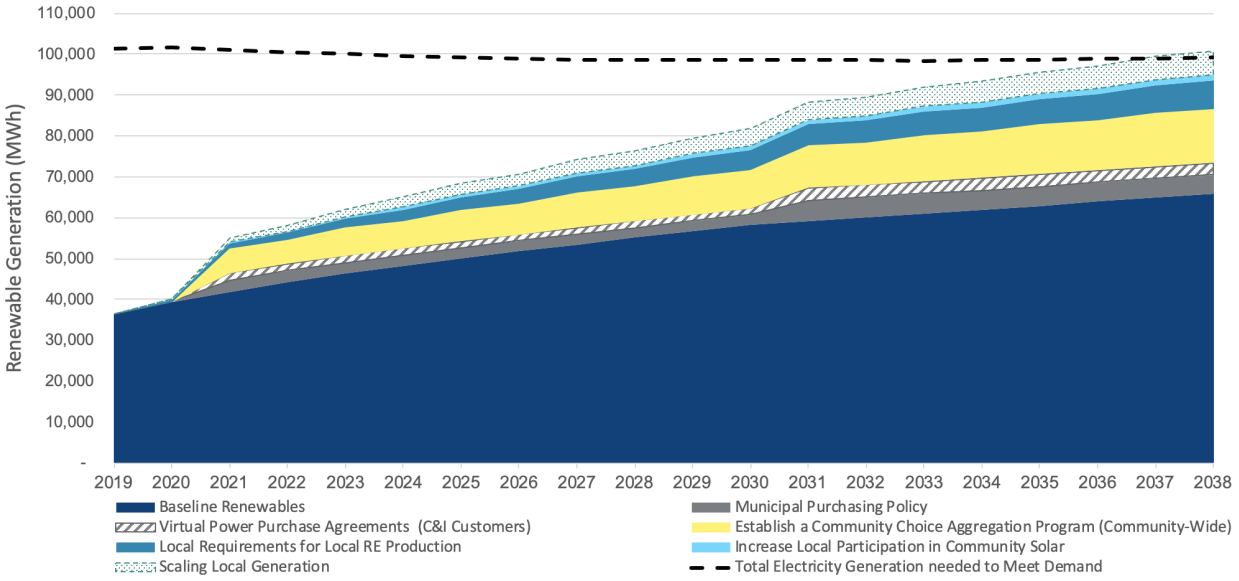

Figure 18: Projected Power Mix by Year: Effect on Renewable Share – Scaling Local Generation Strategies

Priorities Analysis

Each of these strategies plays a key role in supporting Kingston's goal achieve 100% renewable electricity, and it is expected that Kingston will likely pursue as many of the strategies within the category as is feasible. The extent to which this suite of strategies is expected to help achieve Kingston's priorities identified in the clean Energy Program Strategy Framework is summarized below:

Priority	Ranking	Rationale
Local Deployment of RE	**HIGH**	Strategies in the Scaling Local Generation pillar directly enable the build of additional local renewable energy.
Inclusion and Social Equity	**MEDIUM**	Kingston could make progress towards its inclusion and social equity goals with The Scaling Local Generation programs, but the extent to which to these goals are met is largely dependent on program design and efforts to ensure the strategies are accessible to all community members. Keeping in mind community context, financial accessibility, and historical, cultural, and institutional dynamics are best practices for this area.

Priority	Ranking	Rationale
Local Environmental and Social Goals	**HIGH**	Scaling local generation strategies directly help the City make progress towards its environmental and social goals by directly promoting development of renewable energy and its associated co-benefits, including job creation. Resilience during implementation of these strategies can be strengthened by incorporating resilience-related measures directly into criteria of review for awarding incentives requiring solar readiness (strategy 4.1). For example, incentives (strategies 4.4 and 4.5) could be increased in instances that incorporate energy storage in addition to solar.
Feasibility	**MEDIUM**	While strategies in this pillar are within the direct control of the City, implementation requires engagement of the Kingston community at large. The extent to which these strategies are feasibly scaled will depend in part on the level of community members' interest, as well as efforts to ensure the strategies are accessible to all community members. The City can increase outreach and engagement to bolster community support and interest in these strategies (as described in strategy 1.3).

