

COLUMBIA UNIVERSITY NEW YORK, SPRING 2018

**SUSTAINABILITY MANAGEMENT
CAPSTONE REPORT**

**BRINGING ELECTRIC VEHICLES,
ELECTRIC VEHICLES RIDE-SHARING,
AND COMMUNITY SOLAR TO LOW-
TO MODERATE-INCOME AND SENIOR
POPULATIONS IN WESTCHESTER
COUNTY, NEW YORK**

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INTRODUCTION

Sustainable Westchester is a consortium of 43 Westchester County local governments. The organization's goals are to facilitate effective sustainability initiatives and engage municipality stakeholders to foster healthier communities by combining grassroots efforts and municipal forces. Sustainable Westchester's overall mission is for local governments to transform environmental challenges into opportunities for improvement of the quality of life Westchester County residents.¹

Examples of Sustainable Westchester initiatives that are currently underway include:²

Community Choice Aggregation: Sustainable Westchester has been successful in signing up 14 municipalities from the County for 100% renewable or green power through community choice aggregation. This program has helped these municipalities secure a lower electricity supply rate thereby providing savings on the energy bills of residents.

Electric Vehicles: Sustainable Westchester has pushed for the proliferation of electric vehicles for individual ownership and municipal fleets in the County. They have previously partnered with automobile manufacturers such as Nissan to offer discounts for County residents.

Complete Streets: The Complete Streets initiative aims to make travel safer and more comfortable for all users regardless of the mode of transportation.

Solarize Westchester: Solarize Westchester is a public-private partnership developed to make solar energy, both residential and commercial, more accessible to property owners in the County. The Solarize campaigns work on outreach with the aim to educate communities on the benefits of solar energy and help vet and find developers for interested parties.

¹ "About Sustainable Westchester | Sustainable Westchester". 2018. Sustainablewestchester.Org. <http://sustainablewestchester.org/about/>.

² Ibid.

Sustainable Westchester worked on a similar project with a Columbia University Capstone team last year. The project's goals were to analyze the evolving electric vehicle landscape and provide policy and infrastructure recommendations for both Sustainable Westchester as an organization and its constituent municipalities. These recommendations encouraged the use of electric vehicles in support of Governor Andrew Cuomo's Reforming the Energy Vision (REV) plan.

Last year's Columbia Capstone team assessed the greenhouse gas impact of an increasing proportion of electric vehicles; reviewed municipal funding opportunities and policies; and, explored how other cities approached electric car strategies. From the research gathered, the team was able to recommend initiatives in which Sustainable Westchester would be most impactful and created a "municipality toolkit" for the organization to provide its members to encourage electric vehicle use in their communities.³

What is the goal of this year's Columbia University Capstone project?

In building upon the project from last year, the goal of this year's Columbia Capstone project is to encourage local governments in the proliferation of the use of electric vehicles, electric vehicle-sharing, and community solar for senior and low- to moderate-income (LMI) populations in Westchester County.

Below is a brief breakdown of the three technologies Sustainable Westchester wants to promote in Westchester County:

Electric vehicles: Vehicles that use one or more electric motors for propulsion.⁴

Electric vehicle ride-sharing: A carpooling service using electric vehicles. Passengers can order shared rides on demand through a smartphone or website. Hailing a car for individual use does not qualify as ride-sharing, however, pooling with other passengers does.⁵

³ "Bringing Electric Vehicles to Fruition Westchester County, New York". 2017. Columbia University. <http://sustainability.ei.columbia.edu/files/2017/05/Sustainable-Westchester-Capstone-Final-Report-Spring-2017.pdf>.

⁴ What Are Electric Cars?. (2018). Union of Concerned Scientists. Retrieved 3 April 2018, from <https://www.ucsusa.org/clean-vehicles/electric-vehicles/what-are-electric-cars#.Ws01LdPwbBI>

⁵ "Real-Time Ride-sharing". 2018. *En.Wikipedia.Org*. https://en.wikipedia.org/wiki/Real-time_ride-sharing

Community solar: For this project, community solar refers to a solar project located in a community that allows people who can't put up solar panels on their roofs due to financial, spatial or rental conditions to subscribe for solar power and receive credits on their energy bill for their portion of power produced.⁶

How do these technologies address a need within Westchester County?

The goal of the project is to provide information for the implementation of and increased access to community solar, electric vehicle ownership and electric vehicle ride-sharing to the project's target demographic populations, low- to moderate-income (LMI) and seniors, with the benefits and cost savings these technologies can provide. Many included in these target demographics live in areas known as "transit deserts,"⁷ meaning there is limited or no access to public transportation within a half mile radius of their homes. If there is access, public transportation may run less frequently during times when needed most and may not meet specific scheduling demands.⁸ Therefore, it is important to provide those living in "transit deserts" with a transportation options that are on-demand.

LMI populations in New York State have also been found to have an energy burden or percentage of income spent on energy of around 10%.⁹ This means that LMI populations spend a disproportionate share of income on energy expenses compared to middle and upper class households that spend less than five percent of their income on energy, and any fluctuations in price will have a proportionally greater impact on LMI budgets.¹⁰

Finally, the implementation of these technologies may be able to address the issue of energy and social equity. Clean energy, encompassing technologies such as electric vehicles and solar energy, is often seen as being a luxury, when it should not be. The benefits associated with these technologies should be shared by everyone in the community, not just the wealthy. There are several initiatives that include discussions on social equity in clean

⁶ "Community Solar: What Is It? | Energysage". 2018. *Energysage.Com*.

<https://www.energysage.com/solar/community-solar/community-solar-power-explained/>.

⁷ Jiao, Junfeng, and Maxwell Dillivan. 2013. "Transit Deserts: The Gap Between Demand And Supply". *Journal Of Public Transportation* 16 (3): 23-39. doi:10.5038/2375-0901.16.3.2.

⁸ Ibid.

⁹ APPRISE Incorporated. 2017. "NYSERDA Low- To Moderate-Income Market Characterization Income". Princeton, NJ.

¹⁰ Hernandez, Diana and Bird, Stephen. 2010. "Energy Burden and the Need for Integrated Low-Income Housing and Energy Policy." *Poverty Public Policy*. 2010 Nov; 2(4): 5–25. doi: 10.2202/1944-2858.1095

energy, such as the Department of Energy's Solar Energy Evolution and Diffusion Studies (SEEDS) which includes Solar Energy Evolution and Diffusion Among Low- and Middle-Income Households (SEEDS II) program.¹¹ For this to happen, it is vital that local governments and organizations like Sustainable Westchester push for policy mechanisms that will encourage the implementation of pilot projects to give equal access to share in and reap the benefits of clean energy.¹²

Last year's Columbia Capstone team highlighted numerous reasons why the proliferation of electric vehicle ownership would benefit Westchester County. As an extension of last year's Capstone report, Sustainable Westchester understands that clean energy technologies including electric vehicle ownership, electric vehicle ride-sharing, and community solar would benefit Westchester County, but also needs to be inclusive of the target populations. In communicating the goals of the project, Sustainable Westchester highlighted the following three statements to act as the guiding premises of this year's Capstone report: ¹³

- Thousands of Westchester County residents leave their homes every day to drive to work, school or for recreational activities within the County. Others drive to the nearest public transportation to commute into New York City. The use of internal combustion engines or gasoline powered cars produces a significant environmental impact, including the release of toxic air pollution and greenhouse gases. Higher use of mass transit could reduce car travel but is only a part of the larger solution. If the numerous vehicles that traveled the streets and highways of Westchester County were electric vehicles, the reduction in pollution and greenhouse gases would be substantial.
- Emerging technology such as ride-sharing offer senior citizens and LMI populations the opportunity to gain increased mobility, while reducing their costs of car ownership (including reduced fuel and maintenance expenses).
- These same senior and LMI populations could take advantage of new community solar technologies to decrease their energy expenses and reduce their greenhouse

¹¹ "Solar Energy Evolution and Diffusion Among Low- and Middle- Income Households (SEEDS II)." Accessed April 27, 2018. Yale University. <https://cbey.yale.edu/node/2930>

¹² Ibid.

¹³"Integrative Capstone Workshop In Sustainability Management Handout". 2018. New York: Columbia University The Earth Institute and the School of Professional Studies.

gas emissions associated with residential energy usage and the driving of gasoline-fueled vehicles.

Using these premises, this project analyzed the potential for these three technologies to facilitate these benefits. The team conducted a multi-step analysis in order to identify potential locations ideal for implementing and promoting electric vehicle ownership, electric vehicle ride-sharing, and community solar in Westchester County.

DEMOGRAPHIC OVERVIEW

Westchester County is one of 62 counties in New York. The County is located north of New York City and has a population close to one million residents.¹⁴ The map below is a depiction of New York State showing all 62 counties divided by distinct boundaries. Westchester County is highlighted to distinguish it from the other counties.

¹⁴ Westchester County GIS - Census (2000) Data Download. Accessed April 26, 2018. <https://giswww.westchestergov.com/wcgis/Census.htm>.

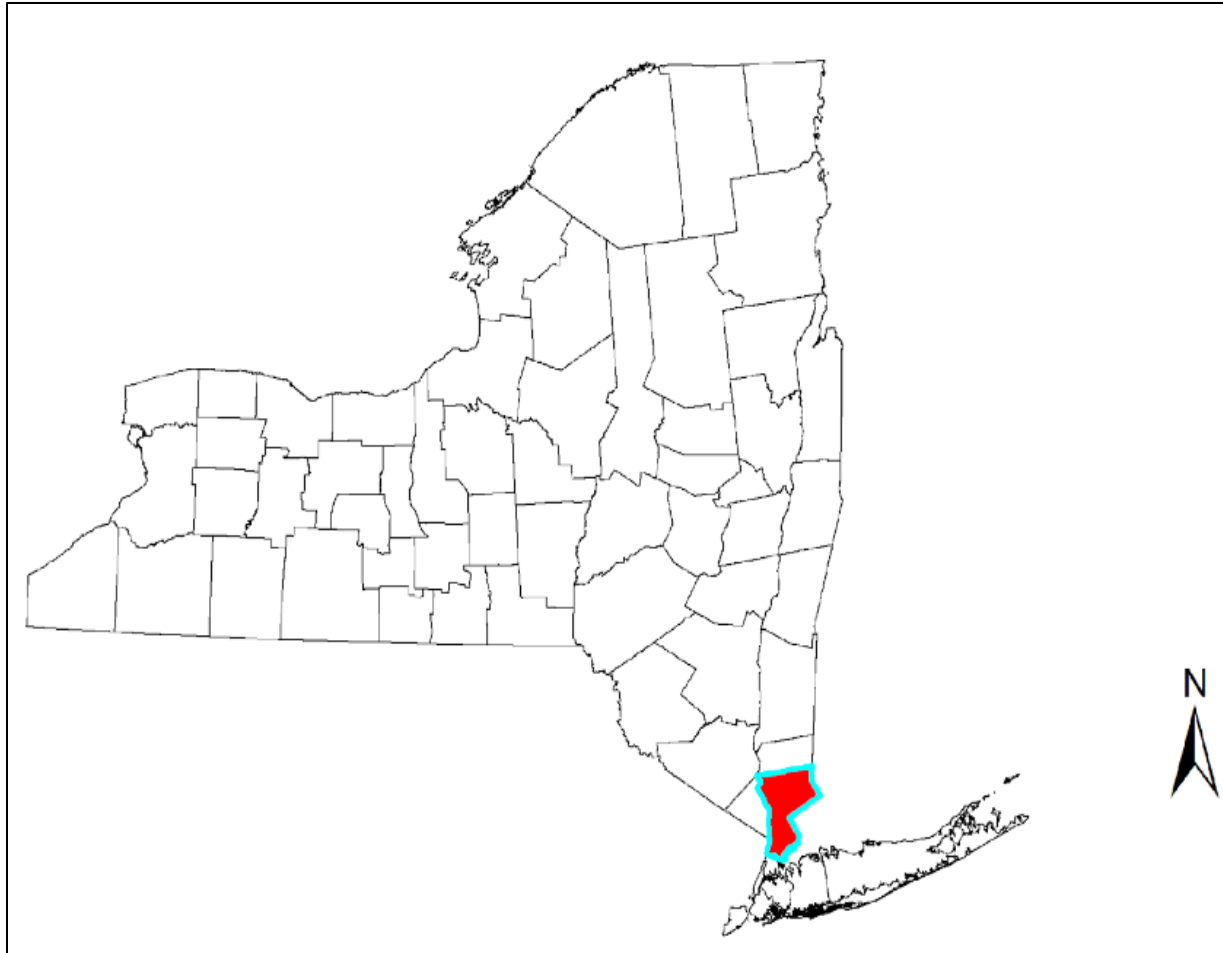


Figure 1: New York State with Westchester County Highlighted¹⁵¹⁶¹⁷

15 Westchester County GIS - Census (2000) Data Download. Accessed April 26, 2018.

<https://giswww.westchestergov.com/wcgis/Census.htm>.

16 Westchester County GIS - District Data Download. Accessed April 26, 2018.

<https://giswww.westchestergov.com/wcgis/Districts.htm>.

17 "GIS.NY.GOV." NYS GIS Clearinghouse - NYS GIS Program Office - NYS Civil Boundaries (includes NYS County Boundaries - Shoreline Version). Accessed April 26, 2018.

<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=927>.

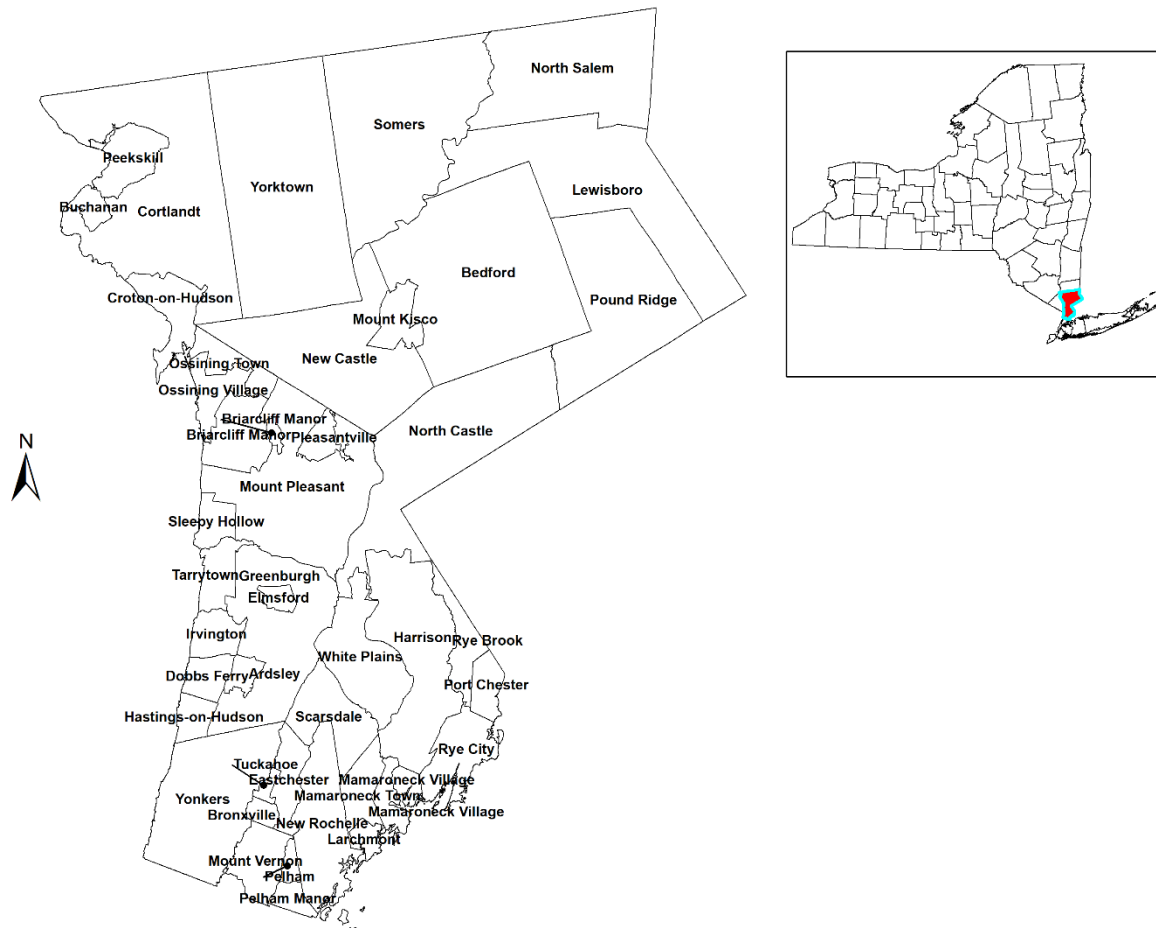


Figure 2: Westchester County with Labeled Towns, Villages, and Cities¹⁸¹⁹²⁰

ArcGIS was used to create this map using the municipality shape file which was retrieved from Westchester County GIS's website. According to the research that was observed based on the U.S. Census data (2012-2015), Westchester County's senior population (individuals above the age of 65) makes up 10% of the total population. The percentages of the senior population for each individual municipality were multiplied by the total population. This calculation estimated the number of senior population for each municipality, and a map was created to visualize how the senior population is spread out throughout Westchester County. The map below is a thematic or choropleth map that was compiled using the data from the

¹⁸ Ibid.

¹⁹ Westchester County GIS - Census (2000) Data Download. Accessed April 26, 2018.

<https://giswww.westchestergov.com/wcgis/Census.htm>.

²⁰ Westchester County GIS - District Data Download. Accessed April 26, 2018.

<https://giswww.westchestergov.com/wcgis/Districts.htm>.

U.S. Census for each individual municipality based on a 2010 Westchester County municipality shapefile.

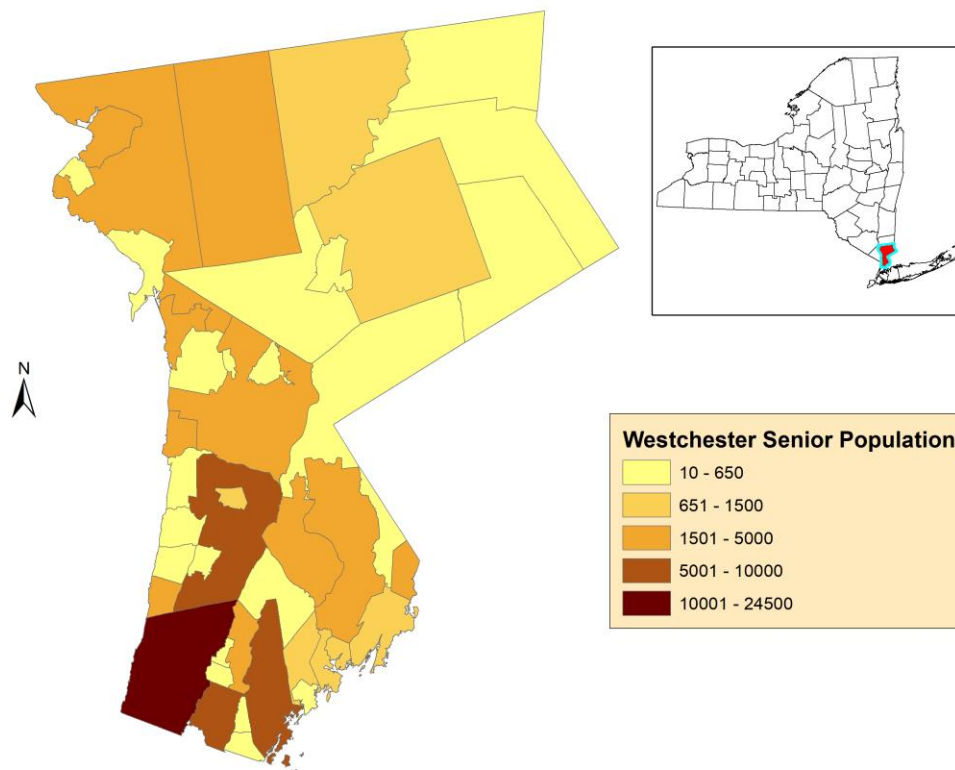


Figure 3: Westchester County Senior Population Choropleth Map²¹²²²³

In the choropleth map, darker areas are correlated with higher concentrations of a particular population. In this case, the darker shaded areas which mostly include areas located within the southern areas of Westchester (i.e. Yonkers, Mount Vernon, New Rochelle, etc.) tend to have a higher population of individuals over the age of 65 compared to other areas within Westchester County based on this map.

²¹ "GIS.NY.GOV." NYS GIS Clearinghouse - NYS GIS Program Office - NYS Civil Boundaries (includes NYS County Boundaries - Shoreline Version). Accessed April 26, 2018.

