A close-up photograph of the side of a light blue Ford electric vehicle. A white charging cable with a black handle is plugged into the charging port, which has a silver circular cover. Below the port is a silver multi-spoke wheel with a Ford logo in the center. Further down the side of the car is a silver 'ELECTRIC' badge with a green and blue leaf-like graphic at the end. A dark blue rounded rectangle is overlaid on the right side of the image, containing the title text.

Central New York Electric Vehicle Charging Station Plan

Central New York EV Charging Station Plan



PREPARED BY:



Central New York Regional Planning & Development Board



IN COLLABORATION WITH:



WITH SUPPORT FROM:



NYSERDA

Department of
Transportation

May 2016

NOTICE

This report was prepared by Energetics Incorporated, Central New York Regional Planning and Development Board, and Clean Communities of Central New York (hereafter referred as the “contractor”) in the course of performing work contracted for and sponsored by the New York State Energy Research and Development Authority (hereafter “NYSERDA”). The opinions expressed in this report do not necessarily reflect those of NYSERDA or the State of New York, and reference to any specific product, service, process, or method does not constitute an implied or expressed recommendation or endorsement of it. Further, NYSERDA, the State of New York, and the contractor make no warranties or representations, expressed or implied, as to the fitness for particular purpose or merchantability of any product, apparatus, or service, or the usefulness, completeness, or accuracy of any processes, methods, or other information contained, described, disclosed, or referred to in this report. NYSERDA, the State of New York, and the contractor make no representation that the use of any product, apparatus, process, method, or other information will not infringe privately owned rights and will assume no liability for any loss, injury, or damage resulting from, or occurring in connection with, the use of information contained, described, disclosed, or referred to in this report.

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Input to the Central New York EV Charging Station Plan was provided by these sponsors and supporters, along with other key stakeholders in the region. Members of this working group which reviewed, ranked, and provided feedback on all aspects of this plan included:

- Adam Ruder, NYSERDA
- Robyn Marquis, NYSERDA
- Colleen Smith-Lemmon, NYSDOT
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- Brian Pincelli – USGBC Upstate NY Chapter
- Sarah Stephens – Synapse/Clean Communities Board
- Lauren Staniec – Pyramid/Clean Communities Board
- Sean Vormwald – Onondaga Community College Sustainability
- Jon Rauscher – City of Oneida Engineering
- John Zepko – Cayuga County Department of Planning & Economic Development
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- Sam Gordon – Town of Dewitt Planning
- Jim D’Agostino – SMTC Director
- Mario Colone – SMTC
- Chris Gorman – National Grid
- Rick Martin – Syracuse University Energy Systems & Sustainability Management
- Mark Lichtenstein – SUNY-ESF Sustainability
- Ken Elander – Burdick Motors
- Daniel Bennett – Graystone GCMS Inc.
- David Holder – Syracuse Convention & Visitors Bureau



Anheuser-Busch Brewery in Baldwinsville installed an AC Level 2 charging station for its employees.



Central New York EV Charging Station Plan

TABLE OF CONTENTS

Executive Summary	1
Overview	3
Background.....	5
Electric Vehicles	5
EV Charging Infrastructure.....	8
Current EV Landscape.....	14
Recommendations for Additional EV Infrastructure	18
DeWitt.....	19
Syracuse.....	23
Clay	27
Camillus.....	29
Fayetteville.....	31
Other Potential Level 2 Charging Station Installation Locations.....	33
DC Fast Charging Infrastructure	34
Recommendations for Community EV Readiness.....	35
Barriers and Solutions.....	37
Car Dealership Support.....	37
Vehicle and Charging Station Costs	37
Zoning Rules.....	38
Educating potential EV owners.....	38
DC Fast Charging Stations	38
Appendix A: EV Models Available in NYS	39

LIST OF ACRONYMS

AC	Alternating Current
BEV	Battery Electric Vehicle
CNY	Central New York
CNYRPDB	Central New York Regional Planning and Development Board
DC	Direct Current
EREV	Extended Range Electric Vehicle
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
HEV	Hybrid Electric Vehicle
ICE	Internal Combustion Engine
kW	KiloWatts
kWh	KiloWatt Hours
MPG	Miles Per Gallon
MPO	Metropolitan Planning Organization
MSRP	Manufacturer Suggested Retail Price
NYC	New York City
NYS	New York State
NYSDOT	New York State Department of Transportation
NYSERDA	New York State Energy Research and Development Authority
SAE	Society of Automotive Engineers
SMTC	Syracuse Municipal Transportation Council
SUNY	State University of New York
PHEV	Plug-in Hybrid Electric Vehicle
VAC	Volts of Alternating Current
ZEV	Zero Emission Vehicle





Central New York EV Charging Station Plan

Executive Summary

This EV Charging Station Plan assesses Central New York's current support for electric vehicles (EVs), often referred to as its EV-readiness. The Plan also provides recommendations to create a more comprehensive charging network that supports EV drivers and addresses any implementation barriers.

EVs can save money and reduce air pollution in New York State. Compared to gasoline-powered cars, EVs are more energy efficient and cost 50-70% less to operate per mile. A large portion of New York's electricity grid is powered by clean low-carbon energy sources (not oil or coal), allowing EVs to reduce greenhouse gas emissions and pollutants that cause smog and acid rain. New York State has prioritized EV market development support through its ChargeNY initiative.

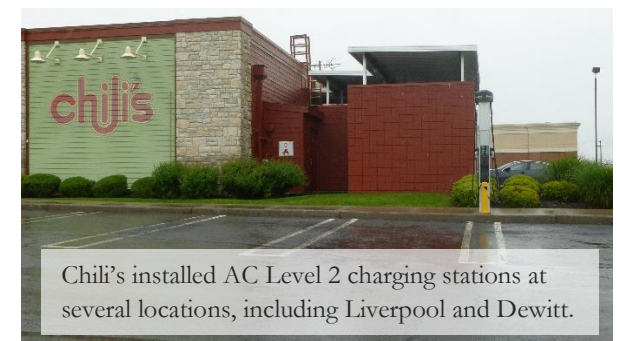
A number of plug-in hybrid electric vehicle (PHEV) and battery electric vehicle (BEV) models are available in New York State due to its participation in California's zero emission vehicle (ZEV) mandate. The ZEV mandate requires all major car manufacturers to sell increasing percentages of ZEVs.

Both PHEVs and BEVs displace petroleum fuel by charging their batteries from the electrical grid. BEVs typically have a larger battery pack for more electric miles (~60-100), but have no option when the battery is depleted. PHEVs have a less electric range (~10-50), but also have a small gasoline engine that can power the vehicle if needed.

EVs replenish their batteries by connecting to charging stations at home, work, or at public locations. Various charging levels provide different rates of charge from 20 minutes to 12 hours, with faster chargers being considerably more expensive to install and operate. The station installation costs can also vary from site to site. Ideal locations are where the parking space is close to the electrical panel and the existing service is sufficient to sustain the additional electrical load.

At the end of 2015, there were 482 EVs registered in Central New York. Seventy-five (75) were BEVs and 407 were PHEVs. Onondaga County has the most EVs in Central New York with 353, which ranks eighth in NYS for the most EVs per county. These represent a very small but growing fraction of all registered vehicles. Currently there are 31 public charging station locations (80 total

charging ports) in the region (11 sites in Syracuse and 6 in Liverpool), 6 private station locations, and one DC fast charging station location.