Implementation Steps

High-level implementation steps and key resources for this strategy are outlined below:

4.1 Local Requirements for RE Production		
Implementation Steps		**Resources and Examples**
1.	Review existing requirements for communities across the U.S. and adapt to the Kingston context as needed.	• City of Santa Monica (CA): Renewable Energy Requirement on New Construction • City of San Francisco (CA): Better Roofs
2.	Consider joining SolSmart for additional technical assistance related to best practices and implementation.	

4.2 Increase Participation in Community Solar		
Implementation Steps		**Resources and Examples**
1.	Identify potential community solar projects within the Central Hudson service territory.	• NYSERDA: Community Solar • NYSERDA: Find Community Solar Near You
2.	Select a project for the City to participate in and/or promote participation to community members.	

4.3 Establish and/or Participate in Group Purchasing Programs		
Implementation Steps		**Resources and Examples**
1.	Research the process for developing a group purchasing campaign and train staff as needed.	• NYSERDA: Resource Guide to Solarize Campaign Success • NYSERDA: Implementing your Solarize Campaign and Selecting a Solar Installer
2.	Develop a team to support campaign activities, including city staff and/or community volunteers.	
3.	Issue a request for proposals (RFP) for installers, evaluate responses, and select an installer.	
4.	Promote the campaign through community outreach.	

4.4 Establish Non-Financial Incentives for Renewable Energy		
Implementation Steps		**Resources and Examples**
1.	Conduct a review of existing non-financial incentive programs that have been implemented in other municipalities across the U.S.	• Sustainable Development Code: Density Bonus for Installation of Solar Energy Systems • Solar Briefing Papers: Integrating Solar Energy into Local Development Regulations (see "incentives") • Greenovate Boston: Carbon Cup
2.	Identify top incentives and adapt to the Kingston context, if needed.	

4.5 Establish Renewable Energy Financial Incentives		
Implementation Steps		**Resources and Examples**
1.	Conduct a review of existing financial incentives programs that have been implemented in other municipalities across the U.S.	• Solar Energy Industries Association: Solar Tax Exemptions • City of Portland: Portland Clean Energy Community Benefits Fund
2.	Identify top incentives and potential funding sources. Adapt to the Kingston context, if needed.	

Integrating Equity

- Equity can best be integrated into Pillar Four through what is called a "targeted universalist" approach to strategies 4.2 through 4.5. Targeted universalism is a policy framework in which the overarching goal is universal, but the programs and processes designed to meet this goal provide targeted support to those who need the most support to achieve the universal goal. Thus, program design should center the needs of marginalized groups and intentionally seek to overcome the unique barriers and needs of these groups.
- In this case, the universal goal is scaling local generation. Using identified strategies 4.2-4.5, a targeted universalist approach begins by working to understand potential barriers to participation

in community solar and group purchasing programs, or to benefiting from non-financial and financial incentives. Then, programs should be designed that direct resources to address potential barriers to participation. Specific guidance on integrating equity into Pillar 4 strategies is outlined below.

ID	Strategy	Equity Context and Considerations
4.1	**Local Requirements for Local RE Production**	• When requiring renewable energy, the City should ensure that implementation can be conducted in a cost-effective way that would not lock underserved groups out of participation in distributed generation. Relatedly, the City should also consider potential unintended consequences of such requirements, such as increased rent on RE-equipped buildings and residences. • Implementation should consider opportunities to foster a local workforce to complete installations.
4.2	**Increase Participation in Community Solar**	• When pursing community solar for low-income customers, it is important to ensure the community solar development is tailored for low-income customers and addresses challenges they may face, such as ensuring the electricity costs do not increase. • If the City is playing an anchor role in the community solar project, it may be able influence factors such as how programs qualify participants to encourage consideration of qualification mechanisms that are alternative to traditional credit score metrics.
4.3	**Establish and/or Participate in Group Purchasing Programs**	• Group purchasing programs may include solar and/or renewable heating and cooling (e.g., heat pumps). For heat pump programs, it is important to articulate that they may not be more cost effective than existing heating technologies, depending on the fuel source or heating technology from which the customer is switching. • Even with a bulk purchasing discount, some costs may remain out of reach for some residents. Financing mechanisms, deferred payments, and other options should be employed to increase affordability to all residents, including income-qualified pathways.
4.4	**Establish Non-Financial Incentives for Renewable Energy**	• Ensure that any non-financial incentives are designed to have appeal to a range of customer types, and are structured in such a way that they do not exclude segments of the target population. • Couple program participation with education and outreach.
4.5	Local Renewable Energy Financial Incentives Program	• Facilitate access to financing and increase affordability for all income levels by considering opportunities to provide credit enhancements or lower interest rates to income-qualified customers where possible.