<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=927>.

²² Westchester County GIS - Census (2000) Data Download. Accessed April 26, 2018.

<https://giswww.westchestergov.com/wcgis/Census.htm>.

²³ Westchester County GIS - District Data Download. Accessed April 26, 2018.

<https://giswww.westchestergov.com/wcgis/Districts.htm>.

According to the U.S. Census data, Westchester County has an average per capita income of \$73,159 and a median household income of \$86,226.²⁴ LMI individuals or families are defined by the United States Department of Housing and Urban Development (HUD), as having a household income not exceeding 115% of the median income. LMI population data derived from 2017 were provided by the U.S. Department of Housing and Urban Development (HUD).²⁵ When the data was analyzed for LMI populations, income levels relative to a particular municipality was observed. In other words, it was understood that some municipalities had higher median incomes than others, therefore, LMI populations were considered and mapped based on a certain municipality's median income as opposed to the median income of Westchester County as a whole. A different shapefile representing the Census tract data from 2010 was used to create the map below, which uses dot density to represent LMI populations on the map.

²⁴ <https://www.census.gov/quickfacts/fact/table/westchesterCountynewyork/PST045216> Accessed 16th April 2018

²⁵ "FY 2017 LMISD by State - All Block Groups, Based on 2006-2010 American Community Survey," US Department of Housing and Urban Development, accessed February 21, 2018, <https://www.hudexchange.info/programs/acs-low-mod-summary-data/acs-low-mod-summary-data-block-groups-places/>.

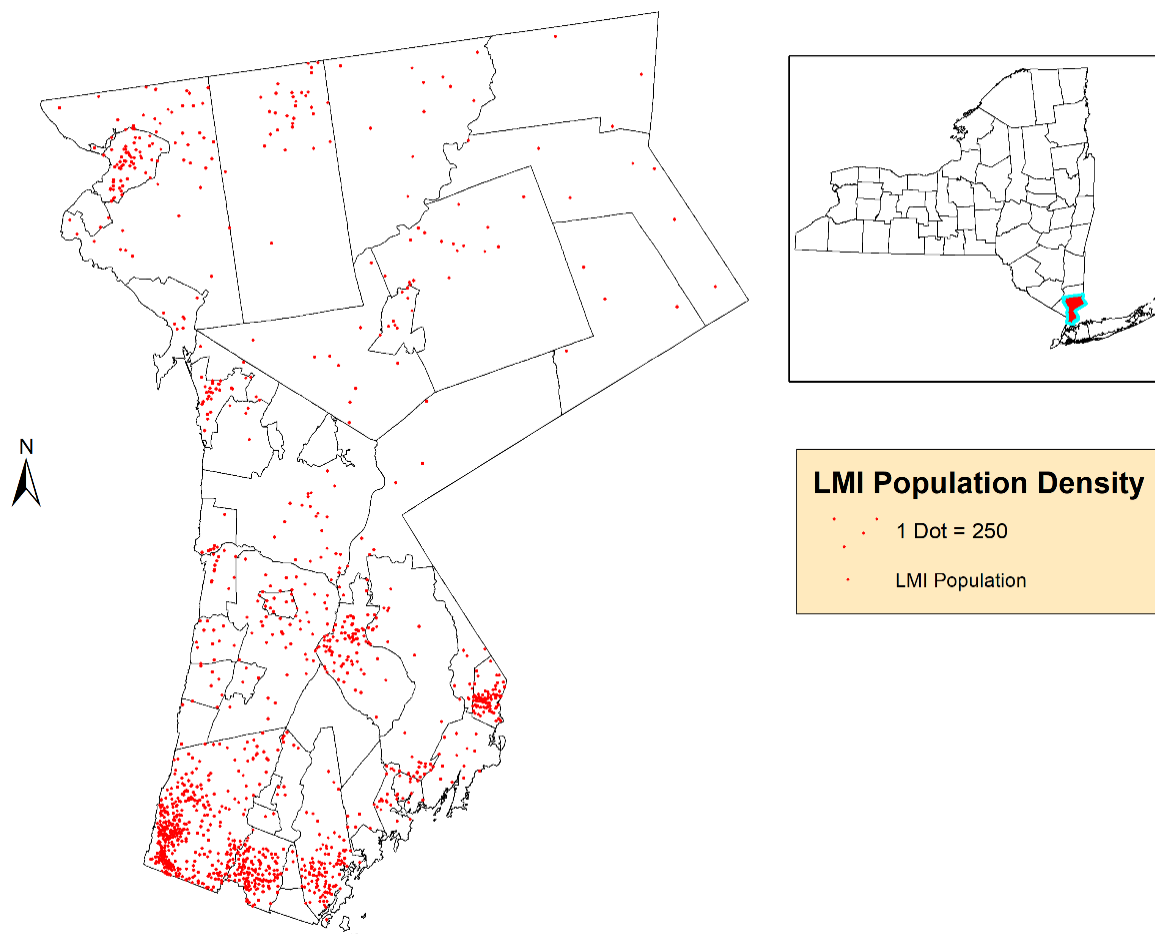


Figure 3: Westchester County Low-to-Moderate Income Population Density and Senior Population²⁶²⁷²⁸

According to the map displayed in figure 4, one dot equates to 250 LMI individuals, and similarly to the senior population map, there is a high population of LMI individuals within the southern areas of Westchester County. However, there are some high concentrations in the northwest within the City of Peekskill as well as within the east such as within the City of Rye as indicated by the map.

²⁶ "GIS.NY.GOV." NYS GIS Clearinghouse - NYS GIS Program Office - NYS Civil Boundaries (includes NYS County Boundaries - Shoreline Version). Accessed April 26, 2018.
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=927>.

²⁷ Westchester County GIS - Census (2000) Data Download. Accessed April 26, 2018.
<https://giswww.westchestergov.com/wcgis/Census.htm>.

²⁸ Ibid.

The map below displays the two variables of the senior population and LMI population together on one map. To the project target population in Westchester County, the 2010 Census tract data was used to construct a thematic map that displays both the senior population (with a distinct color scheme) and the LMI population (represented as a population density dot).

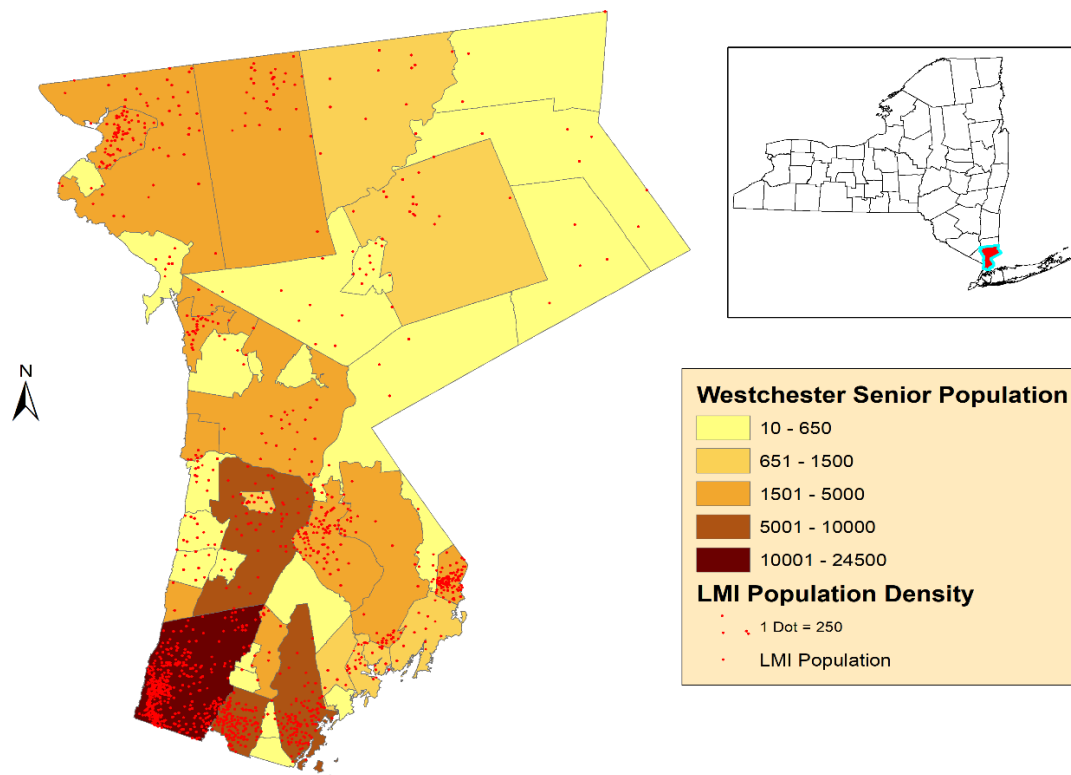


Figure 4: Westchester County Low-to-Moderate Income Population Density and Senior Population²⁹³⁰³¹

Using the latitude and longitude of senior housing and electric vehicle charging locations X and Y geographic coordinates were created to display point data to create maps. The map below is another choropleth map with the senior housing location points also mapped out as point data. The senior housing points were compiled from *Westchester Residential*

²⁹ "GIS.NY.GOV." NYS GIS Clearinghouse - NYS GIS Program Office - NYS Civil Boundaries (includes NYS County Boundaries - Shoreline Version). Accessed April 26, 2018.

<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=927>.

³⁰ Westchester County GIS - District Data Download. Accessed April 26, 2018.

<https://giswww.westchestergov.com/wcgis/Districts.htm>.

³¹ Ibid.

Opportunities, Inc.'s (WRO) 2017 Senior Apartment Guide.³² WRO is a non-profit organization whose mission is to promote equal, affordable, and assemble housing opportunities for all residents within their region, according to their website.³³ According to WRO's senior apartment guide, renters are considered to be seniors if they fall within the age range of 55 and above or 62 and above in which the person may be eligible for affordable housing. Affordable apartments are partially subsidized for renters who fall within the previously mentioned age ranges.³⁴ The map indicates that a high number of the housing dedicated for senior population is located within the darker areas, which represent a higher concentration of senior population.

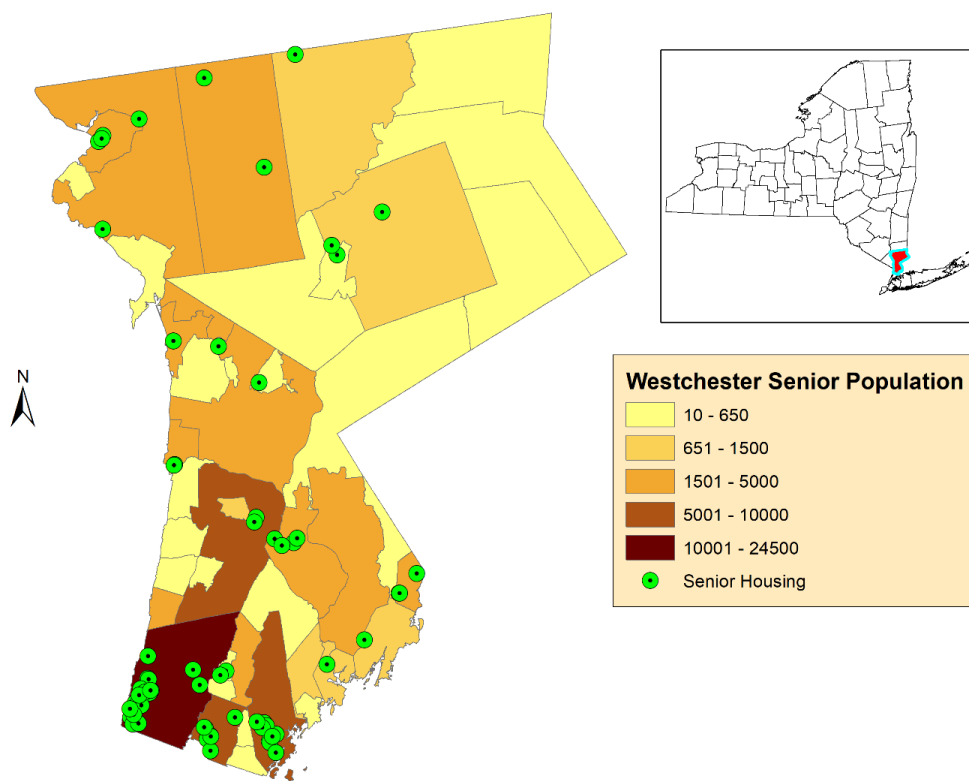


Figure 5: Westchester County Senior Population with Senior Housing Choropleth Map³⁵³⁶

³² "Housing Opportunities, Eviction Prevention: Senior Housing Assistance." 2018. *WroincOrg*. <http://www.wroinc.org/services/seniorprograms>.

³³ *Ibid.*

³⁴ *Ibid.*

³⁵ Westchester County GIS - Census (2000) Data Download. Accessed April 26, 2018.

<https://giswww.westchestergov.com/wcgis/Census.htm>.

³⁶ Westchester County GIS - District Data Download. Accessed April 26, 2018.

<https://giswww.westchestergov.com/wcgis/Districts.htm>.

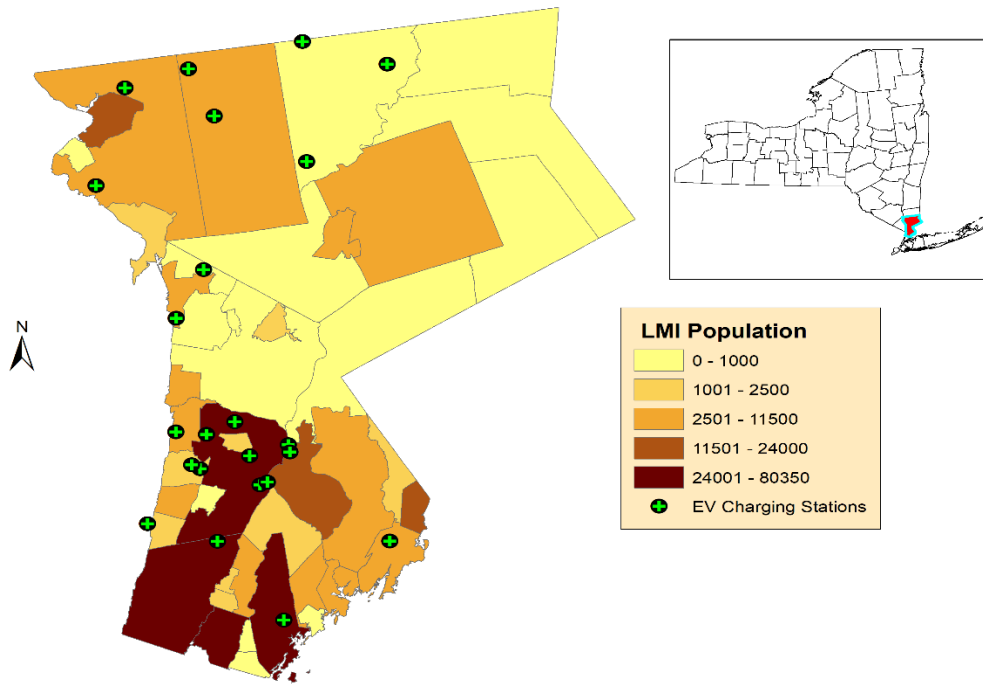


Figure 6: Westchester County EV Charging Stations and Low-to-Moderate Income Population Density³⁹

In similar fashion, EV charging station point data was obtained by gathering the locations of EV charging stations from websites such as Plugshare.com and Chargehub.com. These locations were used to generate point data that was be mapped as seen in the map below.³⁷

When plotting the data points of EV charging stations, a cluster of EV charging stations located within southwestern portion of Westchester (White Plains and Greenburgh) are seen. These areas are observed to have a moderate to high concentration of the LMI population.

The EV charging station and senior housing maps were created to provide some visual guidelines for identifying trends or patterns that could be useful in continuing the research process. While these maps helped provide visual context, the first round of criteria was decided to be kept straightforward. Using the first two data sets and analysis conducted with GIS software, the 24 municipalities (out of the 48 municipalities in the County) with the highest number of senior and LMI populations were selected for the next round of criteria.

³⁷ "Plugshare - EV Charging Station Map - Find The Nearest Location To Charge Your Electric Car!". 2018. Tesla.Plugshare.Com. <https://tesla.plugshare.com/>.

Methodology for Identifying Project Location

The next step in the team's methodology included conducting a benchmarking analysis for community solar, electric vehicle ownership, and electric vehicle ride-sharing to determine successful best practices for implementing these programs. In order to evaluate municipalities according to the benchmarking criteria, a point system was established to understand how each municipality met each criterion. The ultimate goal of the exercise was to highlight municipalities that received the highest scores, which indicated that project implementation would likely be more successful in those locations.

Community solar benchmarking criterion included the following categories:

- Existing or planned community solar projects
- Solarize Westchester Community participant
- Clean Energy Community applicant
- Community Choice Aggregation participant

One point was awarded for each of the four benchmarking indicators, and municipalities scored between zero to four points depending on their level of involvement in other energy-related programs. The four criteria were developed based on research that indicated community solar projects were most commonly implemented when there was municipal support, available technical and planning resources, and interested communities and potential subscribers. As indicators of municipal and technical leadership, and those municipalities that might be interested and knowledgeable about community solar, municipal participation in a Solarize Campaign, a Clean Energy Community applicant, or being part of the Community Choice Aggregation was considered. Existing and planned community solar projects were also included as an indicator of community interest and project viability.

A municipality that has done a Solarize Campaign, participated in the Community Choice Aggregation, and has submitted a Clean Energy Community is assumed to be a more viable option and more interested demographic in community solar than others that have done less or none of those actions.

Electric vehicle ride-sharing benchmarking criteria included the following:

- Number of existing ride-sharing programs
- No vehicle ownership percentage

One point was awarded for each existing ride-sharing program, and municipalities with higher points were considered as more viable options due to existing ride-share penetration and community familiarity with these programs. Additional points were awarded to municipalities that had a higher percentage of households with no vehicles available, understanding that those communities could benefit the most from access to alternative transportation options.³⁸ Access to vehicles or public transportation in each municipality was assessed by looking at the number of existing senior ride-sharing programs that currently existed in each municipality.

Electric vehicle ownership was directly correlated to the presence of electric vehicle charging stations, which indicated that the next criteria would be based on:

- Electric vehicle ownership per capita rank
- Electric vehicle to charging stations ratio

Electric vehicle ownership per capita rank indicated the number of electric vehicles within a municipality. Points ranging from one to three were given for the number of electric vehicles per capita. The lower the electrical vehicle per capita, which indicates a potential market with less electric vehicle penetration to date, the higher the point would be received. The lower the electric vehicle to charger ratio, which indicates more availability electric vehicle chargers, the higher the point would be received.

For community solar and electric vehicle ride-sharing criterion, community interest was taken into consideration and incorporated into the scoring for the community-based organizations (CBO). Community interest was assessed based on the outreach to CBOs in these municipalities. Of the numerous organizations contacted, six CBOs expressed their interest in the project.

³⁸ Tomer, Adie. "Transit Access and Zero Vehicle Households," Metropolitan Policy Program at Brookings. August 2011. https://www.brookings.edu/wp-content/uploads/2016/06/0818_transportation_tomer.pdf

The table below lists the name of community-based organizations that have indicated their interest in the project. (A more detailed summary of outreach and contact information for each of the organization are provided in Appendix A.)

Community-Based Organization Name	Serving Municipalities	Interest in Community Solar	Interest in EV Ride-share	Interest in EV Proliferations
Westchester Residential Opportunities	City of White Plains (serves Westchester County)	Yes	Yes	Yes
SPRYE (Staying Put in Rye & Environs)	Town/Village of Harrison, Village of Port Chester, City of Rye and Rye Brook		Yes	
Family Services of Westchester (FSW)	Based in Port Chester (serves the entire County)	Yes	Yes	
Ride Connect	Based in Mount Kisco (serves the entire County)		Yes	
Hugh A. Doyle Senior Center	New Rochelle		Yes	
United Hebrew	New Rochelle		Yes	

For the individual municipality where these organizations are located, an additional two points were allocated as an indicator for community support and potential partnership. The CBO criterion received higher points than benchmarking criteria because leveraging support from existing CBOs would be integral to implementing the project.

MUNICIPALITY ANALYSIS MATRIX

The matrix on the next page shows the result of the team's complete analysis. Municipalities that scored high in each criterion are highlighted in yellow, green, and blue.