To help create a more comprehensive charging network that supports current and future EV drivers, *five additional charging station installations are recommended at key locations in Central New York:*

- Dewitt
- Syracuse
- Clay
- Camillus
- Fayetteville

Some other locations that could also be considered for installing more charging stations were Cazenovia, Auburn, Cortland, Liverpool, and North Syracuse.

Central New York Electric Vehicle Charging Station Plan

Five barriers were identified to be critical issues limiting the expanded use of EVs in Central New York. Municipalities, counties, and the region as a whole should lead or support initiatives that follow these recommended potential solutions and strategies.

Car Dealership Support is needed to improve dealer knowledge of EVs, which has been uneven and insufficient to address consumer questions and concerns. Dealer education regarding the range, function, electricity consumption, fuel costs and environmental benefits, and service needs of various EVs, as well as determining charging infrastructure needs and costs is needed.

Vehicle and Charging Station Costs are still a barrier to market development and widespread adoption. Cost-effective charging station installation examples and best practices will encourage more businesses and workplaces to offer this perk for employees or customers. There is an existing income tax credit for installing publicly accessible charging stations and the NYS legislature recently approved NYSEDA to facilitate a rebate program for EV purchases.

Zoning Rules that are amenable to the installation of public EV charging stations should be developed by municipalities. At a minimum, zoning laws should permit the installation of each charging station type in an appropriate setting. NYSEDA offers funding for communities to amend their zoning, permitting, and parking ordinances so they are more EV-friendly.

Educating potential EV owners through large scale awareness efforts that are coordinated with EV manufacturers and local dealerships is needed. These efforts should be directed towards key demographics of potential EV buyers and draw a connection to renewable electricity generation initiatives such as the regional Solarize campaigns.

Fast charging stations will be needed to facilitate longer EV travel distances, including inter-regional trips. They should be placed in strategic locations that are convenient for drivers traveling on Interstate highways and in larger cities where there is a concentrated population of EV drivers so the stations can also be used by local residents.

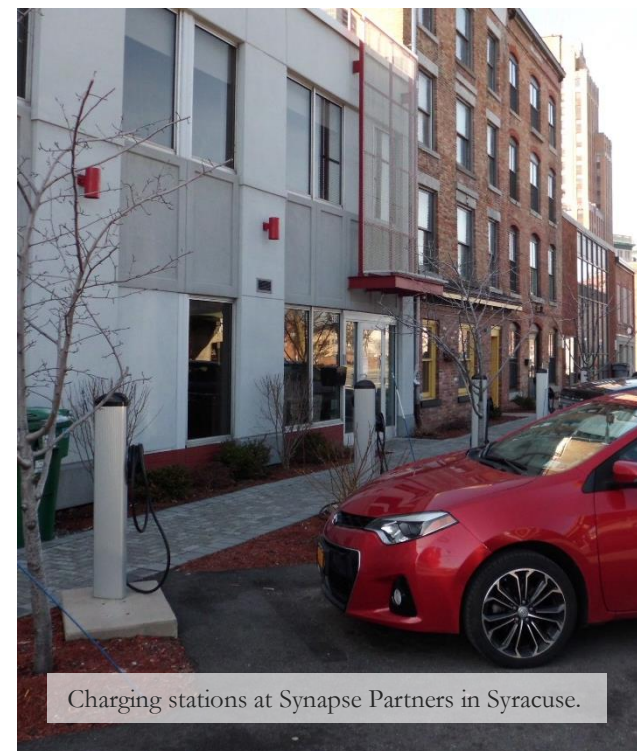
More EVs will be utilized by Central New York residents in the near future because they provide benefits for the entire community. While current EV adoption rates are too low to pursue any charging station requirements or regulations, gradually expanding the charging network in the region and supporting the recommended strategies to help our communities become more EV-ready will prepare us for the future. Even today, attracting EV drivers from other areas of the state can complement the efforts to promote tourism in the Central New York. EVs also attract highly educated and technology savvy individuals who can help drive our emerging technology industries.

The *key next steps to implementing this EV Charging Station Plan* are:

- 1) Holding meetings with key stakeholders in the recommended locations for

additional charging stations to prepare for, and encourage, new installations

- 2) Participate in any efforts to plan or deploy DC fast chargers
- 3) Distribute or post EV information at meetings, in newsletters, or on websites
- 4) Regularly discuss or bring up the topic of EVs at relevant or related activities to increase awareness
- 5) Pursue funding opportunities or other options to create a new EV website or establish a network of EV drivers
- 6) Offer assistance or support any effort promoting EV technology



Charging stations at Synapse Partners in Syracuse.



Central New York EV Charging Station Plan



Overview

For a new technology such as the electric vehicle (EV), which requires coordinated construction of infrastructure and widespread education and outreach, careful planning is essential. Public EV charging stations are important for EV drivers to have the ability and confidence to use their vehicle throughout New York State (NYS), both to travel within and between metropolitan areas.

Incorporating EV charging station planning into broader local and regional planning processes can help ease the adoption of the new technology. EV charging station planning is complex because of the different factors considered by drivers when planning trips, including the different types and speeds of EV charging stations. Educating decision makers and key stakeholders is critical.

A number of initiatives have recently been undertaken to support EV readiness nationally (through the Department of Energy Clean Cities EV readiness grants), within NYS (chiefly through efforts by NYSERDA), and even locally in some cases. This EV Charging Station Plan, along with the process to create it, is one of the first opportunities to discuss and document EV charging infrastructure at the regional level.

OBJECTIVE

The objective of this Central New York EV Charging Station Plan is to recommend strategies for supporting current and future EV drivers travelling within the region and between NYS regions. Since EVs have a more limited range than conventional internal combustion engine (ICE) vehicles that use petroleum fuels, the most critical area of support is providing charging opportunities to EV drivers.

Therefore, this Plan identifies gaps where public infrastructure is not currently available in the region to support EV drivers and recommends charging station installations in key locations to establish a comprehensive charging network. In addition to more charging stations, this Central New York EV Charging Station Plan also outlines critical implementation barriers for charging station installations or EV adoption and recommends strategies for addressing them.

Plan Authors and Contributors

Central New York Regional Planning and Development Board (CNY RPDB), Clean Communities of Central New York, and Energetics Incorporated led the development effort for this Central New York EV Charging

Station Plan. CNY RPDB provides a comprehensive range of services associated with the growth and development of communities in Central New York. Clean Communities of Central New York is one of 90 local DOE-sponsored Clean Cities Coalitions that develops public/private partnerships to promote alternative fuels and vehicles, fuel blends, fuel economy, hybrid vehicles and idle reduction awareness. Energetics is a technical consulting firm with more than 30 years of experience supporting alternative fuel vehicle development and deployment efforts for the U.S. Department of Energy, NYSERDA, and other entities.

NYSERDA and the New York State Department of Transportation (NYSDOT) sponsored the project to develop this plan, which also created four other plans for the other regions along the Interstate 90 corridor. Central New York EV Charging Station Plan was also supported by the Syracuse Metropolitan Transportation Council, the designated Metropolitan Planning Organization (MPO) for Onondaga County and a few other neighboring municipalities.

Central New York Electric Vehicle Charging Station Plan

Plan Components

This Central New York EV Charging Station Plan presents **background** information on the current technology used by EVs and EV charging stations. This information provided our working group members, along with the readers of this report, with a general understanding of what EV models are available, who is buying EVs in NYS, which types of charging stations are on the market, and how charging stations are being used.