Implementation Timeline:

Table 6 below provides a set of near-, medium-, and long-term steps for each pillar within the pathway that the City can take to effectively implement the pathway and achieve its 100% renewable electricity goals.

Table 6: 100% RE Pathway Implementation Timeline

Pathway Pillar	Near-Term (<1 Year)	Medium-Term (1-3 years)	Long-Term (>3 Years)
Pillar 1: Foundational Policies and Programs	• Develop detailed action plan for each strategy	• Implement strategies according to action plan	• Monitor foundational actions for necessary updates
Pillar 2: Municipal Supply Mix Strategies	• Evaluate and prioritize procurement strategies	• Initial implementation of prioritized procurement strategies	• Continue to implement prioritized procurement strategies to reach 100% RE goals
Pillar 3: Community Choice Aggregation	• Develop detailed plan to form CCA and begin early action steps	• Implement CCA, focusing on renewable energy procurement initially	• Expand upon renewable energy offerings to include EE, DER, and other program aspects
Pillar 4: Scaling Local Generation	• Develop detailed action plan for each strategy	• Implement strategies according to action plan	• Increase investment in strategies to expand impact and accelerate local RE installation

Initial Next Steps

While strategy- and pillar-specific implementation steps are provided earlier in the report and in the above table, there are a number of initial steps that can set the groundwork for pathway-level implementation, including

- **Review findings** of this report and consider how to fold these findings into the upcoming climate action plan (CAP) update process.
- **Engage the community** and offer avenues for engagement on strategies that are prioritized. Ensure engagements include previously consulted stakeholders.
- **Access technical assistance** by joining SolSmart.
- **Engage with other local governments and groups** to uncover how Kingston can collaborate and learn from others' local-level efforts.

Conclusion

The City of Kingston's 100% renewable electricity goal is an ambitious target, and by participating in this study, the City has taken a key step in achieving this target. As the results of this analysis show, there is no single strategy or category of strategies that is projected to achieve Kingston's goal. However, the results of this analysis do reveal a potential pathway to achieving Kingston's 100% RE goals by simultaneously pursuing multiple strategies. These strategies can be categorized into four key pillars, including:

- **Foundational policies and programs** that help set the foundation for current and future renewable energy development.
- **Municipal supply mix strategies** which allow the City to lead by example by taking direct action to increase the renewable share of the municipal electricity supply mix.
- **A community choice aggregation program** that employs increasingly advanced methods for sourcing renewable electricity and investing in local distributed energy projects.
- **Local generation strategies** that help scale the deployment of local distributed renewable energy resources.

In addition to serving as a pathway for Kingston to achieve its 100% renewable energy goal, pursuing strategies across these four pillars can also help Kingston advance on other priorities such as increased resilience, inclusivity, improved affordability of and access to renewables, and local job creation.

With the results of this analysis, Kingston is well positioned to begin making substantial progress towards its RE goals over the next several years. Lastly, as the City of Kingston continues to work towards its goal, it is recommended that this study be periodically revised to account for technological, political, and economic shifts and local progress against renewable energy goals.

Appendix A. Modeling Assumptions

The tables on the following pages summarize the methodology and assumptions related to the strategies for both the energy and economic impact modeling. The first section summarizes the modeling assumptions used to define and model each strategy. The second section of this appendix provides a broader methodology for the economic modeling.