	Community Solar					EV Ride-sharing			EV Charging Station	
	Community-Based Organization	Community Choice Aggregation	Clean Energy Community	Solarize Westchester Community	Community Solar Capacity	Community Based Organizations	No Vehicle Ownership %	# of Ride-sharing Programs	EV to Chargers Ratio	EV per Capita Rank
City of Mount Vernon			1					3	3	3
City of New Rochelle			2			2	4	4	1	1
City of Peekskill			1					3	3	3
City of Rye	2		0			2	2	2	4	4
City of White Plains	2		3			2	4	4	1	1
City of Yonkers			1					4	1	1
Town of Bedford			4					1	1	1
Town of Eastchester			0					2	2	2
Town of Greenburgh			2					2	2	2
Village of Greenburgh			2					1	2	2
Town of Harrison	2		0			2	1	1	2	2
Town of Mamaroneck			3					2	1	1
Town of Ossining			3					3	1	1
Town of Rye	2		0			2	2	2	1	1
Town of Somers			3					1	4	4
Town of Yorktown			1					1	1	1
Village of Elmsford			0					1	1	1
Village of Harrison	2		0			2	1	2	1	1
Village of Mamaroneck			2					3	1	1
Village of Mount Kisco			2			2	2	2	1	1
Village of Ossining			2					2	1	1
Village of Port Chester	2		0			2	2	3	1	1
Village of Sleepy Hollow			0					4	1	1
Village of Tarrytown			2					2	1	1

TECHNOLOGIES

Electric Vehicle Ownership and Electric Vehicle Ride-sharing

Electric vehicles (EVs) are vehicles that are exclusively powered by an electric motor. Electric vehicles have many advantages compared to traditional internal combustion engines vehicles. First, electric vehicles have a better emissions profile than internal combustion engines. The lifecycle emissions of an electric vehicle depend on the source of electricity used to charge them, and the U.S. Department of Energy estimates that in New York State an electric vehicle emits 1,813 pounds of CO₂ equivalent per year compared with 11,435 pounds of CO₂ equivalent from a gasoline vehicle. These results show the significant impact that electric vehicles can have towards reducing CO₂ emissions in New York State.³⁹ The World Economic Forum predicts that vehicle electrification could yield up to \$635 billion in value for the U.S. by 2030⁴⁰. Secondly, electric vehicles higher pump-to-wheels efficiency can improve energy security. Electric vehicles pump-to-wheels efficiency, measured as the amount of energy consumed by vehicle that is ultimately converted into vehicle motion, is well over 80% efficient while internal combustion engines suffer from thermal and mechanical efficiency conversion limits of about 20%.⁴¹ The U.S. Department of Energy estimated that in 2015, the U.S. imported about 24% of the petroleum it consumed. As transportation accounts for nearly 75% of U.S. petroleum consumption, using more energy efficient vehicles can have a direct impact on energy security.⁴² Finally, electric vehicles require less maintenance than conventional vehicles because there are usually fewer fluids (such as oil and transmission fluid) to change and fewer moving parts.⁴³ According to a study conducted by the U.S. Energy Information Administration⁴⁴, the market share of electric vehicles in the U.S. in 2016 was 0.6% representing a total stock of about 220

³⁹ "Electricity sources and emissions". U.S. Department of Energy, Accessed April 14 2018.

https://www.afdc.energy.gov/vehicles/electric_emissions.php

⁴⁰ "EV charging practices could create grid constraints". Prometheus Institute. Accessed February 23 2018 <https://prometheus.org/2018/02/22/ev-charging-practices-could-create-grid-constraints/>

⁴¹ "Energy Systems Fundamentals 2016", Chapter 16. Travis Bradford.

⁴² "Benefits considerations of electricity as a vehicle fuel". U.S. Department of Energy. Accessed April 14 2018 https://www.afdc.energy.gov/fuels/electricity_benefits.html

⁴³ "Electric car safety, maintenance and battery life". U.S. Government Office of Energy Efficiency & Renewable Energy. Accessed April 14 2018 <https://www.energy.gov/eere/electricvehicles/electric-car-safety-maintenance-and-battery-life>

⁴⁴ "Global EV Outlook 2017". International Energy Agency. Accessed March 25 2018 <https://www.iea.org/publications/freepublications/publication/GlobalEVOutlook2017.pdf>

thousand vehicles. Data from the National Renewable Energy Laboratory in 2016, exhibited in Figure 8, show that penetration of electric vehicles per residents is more incident in the west coast of the U.S. Cities like San Francisco, Los Angeles, San Diego, Seattle, and Atlanta are leading the way.⁴⁵ Also, Bloomberg Technology estimates that by 2021 electric vehicles could be the cheaper option for a ride-hailing service - \$0.16/mile for an electric vehicle compared with \$0.38/mile in an oil-fueled car.⁴⁶

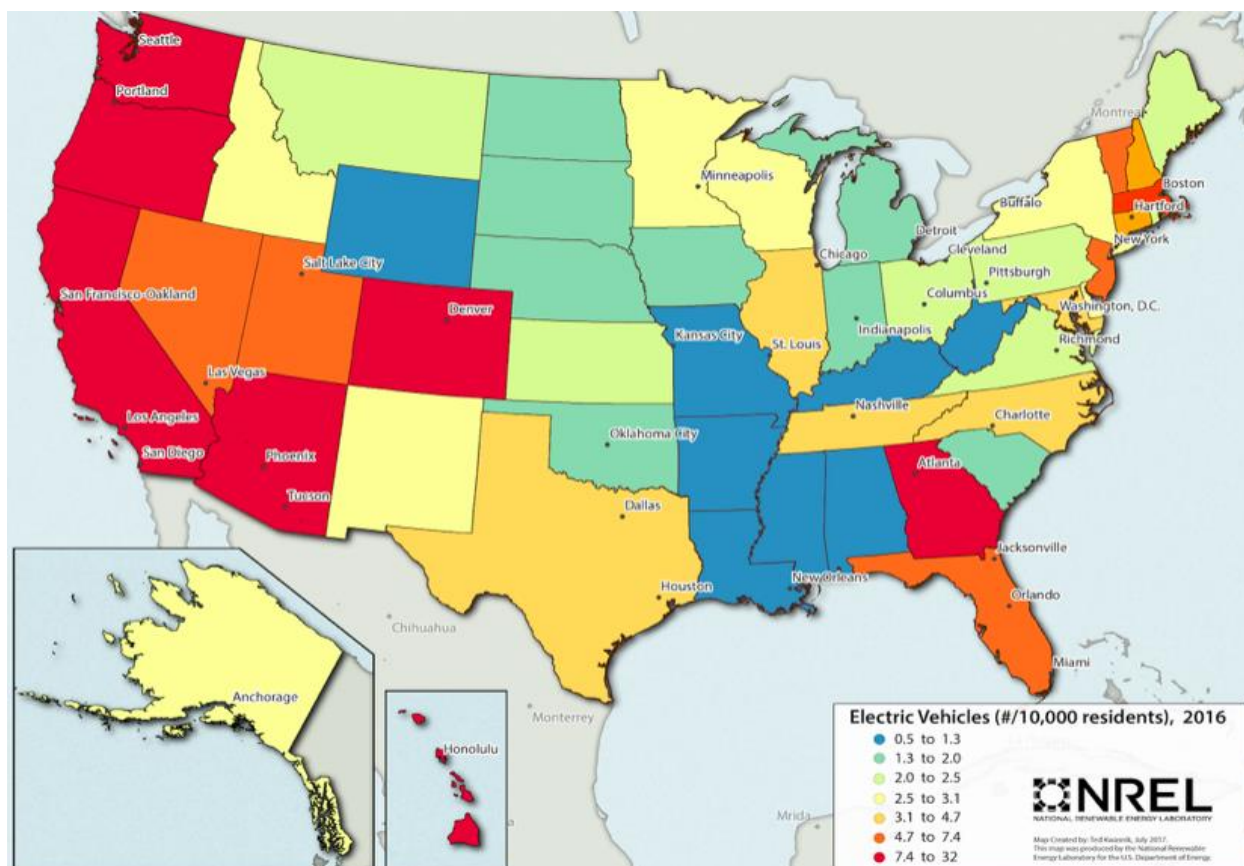


Figure 8 – EV registration per 10,000 residents in 2016 ⁴⁷

Electric vehicles can penetrate the road transportation system in the U.S. through two main models. The first one is electric vehicles ownership. In this model, individuals purchase, own

⁴⁵ “Sustaining electric vehicle market growth in U.S. cities”. The International Council on Clean Transportation. Accessed March 25 2018
https://www.theicct.org/sites/default/files/publications/US%20Cities%20EV%20mkt%20growth_ICCT_white-paper_vF_October2016.pdf

⁴⁶ Bloomberg Technology. Accessed April 14 2018
<https://www.bloomberg.com/news/articles/2017-09-21/how-electric-cars-can-create-the-biggest-disruption-since-iphone>

⁴⁷ “Alternative Fuels Data Center”. U.S. Department of Energy. Accessed March 25 2018
<https://www.afdc.energy.gov/data/>

and use an electric vehicle. In 2017, the sales of EV in the U.S. represented 1.16% of the total vehicle sales⁴⁸, and this relatively low percentage can be partially attributed to the fact that currently acquisition prices of battery electric vehicles are not yet competitive with the traditional internal combustion engine vehicles. The battery cost represents a significant portion of the total acquisition cost of electric vehicles, and therefore lithium-ion cost per kWh is a key metric to foster electric vehicles ownership.⁴⁹ A recent report from Bloomberg projects that battery electric vehicles will become competitive with internal combustion engine vehicles when lithium-ion battery costs are \$100/kWh, almost half of today's cost. This is expected to happen in 2026.⁵⁰

The second model is car sharing. In 2017, McKinsey published a report on how automakers can drive electrified vehicles sales and profitability. It pointed towards car sharing and fleet operation as the most promising new business models.⁵¹ In a car sharing model, commuters travel in a vehicle driven by its owner or fleet employee for a fee, especially as arranged by a website or a mobile application. A car sharing service can improve further its efficiency by doing ride-sharing, where multiple individuals share the same vehicle to do their commute. A car sharing model is attractive not only because it alleviates the economics of electric vehicles by enjoying economies of scale, but also because it addresses another challenge in road transportation - the utilization rate of vehicles. Today's cars are not in use 95% of the time,⁵² which is a challenge for city planners, as those bare-used cars need to be parked. The shift away from car ownership to car sharing can not only improve the economics of the investment

⁴⁸ "EV market share - analyzing key factors that will drive mass adoption of electric vehicles". EV adoption. Accessed March 25 2018 <http://evadoption.com/ev-market-share/>

⁴⁹ "Energy Systems Fundamentals 2016", Chapter 16. Travis Bradford.

⁵⁰ "Electric cars need cheaper batteries before taking over the road". Bloomberg Technology. Accessed March 25 2018 <https://www.bloomberg.com/news/articles/2017-11-28/electric-cars-need-cheaper-batteries-before-taking-over-the-road>

⁵¹ "Electrifying insights: How automakers can drive electrified vehicle sales and profitability". McKinsey&Company. Accessed March 25 2018 https://www.mckinsey.com/~media/McKinsey/Industries/Automotive%20and%20Assembly/Our%20Insights/Electrifying%20insights%20How%20automakers%20can%20drive%20electrified%20vehicle%20sales%20and%20profitability/Electrifying%20insights%20-%20How%20automakers%20can%20drive%20electrified%20vehicle%20sales%20and%20profitability_vF.ashx

⁵² "Today's cars are parked 95% of the time". Fortune. Accessed March 25 2018 <http://fortune.com/2016/03/13/cars-parked-95-percent-of-time/>

in the vehicle but also help make cities denser, more efficient and livable. For the last decade multiple pilots have been deployed in the U.S. and abroad to deliver this vision.

What are the relevant EV policies and incentives in New York?

New York State has many statewide initiatives that address the adoption of electric vehicle and charging infrastructure. These statewide incentives and policies promote ownership of electric vehicles, support the development of electric vehicle charging stations, and create opportunities for demonstration projects such as EV ride-sharing. The most prominent is Governor Cuomo's Charge NY initiative, which is overseen by the New York State Energy Research and Development Authority (NYSERDA) and works in collaboration with the New York State Department of Environmental Conservation (DEC) and the New York Power Authority (NYPA). The goal of the initiative is to have 30,000 electric vehicles on the road in 2018 and 3,000 electric vehicle charging.⁵³ NYSEDA, NYPA, and DEC provide incentive programs, educational materials and information, case studies, and data to support electric vehicle adoption.

Through the Charge NY initiative, New York State residents can earn a Drive Clean Rebate of up to \$2,000 off the purchase of a new car. The Drive Clean Rebate program is a \$70 million initiative allotting \$55 million of the total budget towards electric vehicle purchase rebates. The remaining \$15 million is dedicated towards consumer awareness, installation of charging stations, and for the development and demonstration of enabling technologies towards electric vehicles throughout New York.⁵⁴ As of March 2018, \$7.5 million dollar in approved rebates has been realized since the programs implementation once year ago; specifically, the Mid-Hudson Valley region, which Westchester belongs to, has the second most approved rebates across New York State.

This table below shows rebate applications by region from March 21, 2017 through March 15, 2018:⁵⁵

⁵³ "Electric Vehicles: Tax Credits And Other Incentives | Department Of Energy". 2018. Energy.Gov. <https://www.energy.gov/eere/electricvehicles/electric-vehicles-tax-credits-and-other-incentives>.

⁵⁴ 2018. <https://www.nyseda.ny.gov/All-Programs/Programs/ChargeNY>.

⁵⁵ Ibid.

REDC Region	Total applications*	% of Total
Long Island	1,892	32.8%
<i>Mid-Hudson Valley</i>	<i>1,001</i>	<i>17.4%</i>
Capital District	777	13.5%
Finger Lakes	585	10.2%
New York City	475	8.2%
Western NY	389	6.8%
Central NY	217	3.8%
Southern Tier	201	3.5%
Mohawk Valley	142	2.5%
North Country	81	1.4%

Table 1: Regional Rebate Applications (NYSERDA, 2018)

Since Charge NY met its goal by selling over 30,000 electric vehicles by the end of 2017, Governor Cuomo recently announced Charge NY 2.0. This initiative builds on Charge NY goal of having 3,000 charging stations available and increasing it to 10,000 charging stations available throughout the state by 2021. To help reach this goal, New York State offers an income tax credit for 50% of the cost, up to \$5,000 for the purchase and installation of an electric vehicle charging station.⁵⁶

Along with the Charge NY initiative, New York also offers many incentives which encourage the adoption of EV's through time savings and monetary benefits. Through these benefits, electric vehicle drivers receive an exemption from New York emissions tests which amounts to a savings of \$11 - \$27 dollars annually, the use of High Occupancy Vehicle (HOV) lanes,

⁵⁶ "Electric Vehicles: Tax Credits And Other Incentives | Department Of Energy". 2018. Energy.Gov. <https://www.energy.gov/eere/electricvehicles/electric-vehicles-tax-credits-and-other-incentives>.
56 2018. <https://www.nyserdan.gov/All-Programs/Programs/ChargeNY>.

discounts on E-Z Pass and auto insurance, state tax exemptions, and plug in electric vehicle rebates.⁵⁷

Con Edison, the utility for Westchester County, has partnered with FleetCarma to launch SmartCharge New York. Through this program, EV owners can be incentivized for off-peak charging of their plug in electric vehicles. EV drivers receive a free C2 device which monitors the electric vehicle's charging behavior allowing for the vehicle owner to see comprehensive data on their vehicle charging and usage through the FleetCarma portal and app. They also receive a \$150 for installation and activation of the C2 device.⁵⁸

Federal incentives also account for a majority of the tax credits that make the purchase of a new qualified electric vehicle affordable. These tax credits range in between \$2,500 - \$7,000 based upon an EV's weight rating and battery capacity. Through federal incentives, municipalities can also gain financial assistance for demonstration and deployment projects on electric vehicles which provide public transportation.⁵⁹

Although many of these incentives and policies are targeted towards the purchase of new electric vehicles, they also create an opportunity for the development and deployment of EV ride-sharing programs through realized cost and time savings.

How can charging infrastructure promote EV ownership and EV ride-sharing in Westchester County?

One frequently cited barrier to greater electric vehicles adoption is the lack of charging infrastructure. This is a challenge since there is little incentive to build electric vehicles charging infrastructure until there are more vehicles and no one wants to buy electric vehicles until there is sufficient charging infrastructure. A recent study from the Rocky

⁵⁷ 2018. <https://www.nyserda.ny.gov/About/Newsroom/2018-Announcements/2018-03-22-Governor-Cuomo-Announces-5750-Electric-Car-Rebates-Approved>.

⁵⁸ "Fleetcarma And Con Edison Charge Ahead With Smartcharge Rewards™ For Electric Vehicle Owners". Fleetcarma. <https://www.fleetcarma.com/press-release-con-edison-smartcharge-rewards/>.

⁵⁹ "Electric Vehicle Charging Rewards | Con Edison". 2018. Coned.Com. <https://www.coned.com/en/save-money/rebates-incentives-tax-credits/rebates-incentives-tax-credits-for-residential-customers/electric-vehicle-rewards>.

Mountain Institute states that to accelerate EV adoption, building EV charging infrastructure should be a priority in all states and major municipalities.⁶⁰

New York State has several charging stations programs that provide incentives and discounts on the installation of charging infrastructure. Specifically, the New York State Tax Credit for Public and Workplace Charging, provides an income tax credit of up to \$5,000 towards the purchase and installation of a commercial and workplace electric vehicle charging station. Another resource is the New York State Department of Environmental Conservation's Municipal Rebate Program that provides rebates for costs associated with the purchase or lease of eligible clean vehicles, and installation of eligible infrastructure that supports public use of clean vehicles.⁶¹ On March 6th 2018, NYSDERDA announced the City of Rochester and five local organizations sign pledge to enhance access to electric vehicle charging stations. The pledges are part of Rochester's Electric Vehicle Accelerator initiative, a pilot project to assist the City of Rochester to become the state's first electric vehicle model city.⁶²

The charging infrastructure and vehicle hardware differs per manufacturer and charging location. Electric vehicles chargers are defined both by the type of physical connection between the vehicle's charging inlet, the plug used to connect it and the power type and rating designating the flow rate of energy into the vehicle (i.e. the charging time).

Level 1 charger – Operates at 120V and relies on standard plugs (typical household outlet). It has a capacity between 1.4 - 1.9 kW and it takes 630 to 860 minutes to supply 80 miles of range.⁶³

⁶⁰ "From gas to grid". Rocky Mountain Institute. Accessed April 15 2018
<https://www.rmi.org/wp-content/uploads/2017/10/RMI-From-Gas-To-Grid.pdf>

⁶¹ Charging station programs. NYSDERDA. Accessed April 15 2018
<https://www.nyserda.ny.gov/All-Programs/Programs/ChargeNY/Charge-Electric/Charging-Station-Programs>

⁶² "NYSDERDA Announces the City of Rochester and Five Local Organizations Sign Pledge to Enhance Access to Electric Vehicle Charging Stations". NYSDERDA. Accessed April 15 2018.
<https://www.nyserda.ny.gov/About/Newsroom/2018-Announcements/2018-03-06-City-of-Rochester-and-Five-Local-Organizations-Sign-Pledge-to-Enhance-Access-to-Electric-Vehicle-Charging-Stations>

⁶³ "From gas to grid". Rocky Mountain Institute. Accessed April 15 2018
<https://www.rmi.org/wp-content/uploads/2017/10/RMI-From-Gas-To-Grid.pdf>

Level 2 charger – Operates at 240V and the power drawn can range from 3.4 kW to 20 kW depending on the configuration. It takes 60 to 350 minutes to supply 80 miles of range.⁶⁴

DC fast charger – Only available for commercial grade charging stations as it requires a power input of 500V DC and can have power draws between 50 and 400 kW. While this is enough power to fully charge battery electric vehicles in about 30 minutes, the amount of equipment and electrical infrastructure to safely provide this charge is substantial.^{65 66}

The costs of installing chargers are high for Level 2 and DC fast chargers, though for Level 1 the only cost is for an extension cord to run from the vehicle to a standard wall outlet. For a Level 2 charger the cost can run from around \$500 (to buy a unit off the shelf and install it at home) to around \$6,000 (for a commercial public installation involving removing and replacing concrete, trenching, running conductors, and other tasks). For DC fast chargers the costs are around \$50,000, although some installations can cost considerably more.⁶⁷

In September 2016, Westchester county had 1,742 electric vehicles registered representing 0.3% of the total vehicles in the county.⁶⁸ Despite the low penetration of electric vehicles in the county, Westchester is a leader in the New York State for electric vehicles adoption as shown in Figure 9. This means that the barrier of developing infrastructure before there are sufficient vehicles should be easier to overcome, and that a lack of charge infrastructure has not inhibited electric vehicle ownership in Westchester County relative to other counties in New York. The research and analysis conducted by the team identified 35 charging points in Westchester county and 3 Tesla superchargers (only compatible with Tesla cars). Tesla superchargers are located in White Plains (2 units) and Greenwich (1 unit) and the remaining 35 charging infrastructure according to Table 2.