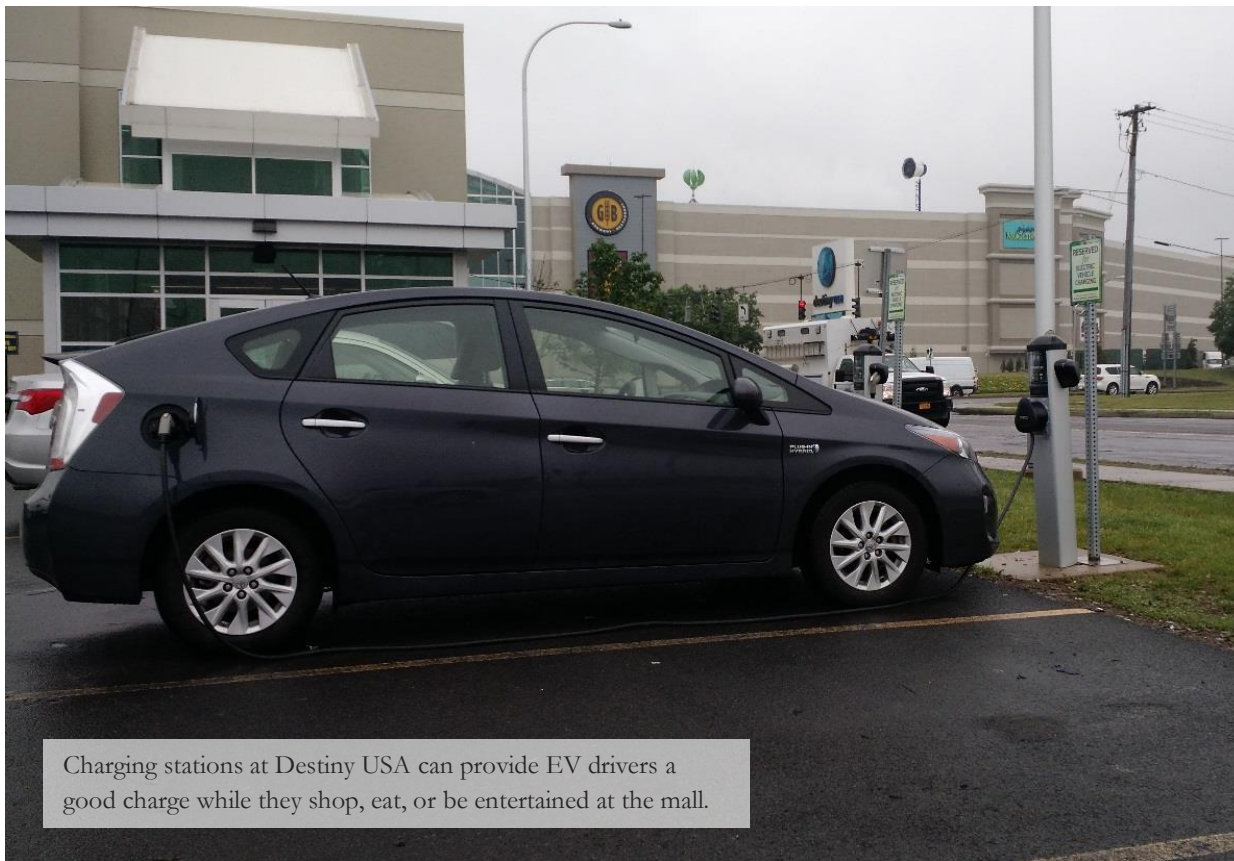
The next section of this Plan details the **existing EV charging infrastructure** in Central New York, along with the current EV owners. Maps in this section clearly show areas that lack EV infrastructure; places where there are no public charging stations and an EV driver passing through the area would not have a feasible option to charge if they need one.

Based on input from the working group, this Central New York EV Charging Station Plan presents the **recommended locations for installing new public charging stations** in this region to establish a more comprehensive charging network that will support current and future EV drivers. Potential venues for AC Level 2 charging station installations in these recommended locations are listed and meetings with those venues and other relevant stakeholders in that location should be held to discuss the best option for pursuing a charging station installation. Coordinating this will allow these locations to capitalize on the existing NYS tax credit for

charging stations or other potential funding which may become available.

Potential locations for the placement of direct current (DC) fast chargers are also presented as discussed among the working group members. These stations allow EV drivers to charge in durations similar to fueling a conventional ICE vehicle. This enables EV drivers to travel between NYS regions while providing more convenient charging for EV drivers in the immediate area surrounding that DC fast charger.

The final section of this Central New York EV Charging Station Plan discusses barriers that are currently limiting the use of EVs in this region's communities. **Recommendations are provided that will help Central New York communities become more supportive of EVs and EV charging infrastructure.** Since we can all benefit from better air quality due to fewer exhaust emissions and importing less petroleum products, it is in our best interest to encourage EV adoption.



Charging stations at Destiny USA can provide EV drivers a good charge while they shop, eat, or be entertained at the mall.



Central New York EV Charging Station Plan



Background

Electric Vehicles

Hybrid electric vehicles (HEVs) supplement the internal combustion engine with electrical power produced by an on-board electric motor. The electrical system acts as a generator when a driver applies the brakes, converting kinetic energy into electrical energy that is stored in a small battery pack. Gasoline or diesel is still the primary fuel.

Electric vehicles (EVs) take the HEV concept further, using a larger on-board battery for extended electric-only range. The driver charges the battery by plugging the vehicle into a charging outlet. When running on electricity, EVs are able to completely offset the use of gasoline, eliminating all tailpipe emissions.

Two different types of EVs are available: plug-in hybrid electric vehicles (PHEV) and battery electric vehicles (BEV). A PHEV is an HEV with a larger battery that plugs in to charge, but it keeps a gasoline or diesel engine as a backup. Some variations are called extended range EVs, or EREVs. After the battery energy is exhausted, the engine starts and the vehicle acts like a normal HEV until it is charged again from the grid.

BEVs fully remove the gasoline or diesel powertrain and replace it with an electric powertrain consisting of an electric motor, power electronics, and a battery pack. BEVs have a longer all-electric range than PHEVs, but do not have a fuel backup when the battery is depleted.

Using electricity as a vehicle fuel is currently less expensive per mile than gasoline, and can be even more cost effective if the EV driver takes advantage of off-peak electricity rates.

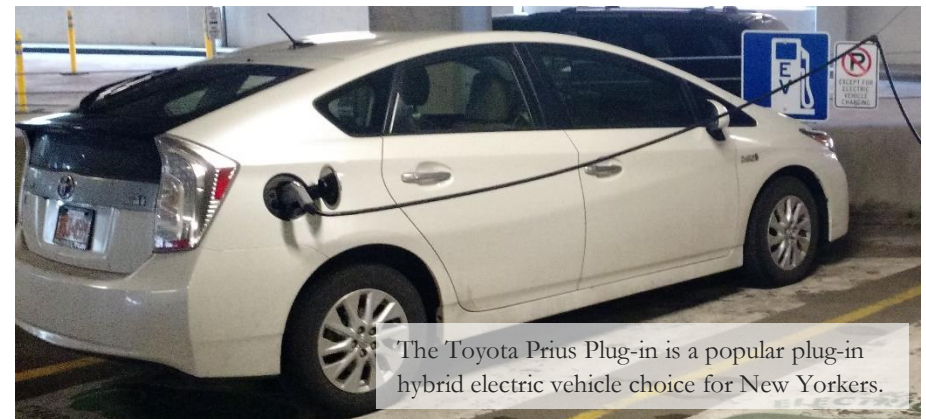
Current BEVs can travel between 60 and 265 miles on a single charge and take at least 30 minutes to recharge the battery. A gasoline vehicle will be able to travel 300-500 miles on a single tank and can fuel in less than five minutes.