Strategy Modeling Assumptions

Strategy 1: Reduce Permitting, Zoning, and Inspection Processes of Solar Projects The City streamlines the permitting, zoning, and inspection processes so that processing time and expenses are reduced. This may include streamlining permitting processes for specific technologies that meet certain standards and eliminating redundancies from inspection protocols.	
Modeling Methodology	**Assumptions**
This policy action describes best practices in local solar policy that have historically been described as targeting the soft costs of solar energy and have been promoted as a set through a series of US Department of Energy programs. Cadmus estimated the increase in solar market penetration that would result from these projected price decreases.	• Assume the Kingston cost of residential solar is $2.99/watt.[50] • To represent the potential effect of this strategy, make a reasonable assumption that a reduction in permitting, zoning, and inspection costs of $0.03/watt (from $0.10/watt to $0.07/watt). This represents a 30% reduction in current permitting, zoning, and interconnection costs for solar installation.[51] • Assume a solar elasticity of demand of -0.65.[52]

[50] EnergySage, "How much do solar panels cost in Kingston, NY in 2019?" https://www.energysage.com/solar-panels/solar-panel-cost/ny/ulster-county/kingston/.

[51] NYSERDA, "SOLAR BALANCE-OF-SYSTEM COSTS BASELINE COST STUDY," https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2017ContractorReports/Solar-Balance-of-System-Cost-Baseline-Study.pdf

[52] The solar elasticity of demand is a statistically determined number. It describes how much a change in the price of solar is expected to change demand. See the following paper published by Yale University on the subject: "Hurdles and Steps: Estimating Demand for Solar Photovoltaics," https://environment.yale.edu/gillingham/GillinghamTsvetanov_SolarDemandCT.pdf

Strategy 3: Local Requirements for Local Renewable Energy Production The City requires renewable energy development in certain cases, such as new construction of residential and/or commercial buildings of a certain size.	
Modeling Methodology	**Assumptions**
The effect of this strategy is determined by calculating the number of residential and commercial buildings that will turn over every year. Building count data comes from the City of Kingston and all new buildings are assumed to be large enough to require solar installation on their rooftops. The total new solar is estimated from scaling up the number of buildings by the solar technical potential.	• Assume all new residential and commercial buildings are required to have solar installed. • Assume a building turnover for residential and commercial buildings of 100 years[53] and 50 years[54] respectively. • Assume that the average residential and commercial solar ready rooftop area is 405 square feet.[55] • Assume a solar capacity factor of 14.1%.[56]

Strategy 4: Increase Local Participation in Community Solar The City acts as an organizer, site host, or anchor customer in a community solar project.	
Modeling Methodology	**Assumptions**
The potential for community solar programs was estimated using NYSERDA data available for community solar projects in Kingston, NY. From this data, this analysis assumes an average annual deployment of community solar and a corresponding rate of project development through 2038.	• Assume a typical community solar project size is equivalent to the "Point of Praise Family Life Center Community Solar Array" installed in 2019 of 485 kW.[57] • Assume one community solar project is organized and installed every 3 years. • Assume that community solar projects may exceed the city boundary.

[53] SwissLife, "What is the lifespan of a house?" https://www.swisslife.com/en/home/hub/wie-lange-lebt-ein-haus.html
[54] RDH, "How Long do Buildings Last?" https://www.rdh.com/blog/long-buildings-last/
[55] Google Project Sunroof, Kingston, NY. https://www.google.com/get/sunroof/data-explorer/place/ChIJJ4HJLQEP3YkRE8kyWFqJ10E/
[56] NREL, PVWatts, https://pvwatts.nrel.gov/pvwatts.php
[57] NYSERDA, "Find Community Solar Near You", https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Solar-for-Your-Home/Community-Solar/Community-Solar-Map