⁶⁴ “Energy Systems Fundamentals 2016”, Chapter 16. Travis Bradford.

⁶⁵ Ibid.

⁶⁶ “Energy Systems Fundamentals 2016”, Chapter 16. Travis Bradford.

⁶⁷ “From gas to grid”. Rocky Mountain Institute. Accessed April 15 2018

<https://www.rmi.org/wp-content/uploads/2017/10/RMI-From-Gas-To-Grid.pdf>

⁶⁸ “Electric vehicle charging station data”. NYSERDA. Accessed February 6 2018

<https://www.nyseda.ny.gov/Researchers-and-Policymakers/Electric-Vehicles/Resources/Electric-Vehicle-Charging-Station-Data>

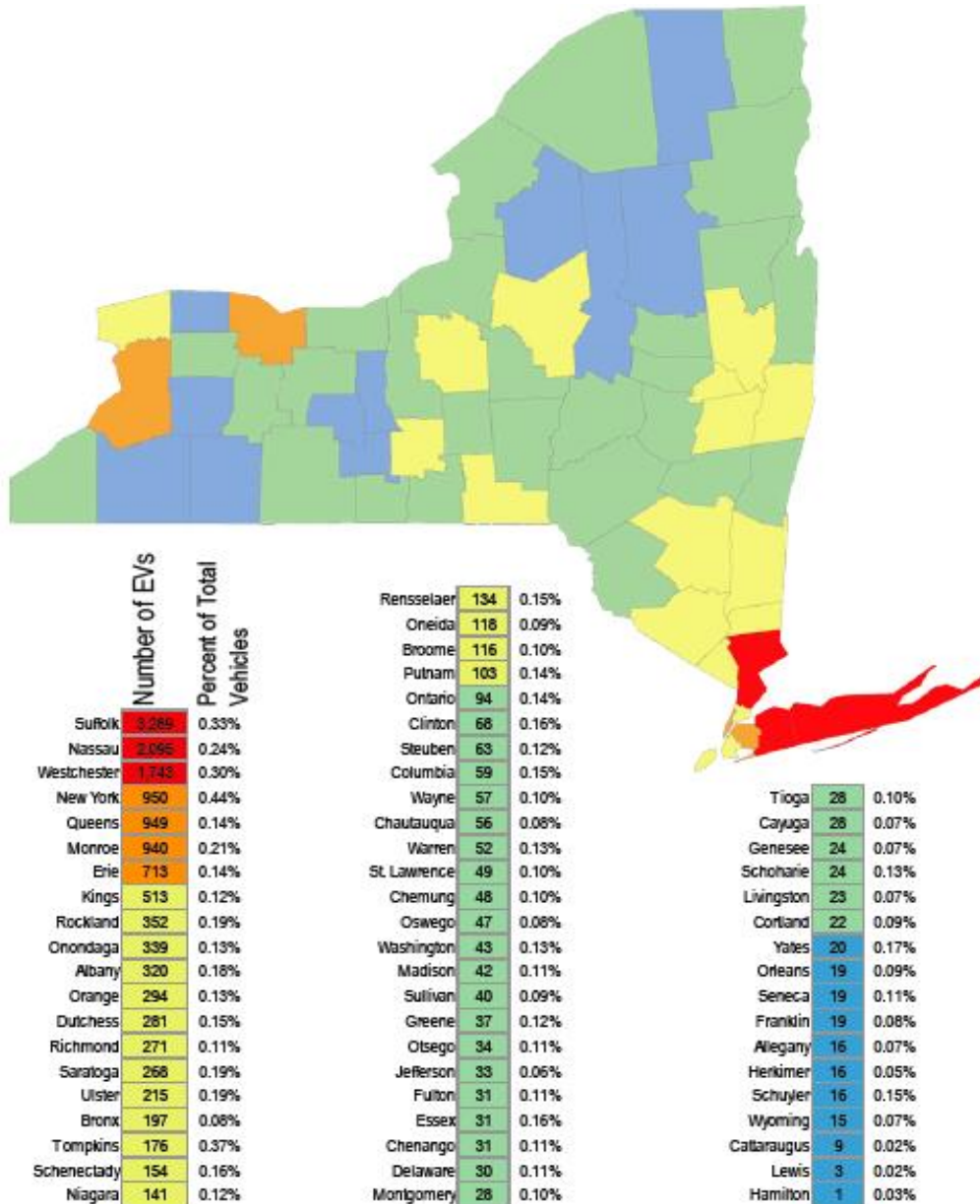


Figure 9 – Electric vehicle volume and market share per New York State County in 2016⁶⁹

⁶⁹ “EV charging station demonstration program”, Q3 2016. NYSDERDA. Accessed April 15 2016
<https://www.nysderda.ny.gov/Researchers-and-Policymakers/Electric-Vehicles/Resources/Electric-Vehicle-Charging-Station-Data>

Municipality	EV public chargers
City of White Plains	6
City of Yonkers	3
Town of Cortlandt	3
Town of Yorktown	3
City of New Rochelle	2
Village of Tarrytown	2
Town of Harrison	2
Town of Mount Kisco	2
Town of Ossining	2
Town of Somers	2
Town of Bedford	1
Town of Eastchester	1
Village of Dobbs Ferry	1
Town of Mamaroneck	1
Village of Briarcliff Manor	1
Town of Rye	1
Village of Port Chester	1
Town of Scarsdale	1

Table 2 – Charging stations per municipality in Westchester County ^{70 71}

⁷⁰ Electric Vehicle Station Locator tool. NYSDA. Accessed February 15 2018

<https://www.nyserda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate/Charging-Options/Electric-Vehicle-Station-Locator>

⁷¹ Electric vehicle charging station tool. ARCGIS. Accessed February 20 2018

<https://www.arcgis.com/apps/webappviewer/index.html?id=4b65348487ac4c96ba3979acea748f13&extent=-8240339.3581%2C4994170.5636%2C-8178272.4912%2C5066556.4294%2C102100>

Electric Vehicle Ownership Barriers

The benefits of electric vehicles often have a price premium, and the acquisition of EV for private transportation is still not very competitive in terms of price and variety of models compared to internal combustion engines vehicles. As mentioned previously, batteries are a key-component in the EV cost, and as they become cheaper (lower \$/kW), the uptake of these vehicles will increase. Additionally, until the charging infrastructure has a higher proliferation, “range anxiety” will inhibit people to buy EVs. In the meantime, discounts, rebates and incentives in place are a positive push for early-adopters but large-scale adoption will need to see the industry becomes more competitive (i.e. electric vehicles achieving price parity with internal combustion engines) and more charging stations in place to achieve a significant uptake in EV ownership.

What are the program design options for EV proliferation?

To promote EV ownership, Westchester County can take advantage of current rebates and other incentive programs in New York State for EV acquisition and installation of charging infrastructure. Governor Andrew M. Cuomo’s Charge NY initiative is offering electric car buyers the Drive Clean Rebate of up to \$2,000 for new car purchases or leases. Combined with a Federal Tax Credit of up to \$7,500, and a portfolio of more than eligible 30 EV models to choose from, Westchester residents can go electric while enjoying competitive EV acquisition prices.⁷² Rebates and other incentive programs for homeowners and businesses to install chargers at a relatively low-cost are also available. New York State provides an income tax credit of up to \$5,000 for the purchase and installation of an EV charging station at commercial and workplace locations before 2022. The NYSDEC Municipal Rebate Program also provides rebates for the installation of public chargers.⁶¹

As discussed earlier, NYSERDA recently announced that the City of Rochester and five local organizations pledged to enhance access to electric vehicle charging stations,⁷³ and

⁷² “Its a great time to get an electric car in New York State”. NYSERDA. Accessed April 15 2018 <https://www.nyserdera.ny.gov/All%20Programs/Programs/Drive%20Clean%20Rebate>

⁷³ “NYSERDA Announces the City of Rochester and Five Local Organizations Sign Pledge to Enhance Access to Electric Vehicle Charging Stations”. NYSERDA. Accessed April 15 2018.

Westchester municipalities should develop pledges for the enhancement of access to EV charging stations. Given Sustainable Westchester's role as a facilitator, the program design below highlights the broader implementation roles and includes stakeholders, costs and benefits to the stakeholders, and project impacts.

PROGRAM DESIGN – EV OWNERSHIP

Example Project: 2018 Nissan Leaf for private use (City of New Rochelle)

Project Overview

- 2018 Nissan Leaf upfront cost **before incentives \$29,990**⁷⁴
- 30 kWh battery providing **151 miles of autonomy** ⁷⁵
- Based on Con Edison's utility tariffs in Westchester, average **\$46 increase in electricity bill**⁷⁶
- **80%** of the battery can be **charged in 30 minutes** using DC fast chargers⁷⁷
- Reduced maintenance costs for customer and **no oil changes and tune-ups** ⁷⁸

Project Team and Roles:

- **Sustainable Westchester**
 - Role: EV Promoter, Aggregator of EV incentives and benefits
 - 1 person staffed on marketing
 - Marketing campaign rollout is estimated to be 3 months.
 - Costs: Time and costs to pledge for EV proliferation among federal and state organizations, Time to consolidate and disseminate EV incentives and benefits to municipalities
 - Benefits: Advance EV proliferation, Reduce GHG emissions in Westchester
- **Municipality**
 - Role: Enable EV adoption, Facilitate charging infrastructure installation
 - Costs: Time to disseminate EV information to local organizations
 - Benefits: Advance local EV proliferation, Local GHG emissions reduction

Customer Incentives⁷⁹

<https://www.nyserda.ny.gov/About/Newsroom/2018-Announcements/2018-03-06-City-of-Rochester-and-Five-Local-Organizations-Sign-Pledge-to-Enhance-Access-to-Electric-Vehicle-Charging-Stations>

⁷⁴ WATT plan calculator. NYSDERDA, Accessed April 18 2018. <https://nyserda.wattplan.com/ev/>

⁷⁵ Ibid.

⁷⁶ Ibid.

⁷⁷ "Nissan turns over an electric Leaf". Wired. Accessed April 18 2018.

<https://www.wired.com/2009/08/nissan-electric-leaf/>

⁷⁸ Nissan Leaf Calculator. Nissan USA. Accessed April 18 2018

<https://www.nissanusa.com/vehicles/electric-cars/leaf/cost-calculator/>

⁷⁹ WATT plan calculator. NYSDERDA, Accessed April 18 2018. <https://nyserda.wattplan.com/ev/>

- **\$7,500** plug-in vehicle **federal tax credit**.
- **\$2,000** plug-in vehicle **state tax credit**.
- High Occupancy Vehicle lane access.
- Emission inspection exemption.
- Toll road discounts (Port Authority Green Pass Discount Plan).
- Up to \$5,000 income tax credit for 50% of the cost of alternative fueling infrastructure.
- 2 years of complimentary public charging (in specific locations). ⁸⁰

Customer Savings ⁸¹

- Estimated **\$4,800 savings over 5 years:**
 - Cost increase: \$7,000 in upfront cost; \$1,000 in resale value of the vehicle purchase.
 - Cost reduction: \$9,500 in incentives; \$2,600 in energy savings; \$700 in maintenance savings.

GHG Impacts

- **~7,100 pounds of CO2** GHG emissions avoided annually. ⁵
- Or the equivalent carbon sequestration of 3.8 acres of U.S. forest in one year. ⁸²

⁸⁰ Nissan Leaf Calculator. Nissan USA. Accessed April 18 2018

<https://www.nissanusa.com/vehicles/electric-cars/leaf/cost-calculator/>

⁸¹ Ibid.

⁸² GHG calculator. EPA. Accessed April 18 2018. <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

Electric Vehicle Ride-Sharing

Why is EV ride-sharing important for our target demographic populations?

Shared mobility services such as ride-sharing has seen explosive growth and market penetration in recent years. It is becoming one of the fastest growing forms of transportation in the New York area. In 2016 the average rides per day in New York from ride-hailing apps such as Uber, Lyft, Via, Juno, and Gett were around 304,000.⁸³ Due to the rapidly decreasing cost of batteries, strong policy and initiative support from state and local governments, low operational costs, and rising commitments from automakers, exponential growth is expected to continue with electrical vehicles and the amount of annual passenger rides they bring.⁸⁴

Studies show that “Ride-sharing programs are most useful in connecting areas that are not well served by public transit, or in bringing users to concentrated activity areas like employment centers or healthcare institutions.” (Kodransky & Lewenstein, 2014)

EV ride-share services represent a large opportunity for Sustainable Westchester to increase EV penetration within Westchester, attract third party investments into charging stations, and enable the Senior and LMI population to have a reliable mode of transportation.

Senior Population: A large amount of Westchester’s transportation system relies heavily on cars and for seniors that can prove to be a risk. Seniors with slowed reflexes and cognitive functioning can find driving a vehicle to be difficult or not possible; however, at the same time public transportation on trains and buses can be discouraging because of long rides, specific scheduling, and multiple transfers. Not having a mode of transportation that is accessible creates a lack of independent mobility for seniors leading them to miss daily activities, social interactions, and medical appointments.⁸⁵

⁸³ "Yellow Cab, Long A Fixture Of City Life, Is For Many A Thing Of The Past". 2018. Nytimes.Com. <https://www.nytimes.com/2017/01/15/nyregion/yellow-cab-long-a-fixture-of-city-life-is-for-many-a-thing-of-the-past.html>.

⁸⁴ O'Connor, Peter. 2018. "40% Growth? The Latest Electric Vehicle Sales Numbers Look Good". Union Of Concerned Scientists. <http://blog.ucsusa.org/peter-oconnor/electric-car-rolling-sales-numbers>.

⁸⁵ SNYDER, TANYA. 2018. "Uber, But For Grandma". The Agenda. <https://www.politico.com/agenda/story/2017/09/27/transportation-for-the-aging-population-000531>.

Many private sector transportation companies such as Uber and Lyft have begun to create the concept of a ride-share economy model and have recently recognized the potential and the necessity to address the growing senior population⁸⁶; however, there are a few barriers that hinder ride-sharing for seniors. According to a Pew Research Center Report, 42 percent of Americans over 65 own a smartphone,⁸⁷ which means that a ride-sharing mobile application-based solution will only be useful for less than half the senior population.

LMI: In the U.S., the poorest one-fifth of households spend 42 percent of their income on car ownership according to the Surface Transportation Policy Project (2005)⁸⁸, suggesting that an affordable ride-share program can help to free up income to be used on other important priorities.

Studies have shown that disadvantaged communities are disproportionately impacted by air pollution but have the least adequate access and options to cleaner technology due to lack of affordability. These neighborhoods are under-served for transit and mobility connections creating an inequality that limits people's access to economic, social, and educational opportunities. Research has also shown that longer commuting times make it harder for LMI families to move up in the income ladder.⁸⁹

What are examples of successful programs?

There are several pilot electric vehicles sharing programs deployed in the U.S. which are detailed in the following section. These pilot programs proved overall to be successful from an environmental and social perspective; however, the economics associated with emerging car sharing business model are still a challenge for large scale deployment. Key elements of success for these programs include access to public funding, financial incentives and favorable policies, access to reliable charging infrastructure, simplicity of tariffs (e.g. flat rate),

⁸⁶ "FACT SHEET: The White House Conference on Aging." The White House. Last Updated July 13, 2015. <https://obamawhitehouse.archives.gov/the-press-office/2015/07/13/fact-sheet-white-house-conference-aging>

⁸⁷ Anderson, Monica, and Andrew Perrin. 2018. "1. Technology Use Among Seniors". Pew Research Center: Internet, Science & Tech. <http://www.pewinternet.org/2017/05/17/technology-use-among-seniors/>.

⁸⁸ "What Is The STPP? - Surface Transportation Policy Partnership". 2018. Surface Transportation Policy Partnership. <http://transact.org/>.

⁸⁹ Bouchard, Mikayla. 2018. "Transportation Emerges As Crucial To Escaping Poverty". Nytimes.Com. https://www.nytimes.com/2015/05/07/upshot/transportation-emerges-as-crucial-to-escaping-poverty.html?_r=0&mtrref=www.opb.org.

ease of payment (e.g. online account for the EV sharing service is connected to the customer credit card), convenience of reservation (e.g. website or mobile application), and geographical market prioritization strategy focused on high density areas for the target population. Although some of these key elements were successful for the general population, a few can be seen as barriers. The key best practices and barriers seen from these case studies have been used to develop program designs for LMI and Senior EV rideshare deployment for consideration by Sustainable Westchester.

Illinois - EV ridesharing pilot for seniors

In Chicago, ComEd's utility partnered with the Bronzeville Community Development Partnership and Innova EV to launch a senior ride-sharing service that meet local community technology needs. The pilot is part of ComEd's Community of the Future initiative in Bronzeville, where it is collaborating with residents of the Chicago South Side neighborhood to explore how to leverage smart grid technology and related services to enhance everyday life of the community.⁹⁰

The pilot provides road transportation to residents of the TRC Senior Village in Chicago and drives them to various destinations, including pharmacies, grocery stores, banks, medical facilities, and public transit, among others. The service has a fixed rate fee of \$3 per ride for eligible residents and commutes can reserve up to one week in advance by calling dispatch and through a web-based reservation system.⁹¹ Innova EV Dash, a battery electric vehicle, is the vehicle of choice for this program. It has a range of 150 miles

“Our work with the Bronzeville Community continues to present an exciting opportunity for us to invest in people and technology to create a “community of the future” – connected, custom, affordable and sustainable” Melissa Washington, vice president of External Affairs and Large Customer Services for ComEd

⁹⁰ “ComEd using electric car ride-sharing program to examine energy use”. Chicago Tribune. Accessed April 15 2018

<http://www.chicagotribune.com/news/local/breaking/ct-met-comed-electric-cars-bronzeville-20171222-story.html>

⁹¹ “Comed revs up electric car service for Bronzeville seniors”. Comed. Accessed March 25 2018
<https://poweringlives.comed.com/comed-revs-up-electric-car-service-for-bronzeville-seniors/>

per charge of its lithium-ion battery and a maximum speed of 35 miles per hour. Dash vehicles are equipped with more than 40 built-in sensors that collect data about the cars' performance and ridership statistics.⁹² In early 2018, a five-passenger vehicle that is compliant with the American with Disabilities Act was added to the service.⁹³ Currently the drivers serving the program are residents of the neighborhood they serve and the expectation is to continue to support employment in the community as the program grows.⁹⁴

Lessons Learned:

- Much of the success of this sharing pilot program for the local senior residents of South Side Chicago can be attributed to the public funding made available and the partnership of key stakeholders - electric utility, local community organization and sustainable EV provider.
- The straightforward tariff structure of \$3 fixed rate per ride makes it very accessible for senior residents to understand the service costs and simplifies their decision process to use the service.
- The limited geographical scope of the program focused on the residents of the TRC Senior Village associated with frequent destinations such as local pharmacies, grocery stores etc. can leverage efficiency in the ride sharing service.
- The phone and web channels provided by this pilot to reserve or book a ride in advance provides convenience and universality to it.