This “range anxiety” can often be solved with careful planning (including being sure to plug in every night and knowing where charging stations are along your route), or through the purchase of a PHEV to have a gasoline engine in reserve. PHEVs have

ranges similar to gasoline vehicles, but typically only run on electricity for the first 10 to 50 miles.

Cold and hot ambient temperature conditions will impact the realized driving range due to added power requirements to heat or cool the interior. There is also a decrease in performance of the EV batteries. While manufacturers continue to improve the vehicle’s performance for adverse climates, a decrease in electric mileage by up to 50% on the coldest days and 20% on the hottest may occur. Pre-conditioning the EV while it is still plugged-in is a good strategy for minimizing the decline in range.

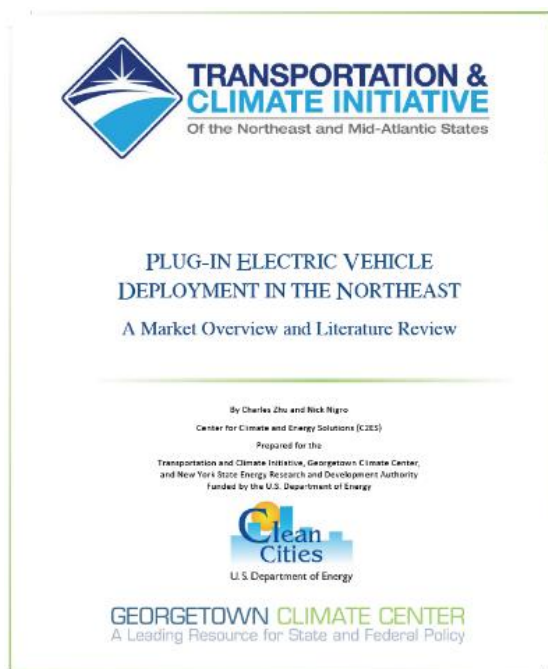
EV models available for purchase in New York State are listed in Appendix A.



The Toyota Prius Plug-in is a popular plug-in hybrid electric vehicle choice for New Yorkers.

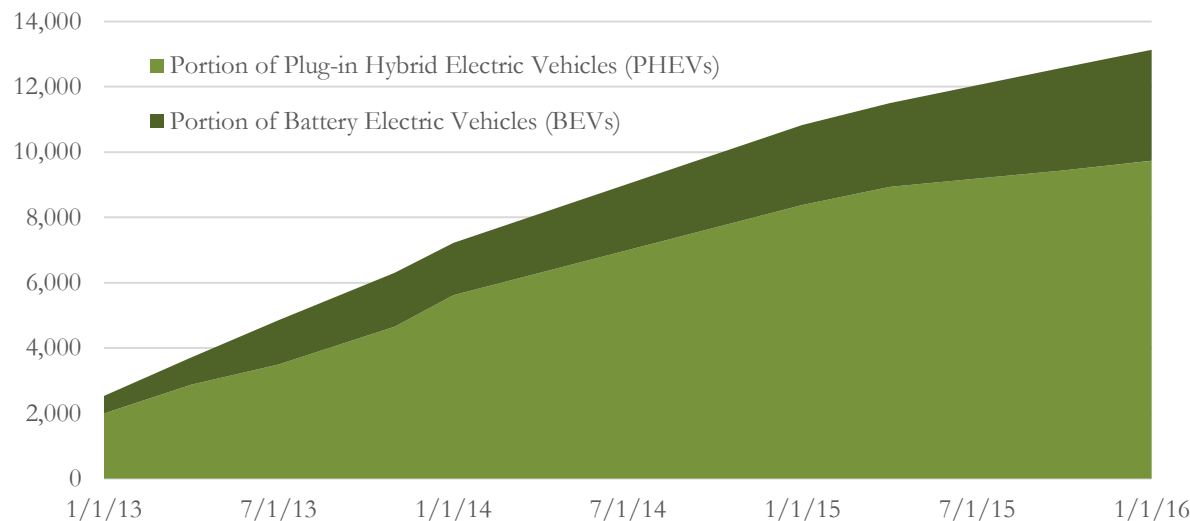
Central New York Electric Vehicle Charging Station Plan

The [Literature review of EV use in the Northeast](#) provides an overview of EV deployment in the Northeast as of 2012. The document is intended to serve as a resource for consumers and policymakers who seek to better understand the nature of and challenges facing EV deployment in the Northeast.

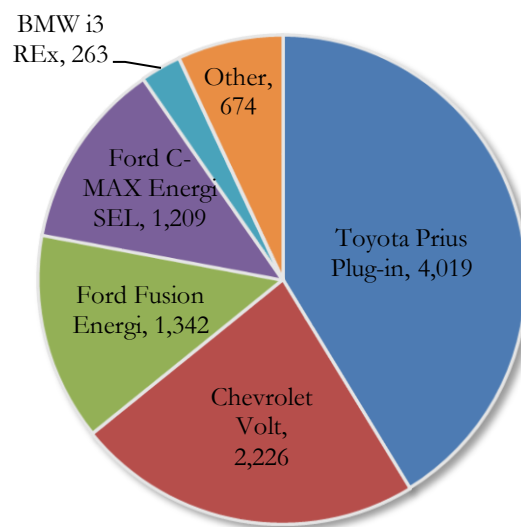


EV ownership in New York State has been increasing rapidly in the past couple of years. There are close to three times more PHEVs registered in New York State than BEVs, but a variety of models are being offered and purchased for both technologies. EVs still only account for 0.16% of all registered vehicles.