Strategy 5: Purchase Renewable Energy On-site to Supply City Operations The City installs renewable energy projects on city-owned facilities and lands and also evaluates the addition of solar to other municipal buildings such as hospitals, county government buildings, and schools.	
Modeling Methodology	**Assumptions**
The potential for solar sited at City-owned and other municipal buildings was estimated using advanced solar design software. Given a list of building addresses, an estimate of solar potential for 28 municipal government buildings, hospitals, county government buildings, and schools was created. It is assumed that all 28 buildings are solarized in the analysis time period, with three buildings adding solar every other year.	• Using Helioscope, advanced solar design software, estimate the solar potential for 28 municipal government buildings, hospitals, county government buildings, and schools. • Assume solar is added to all 28 buildings, in the order of government buildings are solarized first, followed by hospitals, county government buildings, and schools. • Assume solar is added to three buildings every other year until all 28 buildings have solar. • Assume solar starts to be installed on buildings in 2021. • Assume a solar capacity factor of 14.1%.[58] • Using data obtained from the City of Kingston on municipal parking lots, Cadmus used Helioscope to calculate the kW of new solar that could be installed over parking lots. On average, 34% of parking lot square feet are assumed to be covered with parking canopies, with an average of 9 watts per square foot of canopy. • Assume that Kingston puts solar on 5 of its park pavilions. Used Helioscope to calculate the kW of new solar installed on each pavilion.

Strategy 7: Establish and/or Participate in Group Purchasing Programs The City hosts or supports group purchasing programs for renewable energy (e.g., Solarize campaigns) to reduce costs and support market development.	
Modeling Methodology	**Assumptions**
The results of an expanded Solarize program were estimated based on the results of previous Solarize campaigns in the Hudson Valley and the City of Kingston. We assume that campaigns would occur every five years, starting in 2021.	• Assume 20 new contracts each solarize campaign (increase from the 14 new contracts signed out of Kingston's 2015 solarize campaign).[59] • Assume average system size of 5 kW per contract. • Assume one solarize campaign every five years starting in 2021.

[58] NREL, PVWatts, https://pvwatts.nrel.gov/pvwatts.php

[59] NYSERDA, "Solarize Campaigns," https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Communities-and-Local-Governments/Solarize/Solarize-Campaign-Map

Strategy 9: Local Renewable Energy Financial Incentives Program The City establishes programs to incentivize renewable energy for residents and businesses. Such programs could include local tax rebates for renewable energy installations, tax credits, exemptions from property taxes, and zero interest and forgivable loans.	
Modeling Methodology	**Assumptions**
We used the findings from a NYSERDA balance of solar system cost report to estimate potential price reductions applicable to solar costs due to local financial incentives. Cadmus estimated the increase in solar market penetration that would result from these projected price decreases.	• Assume the Kingston cost of solar is $2.99/watt.[60] • To represent the effect of potential local financial incentives, assume reductions in the solar system costs for the sales tax (from $0.05 to $0.01) and customer acquisition costs (from $0.34 to $0.24).[61] • Assume a solar elasticity of demand of -0.65.[62]

Strategy 10: Procure Renewable Energy from Retail Electricity Providers (City Operations) The City purchases electricity from a competitive supplier to supply municipal operations with renewable energy.	
Modeling Methodology	**Assumptions**
The effect of this strategy is determined by setting a target of municipal electricity to be purchased through retail providers. This target is then met through retail electricity provider procurement.	• Municipal electricity load in 2017 is 6264 MWh (data from the City of Kingston). • Assume municipal electricity load decreases over time due to energy efficiency forecasts from EIA. • Assume that the City of Kingston purchases renewable energy from retail electricity providers to meet 100% of their municipal operations over the timeframe considered. • Assume these purchases start in 2020 and continue annually. • Assume that purchases begin at 10% of municipal electricity load and then increase by 10% each consecutive year until 100% of municipal electricity load is renewable.

[60] EnergySage. *How much do solar panels cost in Kingston, NY in 2019?* https://www.energysage.com/solar-panels/solar-panel-cost/ny/ulster-county/kingston/.

[61] NYSERDA, "SOLAR BALANCE-OF-SYSTEM COSTS BASELINE COST STUDY," https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2017ContractorReports/Solar-Balance-of-System-Cost-Baseline-Study.pdf

[62] Yale, "Hurdles and Steps: Estimating Demand for Solar Photovoltaics," https://environment.yale.edu/gillingham/GillinghamTsvetanov_SolarDemandCT.pdf

Strategy 11: Offsite PPA: Partner with a Third Party to Procure Renewable Energy (City Operations) The City partners with an independent power producer (IPP) within the Central Hudson service territory to directly procure renewable electricity for municipal operations though a power purchase agreement.	
Modeling Methodology	**Assumptions**
The effect of this strategy is determined by setting a target of municipal electricity to be purchased through a PPA. This target quantity is procured and incorporated into the renewable energy mix supplying the City of Kingston.	• Municipal electricity load in 2017 is 6264 MWh (data from the City of Kingston) • Assume municipal electricity load decreases over time due to energy efficiency forecasts from EIA. • Assume a PPA contract lasts for 10 years and that Kingston plans to implement one covering 50% of municipal electricity load in 2021 and a second covering 100% of municipal electricity load in 2031. • Assume that PPA prices are stable through 2038.