California - EV shared mobility program for disadvantaged communities

The California Energy Commission granted in 2017 almost \$3 million to car sharing programs using electric vehicles in disadvantaged communities in the state.⁹⁵ The maximum grant for a

⁹² Innova EV Dash. Innova EV. Accessed April 15 2015

<http://www.innovaevcarshare.com>

⁹³ "Comed revs up electric car service for Bronzeville seniors". Comed. Accessed March 25 2018

<https://poweringlives.comed.com/comed-revs-up-electric-car-service-for-bronzeville-seniors/>

⁹⁴ "Comed launches electric car service for Bronzeville seniors". Comed. Accessed March 25 2018

https://www.comed.com/Pages/PageNotFoundError.aspx?requestUrl=https://www.comed.com/News/Pages/NewsReleases/2017_14_12.aspx

⁹⁵ "Calif. Funds EV ride-sharing in disadvantaged communities". Next-Gen Transportation News. Accessed March 25 2018

<https://ngtnews.com/calif-funds-ev-ride-sharing-disadvantaged-communities>

single agency, \$1.5 million⁹⁶, was awarded to Envoy Technologies. Envoy Technologies, which has a turnkey solution to implement closed and exclusive car sharing, e-bike and e-scooter sharing services for any size community⁹⁷, was awarded the grant to develop a pilot that positions electric vehicles and charging stations throughout low-income neighborhoods in the Bay Area and Sacramento. These communities also happen to be the most burdened by air pollution.^{98 99}

The goal of the pilot is to provide electric vehicles car sharing services at a minimal cost.¹⁰⁰ Members of the communities are able to reserve vehicles for either personal use or to earn income driving for delivery services such as Postmates, Grubhub and ride hailing companies like Uber and Lyft. Envoy partnered with ChargePoint for the installation of EV chargers.¹⁰¹

The major barriers that low-income residents face for car sharing services are cost, language and the need to use credit cards, which aren't always accessible to them. To overcome payment barriers, Envoy is working with consultants to help their mobile application work for people who don't have bank accounts. The company is also experimenting with different pricing and time limit schemes to find an approach that's profitable in under-served communities. Envoy plans to have 30 vehicles spread across 15 sites in San Mateo, San Francisco, Alameda and Contra Costa counties. The sites are still being selected.¹⁰²

Lessons Learned:

- Government grants can accelerate EV deployment and democratize the access to cutting-edge technologies and innovative business models. The California Energy

⁹⁶ "“Public ride-sharing, shuttle program: \$4 million in grants”.San Francisco Patch. Accessed April 15 2018 <https://patch.com/california/san-francisco/public-ridesharingride-sharing-shuttle-program-4-million-grants>

⁹⁷ “Company overview of Envoy Technologies Inc.”. Bloomberg. Accessed April 15 2018 <https://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=1105012>

⁹⁸ “Envoy Technologies awarded \$1.5M in funding from California Energy Commission ”Business Wire. Accessed April 15 2018

<https://www.businesswire.com/news/home/20170925005477/en/Envoy-Technologies-Awarded-1.5M-Funding-California-Energy>

⁹⁹ “Public ridesharing, shuttle program: \$4 million in grants”.San Francisco Patch. Accessed April 15 2018 <https://patch.com/california/san-francisco/public-ridesharing-shuttle-program-4-million-grants>

¹⁰⁰ “Calif. Funds EV ridesharing in disadvantaged communities”. Next-Gen Transportation News. Accessed March 25 2018

<https://ngtnews.com/calif-funds-ev-ride-sharing-disadvantaged-communities>

¹⁰¹ “Company overview of Envoy Technologies Inc.”. Bloomberg. Accessed April 15 2018 <https://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=1105012>

¹⁰² “California grant promotes EV car-sharing in low-income communities”. Government Technology. Accessed March 25 2018

<http://www.govtech.com/fs/transportation/California-Grant-Promotes-EV-Car-Sharing-in-Low-Income-Communities.html>

Commission awarded \$1.5 million for Envoy Technologies to deploy a pilot in disadvantaged communities in Bay Area and Sacramento. The goal of the grant is to demonstrate the use of electric vehicles in mobility services and increase population's awareness for clean technologies.

- Having the critical charging infrastructure in place is a key factor of success to EV programs. Investments in infrastructure should be planned according to current and predicted demand and consider interoperability considerations to avoid the risk of become a stranded asset.
- Easy and accessible payment processes for the target residents that will be using the service is key for the success of the program.

California - EV ridesharing pilot for low-income population (BlueLA)

A three-year pilot was launched in Los Angeles to make EV ridesharing available to lower-income population - BlueLA. The pilot is a partnership between Shared-Use Mobility Center, California Air Resources Board and the City of Los Angeles and has a goal of reducing greenhouse gas emissions and make new technologies available to disadvantage communities. Qualified low-income people can access BlueLA for 15 cents a minute or \$9 an hour compared to 80 cents per minute and \$48 an hour for non-members.¹⁰³

The pilot is funded with \$1.67 million from state cap-and-trade revenues and the expectation is that it will reduce annual greenhouse gas emissions by approximately 2,150 metric tons of CO₂. BlueLA was named to the Sustania100 list of the 100 most innovative urban sustainability projects in 2016.¹⁰⁴

Lessons Learned:

- Available funding is given to extend EV charging stations to disadvantaged communities promoting equitable access to cutting-edge infrastructure and

¹⁰³ "Programs bring electric cars to low-income people". USA Today. Accessed March 25 2018
<https://www.usatoday.com/story/money/cars/2017/06/20/programs-bring-electric-cars-low-income-people/102790350/>

¹⁰⁴ "Los Angeles EV car sharing pilot". Shared-use Mobility Center. Accessed March 25 2018
<http://sharedusemobilitycenter.org/la-ev-carsharing-pilot/>

technology. The community for this pilot is ranked within the top 10% most disadvantaged as determined by the California EPA.¹⁰⁵

- Provide affordable rates is key to the target the low-income population. Despite the fact that in this pilot the tariff is not flat it is simple to implement as it only depends on the duration of the usage of the service.

What are the program design options for EV ridesharing?

After analyzing current EV and charging stations incentives eligible in New York State, successful EV ride-sharing pilot programs for disadvantaged communities and the municipalities profile in Westchester county, there are three main guidelines this project recommends for designing a ridesharing program for LMI in Westchester. First, ensure access to grants that allow to subsidize the program and rides. Both EV pilots in California received funding of about \$1.5 million to setup the program and subsidize the rides - a fixed tariff of \$3 per ride (Envoy Technologies pilot) or \$9 per hour (BlueLA pilot). Secondly, through the municipality analysis, it is recommended that EV ride-sharing programs in Westchester be piloted in the City of New Rochelle and the City of White Plains. Programs in California and Illinois operate in selected villages and neighborhoods which enable ride-sharing service consolidation and potential economic benefits for the program (the pilot program for seniors in Illinois demonstrated that rides are typically done to and from local services such as pharmacies and grocery retail stores). Finally, a pilot for LMI in Westchester must accommodate flexible payment methods. Accepting cash payments along with credit card payments will allow for a larger market penetration. According to the 2017 Boston Federal Reserve data, 23.1 percent of the United States population do not have a credit card or charge card.¹⁰⁶

A ridesharing program for senior population of Westchester, in addition to the three main guidelines described above, should also provide on-line (web, app) and offline (phone)

¹⁰⁵ "Los Angeles EV car sharing pilot". Shared-use Mobility Center. Accessed March 25 2018
<http://sharedusemobilitycenter.org/la-ev-carsharing-pilot/>

¹⁰⁶ <https://www.creditcards.com/credit-card-news/ownership-statistics.php>

booking channels. The pilot for senior EV ridesharing in Illinois also offered a booking in advance service which has advantages in terms of service planning.

Electric Vehicles Ride-Sharing Incentives and Funding Sources

New York State and the Lower Hudson Valley region have ambitious goals for greenhouse gas reductions. To promote EV proliferation in Westchester County, municipalities are eligible to receive incentives through NYSERDA, Sparkfund, NYPA, GE and car manufacturers that do rebates on EV and charging stations.

- [EV Quick Charging Station Program](#)
- [Sparkfund - Funding Source](#)¹⁰⁷
- [New York State Alternative Fuel Vehicle Recharging Tax Credit](#)¹⁰⁸
- [Charge NY](#)¹⁰⁹
- [Municipal Zero-Emission Vehicle \(ZEV\) & ZEV Infrastructure Rebate Program](#)¹¹⁰
- [SmartCharge New York](#)¹¹¹
- [Drive Clean Rebate](#)¹¹²

In addition to funding for investments in infrastructure and EV fleet acquisition, long-term senior and LMI EV ride-sharing program sustainability is strongly linked to the service tariff. Considering that the EV ride-sharing program in Westchester County would target senior and LMI population, affordability is also a concern. These two forces under tension, service tariff and service affordability, can be resolved by accessing public funding from stakeholders, utilities, and municipalities, as shown by existing programs.

Sustainable Westchester should consider the following variety of funding and grant sources to coordinate EV ride-sharing services in specific municipalities:

- [Title III Older Americans Acts funds from the Administration on Aging](#)¹¹³

¹⁰⁷ <https://www.sparkfund.com/technology-subscription/>

¹⁰⁸ https://www.tax.ny.gov/pit/credits/alt_fuels_elec_vehicles.htm

¹⁰⁹ <https://www.nypa.gov/innovation/programs/chargenyc>

¹¹⁰ <http://www.dec.ny.gov/energy/109181.html#ZEV>

¹¹¹ <https://www.fleetcarma.com/smartchargenewyork/>

¹¹² <https://www.nyserda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate/How-it-Works>

¹¹³ <https://www.acl.gov/about-acl/older-americans-act-oaa#title3>

- [Medicaid funds for transporting Medicaid-eligible clients¹¹⁴](#)
- [Section 5311 rural public transportation funds¹¹⁵](#)
- [Funding from the municipalities served](#)
- [Municipality local property revenue](#)

Community based organizations have also an important role in the deployment of an EV ride-sharing program by having a direct connection with the targeted LMI and senior population and promoting the advantages of the program. In our interviews with Con Edison, Innova, Chevrolet and other stakeholders it become clear that partnering and engaging with local organizations is a critical factor for the program to succeed.

Potential Barriers and Design Considerations

From a ride-sharing perspective, most of the existing programs in the U.S. specifically for the LMI and senior populations are pilots. Financial constraints are obstacles prohibiting the deployment of electric vehicle ride-sharing programs. Necessary investments into electric vehicle charging infrastructure is costly undermining program viability as service affordability for the LMI and senior population is an important aspect. The success of existing LMI and senior ride-sharing programs are based on utility, municipality, or stakeholder funding. For example, Innova was able to pilot a ride-sharing program to a Bronzeville senior community due to Com Ed's "Community of the Future" plans. This programs funds and incentivizes innovative and sustainable products such as energy efficiency, smart grids, and a wide array of innovations that make residents lives easier. Innova was awarded a grant to make a ride-share program for seniors available acknowledging that this population lacked mobility services.

Partner Outreach

The team reached out to several community-based organizations to gauge interest in a potential ride-sharing program. One of those, United Hebrew of New Rochelle, is a 7.5-acre senior healthcare campus located in New Rochelle. The campus includes a nursing home, independent senior housing, assisted living facilities, home health care services and

¹¹⁴ <https://www.cms.gov/medicare-medicaid-coordination/fraud-prevention/medicaid-integrity-education/downloads/nemt-booklet.pdf>

¹¹⁵ <https://www.transit.dot.gov/rural-formula-grants-5311>

rehabilitation center. Senior housing options on campus offer residency for seniors who are 62 years of age or older, or those with mobility challenges, and income-qualified under the HUD guidelines. There are 167 senior residences on campus.

Director of Campus Facilities and Grounds at United Hebrew Robert Michael and has expressed interest in learning more about the electric vehicle ride-sharing program. According to him, of the senior residents living in the campus, 75 people own cars. For those who do not have cars, United Hebrew operates a small mini-van and bus to serve the campus. The transportation system is arranged by the Recreation Department's monthly calendar, and approximately 150 people use this transportation service to access the mall, casinos, local markets, baseball games, medical appointments and food shopping. United Hebrew sees a demand for more transportation options and a ride-sharing program. While United Hebrew is not interested in having on-site electric vehicle charging stations at this time, the organization would be interested in an electric vehicle ride-sharing if the program were offered at no charge for seniors as they have limited income.

Another community-based organization that was contacted was the Hugh A. Doyle Senior Center – a multi-services senior center serving the City of New Rochelle. The Center is open Monday through Friday from 8:30 a.m. to 4:30 p.m., and provides a range of social, educational, and recreational activities for seniors. The Center is operated by the New Rochelle Office for the Aging, which provides free, comprehensive services for New Rochelle seniors and their families.

Executive Director of New Rochelle Office For the Aging Phillis Maucieri and has shown deep interest in the electric vehicle ride-sharing program. The Center currently operates a 5-person Ford vehicle that serves seniors a few hours a day in the mornings and afternoons to provide transportation to supermarkets and medical trips. In addition, the Center has a 14-passenger vehicle to pick up seniors from their homes to transport them to the Center in the mornings and drop them off in the afternoons. There is a demand for more transportation option to serve seniors. The Center would be interested in learning more about an electric vehicle rideshare as the current vehicles consume a lot of gas.

Westchester Residential Opportunities, Inc. (WRO) is a community-based organization that has been working to improve the lives of Seniors and LMIs in Westchester County since 1968.

Their mission is to promote equal, affordable, and accessible housing opportunities. All the services they provide to their customers are free, and are funded by government grants, private contributions and corporate support.

The organization's Executive Director, Geoffrey Anderson, is open to talking to Sustainable Westchester about encouraging the use of clean technologies to their Senior and LMI clients. In regard to the proliferation of Electric Vehicles and the Electric Vehicles Ridesharing, they have agreed to be part of the marketing campaign, outreach and education to the demographics they work with. This means, they will provide information about the programs and post the information on their website targeting Seniors and LMIs.

Family Services of Westchester is a nonprofit agency with a staff of more than 450 professions that offer innovative services to meet the needs of children, teens, and adults. In addition, they offer services to seniors in their seven Family Centers in Westchester County. One of the services they provide is transportation through Ride Connect. Ride Connect is a transportation program that helps connect transportation providers with those in need, specifically, older adults, age 60 plus.

Eric Toth is the Vice President of Program Operations for Family Services and is interested in working with Sustainable Westchester on both EV proliferations and EV Ridesharing in Westchester county. Karen Ganis is the Director of Ride Connect, and she is specifically interested in providing additional ridesharing services to seniors. Since its launch in 2010, Ride Connect, has grown from about 200 rides/referrals to almost 16,000 in 2016. In 2017, they provided 17,000 services, 12,000 services were referrals to transportation options and 5,000 were volunteer transportation services. Unfortunately, Ride Connect is unable to provide an additional 130 rides a month on average due to lack of volunteers. Both Eric and Karen are interested in learning more about the programs Sustainable Westchester aims to provides to Seniors and LMIs.

SPRYE (Staying put in Rye and ENVIRONS) is a social networking services in Westchester County for residents by residents. The services and programs they provide support independent living for Seniors in the community. These services include: Transportation, Social and Cultural Program, Patient Advocacy, Technology and home Assistant. According to

their website, “Transportation is the most-frequently mentioned issue in our surveys and focus groups.”

Betti Weimersheimer is the director of SPRYE, and she is interested in learning more about the EV Ridesharing program. Currently, they provide rides to medical appointments, grocery shopping, and other critical errands. These services are provided by volunteer drivers. The drivers are trained to accompany the passenger into their destination when desired. SPRYE services are not free, they charge a yearly membership fee for up to two rounds of transportation a week. They charge associate membership an annual fee of \$190/individual; and \$250/household, household fees do not include rides or volunteer’s services. Full membership annual fees are \$375/individual; \$500/household. For transportation, full membership fees include rides to medical/dental appointment, essential errands, grocery shopping, hairdresser and to all SPRYE sponsored programs. Transportation is available Monday through Friday, 9 a.m. to 5 p.m.

Innova is one of the best-known project developers who have successfully piloted a program in the senior population for a shared, on-demand, zero-emission ride-share service. In this program, Innova opted for an end-to-end approach to the development of an EV car sharing program by providing vehicles, charging stations, routine maintenance, reservation system management, car documentation such as title, insurance, etc., and employing local residents to help build community involvement. Innova’s major first step was securing funding from a municipality or utility. Once funding was guaranteed, Innova extensively researched and interacted with the senior community to identify local needs and interests that could be delivered by its shared mobility service. Innova’s first pilot program saw results of ridership doubling within the first two months of deployment with a 20% of building residents currently subscribing to the program. They expressed a desire to create a relationship with Sustainable Westchester and evaluate a viability for extending their mobility EV ride-share program for the LMI and senior population in the County.

To deliver an electric vehicle ride-share program in Westchester, the first step is to secure funding. Following that, it is important to identify targeted LMI and senior housing complexes with limited mobility options that could be alleviate by this program. Sustainable

Westchester plays a key-role in this process by facilitating partnerships between public and private stakeholders interested in investing in the project and local communities.

The regions with the highest potential from the Municipality Analysis Matrix (see page 19) for this EV ride-sharing program to be deployed. The following municipalities were selected as recommended candidates for an EV ride-sharing program:

- City of White Plains
- City of New Rochelle
- City of Yonkers
- Village of Sleepy Hollow

Con Edison Partner List

Partner	About
Electric Vehicle Infrastructure Advisors LLC	Contact: connect@electricvia.com The Electric Vehicle Infrastructure Advisors team has been directly responsible for the deployment of hundreds of EV chargers at over 250 locations across America, including DC fast and Level 2 chargers. Their consulting services encompass every phase necessary for successful electric vehicle charging station deployment, from strategy to business development through execution. Our advisors can guide you through the entire process, or integrate with your team to perform a la carte tasks (see electricvia.com for services).
Oxygen Initiative	Contact: Mike Ferry mferry@oxygeninitiative.com Smart charging solutions for homes and businesses. Expertise in plug and charge, 15118 implementation, and utility electric vehicle charging programs.
IoTecha	Contact: gadi@iotecha.com IoTecha produces sophisticated hardware and embedded software for electric vehicle chargers and a complementary cloud-based software platform, which delivers a variety of services (e.g. grid integration supporting services, smart charging, remote charger monitoring, alerting and visualization, and remote firmware update) to multiple stakeholders. The charger module that we produce, sell, and deploy (to multiple charger vendors) supports, out of the box, multiple standard communication protocols (ISO/IEC 15118, OCPP 1.6J, SEP 2.0 and others) and the embedded Linux environment and powerful application processor enables many additional potential applications.

Village of Tuckahoe	Contact: 1-914-231-0214 Westchester community interested in adding charging stations at its train station and adding electric vehicles to its fleet.
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PROGRAM DESIGN – EV RIDE-SHARING

Private/Public Partnerships:

1. Sustainable Westchester should build a network of local needed partners to coordinate with.
 - a. Sustainable Westchester should start by contacting senior leaders of the organizations that are interested in the EV Ridesharing program such Innova and SPRYE. Each of the organizations provides specific technical support in launching the EV ridesharing program.
 - b. Because Municipalities and local governments are the most common partner for coordinated Senior and LMI transportation Sustainable Westchester should build a network of interested Private Organization, Constituents of Sustainable Westchester (the local government representatives), and Community Based Organizations. We have provided a list of organizations that are interested in establishing a ridesharing program for Seniors and LMI communities.
 - c. Other local partnerships should include the public transportation authorities, faith-based groups, local businesses, and welfare to work programs.
2. Secondly, Sustainable Westchester should coordinate with a third-party to develop a need assessment study to understand the LMI and Senior population transportation issues and needs.
 - a. In previous pilot programs the municipality and ride-sharing organization have done the needs assessment study. In this matter, Sustainable Westchester and Innova can help to understand the ride-sharing needs assessment within the municipalities but they should outsource fieldwork to an organization such as Fieldwork NY-Westchester to manage their focus group studies. Municipalities and organizations that are committed to Westchester ride-sharing might have trouble recruiting independent participants for focus group studies because they are committed to the issues at hand regarding their mission. Fieldwork NY-Westchester can offer a different perspective the systematic approach they have developed within the company.

- b. Fieldwork includes the following:
 - i. - Coordinate focus groups
 - ii. - Survey the community and find common destinations
 - iii. - One on one and group meetings with the community
 - c. Innova can work on the technical part of the study while SPRYE can provide participants for the Study; however, the lead of the focus group studies should be Fieldwork NY-Westchester.
- 3. Next, Sustainable Westchester should identify specific LMI and Senior population housing complexes in which an EV ride-sharing program would serve best.
- 4. Sustainable Westchester should then focus on securing funding streams for the EV ride-sharing program.
 - a. For Profit and nonprofit partners should work in collaborating with Sustainable Westchester on securing funds for the project as they have the expertise in doing so. Innova has secured \$3 million in the program they launched in Chicago. Additionally, Ride Connect and the Family Services of Westchester have obtained three secured grant renewals valued at over \$3 million for their transportation services.
 - b. This funding sources that are available for EV's and Ride-Sharing programs are:
 - i. - Federal and State Incentives
 - ii. - Utility Incentives
 - iii. - Local Government and Municipality Funding and Grants
- 5. Next, Sustainable Westchester should contact Innova and other potential EV ride-sharing stakeholders interested in partnering for the program.
 - a. Sustainable Westchester can certainly add to what they are already doing to promote EV Ridesharing. After the adoption of the program, Rideconnect can be one of the organization, responsible for promoting clean technology ridesharing in Westchester. They have been recognized by the Community Transportation Association of America as a "STAR Award" recipient. Additionally, have a contact list of clients interested in ridesharing program, most importantly, they provide 17,000 rides/referrals per year.
 - b. Secure Stakeholder Funding

- c. Katya Iwanik, Project Manager at Innova EV, expressed interest in connecting with Sustainable Westchester and the County's municipalities to explore a potential program for the region.
- d. Sustainable Westchester is currently in contact with Michael Mazur who is responsible for Business Development at Greenspot (michael@joininggreenspot.com). They are in negotiations on which locations to install charging stations and the funding and revenue allocation from the installed charging stations.