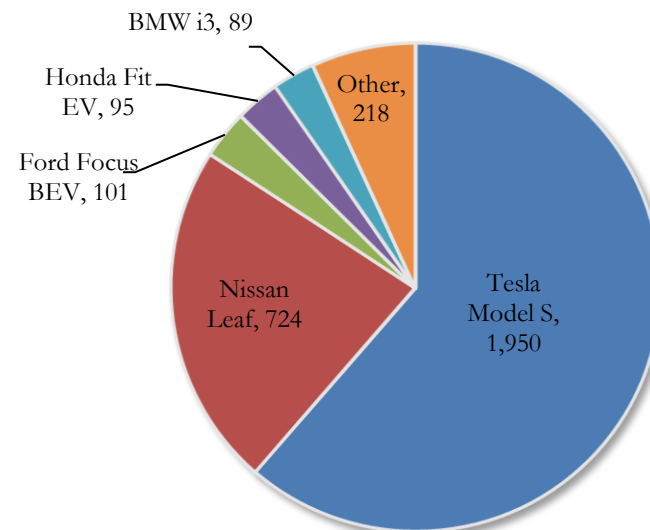
Total Registered EVs in New York State



Current PHEVs in New York State



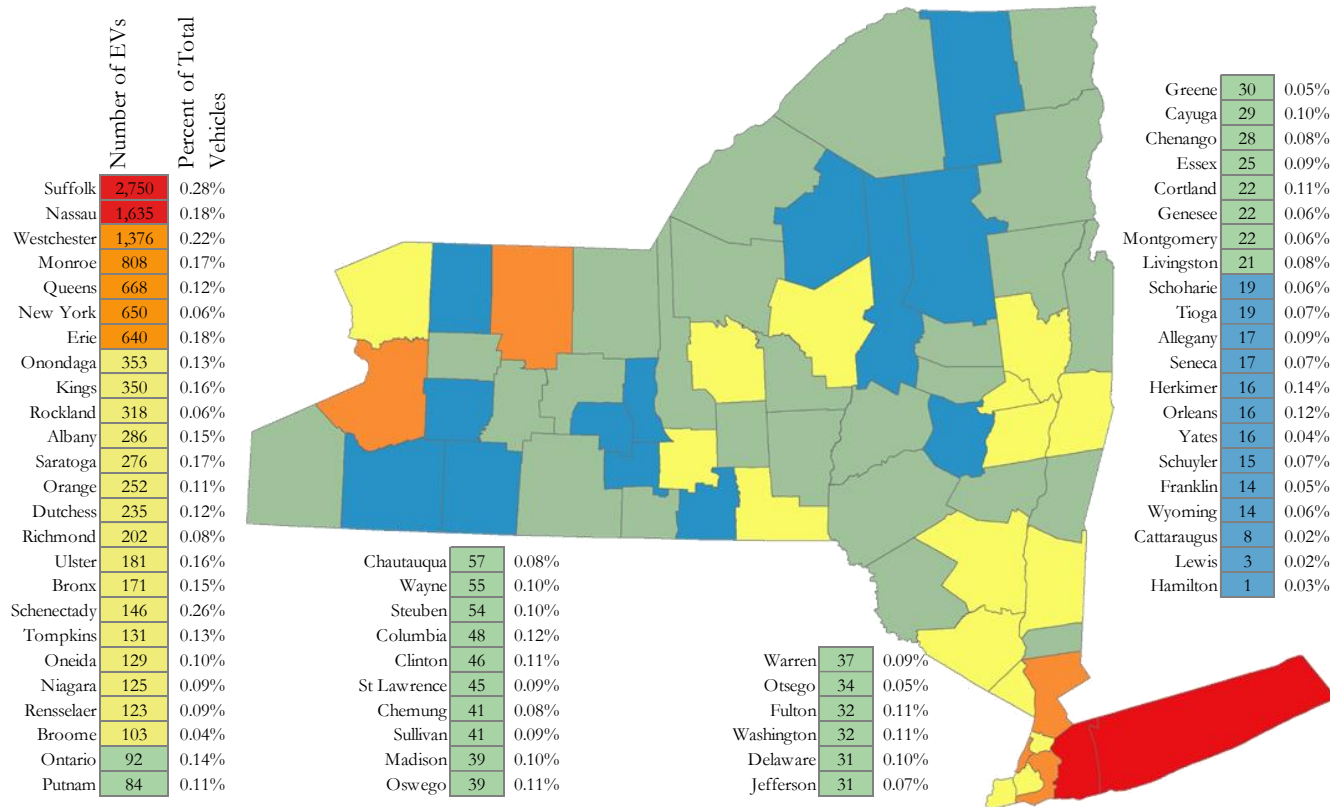
Current BEVs in New York State



Different parts of New York State have seen greater adoption of EVs. Note that Onondaga County has the eighth highest EV population.

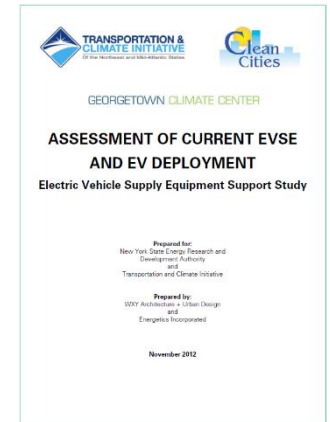
BEVs and PHEVs by County

(NYS Department of Motor Vehicle data as of 1/1/2016)



The [Assessment of Current Charging Station and EV Deployment for the Northeast](#) found that:

- Communities with EV ownership are significantly less dense than communities without EVs, with nearly all EV ownership located outside of urban cores. Whether driven by more straightforward EV charging infrastructure installation, more suitable automotive trips or other factors, these communities contain more single-family homes and fewer multifamily structures than communities with no EV ownership.
- Communities with EV ownership tend to be more educated and wealthier than communities without EVs. Greater incidence of EV ownership correlates with higher income and more graduate degree attainment.
- Greater access to EV dealerships and EV charging stations relates to greater numbers of EVs in communities.



Central New York Electric Vehicle Charging Station Plan

EV Charging Infrastructure

EV drivers have various options available to plug in and charge their batteries at charging stations, which are also referred to as electric vehicle supply equipment (EVSE). For the majority of users, a home charger can fulfill almost all of their charging needs. Public charging stations are used to recharge EVs while drivers are at work, shopping, or at other destinations, and help expand the functionality of electrification technology for many owners.

For many EV owners, the vehicle they select will accommodate their normal daily driving needs without needing to charge during the day. However, if that owner needs to run extensive errands one day, wants to take their EV to a recreational destination in the evening or on weekends, or is pushing the limits of their EV's battery range in the winter when it operates less efficiently, they will want to find an opportunity to get an additional charge during the day.

For some EV owners, installing a charger at their primary residence may be challenging (e.g. if they are renting or have an older house with insufficient electrical capacity to add more load) and will need charging infrastructure at their workplace or a public venue to feasibly use an EV.

Charging stations are classified by their approximate charge rates and the form of power delivered (alternating current [AC] or direct current [DC]). Charging times for each specific vehicle vary depending on power electronics, state

of charge, battery capacity, and level of charging station used.

AC Level 1 Charging is limited to 120 volts of alternating current (VAC) and uses a typical household three-prong plug. All current EVs are sold with AC Level 1 capabilities and only need a dedicated 20 amp outlet to charge. AC Level 1 stations charge slowly, and are generally used in home or workplace charging applications where EVs will be parked for long periods of time. AC Level 1 charging adds 2 to 5 miles of electric range per hour of charging time. Usually, a portable AC Level 1 charger is included in the initial vehicle purchase price. Hardware cost: Up to \$1,000.



AC Level 2 Charging provides electrical energy at either 240 VAC (typical for residential applications) or 208 VAC (typical in commercial and industrial applications). This level of charging is viable for both residential and public charging locations. Unlike AC Level 1 charging, AC Level 2 charging requires additional hardware that can be

mounted on the wall, to a pole, or as a stand-alone pedestal. It must be hard-wired to the electrical source. The increased charging rate and affordability of AC Level 2 charging stations make them the most popular choice for all EV charging applications. It provides up to 7.2 kilowatts (kW) for residential and up to 19.2 kW for commercial, which typically results in 10 to 20 miles of range added per hour of charging time. Hardware cost: \$450-\$5,000.



Central New York Electric Vehicle Charging Station Plan

DC Fast Charging utilizes direct-current (DC) energy transfer and a 480 VAC input to provide extremely rapid recharges at heavily used public charging locations. The type of station is generally cost prohibitive for home applications. However, depending on the EV, DC fast charge stations can provide an 80% recharge in as little as 20 minutes. This option is only available on certain EVs. Hardware cost: \$7,000-\$40,000.

Tesla's Supercharger Network offers DC fast charge for free, but is only available for Tesla owners. The network currently covers many major travel corridors across North America. Each Supercharger offers 120 kW charging (about 140 miles of range in 20 minutes).



Tesla DC Fast Charge Stations

Connectors, or plugs, for AC Level 1 and Level 2 charging stations have been standardized to allow owners of all EV models to utilize the same charging infrastructure. The industry standard for AC Level 1 and AC Level 2 charging is the Society of Automotive Engineers (SAE) J1772 connector,

which provides significant safety and shock-proof design elements.