Strategy 12: Virtual Power Purchase Agreements (VPPAs) (City Operations and/or Commercial and Industrial Involvement)

In a virtual power purchase agreement, the seller and customer agree to a "strike price" per kilowatt-hour that the seller will receive for its delivery of null electricity into the wholesale market. Thereafter, any monetary difference between the strike price and wholesale market price is exchanged between the two parties, such that the seller in net always receives the strike price for its sales of electricity. The renewable energy certificates (RECs) generated by the renewable electricity generator are usually contractually conveyed to the customer in the Financial PPA. The RECs entitle the customer to exclusive rights to make claims about using the green power produced by the generator and the associated reductions in scope 2 emissions. However, no electricity is physically conveyed from the generator to the customer.

Modeling Methodology	Assumptions
The effect of this strategy is determined by setting a target of municipal electricity to be purchased through a VPPA. This target quantity is procured and incorporated into the renewable energy mix supplying the City of Kingston.	• Municipal electricity load in 2017 is 6264 MWh (data from the City of Kingston). • Assume municipal electricity load decreases over time due to energy efficiency forecasts from EIA. • Assume a VPPA contract lasts for 10 years and that Kingston plans to implement one covering 50% of municipal electricity load in 2021 and a second covering 100% of municipal electricity load in 2031. • Note that while executing C&I VPPAs lie outside the direct control of city government, the city can encourage C&I businesses to become active partners in reaching Kingston's renewable energy goals. • Thus, assume C&I customers in Kingston are encouraged to collaborate and establish a VPPA of their own. • Commercial and industrial electricity load in 2018 is 39853 MWh (data from the City of Kingston). • Assume C&I customers set up two subsequent VPPA contracts that each last for 10 years. • Based on conversations with the City of Kingston, we assume that C&I customers implement the first VPAA covering 5% of C&I electricity load in 2021 and the second covering 10% of C&I electricity load in 2031.

Strategy 14: Establish a Community Choice Aggregation Program (Residential Community-Wide) The City establishes a local community choice aggregation program to support the bulk purchasing of renewable energy.	
Modeling Methodology	**Assumptions**
The effect of this strategy is determined by using the typical opt-out and opt-up rates for CCA programs, combined with the corresponding renewables mix in each program (opt-out, default CCA, and opt-up) to determine residential electricity supply.	• Assume that 10% of residents opt-out of the CCA,[63] 2% of residents opt-up to a 100% renewable plan, called the Deep Green CCA,[64] and 88% of residents continue their participation in the default, Light Green CCA. • Assume that only residential energy users are enrolled in the CCA program when it is established. • Assume that the City will renegotiate the CCA every two years. • Assume the City opts for its CCA renewable mix to be 3.5% above the baseline renewable mix in the year they renegotiate. • Assume CCA program begins in 2021.

Strategy 16: Streamline Interconnection Processes Collaborate with Central Hudson to simplify utility interconnection procedures.	
Modeling Methodology	**Assumptions**
We used the findings from a NYSERDA balance of solar system cost report to estimate the potential price reduction of streamlining interconnection processes. Cadmus then estimated the increase in solar market penetration that would result from these projected price decreases.	• Assume the Kingston cost of solar is $2.99/watt.[65] • To represent the effect of potential streamlining, make a reasonable assumption that a reduction in streamlining interconnection processes of $0.02/watt, which represents a 20% reduction in current costs for solar interconnection.[66] • Assume a solar elasticity of demand of -0.65.[67]

[63] NREL, "Community Choice Aggregation: Challenges, Opportunities, and Impacts on Renewable Energy Markets," https://www.nrel.gov/docs/fy19osti/72195.pdf

[64] Central Coast Power, "Technical Feasibility Study on Community Choice Aggregation," http://www.centralcoastpower.org/uploadedFiles/centralcoastpower/Content/Documents/resources/Central%20Coast%20Power%20Feasibility%20Study_Report_FINAL.pdf

[65] EnergySage. *How much do solar panels cost in Kingston, NY in 2019?* https://www.energysage.com/solar-panels/solar-panel-cost/ny/ulster-county/kingston/.