Overall, the steps above outline recommended steps Sustainable Westchester can take to support the implementation an electric vehicle ride-sharing program. As a facilitator and promoter of clean energy technologies, Sustainable Westchester should focus on bring the right stakeholders together who can implement a project like this that requires technical knowledge, outside funding, and infrastructure development. The example program design below discusses the roles, costs and benefits to each stakeholder, and example impact a successful electric vehicle ride-sharing program could have in Westchester County.

Example Project: Hugh A. Doyle Senior Center¹¹⁶ EV Ride-Sharing

Project Overview

- **2 Innova Dash Electric Vehicles**
- **1 Charging Station**
- Development cost of **\$300,000¹¹⁷**
 - **Charger**
 - **Car cost**
 - **Driver**
 - **Overhead costs**
- This building is not a commercial building but instead a daily senior center where residents of the town go for lunch, activities, classes, and social gatherings. 50 rides daily is the estimated use.
- **80% of the battery can be charged in 30 minutes¹¹⁸**

Project Team and Roles:

- Sustainable Westchester
 - Role: Project Sponsor, Coordinate Stakeholders
 - Costs: Time to coordinate parties, help design program
 - Benefits: Advances Sustainable Westchester's clean energy goals

¹¹⁶ <https://www.newrochelleny.com/453/Hugh-A-Doyle-Senior-Center>

¹¹⁷ <https://ece.osu.edu/news/2016/08/smartshuttle-program-receives-nsf-funding>

¹¹⁸ <http://www.innovaevcarshare.com/student-experience/>

- Municipality
 - Role: Help identify project sites, provide funding and grant opportunities
 - Costs: Time to provide oversight and gather community input on siting the program, time to analyze funding and grant opportunities, time to reorganize municipal budget allocations
 - Benefits: Advances municipality energy goals, Advances community benefits and mobility options
- Ride-Share Program Developer
 - Role: Project Developer - Design, Finance, provide vehicles and charging stations, manages car paperwork, oversee ride requests through mobile application and calls, manages reservation system, performs routine maintenance, program management
 - Costs: Time to develop and implement project, cost of vehicles, charging station, program manager, maintenance, and driver
 - Benefits: Opportunity for funding and grants, pilot tailored programs to senior population,

Community Impact

- New Rochelle has a population of **77,062 (15,792 Senior Citizens)**.
- 15,223 annual vehicle miles traveled per household

GHG Impacts

- **~7,100 pounds of CO2** GHG emissions avoided. ⁵

Community Solar

Some of the most common solar photovoltaic (PV) installation types, such as residential rooftop, commercial and industrial rooftop, and utility scale ground-mount installations, are well-known and have been implemented for decades. Notable early projects such as the first megawatt scale power station built in Hisperia, California by ARCO solar in 1982¹¹⁹. In 1993, Pacific Gas and Electric installed the first grid-supported solar PV system, and in 2001, Home Depot started selling residential solar PV systems in their stores. In recent years, a new solar PV concept, community solar, has increased in popularity to help fill a consumer need unmet by the existing installation types.

Community solar is a solar project where the electricity is shared by more than one household.¹²⁰ Community solar, also known solar gardens, shared renewables, or in New York, community distributed generation, allows customers to participate by subscribing a solar project and having credits from the electricity generated by the project applied to the customer's electric bill each month. Each community solar project has a sponsor who can be a private company or project developer that owns the project, organizes subscriptions, and coordinates with the local utility company that provides the distribution and grid services.¹²¹ The project coordinator handles the accounting for the project credits by providing the list of customers and the allocation of the net energy metering credits to the utility company to apply to each subscriber's monthly utility bill.

Community solar allows customers to overcome traditional barriers to rooftop solar, such as those who do not have the space to install rooftop solar (e.g., apartment owners), do not want to commit to the long-term investment of owning a rooftop solar system (e.g., home renters), or do not want the aesthetic or responsibility of install a rooftop system, by allowing the project to be sited in a suitable location within their utility zone.¹²²

¹¹⁹ "The History of Solar." U.S. Department of Energy. Accessed February 24, 2018. https://www1.eere.energy.gov/solar/pdfs/solar_timeline.pdf

¹²⁰ "Community solar: What is it?". EnergySage. Accessed March 14, 2018.

¹²¹ "Community Solar." NYSERDA. Accessed February 24, 2018. <https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Project-Developers/Community-Solar>

¹²² "Community Solar Options." NYSERDA. Accessed February 24, 2018. <https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Customers/Solar-Options/Community-Solar>

Community solar is different than purchasing energy from an Energy Services Company (ESCO) or Community Choice Aggregation (CCA). In New York, a CCA allows local governments to procure electricity for residents in the community through a shared purchasing model. While many of the same benefits are present, such as the opportunity to support clean energy development, potentially reduce customer costs, and support consumer supply choice, these projects are different than community solar.¹²³ The primary differences are that individuals actively subscribe to a specific community solar project and the benefits are credited to their bill with predictable rates. In a CCA, electricity is negotiated in bulk and purchased from the open market, and the entire municipality is signed up with individual consumers having an option to opt-out. Purchasing green power through an ESCO is another similar option with several key differences. This is typically done through the purchase of renewable energy credits (RECs) and is done as a premium on top of the existing utility bill. Another key difference is that procuring green electricity from ESCO will likely be sourced by an existing renewable system and may not have the same local benefits or help support the development of a new solar project.¹²⁴

What are the relevant community solar policies and incentives in New York?

In New York, there are policies that outline requirements for community solar projects. For example, subscribers must be in the same utility and NYISO zone to participate in a community solar project, and a project must have at least 10 subscribers. Westchester County is located with NYISO Zone I¹²⁵, so any community solar project in Westchester County could enroll subscribers within the County. Each individual subscriber must be allocated at least 1,000kWh annually and not exceed their historic annual average consumption.¹²⁶

¹²³ “Community Choice Aggregation.” NYSERDA. Accessed February 24, 2018. <https://www.nyserdera.ny.gov/All-Programs/Programs/Clean-Energy-Communities/Clean-Energy-Communities-Program-High-Impact-Action-Toolkits/Community-Choice-Aggregation>

¹²⁴ “Community solar: What is it?”. EnergySage. Accessed March 14, 2018. <https://www.energysage.com/solar/community-solar/community-solar-power-explained/>

¹²⁵ “New York Control Area Load Zones.” NYISO. Accessed March 14, 2018. http://www.nyiso.com/public/webdocs/markets_operations/market_data/zone_maps_graphs/nyca_zonemaps.pdf

¹²⁶ “Community Solar.” NYSERDA. Accessed February 24, 2018. <https://www.nyserdera.ny.gov/All-Programs/Programs/NY-Sun/Project-Developers/Community-Solar>

In terms of long-term valuation, the NY Value of Distributed Energy Resources (VDER) proceedings will have a large impact on how community solar projects are financed and credits are applied to subscribers. This is an evolving process and the outcomes will shape how community solar projects in Westchester are compensated. Most solar advocates and developers prefer a retail net metering arrangement for community solar projects, but the VDER proceedings are shifting towards a system that will compensate projects based on their wholesale energy value in addition to environmental and locational/transmission-based value added to the grid. The challenge of the developing VDER process is that has introduced financial uncertainty in projects, with the locational system relief value (LSRV) that utilities have calculated with large variances and potential to change every few years.¹²⁷

There are two ongoing cases as part of the VDER proceedings, with 15-E-0751, “In the Matter of the Value of Distributed Energy Resources,” and Case 15-E-0082, “Proceeding on Motion of the Commission as to the Policies, Requirements and Conditions For Implementing a Community Net Metering Program”

As of March 14, 2018, there have been 1,520 Public comments, 31 interested parties, and 265 filed documents with the DPS for Case 15-E-0082.

that have been ongoing since early 2015.¹²⁸ As part of the proceedings of the latter case, a collaborative working group has been established to evaluate low-income resident participating in community solar (see text box for information on participation in the working group¹²⁹). The first part of the community net metering focused proceedings focused on identifying locations where there would be the greatest locational benefits to the grid or could include at least 20% of project subscribers as low-income customers who are currently enrolled in existing utility low-income assistance programs¹³⁰. The map below shows the “Community DG Opportunity Zones” that Con Edison created for Westchester County. The

¹²⁷ John, Jeff St. “Why Solar Advocates Are Crying Foul Over New York’s Latest REV Order”. Green Tech Media. Last Modified September 19, 2017. <https://www.greentechmedia.com/articles/read/why-solar-advocates-are-crying-foul-over-new-yorks-latest-rev-order#gs.yenzIL4>

¹²⁸ “CDG Low Income.” NY DPS. Accessed March 14, 2018.

<http://www3.dps.ny.gov/W/PSCWeb.nsf/All/8A75B07F45E1672485257EDD00602D7C?OpenDocument>

¹²⁹ “Matter Master: 15-00348/15-E-0082.” NY DPS. Accessed March 14, 2018

<http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=15-E-0082&submit=Search+by+Case+Number>

¹³⁰ “Summary of the Collaborative Working Group Reports Regarding Community Distributed Generation for Low-Income Customers. NY DPS. Last Modified August 15, 2016.

[http://www3.dps.ny.gov/W/PSCWeb.nsf/ca7cd46b41e6d01f0525685800545955/8a75b07f45e1672485257edd00602d7c/\\$FILE/15-E-0082%20Low%20Income%20Collaborative%20Report%208-15-16.pdf](http://www3.dps.ny.gov/W/PSCWeb.nsf/ca7cd46b41e6d01f0525685800545955/8a75b07f45e1672485257edd00602d7c/$FILE/15-E-0082%20Low%20Income%20Collaborative%20Report%208-15-16.pdf)

second phase of the project focused on the larger utility service territory without the restrictions of the first phase.¹³¹

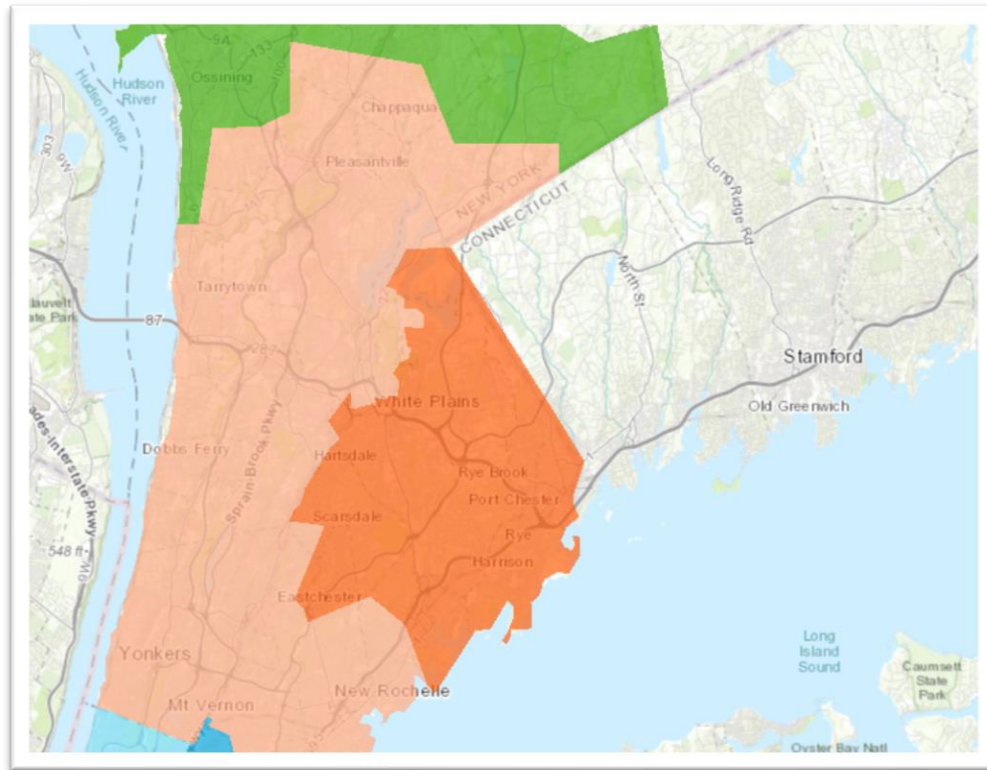


Figure 10- Community DG Opportunity Zones in Westchester County identified as priority areas in the first phase of development

In New York, there are several incentives to support the state's renewable energy and greenhouse gas reduction goals. Through the NY-Sun program, solar electric projects can receive financial incentives based on the project size and location.¹³² For community solar projects, a NY-SUN Participating Contractor can receive grants through the NY-SUN Incentive Program¹³³. The Commercial/Industrial MW Block Dashboard outlines the current incentive for projects greater than 200 kW based on the number of proposed/existing projects and region. For Con Edison, by which Westchester County is served, they are currently in Block 3 that opened on February 23, 2018. Incentives for this block include \$0.17/kWh

¹³¹ "Community DG Opportunity Zones. ArcGIS. Accessed March 14, 2018.

<http://www.arcgis.com/home/webmap/viewer.html?webmap=40f8947e9f2e4536bc546cc5e8e726d4&extent=-74.9425,40.4958,-72.9142,41.3353>

¹³² "Available Incentives." NYSEDA. Accessed March 14, 2018. <https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Customers/Available-Incentives>

¹³³ "Community Solar." NYSEDA. Accessed February 24, 2018. <https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Project-Developers/Community-Solar>

performance-based incentive (PBI) for kWh of generation over the first three years of the project and \$0.59/watt per capacity of the project.^{134 135}

Why is community solar important for our target demographic populations?

As discussed in the Introduction section on “How do these technologies address a need within Westchester County?” LMI and seniors have fixed or limited income and are price sensitive to fluctuations in utility prices since a higher percentage of their income is spent on utilities than other consumers. As discussed on page 5, many of the financial benefits of rooftop solar or community solar such as decreased electricity costs and predictable long-term electricity costs may not be available to these populations despite the potential magnified positive impact they would have on more economically vulnerable populations. For solar projects, both LMI populations and senior citizens may not be able to finance rooftop solar either due to a lack of capital or access to capital (e.g., loans) or living arrangement (e.g., multifamily housing) that does not permit rooftop solar.¹³⁶ While community solar can mitigate some of the traditional barriers to rooftop solar, many of the financing and access issues are present.

Many participants in the Community Net Metering case, including GRID Alternatives, Clean Energy Collective, the City of New York, and NRG Energy, noted the upfront costs of subscribing and an inability to access financing due to low credit scores as primary barriers. Another barrier that Grid Alternatives cited was the long-term return on the investment that may not be a priority for low income populations who may be more focused on short-term return on investment.¹³⁷

¹³⁴ “Block Incentives Commercial.” NYSERDA. Accessed February 24, 2018. https://nyserda-site.secure.force.com/BlockChart_Commercial_Page

¹³⁵ “NY-Sun Commercial and Industrial Incentive Program.” U.S. Department of Energy. Accessed February 24, 2018. <https://energy.gov/savings/ny-sun-commercial-and-industrial-incentive-program>

¹³⁶ “Affordable Solar Predevelopment and Technical Assistance.” NYSERDA. Accessed April 27, 2018. <https://www.nyserda.ny.gov/All%20Programs/Programs/NY%20Sun/Communities%20and%20Local%20Governments/Predevelopment%20and%20Technical%20Assistance>

¹³⁷ “Summary of the Collaborative Working Group Reports Regarding Community Distributed Generation for Low-Income Customers. NY DPS. Last Modified August 15, 2016. [http://www3.dps.ny.gov/W/PSCWeb.nsf/ca7cd46b41e6d01f0525685800545955/8a75b07f45e1672485257edd00602d7c/\\$FILE/15-E-0082%20Low%20Income%20Collaborative%20Report%208-15-16.pdf](http://www3.dps.ny.gov/W/PSCWeb.nsf/ca7cd46b41e6d01f0525685800545955/8a75b07f45e1672485257edd00602d7c/$FILE/15-E-0082%20Low%20Income%20Collaborative%20Report%208-15-16.pdf)

What are the design options?

Community solar projects can have various ownership, financing, and subscriber designs. The table below, from an NREL resource to support the development of community solar projects.¹³⁸

Administered By	Utility	Special Purpose Entity	Non-profit
Owned by	Utility or 3 rd party	SPE members	Non-profit
Financed by	Utility, grants, ratepayer subscriptions	Member investments, grants, incentives	Donor contributions, grants
Hosted by	Utility or 3 rd party	3 rd party	Non-profit
Subscriber Profile	Electric rate payers of the utility	Community investors	Donors
Subscriber Motive	Offset personal electricity use	Return on investment; Offset personal electricity use	Philanthropy
Long-term Strategy of Sponsor	Offer solar options Add solar generation (possibly for Renewable Portfolio Standard)	Sell system to host Retain for electricity production for life of system	Retain for electricity production for life of system

Figure 11 - The National Renewable Energy Laboratory overview of community solar structuring options.

¹³⁸ "A Guide to Community Solar: Utility, Private, and Non-profit Project Development." U.S. Department of Energy. Accessed March 14, 2018. <https://www.nrel.gov/docs/fy11osti/49930.pdf>

Within New York, the Community Distributed Generation program has three types of participants.¹³⁹ The host or project sponsor, who would take on the responsibilities for ownership, financing, and hosting in the table above. The satellites, or subscribers would own or contract a portion of the project. The local distribution company, which the case of Westchester County is

Con Edison's Shared Solar Pilot Program will utilize company property to install solar arrays to serve low-income participants at no cost. Con Edison estimates that the first phase of the project will cost about \$9 million to build 3 MW of solar in New York City and Westchester County. This program could serve up to 1,600 households and save each household up to \$60 annually on their energy bill.

Con Edison, would continue to provide electricity service and billing to customers. The most likely model would be a variant of the Special Purpose Entity description above. Regarding Con Edison's role, as detailed in the text box, there is a new program that offers some insights into a solar program design to serve low-income customers with clean energy. While this is not a community solar project, it does provide some an example of a creative solar program design leveraging non-residential rooftop space to serve the community¹⁴⁰.

At a state level, government incentives or subsidies for low-income subscribers or developers could reduce the initial cost barrier to entry, and direct grants and technical assistance from the state would also support projects (see text box). Overall efforts to streamline community solar projects and share data could reduce costs through the standardization of contracts, marketing, and financing models.¹⁴¹

In New York, one of the topics of discussion is a 20 percent participation goal for community projects to enroll LMI subscribers. It is unclear what the optimal LMI target percentage should be, how it would be enforced (e.g., verifying LMI status), and if it would be an ongoing requirement (e.g., if a customer drops and needs to be replaced). Setting a LMI threshold

¹³⁹ "Community Distributed Generation Procedural Requirements for Value Stack Customers." Con Edison. Accessed March 14, 2018. <https://www.coned.com/-/media/files/coned/documents/save-energy-money/using-private-generation/specs-and-tariffs/community-distributed-generation-procedural-requirements.pdf?la=en>

¹⁴⁰ "Con Edison To Make Solar Energy Available To Low Income Customers." Last updated August 2, 2017. Con Edison. <https://www.coned.com/en/about-con-edison/media/news/20170802-2/con-edison-make-solar-energy-available-low-income-customers>

¹⁴¹ "Summary of the Collaborative Working Group Reports Regarding Community Distributed Generation for Low-Income Customers. NY DPS. Last Modified August 15, 2016. [http://www3.dps.ny.gov/W/PSCWeb.nsf/ca7cd46b41e6d01f0525685800545955/8a75b07f45e1672485257edd00602d7c/\\$FILE/15-E-0082%20Low%20Income%20Collaborative%20Report%208-15-16.pdf](http://www3.dps.ny.gov/W/PSCWeb.nsf/ca7cd46b41e6d01f0525685800545955/8a75b07f45e1672485257edd00602d7c/$FILE/15-E-0082%20Low%20Income%20Collaborative%20Report%208-15-16.pdf)

could impact the project's financial viability and restricts the developer's flexibility to design and finance projects.¹⁴²

Focusing specifically on customer involvement, there are several financing options. In New York State, projects can be financed using a power purchase agreements (PPA) and leases where developers would sell power to customers at a defined rate to customer.¹⁴³ The rate could be defined as a flat per kWh rate (e.g., set rate that could be higher or lower than the utility rate) or a discount over the utility rate (e.g., a percentage or dollar discount on the utility tariff rate).¹⁴⁴ Loans are another option for funding community solar projects, however, this is less common due to the upfront costs of development and project ownership. Third-party ownership of community solar projects is common, and this helps reduce initial costs for customers, but often introduces the credit score or debt-to-income ratios that can prevent LMI participants from subscribing.