Up until 2013, the Japanese CHAdeMO connector was the only DC fast charge standard connector, available on both the Nissan Leaf and Mitsubishi i-Miev. In early 2013, the SAE J1772 connector standard was expanded to include DC fast charge with the SAE J1772 Combo connector, which is available on the Chevrolet Spark, Volkswagen e-Golf, and BMW i3.

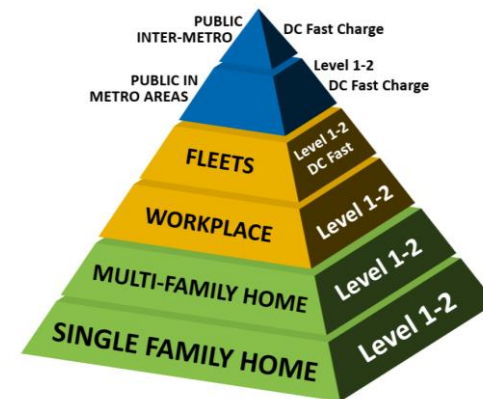


SAE J1772 Combo connector
(AC Level 1 and Level 2 connector would include the top circular plug components)

Tesla uses a different proprietary connector, but includes a SAE J1772 compliant adapter cable with each vehicle sold and offers adapters for CHAdeMO and SAE J1772 Combo connections for an additional price.

AC Level 1 charging stations are most suitable for residential overnight charging. However, because of their low cost and lower power draw from the grid, AC Level 1 can also be an effective option for locations where EVs are parked all day long, especially PHEVs that have smaller battery packs.

This includes workplaces, commuter lots, or long term parking at airports. Many AC Level 2 charging stations are designed to be more durable for an outdoor setting and work well for public venues where an EV may be parked for 2-6 hours.



DC Fast Chargers require a significant investment and draw considerable power, but they are necessary for inter-regional travel by EVs that wish to use major highways and go farther than the distance available from one battery charge. DC Fast Chargers may also be effective in urban areas with a high population of EVs because they provide convenience over AC Level 2 charging (much shorter time) and they don't require a large number of parking spaces that would be needed to charge a lot of EVs using AC Level 2 chargers.

Higher charging station power draw can lead to increased electrical costs for the facility, but some applications may be able to take advantage of lower off-peak electrical rates with a time-of-use

schedule if the EV charging will occur during off-peak times (night).

Most AC Level 2 and DC Fast Chargers come with an option to purchase a *subscription to a charging network* that can collect payments from users and limits use of the station to charging network members. There is often no fee for EV drivers to become a member, and there is also an option to activate the station using a toll-free number for anyone that does not have a network card. In addition to listing the station on its network maps for EV drivers, the network will track station usage so you know when and how long it is being used. Network subscriptions typically cost the station owner about \$20 to \$30 per month per charging outlet.

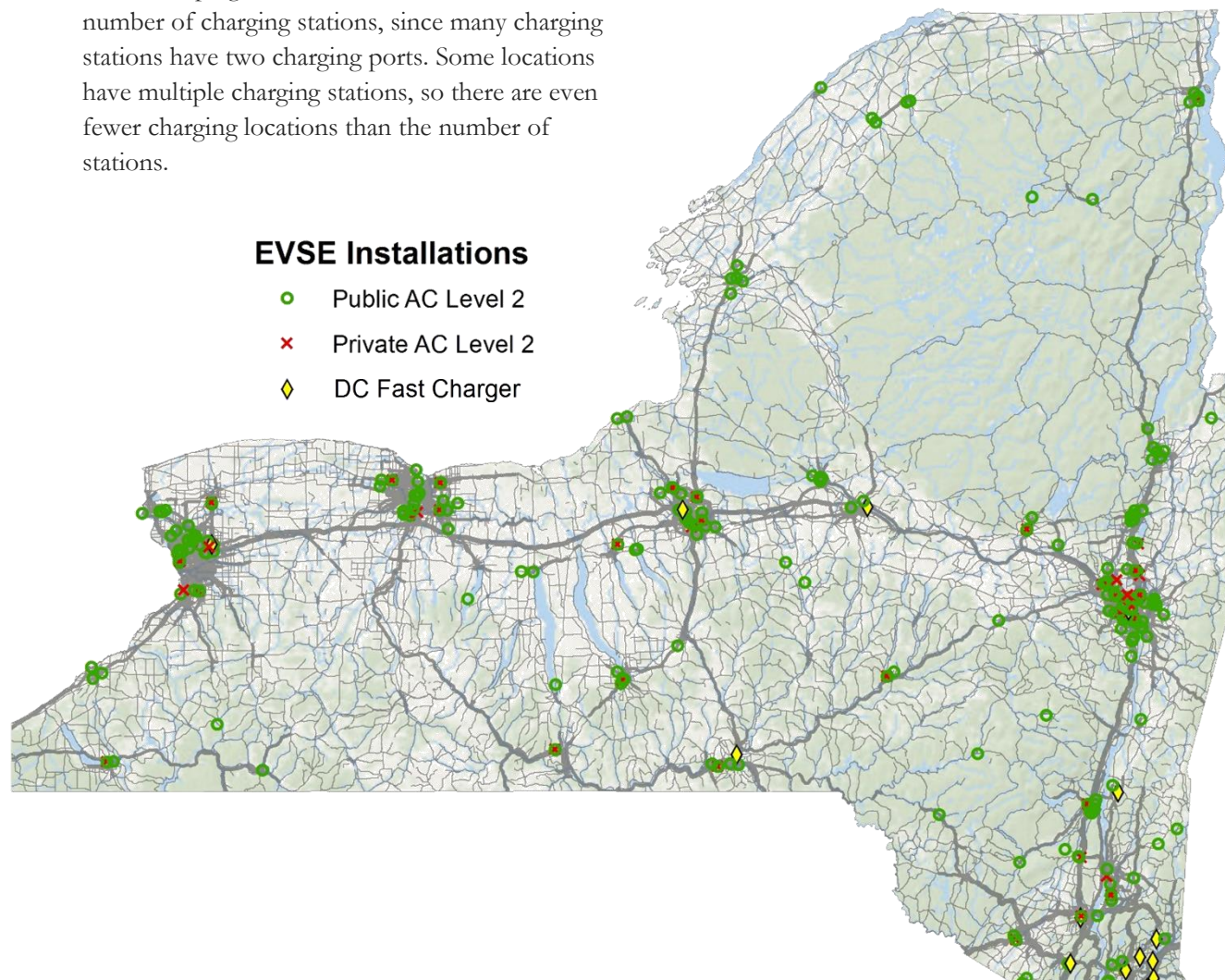
Different *ownership options* exist for charging stations with the most common model of a charging station host owning it. However, third-party charging station service providers may pay for the installation, operate the station, and share some of the profits with the host site. Some charging station manufacturers, third-party charging station service providers, or charging station network providers are considering offering the option to lease charging stations as well.