[66] NYSERDA, "SOLAR BALANCE-OF-SYSTEM COSTS BASELINE COST STUDY," https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2017ContractorReports/Solar-Balance-of-System-Cost-Baseline-Study.pdf

[67] Yale, "Hurdles and Steps: Estimating Demand for Solar Photovoltaics," https://environment.yale.edu/gillingham/GillinghamTsvetanov_SolarDemandCT.pdf

Note that impact of each strategy is slightly smaller in the moderate growth baseline compared to the conservative baseline. The reasons for this include:

- **Power Mix:** The energy impact assumptions for strategies that affect the power mix, including the CCA, the VPPA, the offsite PPA, and procuring renewable energy from retail electricity providers, are dependent on the share of renewables already supplying the City. Given that the moderate baseline includes a utility mix that is more renewable, these strategies have a smaller relative impact.
- **Distributed Generation**: The model calculates the new distributed generation by subtracting the MWh of generation produced by distributed resources from the energy generation required to meet City demand from the utility. Accordingly, as the amount of distributed renewable generation increases, the amount of utility electricity decreases, and therefore removes some of the renewables being supplied by the utility.

Economic Modeling

To derive economic benefit estimates, Cadmus utilized a model adapted from the National Renewable Energy Laboratory's Jobs and Economic Development Impact (JEDI) modeling tool. Cadmus focused on solar PV generation capacity development as the key underlying resource type for the modeling.[68] The solar PV JEDI model was chosen for analysis for two key reasons: 1) many of the strategies explicitly require installing solar and 2) in strategies where new renewables do not explicitly need to be solar, it is more likely that local solar may be built as opposed to local wind. The model was updated to reflect more recent solar costs based on NREL's U.S. Solar Photovoltaic System Cost Benchmark: Q1 2018 report,[69] and used to calculate the incremental and cumulative economic benefits for installing solar PV systems in New York. Depending on the strategy evaluated, inputs for the solar PV JEDI model are modified in the following ways:

- For strategies that aim to **increase distributed solar** resources in and around Kingston, input costs in JEDI are updated to **reflect residential solar PV** system costs per the NREL Q1 2018 report. The modeled nameplate capacity of solar is updated to match assumptions per each strategy.
- For strategies that **will increase larger utility-scale solar installations** in New York state, input costs in JEDI are updated to reflect a single axis **utility-scale PV system**. Results are then scaled based on the anticipated economic impacts of 1 MW nameplate capacity.

Economic financial impacts are calculated for 2019 dollars. These impacts include the dollar impacts of additional solar industry jobs (including planning, development, construction, interconnection, and supply chain jobs), wages, cost of materials and labor, and financing in New York state. The economic benefits are then calculated for each strategy based on the assumed incremental new solar capacity each year and the cumulative operating year impacts from all cumulative capacity added.

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[68] These economic impact models are provided by the National Renewable Energy Laboratory. The solar PV JEDI model is no longer publicly available, but the December 23, 2016 version was obtained through request.

[69] NREL, US Solar Photovoltaic System Cost Benchmark: Q1 2018, Ran Fu, David Feldman, Robert Margolis, https://www.nrel.gov/docs/fy19osti/72399.pdf

Estimates of economic benefits produced by renewable development include the following outputs:

- **Jobs:** equal to one-year full-time equivalent (FTE) employment of 2080 hours or equivalent related to development, construction, operations and maintenance of renewable energy facilities;
- **Living wages**: wage and salary compensation and benefits paid to workers (expressed in current year 2019 dollars); and
- **Local economic development:** the value of production, distribution, and consumption of goods and services in the state or local economy, which is driven by good paying, local jobs as well as ongoing lease payments to landowners where renewable energy projects are sited.