For any consumer in New York interested in signing up for community solar, the process of identifying potential projects to subscribe to can be challenging. Even for a consumer with high credit score, willingness to commit to longer-term contracts, and a good understanding of energy and finance terminology, the process is less than straightforward.

¹⁴²"Summary of the Collaborative Working Group Reports Regarding Community Distributed Generation for Low-Income Customers. NY DPS. Last Modified August 15, 2016.
[http://www3.dps.ny.gov/W/PSCWeb.nsf/ca7cd46b41e6d01f0525685800545955/8a75b07f45e1672485257edd00602d7c/\\$FILE/15-E-0082%20Low%20Income%20Collaborative%20Report%208-15-16.pdf](http://www3.dps.ny.gov/W/PSCWeb.nsf/ca7cd46b41e6d01f0525685800545955/8a75b07f45e1672485257edd00602d7c/$FILE/15-E-0082%20Low%20Income%20Collaborative%20Report%208-15-16.pdf)

¹⁴³"Summary of the Collaborative Working Group Reports Regarding Community Distributed Generation for Low-Income Customers. NY DPS. Last Modified August 15, 2016.
[http://www3.dps.ny.gov/W/PSCWeb.nsf/ca7cd46b41e6d01f0525685800545955/8a75b07f45e1672485257edd00602d7c/\\$FILE/15-E-0082%20Low%20Income%20Collaborative%20Report%208-15-16.pdf](http://www3.dps.ny.gov/W/PSCWeb.nsf/ca7cd46b41e6d01f0525685800545955/8a75b07f45e1672485257edd00602d7c/$FILE/15-E-0082%20Low%20Income%20Collaborative%20Report%208-15-16.pdf)

¹⁴⁴ "Community Solar: Pricing Models." Accessed April 15, 2018. Energy Sage.
<https://www.energysage.com/solar/community-solar/pricing-models/>

NYSERDA recently created a launched a new version of a tool called “Find Community Solar Near You”¹⁴⁵ that allows users to locate a community solar project within their NYISO zone, and for Westchester County there is only one project listed. Basic information about the project (such as its operation status, enrollment status, or project size) is not available on the site. Interested subscribers would need to contact the developer listed on the site to learn more about the project and signup. A related issue is an overall lack of a consolidated resource in terms of what

NYSERDA offers several assistance programs:

PON 3414 is accepting applications through August 31, 2018 and has \$4.4 million dollars available to provide “Affordable Solar Predevelopment and Technical Assistance” for multi-family affordable housing and community generated distribution.

The Solarize Your Community Campaign has been ongoing for several years. It helps homes and business in the same area go solar together through locally organized community outreach. Several Westchester Municipalities have participated, including ongoing efforts in Croton and Pelham.

projects are completed in an area. As recently as February 2018, the previous iteration of the NYSERA locator tool listed three community solar projects in development in Westchester County, but zero completed projects; however, an article published in March 2017 described two additional projects enrolling customers in Westchester that were not listed on either NYSERDA source¹⁴⁶ which raises a question of the comprehensiveness of the data on NYSERDA’s site. Since the NYSERDA map does not provide any information on pricing or enrollment, other sites hosting information like EnergySage and PowerMarket play a key role in engaging interested customers. For both of these sites, there is a lack of transparency in the pricing and contract terms. The next two figures show what an interested consumer would find if they searched for community solar projects in New York. The third figure in this set shows the sign-up form on Solarize Westchester’s site for interested community solar subscribers.

¹⁴⁵ “Find Community Solar Near You.” NYSERDA. Last Accessed April 14, 2018.

<https://www.nyserra.ny.gov/All-Programs/Programs/NY-Sun/Solar-for-Your-Business/Community-Solar/Community-Solar-Map>

¹⁴⁶ “PowerMarket community solar platform wants to bring ‘solar to everyone’.” Westfair Business Publications. Last updated March 2, 2017. <https://westfaironline.com/86293/powermarket-community-solar-platform-wants-to-bring-solar-to-everyone/>

Catlin Community Solar Farm
(Renovus Solar)



Renovus Solar constructed the first community solar farm in NY just a few short years ago. We are a local company, with more experience than any other solar firm in New York state, maintaining and optimizing community solar arrays.

Project Location: Catlin, NY

Customers Served: NYSEG customers in Central NY.

Catlin Community Solar Farm

Offer: Up to 100% offset of your electric bill depending on capacity.
Contract Type: Pay Upfront
More Info: Renovus offers an ownership-centric community solar model. You own your panels, and all the electricity produced by them. This energy is then credited directly to your utility bill, offsetting up to 100% of your cost.

Term Length: 25-year guarantee
Cancellation: No Cancellation Allowed

[Learn More](#)

Orange and Rockland Project
(NRG Energy)



Multiple community solar projects now available to all qualified residents in the counties of Orange and Rockland, New York. Sign up to lock in rates for the next 20 years.

Project Location: Orange and Rockland Counties, NY

Customers Served: Orange & Rockland (O&R) utility customers

New York Local Community Solar

Offer: Savings on electric bill
Contract Type: Fixed Rate + Escalator

Term Length: 20 years
Cancellation: Transfer Required

[Request Details](#)

Figure 7- EnergySage Community Solar Marketplace. Note the ambiguous cancellation terms and savings and cost implications¹⁴⁷

About the Project

Project Story

In the foothills of the newly renovated Kosciuszko Bridge now lies New York City's 1st large Community Solar project! The previously empty roof will allow households across the 5 boroughs to offset their ConEdison bill with credits generated from the The Queens Community Solar Project. Sign up for today to reserve a limit spot and support local, renewable generation right here in your home city.

Contract Details

CONTRACT TERM

As long as you live in NYC

CONTRACT TYPE

PPA

CANCELLATION FEES

\$0 if you move out of NYC

CANCELLATION INFO

Contract transferable to others

¹⁴⁷ "Find community solar projects near you." EnergySage. Accessed April 14, 2018. <https://www.energysage.com/community-solar/projects-companies/>

Figure 8- PowerMarket community solar listings. Note the unclear pricing structure and cancellation information. ¹⁴⁸

Solar Benefits for All

Community Solar allows all utility customers – homeowners, renters, businesses, non-profits and municipalities – to easily participate in solar regardless of their ability to install a solar array on their own property.

- SAVINGS ON YOUR ELECTRIC BILL
- NO solar installation on your property
- NO MAINTENANCE REQUIRED
- Support LOCAL RENEWABLE ENERGY

Community Solar Subscription Terms

Going Solar the Easy Way!

Sustainable Westchester's Community Solar for All program will provide subscribers with a range of subscription options. Our first project, Montrose Community Solar, offers the following:

- *Savings: 10% Discount on the value of bills credits received (e.g. you pay \$90 for \$100 of bill credits)*
- *Simple: No upfront fees. Pay only a discounted amount for the electricity credits you receive.*
- *Cancellation: No penalties or cancellation fees for any reason if you provide the required notice.*

Figure 9- Sustainable Westchester's "Community Solar for All" sign-up form¹⁴⁹

As shown in Figure 7 and Figure 8, there are varying types of information available regarding the terms, pricing, and contract fees all varied amongst the projects listed on EnergySage and PowerMarket's sites. The projects in the figures are not in Westchester County, but are indicative of the variety of sources providing information about community solar projects. In terms of projects in Westchester, Solarize Westchester recently listed the small pilot project at Montrose Community Solar project as shown in Figure 9, but an interested participant would need to provide contact information to begin the process of finding out if they could sign up. Whether it is from a state resource like NYSEDA, non-profit site like Solarize Westchester, or private company site such as EnergySage and PowerMarket, there is a lack of consolidated resources that would easily allow a user to sign up.

What are examples of successful programs in other states?

There are several community solar programs that have been successfully implemented around the United States that have been utility led. Overall, there has been success with community solar at rural electric cooperatives. Key elements for success include having strong customer engagement, excitement within the community, and strong partners that

¹⁴⁸ "Marketplace." PowerMarket. Accessed April 14, 2018. <https://thepowermarket.com/marketplace.html>

¹⁴⁹ Solarize Westchester. Accessed April 14, 2018. <http://www.solarizewestchester.com/community-solar/>

can bring the technical and sales expertise needed to implement a project. One of the primary elements that can negatively impact a project is confusing price structures, such as pricing by kW instead of kWh or including adjustment factors such as the utility's fuel adjustment factor.

There are also several elements that can have varied results on customers. For example, the term length and project visibility are both considerations that have been shown to have varying impacts. For some customers, term lengths that are relatively short, such as 5 years, or too long such as 20 years, may detract from customers subscribing. Different projects have also had varying feedback from customers based on the location and siting of the project – some customers want to be able to view the project and value a visible location, but this should not come at a cost that impacts the value to customers if cheaper land is available further away.¹⁵⁰ See the text box for more information on New York City's recent expansion of community solar programs which highlights the collaborative design of the project by bringing in multiple municipality, non-profit, and community stakeholders.¹⁵¹

In February 2018, New York City Mayor Bill de Blasio announced an expansion of the Solarize NYC campaign to the Brownsville (Brooklyn) neighborhood to help community solar purchasing in neighborhoods that have traditionally lacked access to clean energy. The NYC Solar Partnership, led by Sustainably CUNY, New York City Mayor's Office of Sustainability, and New York City Economic Development Corporation, will work with the Nehemiah Economic Development group and Brownsville community leaders to design and implement the program.

Minnesota

Minnesota has become the leading state in utility community solar with over a 120 MWs of deployed.¹⁵² In 2013, the community solar programs in Minnesota started in large part due

¹⁵⁰ "What makes a successful utility-led community solar program?" Utility Dive. Last Modified June 8, 2017. <https://www.utilitydive.com/news/what-makes-a-successful-utility-led-community-solar-program/442663/>

¹⁵¹ "Solarize NYC Expanded to Brooklyn Neighborhood." Environmental Protection. Last Modified February 27, 2018. <https://eponline.com/articles/2018/02/27/solarize-nyc-expanded.aspx>

¹⁵² "Top Community Solar States: Minnesota vs California, Massachusetts Colorado Community Solar." Energy Sage. Accessed February 24, 2018. <https://news.energysage.com/comparing-top-community-solar-states-minnesota-california-massachusetts-colorado/>

to influence by Fresh Energy, an independent clean energy non-profit, to shape policy that allowed for community solar projects to take form.¹⁵³ While the state had targeted 20 MW of community solar between 2013 and 2015, 430 MW were installed during this time period due to customer interest. Projects are credited at retail net metering. The text box below outlines a program in Minnesota focusing on low-income consumers.¹⁵⁴

Lessons Learned:

- Much of the success of Minnesota can be attributed to the state Public Utility Commission's emphasis on renewable energy and close collaboration with the utility, Xcel Energy, to facilitate a program that could easily enroll subscribers and also incentive community solar projects financially.¹⁵⁵ Minnesota has uncapped development of community solar programs, whereas some states will cap the program at a MW value such as Colorado.¹⁵⁶
- Grid transparency and access to information have allowed developers to have more insight into the community solar interconnection queue, and Xcel Energy also will help developers determine capacity infrastructure and load analysis studies to help developers site projects.¹⁵⁷

Colorado

Colorado is another leading state in community solar, and it leads the nation in the number of completed projects with 28 active community solar projects with 16 MW of installed

¹⁵³ "Xcel Energy's Community Solar Program Hits Major Milestones in Year 3." Green Tech Media. Last Modified December 21, 2017. <https://www.greentechmedia.com/articles/read/xcel-energy-community-solar-program-turns-three#gs.USL52Vw>

¹⁵⁴ "Minnesota community solar projects aimed at low-income subscribers." Energy News Network. Last Modified July 6, 2017. <http://midwestenergynews.com/2017/07/06/minnesota-community-solar-projects-aimed-at-low-income-subscribers/>

¹⁵⁵ "Top Community Solar States: Minnesota vs California, Massachusetts Colorado Community Solar." Energy Sage. Accessed February 24, 2018. <https://news.energysage.com/comparing-top-community-solar-states-minnesota-california-massachusetts-colorado/>

¹⁵⁶ "Why Minnesota's Community Solar Program is the Best." Institute for Local Self-Reliance. Last Modified March 13, 2018. <https://ilsr.org/minnesotas-community-solar-program/>

¹⁵⁷ "Xcel Energy's Community Solar Program Hits Major Milestones in Year 3." Green Tech Media. Last Modified December 21, 2017. <https://www.greentechmedia.com/articles/read/xcel-energy-community-solar-program-turns-three#gs.USL52Vw>

capacity¹⁵⁸. Projects are credited at retail net metering (minus transfer charge). Xcel Energy, the same utility company in Minnesota, is also present in Colorado and is helping lead the development of projects within the state. Colorado has legislation that requires 5 percent of electricity from community solar projects in the state to be set aside for low income participants to qualify for state RECs.¹⁵⁹ The text box below outlines a Colorado project's specific low-to-moderate income customer enrollment obligations and project development structure.¹⁶⁰

Lessons Learned:

- One of the key drivers of success in Colorado is the GRID Alternatives Colorado Program which helps build community solar projects specifically for low-income communities.¹⁶¹
- SunShare, one of the largest community solar developers, is based in Colorado and has worked closely with utilities in the state to encourage and attract subscribers.
- The complexity of state utility system, which is made of investor-owned, municipal, and cooperative utilities in the state, has led to varied policies and programs for community solar.¹⁶²

Massachusetts

¹⁵⁸ "Top Community Solar States: Minnesota vs California, Massachusetts Colorado Community Solar." Energy Sage. Accessed February 24, 2018. <https://news.energysage.com/comparing-top-community-solar-states-minnesota-california-massachusetts-colorado/>

¹⁵⁹ Bovarnick, Ben and Banks, Darryl. "State Policies to Increase Low-Income Communities' Access to Solar Power." Center for American Progress. Last Modified September 23, 2014. <https://www.americanprogress.org/issues/green/reports/2014/09/23/97632/state-policies-to-increase-low-income-communities-access-to-solar-power/>

¹⁶⁰ "Poudre Valley REA community solar project broadens access." Western Area Power Administration. Last Modified November 2017. <https://www.wapa.gov/EnergyServices/Documents/Nov17.pdf>

¹⁶¹ "Top Community Solar States: Minnesota vs California, Massachusetts Colorado Community Solar." Energy Sage. Accessed February 24, 2018. <https://news.energysage.com/comparing-top-community-solar-states-minnesota-california-massachusetts-colorado/>

¹⁶² "Top Community Solar States: Minnesota vs California, Massachusetts Colorado Community Solar." Energy Sage. Accessed February 24, 2018. <https://news.energysage.com/comparing-top-community-solar-states-minnesota-california-massachusetts-colorado/>

Massachusetts is a leader in solar deployments due primarily to strong state policies that allow for virtual net metering and an aggressive Renewable Portfolio Standard, and 70 MWs of community solar have been deployed. Massachusetts' community solar projects have primarily been driven by third party installers such as NRG, Clean Energy Collective, and Nexamp.¹⁶³ The Massachusetts

Solstice is a Massachusetts based non-profit focusing on developing community solar projects that are accessible to all of the population. They have focused on short-term contracts that allow for flexibility for LMI renters and reduce reliance on credit scores. Solstice also works with developers to ensure projects will be bankable and manages outreach and subscriptions.

Solar Massachusetts Renewable Target (SMART) policy has been taking shape and will likely begin in the summer of 2018 that will change the way solar is valued in the state and remove SRECs.¹⁶⁴

Lessons Learned:

SREC II Carve Out program provides additional incentives for community solar by allowing homeowners to sell credits from their electricity production which is uncommon for community solar projects in other states.

- In Massachusetts, the state supports LMI populations subscribe to community solar programs by providing loans and also allows lenders to offset their credit risk by using state-funded loan loss reserve accounts.¹⁶⁵ See text box for more information on Solstice's program design.¹⁶⁶

Partner Outreach

¹⁶³ "Top Community Solar States: Minnesota vs California, Massachusetts Colorado Community Solar." Energy Sage. Accessed February 24, 2018. <https://news.energysage.com/comparing-top-community-solar-states-minnesota-california-massachusetts-colorado/>

¹⁶⁴ "Solar Massachusetts Renewable Target (SMART): Massachusetts' SREC II replacement program." Energy Sage. Accessed March 14, 2018. <https://news.energysage.com/solar-massachusetts-renewable-target-smart-massachusetts-srec-replacement-program/>

¹⁶⁵ "Low- and Moderate-Income Solar Policy Basics." National Renewable Energy Laboratory. Accessed March 14, 2018. <https://www.nrel.gov/technical-assistance/lmi-solar.html>

¹⁶⁶ "Increasing Access Part II: Expanding Access to Community Shared Solar in Your Community." Metropolitan Area Planning Council. Last Modified June 28, 2017. http://www.mapc.org/wp-content/uploads/2017/12/Increasing-Access-Part-II-Master-Slide-Deck_06-28-17.pdf

Based on our research, many of the common themes and lessons learned from other states with leading community solar programs are state-specific. For example, much of the success in proliferation of solar in Minnesota can be attributed to the state's ambitious renewable energy targets and in Massachusetts can be attributed to the financial mechanisms the SREC program implemented by the Massachusetts Office of Energy Resources. Fortunately for Westchester County, New York State has ambitious renewable energy goals, progressive regulatory proceedings led by DPS, and an innovative and supportive State Agency, NYSERDA, to help provide technical guidance and financial support.

As briefly mentioned in the Community Solar Design Options section, given New York's energy market structure, any community solar project in the state would likely follow a third-party design. Since much of the state regulatory and incentive framework is established and out of Sustainable Westchester's direct influence (e.g., Sustainable Westchester cannot impose an RPS standard or create an SREC market), many of the overarching design considerations for a third-party will be based on existing state framework, but specific design elements will be greatly influenced by local governments, community-based organizations, and solar project developers. As highlighted in our call-out boxes in the Community Solar Case Studies section, community solar programs that have successfully enrolled LMI populations often have outside funding sources (e.g., Colorado grant to Grid Alternatives), creative financial structures minimize the importance of credit scores (e.g., Solstice in Massachusetts), and back-up subscribers and community support (e.g., Cooperative Energy Futures in Minnesota). Given the importance of community based organizations in reaching out to LMI and senior populations, in addition to the expertise of solar project developers with experience of working in New York's energy regulatory and market frameworks, we conducted outreach with organizations with experience developing projects in New York or handling community outreach to learn more about an optimal program structure Sustainable Westchester could follow to successfully implement a community solar program with significant senior and LMI enrollment.

Outreach focused on reaching solar experts that with expertise throughout the community solar project development process, such as the regulatory framework and incentives, project development and siting, and customer enrollment and community outreach. Organizations contacted include NYSERDA, Solarize Westchester, Solstice, SolarOne, UGE, Green Energy

Hybrid Solutions, and Venture Solar. Contact information for each of the organizations is provided in Appendix B.

Public Organizations

NYSERDA and Solarize Westchester are the two public organizations that were contacted. These organizations have expertise in solar and community solar operations and funding within New York state and Westchester County. NYSERDA aims to promote energy efficiency and renewable energy as a tool to reduce greenhouse gas emissions, promote economic growth and to provide cost savings on consumer energy bills. NYSERDA partners with stakeholders in New York state to help develop such projects through grants, private funding and technology sharing. With regards to promoting solar energy throughout the state, NYSERDA has the NY-Sun Residential / Small Commercial Incentive Program (PON 2112) or the block program that provides cash incentives or funding to residential and small commercial solar projects (<200 KW in Upstate and ConEd regions). There are additional incentives for households that qualify as LMI under this program. For LMI populations specifically, NYSERDA has the Affordable Solar Predevelopment and Technical Assistance (PON 3414) program which has \$4.4 million in total funding and provides up to \$200,000 for a single project that aims to reduce barriers for solar adoption to LMI populations residing in housing that is not served by traditional residential onsite solar. NYSERDA is also currently working on a program called “Solar for all” where NYSERDA will work with developers to get capacity from community solar for income eligible populations and will deliver subscriptions to these customers free of charge. This program aims to reduce the energy bill of LMI populations and is slated for implementation in the summer of 2018.

Solarize Westchester is a public-private partnership that aims to provide easier access to residential and commercial solar to homeowners and commercial property owners in Westchester County. They have helped run Solarize Your Community campaigns in 22 Westchester municipalities, and one of their key findings is that the majority of the residents who are interested in solar energy were not good candidates for installing rooftop solar due to roof constraints, financial limits, or non-ownership status (e.g., apartment renters). These campaigns provide two good resources for Sustainable Westchester in terms of community

solar development including (1) a contact list of residents interested in solar that did not install rooftop solar and (2) municipality contacts who supported the Solarize campaigns. Also, in our conversation with Solarize Westchester, it was learned that they launched sign-ups for a small community solar rooftop project for 20 customers on April 16, 2018 which will serve as a pilot project. In terms of LMI outreach, Solarize Westchester made a good point that materials should be available in multiple languages (e.g., Spanish).