As of 2013, *New York State provides an income tax credit* for 50% of the cost, up to \$5,000, for the purchase and installation of alternative fuel vehicle refueling and electric vehicle recharging stations. The New York State Alternative Fuel Vehicle Recharging Tax Credit for commercial and

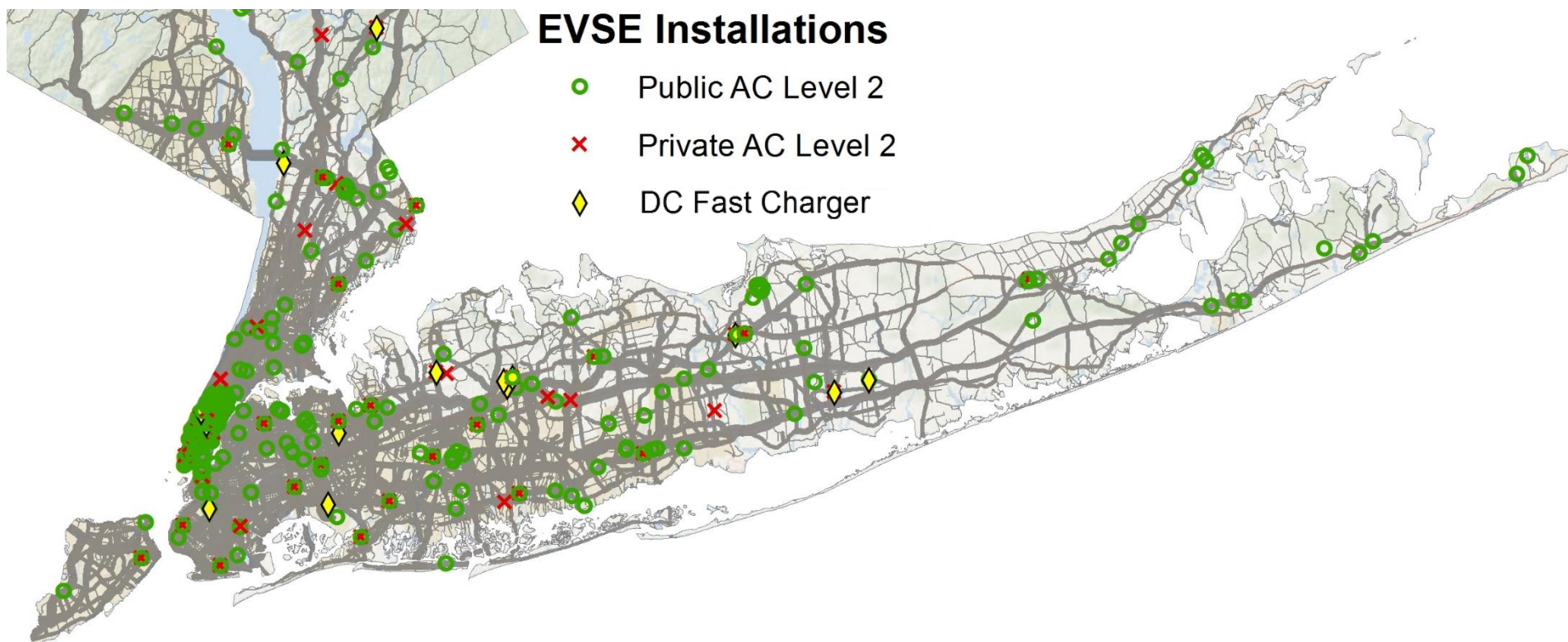
workplace charging stations is available through December 31, 2017.

As of December 2015, New York State has just over 1,200 total public EV charging outlets or ports. This number represents the number of EVs that could plug in at one time and differs from the number of charging stations, since many charging stations have two charging ports. Some locations have multiple charging stations, so there are even fewer charging locations than the number of stations.

NYSERDA has funded 634 new EV charging port installations since 2012 which has significantly increased the public EV charging infrastructure in the state. The U.S. Department of Energy maintains an [interactive map of alternative fuel station locations](#).



Central New York Electric Vehicle Charging Station Plan



For a *cost-effective and successful charging station installation*, one must factor in how much use can be expected and how much benefit EV drivers can get from charging while parked at that location. Offering charging can help businesses increase visits, keep customers for longer durations, and serve as a good perk for employees or residents. EV drivers often seek out charging locations as they go about their everyday routines at, for example, restaurants, stores, and entertainment venues.

For public installations, consider the time an EV driver would typically spend parked at that

location, because short durations may offer fewer benefits to EV drivers. Other important factors include, but are not limited to: patterns of travel in an area; an area's demographics, which may be correlated with characteristics typical of EV owners; and the nature of a potential EV charging station location, whether it is public property, private businesses such as retail companies, multifamily housing or other institutions. Building leases or third-party operated parking can complicate charging station installations and all parties should work out arrangements to clarify ownership, operation, and revenue in advance.

Installing *EV charging stations at workplaces* can be very successful at the right business and have benefits for employers and their employees alike. EV charging stations can attract and retain desirable employees. EV drivers are typically tech-savvy and highly educated, qualities many employers seek in prospective employees.

Charging stations visibly demonstrate an organization's commitment to sustainable energy consumption and complement other environmentally friendly initiatives. Some workplace charging locations are able to serve

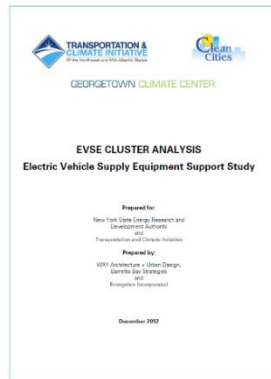
employees and visitors, as well as the general public. Two key examples are:

- Colleges or Universities
- Medical Campuses

Other examples of public venues that have successful charging station installations include:

- Regional transit (commuter lots)
- Downtown multi-purpose parking lots or garages
- Retail destinations (malls or outlets with multiple stores)
- Popular year-round leisure destinations

The [Charging Station Cluster Analysis](#) walks through the location types where EV charging infrastructure might be installed and informs decision-makers and prospective EV charging station hosts of which factors make a good EV charging location. Targeting locations for EV charging infrastructure rollout through this cluster approach can help create a system of EV charging in the critical early stages of EV adoption.



In 2012 and 2013, NYSEDA awarded \$8 million to 14 organizations through its Charging Station Demonstration Program to install AC Level 2 EV infrastructure, from Long Island to Buffalo. These

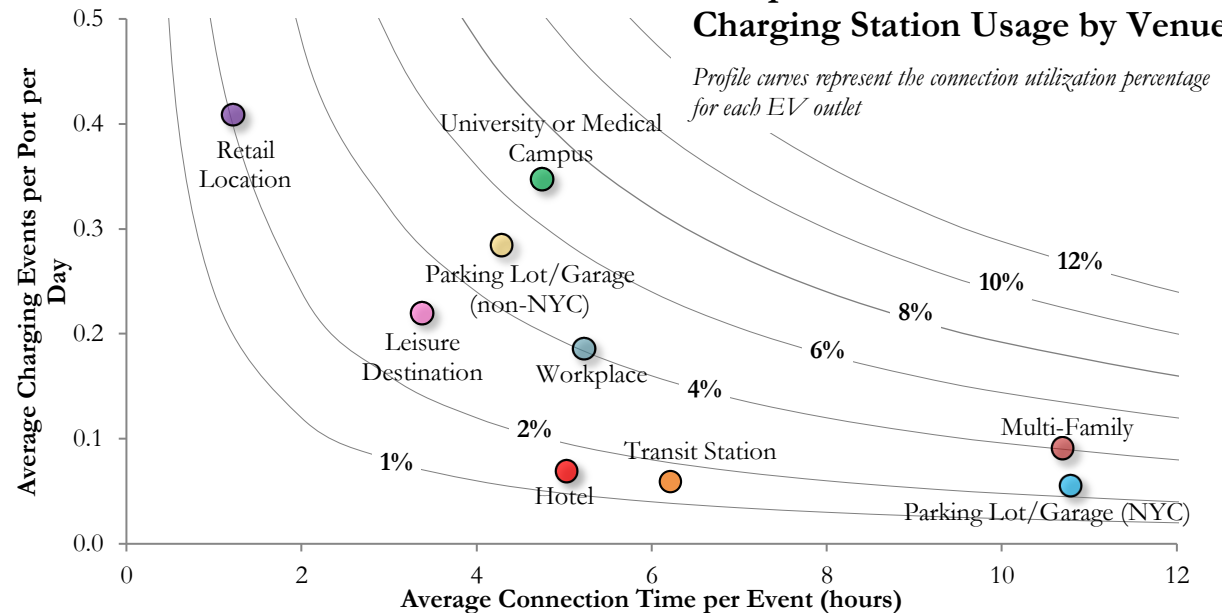
installations, which will be about 700 charging outlets in total, represent a wide range of business models and approaches to providing public charging infrastructure.