Private Developers

UGE is one of the leading community solar project developers in New York. UGE handles the development of the community solar projects but outsource the community enrollment and sell the completed projects to a long-term asset holder. One the key first steps for UGE in developing a community solar project is securing the property and permitting. With the recent increase in community solar size limits from 2MW to 5MW in New York and overall attractive economic incentives, UGE have a strong desire to develop community solar projects in Westchester County. One of the biggest barriers to projects is finding the right communication channels to local decision makers and municipal governments to be able to permit community solar projects.

Venture Solar is another developer with expertise in New York City solar development, and it is currently developing a community solar project in Queens. Venture Solar noted one key challenge is working with the utility to get quick and cheap responses based on the interconnection application process and identification of any infrastructure needed on the utility side. Another challenge mentioned is maintaining subscriptions and long-term contracts in areas with lots of renters. Due to the challenges of customer engagement and subscription management, Venture Solar is considering using a third party to handle this aspect of the project. Overall, Venture Solar emphasized the importance of marketing to communities and making sure potential subscribers are well educated on how community solar works.

A third developer that were contacted is Green Hybrid Energy Solutions, which is based on Westchester County and developed one of the first community solar projects in Westchester

County. Green Hybrid Energy Solutions noted that some towns and municipalities can be harder to get permits for solar than others, but the overall trend of application standardization is helping with the permitting process. There are also unique restrictions on solar development in some towns, such as in Harrison, NY, where solar panels cannot face the street. Similar to UGE, Green Hybrid Energy Solutions uses a third party to handle subscription management.

Non-Profit Outreach and Education Organizations

Two organizations, which focus on community outreach and subscription management, with a goal of reaching traditionally underserved demographics, were contacted. Both Solstice and SolarOne have expertise working as educators to build community knowledge about community solar. Solstice works in a more traditional role, helping connect project developers with off takers, and it is usually brought into community solar projects after it has been permitted and construction has started. Solstice focus on grassroots style education and digital marketing to enroll underserved demographics and often partner with houses of worship, universities, housing organizations, and environmental groups. To specifically help with LMI populations that may not have sufficient FICO credit scores to enroll in some community solar projects, Solstice has partnered with Stanford and MIT to develop a new metric, EnergyScore that uses customer payment history and utility customer data to predict the likelihood for customers to default on utility bills. The EnergyScore metric allow for a more inclusive population to be eligible for community solar subscription that a less tailored financial metric such as FICO scores. Solstice is actively seeking project partners to help pilot the EnergyScore metric and would be interested in having a conversation with Sustainable Westchester about possible collaboration. SolarOne has an approach to community solar that is more focused on providing technical assistance to multi-family housing units. It works with non-profit organizations that provide affordable housing and supportive housing, so a natural partner for SolarOne would be Westchester based community development organizations or multi-unit housing providers.

While much of our online research identified numerous sources and discussions around LMI populations and community solar, there was little to no research available discussing

enrollment of senior populations in community solar programs. Both Solstice and SolarOne have experience working with senior citizens, and overall recommendations were focused on making sure the process of enrollment is straightforward and accessible. These organizations raised concerns that seniors may be more skeptical of programs offering guaranteed savings or that have enrollment fees since fraudulent operations frequently target senior populations. Moreover, many community solar programs handle enrollment online and require online banking information; therefore, seniors interested in enrolling need to be computer literate and comfortable providing financial information online.

Potential Barriers and Design Considerations

Based on our research and conversations, there are specific barriers that should be considered in the context of enrolling senior citizens and low-to-moderate income populations.

Senior Citizen and LMI Specific Barriers

- **Consumer education and outreach**
 - **Barrier** - There is a need for outreach and education on the benefits of community solar and how to enroll. There is also a need for communication regarding the obligations of signing up for community solar (e.g., term of an agreement) or risks with signing up (e.g., a fixed price that may end up being higher than the utility price).
 - **Potential Solution** – Sustainable Westchester can utilize solar enrollment organizations that specialize in outreach for community solar. Sustainable Westchester can also partner with housing non-profit organizations and Community Based Organizations to facilitate this outreach and better understand the best way to reach target audiences. Translated materials should be available.
- **Contract Length**
 - **Barrier** – Some community solar projects require long-term contracts (e.g., 20 years) and require subscribers to find replacements if they want to opt out of an agreement.

- **Potential Solution** – Sustainable Westchester could require project developers and subscription management partners allow customers the flexibility to cancel with no penalty or offer short-term contracts.

Additional LMI Specific Barriers

- **Credit Scores**
 - **Barrier** – Some customer enrollment organizations require a minimum credit score to enroll that excludes those with limited credit history or lower credit scores.
 - **Potential Solution** – Sustainable Westchester can utilize an organization such as Solstice and pilot their use of the EnergyScore metric that will reduce the barrier to entry that FICO scores may create. Another option would be to find a financial backer. As discussed in the Minnesota case study section, a local organization such as a faith-based organization that will offer to back-up subscribers if they were to default on their utility bill.
- **Sign-up fees**
 - **Barrier** – Some community solar projects require start-up costs as either part of an ownership/lease model or an upfront cost as part of a subscription model.
 - **Potential Solution** – Sustainable Westchester could require project developers and enrolment managers to utilize a subscription model with no up-front costs.

Senior Citizen Specific Barrier

- **Reliance on Technology and Exchange of Financial Information Online**
 - **Barrier** – Signing up for community solar requires a computer, online access, and the ability to identify and navigate to a legitimate and trustworthy community solar enroller. Often times it requires users to provide personal or financial information online, and senior citizens may be less comfortable providing this information online.

- **Potential Solution** – Sustainable Westchester could facilitate enrollment in-person at community events or by working with Community Based Organizations to facilitate enrollment at housing centers.

PROGRAM DESIGN – COMMUNITY SOLAR

For community solar to be deployed in Westchester County, there are two primary routes that Sustainable Westchester could help facilitate: 1) private development of large projects that are ground-mount solar installations and sited on public or private land or 2) public/private partnerships developing projects on government property or buildings.

It is our recommendation that both options are pursued since they are not mutually exclusive and could be synergistic in terms of coordination with developers and community outreach organizations. Based on the Municipality Analysis Matrix (on page 19), Sustainable Westchester should start work with municipalities who have high numbers of the targeted demographics and have expressed interest in similar clean energy initiatives before. The following municipalities, which received higher score in the Municipality Analysis Matrix, are identified as the first round of community solar partners:

- City of White Plains
- Town of Bedford
- Town of Mamaroneck
- Town of Ossining
- Town of Somers

Option 1: Private development of large projects on private land that are ground-mount solar installations

1. The first step for Sustainable Westchester should be to identify the individuals at each municipality who can assist with community solar project siting and permitting. Ideally, Sustainable Westchester can utilize existing resources through Sustainable Westchester's partnership with Solarize Westchester and the work that is being led by Solarize Westchester's staff to develop a pilot community solar project. Private developers will need to do preliminary site research and outreach to private land owners to identify candidate sites. After candidate sites are identified, then the permitting process can begin.

- As learned through conversations with UGE, one of the primary barriers for private development of community solar projects is getting the land permits since ground mounted solar is typically not considered in the standard zoning process.
 - Green Hybrid Energy Solutions noted that some towns can be more challenging to get permits for than others in Westchester County and some towns have specific regulations that restrict project siting such as limitations on proximity to roads. They also noted that there is a general movement towards easing the permitting process through the New York Unified Solar Permit, however, this permit is only for installations 25 kW or smaller.¹⁶⁷
2. The second step should be for Sustainable Westchester to connect interested municipalities with solar developers.
- Each of the contacts at solar developer companies were interested in working with Sustainable Westchester and interested Westchester municipalities to discuss community solar project siting and development.
 - Brandon Jacobs, Business Development Manager at UGE
 - Alex Glover, VP of Sales at Green Hybrid Energy Solutions
 - Brandon Davis, Commercial Business Developer at Venture Solar
3. The third step should be to identify community solar subscription carve-out goals for LMI and senior populations. If Sustainable Westchester moves forward with one of the recommended municipalities, there will be a high number of LMI and seniors for the community solar subscribers to reach out to. The goal or target carve-out will likely be a negotiation with the private developers. While Sustainable Westchester should consider as high of a target as possible (e.g., 100% LMI or senior), this decision will influence the attractiveness of the project to the private developer and subscription management team since a stricter goal could lead to more work done by the private entities to fully subscribe the project (due to a limited population).
- Based on the rollout of other programs (e.g., Grid Alternatives project in Colorado with a goal of 700kW of the 1,962kW project being set aside for LMI

¹⁶⁷ “Unified Solar Permit.” NYSEDA. Accessed April 15, 2018. <https://www.nyserda.ny.gov/-/media/Files/Programs/Clean-Energy-Communities/CEC-Unified-Solar-Permit-Step-by-Step-Guidance.pdf>

populations) or other goals discussed within New York (e.g., 20% enrollment of LMI populations), a numerical goal should be established to enroll LMI and senior populations.

4. The fourth step should be to identify enrollment specialists and community outreach organizations with goals that align with Sustainable Westchester that partner with project developers like UGE. Since the project will be privately developed (with municipal oversight in terms of permitting), the partnership between the project developer and subscription managers can be handled on an individual project basis. Given Sustainable Westchester's role as a facilitator and influencer at the municipal government level, Sustainable Westchester should be able to provide recommendations and influence the partnership process so that a subscription manager with LMI and senior population outreach experience would be highly valued.
 - Based on conversations with Solstice and SolarOne, both of these organizations partner on community solar projects to help make them accessible to all populations and are interested in working with Sustainable Westchester. These organizations have the expertise and the goal of making projects available to LMI and senior populations. A third organization that handles community solar subscription management and has been mentioned by multiple parties throughout our outreach is Project Economics. However, it was difficult to get in contact with them and their focus seems to be on software development to manage community solar subscriptions and have no stated focus on LMI or senior population outreach like Solstice and SolarOne.
5. The fifth step, which should be considered as an ongoing step, is coordination with state organizations like NYSERDA. There are several relevant funding opportunities interested municipalities should apply for including PON 3414 is accepting applications through August 31, 2018 and has \$4.4 million dollars available to provide "Affordable Solar Predevelopment and Technical Assistance" for multi-family affordable housing and community generated distribution. Many incentives would be received by the project developer, such as the Con Edison Production Based Incentive discussed in the "What are the relevant community solar policies and incentives in New York?" section. While Sustainable Westchester will not be receiving

this incentive, the incentive is a key financial aspect of community solar developers being able to offer discounts on utility bill costs to customers.

Option 2: Siting projects on government property or buildings

1. The first step should be for Sustainable Westchester to identify individuals at each municipality responsible for government building operations and public housing. Sustainable Westchester can work with its constituent members to identify large municipal buildings that could be the site for rooftop solar. While these projects would be smaller compared to a ground-mount system, if the community solar project is sited on a municipality-owned building, then the municipality can take more ownership and define the project.
 - Based on our conversation with SolarOne, one of the unique ways that municipalities can serve the community and leverage existing assets is to open up suitable roof-space or open municipal land to community solar development. Given the challenges of siting and permitting projects outlined in the previous section, this could streamline the siting process. They also stressed on the importance of having multiple financing options, as in their experience, this is the key to making solar projects work.
2. The second step should be for Sustainable Westchester to connect interested municipalities with an organization like SolarOne that can provide preliminary site assessments, help develop RFPs, and assist in the selection of engineers and contractors.
 - Similar to projects completed as part of the Solarize Westchester campaigns, there are funding resources (e.g., NYSERDA) or non-governmental organizations/non-profits willing to partner and provide leadership to guide this process.
3. The third, fourth, and fifth steps would be similar to the previous option – identification of enrollment goals and identifying enrollment and outreach organizations.

Overall, these steps provide recommended steps for Sustainable Westchester to take. Since Sustainable Westchester will not take on the role of project design and construction, subscription management, or permitting, the steps above highlight the recommended approach for convening the key parties that can take a community solar concept and turn it into an implemented project. The process of Below is an overview of an example project that highlights the roles, costs and benefits associated with each role, and projected project impacts.

Example Community Solar Project: 2MW Ground-mount project on private land (City of White Plains)

Project Overview

- **2MW** ground-mount solar on **12 acres** of land (~1MW per 6 acres of land)¹⁶⁸
- Development cost of **\$6-8 million before incentives**¹⁶⁹
- **~2,500,000 kWh** generated annually¹⁷⁰ to reach approximately **200-400 households**¹⁷¹

Project Team and Roles:

- **Sustainable Westchester**
 - Role: Project Sponsor; Stakeholder Coordinator
 - Costs: Time to coordinate parties and help design program
 - Benefits: Advance Sustainable Westchester's clean energy goals
- **Municipality – City of White Plains**
 - Role: Facilitate permitting; help identify project sites
 - Costs: Time to provide oversight and gather community input on permitting and siting the project
 - Benefits: Potential income if they lease roof space or municipal land; local clean energy development
- **Solar Developer**
 - Role: Project Developer (Design, Permit, Finance, Construction)
 - Costs: Time and money to develop and implement project; cost of leasing project site
 - Benefits: Opportunity for NYSERDA funding; project will be developed only if profitable
- **Subscription Manager**

¹⁶⁸ "Introduction to Community Solar." NYSERDA. Last updated November 17, 2017. http://www.gflrpc.org/uploads/5/0/4/0/50406319/community_solar_training_11.17.17.pdf

¹⁶⁹ Ibid.

¹⁷⁰ "Solar Resource Data". NREL. Last Accessed April 17, 2018. <http://pvwatts.nrel.gov/pvwatts.php>

¹⁷¹ Ibid.

- Role: Customer education and enrollment; Coordination with Con Edison; Accounting of billing credits
- Costs: Time to communicate and enroll customers; time to manage subscriptions and replace subscribers who are delinquent on payments
- Benefits: Opportunity to recoup costs of outreach from Solar Developer; opportunity to further mission of clean energy access for all
- **Customers – Westchester Residential Opportunities**
 - Role: Outreach to community solar subscribers
 - Costs: No capital costs, minimal time required to facilitate contact with Subscription Manager to residents
 - Benefits: Reduced utility bill costs for subscribers, support local clean energy development

Population Impact

- City of White Plains has a population of **57,925 (23,170 LMI and 4,624 Senior Citizens)**.
 - If average household in Westchester is 2.8¹⁷², could reach **~560-1,120 individuals**.
 - If the target population carve-out is 20%, would reach approximately **112-224 LMI or Senior Citizens**.

Utility Bill Impacts

- Typical household consumption is 6,000 kWh¹⁷³
- Based on Con Edison's utility tariffs in Westchester, **annual cost would be \$1,730**.¹⁷⁴
- Savings of 10% compared to utility bill would yield **savings of \$173 per year**

GHG Impacts

- Replacing 2MW of typical grid GHGs with solar would **eliminate ~1.6M lbs. CO2**¹⁷⁵

¹⁷² "Households and Families." Westchester County. <https://planning.westchestergov.com/households-and-families>

¹⁷³ "Patterns and Trends." NYSEDA. Last Updated October 2015. <https://www.nyserda.ny.gov/-/media/Files/Publications/Energy-Analysis/1999-2013-Patterns-Trends.pdf>

¹⁷⁴ "CECONY Average Monthly Westchester Residential Bills." Con Edison. Last Accessed April 17, 2018. https://www.coned.com/_external/cerates/documents/average_monthly_electric_bills.pdf

¹⁷⁵ https://www.epa.gov/sites/production/files/2018-02/egrid2016_data.xlsx

APPENDIX

A. Community-Based Organization Outreach Results

APPENDIX A: COMMUNITY-BASED ORGANIZATION OUTREACH SUMMARY

1. **Organization Name:** [Westchester Residential Opportunities, Inc.](#)

Primary Location: City of White Plains (serves the entire Westchester County)

Contact Name & Title: Geoffrey Anderson, Executive Director of Westchester Residential Opportunities

Technology of Interest: Community solar, electric vehicle, electric vehicle ride-sharing

Outreach Summary:

- Most landlords pay electric and gas bills, and they might be interested learning more about community solar.
- Many residents currently partake in paratransit to go to senior centers, doctors' office, etc. Some residents own vehicles.
- The organization is willing to post information about the three technologies on the website and incorporate into its outreach and education materials for seniors.

2. **Organization Name:** [United Hebrew](#)

Location: City of New Rochelle

Contact Name & Title: Robert Michael, Director of Campus Facilities and Grounds

Technology of Interest: Community solar, electric vehicle rideshare

Outreach Summary:

- Of the senior residents living in the campus, 75 people own cars. United Hebrew offers a small mini-van and bus to serve the campus. 150 people use the transportation to access the mall, casinos, local markets, baseball games, medical appointments and food shopping. The transportation system is run through the Recreation Department's monthly calendar, on call. There is a demand for more transportation.
- There is a demand for a ride-share program. It is a great concern for liability. United Hebrew would be interested in an EV ride-share program if the program were free. These people have limited income.
- United Hebrew is not interested in having on-site EV charging station at this time.
- Seniors who live in the Section 8 HUD building pay their own electric and gas bills. They are afforded a utility allowance. While the senior residents may not be interested in community solar, United Hebrew is interested in learning more about it.

3. **Organization Name:** [Hugh A. Doyle Senior Center](#)

Location: City of New Rochelle

Contact Name & Title: Phillis Maucieri, Executive Director of [New Rochelle Office For The Aging](#)

Technology of Interest: Electric vehicle ride-share

Outreach Summary:

- The Center is very interested in electric vehicle ride-share because the current vehicles consume a lot of gas.
- The Center currently transports about 35 seniors from and to the Center during the day. Current vehicles include the following:
 - (1) 5-person Ford vehicle, which operates a few hours a day in the mornings and afternoons to provide transportation to supermarkets and medical trips
 - (1) 14-passenger vehicle, which operates in the morning to pick up seniors from their homes to the Center and drop them off in the afternoon.
- There is a demand for more transportation option.
- The Center does not have an EV charging station but has on-site parking.

4. **Organization Name:** [SPRYE \(Staying Put in Rye & Environs\)](#)

Primary Locations: Town/Village of Harrison, Village of Port Chester, City of Rye and Rye Brook

Contact Name & Title: Betti Weimersheimer, Director of SPRYE

Technology of Interest: Electric vehicle rideshare

Outreach Summary:

- The organization provides transportation for seniors through the help of volunteers, help transport seniors to medical appointments, grocery shopping, etc. Volunteers use their own vehicles and they are individualized.
- There is a yearly membership fee, covering up to two rounds of transportation in a week. There is no payment option for the volunteers.
- They have 120 members, and about 50 or 60 people use the current ride-share program regularly.
- Volunteers are also available to help with mobility and health issues.

5. **Organization Name:** [Family Services of Westchester \(FSW\)](#)

Primary Location: Based in Village of Port Chester (serves the entire Westchester County)

Contact Name & Title: Eric A. Toth, Vice President of Program Operations

Technology of Interest: Electric vehicle rideshare

Outreach Summary:

- In 2017, they provided 17,000 services. Of these, 12,000 to or 13,000 were referral to other services.
- Most the organization's work have been in the north of the Country where there is less transportation options.
- The organization provides a ride-share system, which is volunteer-driven. Because the system is dependent on the availability of volunteers, ride-share is not always available to seniors.
- Volunteers can log into a database. Seniors have access to the system as well.
- The organization thinks seniors will be interested in the three technologies if offered at a right price.
- The organization is willing to advertise community solar if it decreases the cost of living for seniors in Westchester.

6. **Organization Name:** [RideConnect \(a program of FSW\)](#)

Primary Location: Based in Mount Kisco (serves the entire Westchester County)

Contact Name & Title: Karen Ganis, Director of RideConnect

Technology of Interest: Electric vehicle rideshare

Outreach Summary:

- The organization provides 100% free service due to the regulation. Overall, there are about 10,000 rides around Westchester. The organization is currently unable to provide an average of 130 additional rides per month because of the lack of volunteers.

B. Community Solar Contacts

- Brandon Davis, Venture Solar (347-377-2580)
- Noah Ginsburg, SolarOne (noah@solar1.org)
- Alex Glover, Green Hybrid Energy Solutions (info@ghessolar.com)
- Taro Gold, Solstice (taro@solstice.us)
- Brandon Jacobs, UGE (brandon.jacobs@ugei.com)