Charging station data is regularly collected and analyzed. The following results are from 2015.

- EV charging stations the Rochester/Finger Lakes region were occupied most (a vehicle was plugged into a port an average of 7.2% of the time respectively), followed by Long Island (5.6% of the time) and the Capital District (4.2% of the time).
- EV charging stations that charged a fee for use (most are NYC parking garages) followed this same trend: few charge events per day, but high energy dispensed per charge event.

- EV charging stations in New York City (NYC) parking garages, multi-family dwellings, and hotels averaged few charge events per day, but dispensed the highest amounts of energy per charge event.
- The average plug-in time per charge event differed for various location types. Shortest, by far, were the retail locations (1.2 hours), followed by leisure destinations (3.4 hours), non-NYC parking lot/garages (4.3 hours), university or medical centers (4.7 hours), hotels (5.0 hours), workplaces (5.2), and transit stations (6.2 hours). NYC parking garages and multi-family dwellings showed the longest plug-in times per charge event, with an average of 10.8 and 10.7 hours respectively.

Comparison of Public NYS EV Charging Station Usage by Venue



Central New York Electric Vehicle Charging Station Plan

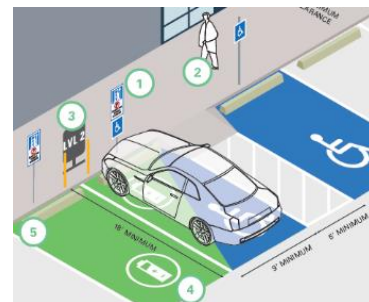
In addition to the EV charging station's location, *where it is placed onsite and how it is installed will also impact the ease of use for EV drivers and station cost effectiveness.* Charging station installation costs can exceed the cost of the hardware itself and are influenced by a number of factors that should be considered when determining if a site is good and where to install the charging station on the property.

The largest factor can be the currently available electrical service. All new charging station installations should have a load analysis performed on the facility's electrical demand to determine if there is capacity to add EV charging stations. Upgrading electrical service would add significant cost to the installation. A longer distance between the electrical panel and the EV charging station means increased installation costs because it increases the amount of necessary trenching (and repair), conduit, and wire.

Although it is desirable to minimize the distance between the electrical panel and EV charging station as much as possible, you also need to consider the impact of placing the station at that location on the property. For example, placing charging station parking spaces in the back of a building might discourage their use, but other customers may be upset if a charging station is installed in prime parking spaces that often remain vacant because there are few EV drivers.

Other considerations have less impact on installation costs, but can impact how effective the station is at benefiting EV drivers and other clients. Be sure to think about the path of the charging cord when in use (so it is not a tripping hazard), parking lot management practices (will the charging station get in the way of pavement cleaning or snow plowing, or is it a space where snow is piled in the winter or where equipment might be stored), and signage (for EV drivers to easily find the station).

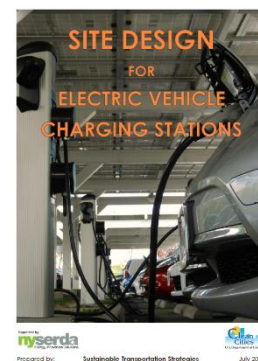
[Siting and Design Guidelines for Charging Stations](#) identify and diagram key siting and design issues that are relevant to local governments as well as developers, homeowners, businesses, utility



providers, and other organizations interested in best practices for EV charging infrastructure implementation.

[Site Design for Electric Vehicle Charging Stations](#)

highlights best practices for designing EV parking spaces, and provides several illustrated design scenarios.



Effective signage helps EV drivers navigate to charging station spaces and helps to prevent those spaces from being occupied by a non-EV. The [Charging Station Signage Overview](#) covers general service (guidance), regulatory (enforceable), and



special (information/trailblazer) signage. Another effective strategy for distinguishing the EV charging space is to paint the entire space green or mark the pavement with an EV charging symbol.



Optimal EV Charging Station Installations are Close to the Building and Convenient for EV Drivers, but not in the Most Premium Parking Spaces.

Central New York EV Charging Station Plan



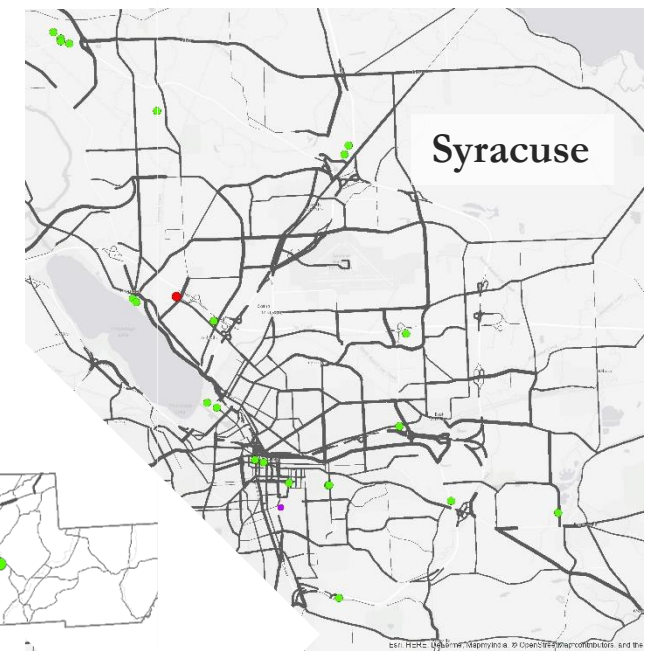
Current EV Landscape

Currently, there are 31 public EV Level 2 charging station locations, representing 80 charging ports as most have at least 2 charging ports per location, in Central New York, including:

- Destiny USA (North Garage, Solar Street)
- Convention Center at OnCenter
- Crouse Irving Memorial Hospital
- Farmer's Market Lot
- Onondaga Lake Park
- Skaneateles Village Hall
- Towne Center (Fayetteville)
- Colgate University
- SUNY Environmental Science and Forestry
- SUNY Morrisville
- Anheuser-Busch Brewery
- Central New York JATC
- Chili's (Liverpool, Syracuse)
- Covanta Energy
- Nichols Supermarket
- Residence Inn (Syracuse)
- Synapse Headquarters

Tesla DC fast charging stations are at the Holiday Inn on Electronics Parkway in Liverpool.

Central New York has several areas where there are gaps in the EV charging network as shown in these maps with the existing stations.



EV Chargers

- DC Fast Charger
- Public AC Level 2
- Private AC Level 2

Central New York Electric Vehicle Charging Station Plan

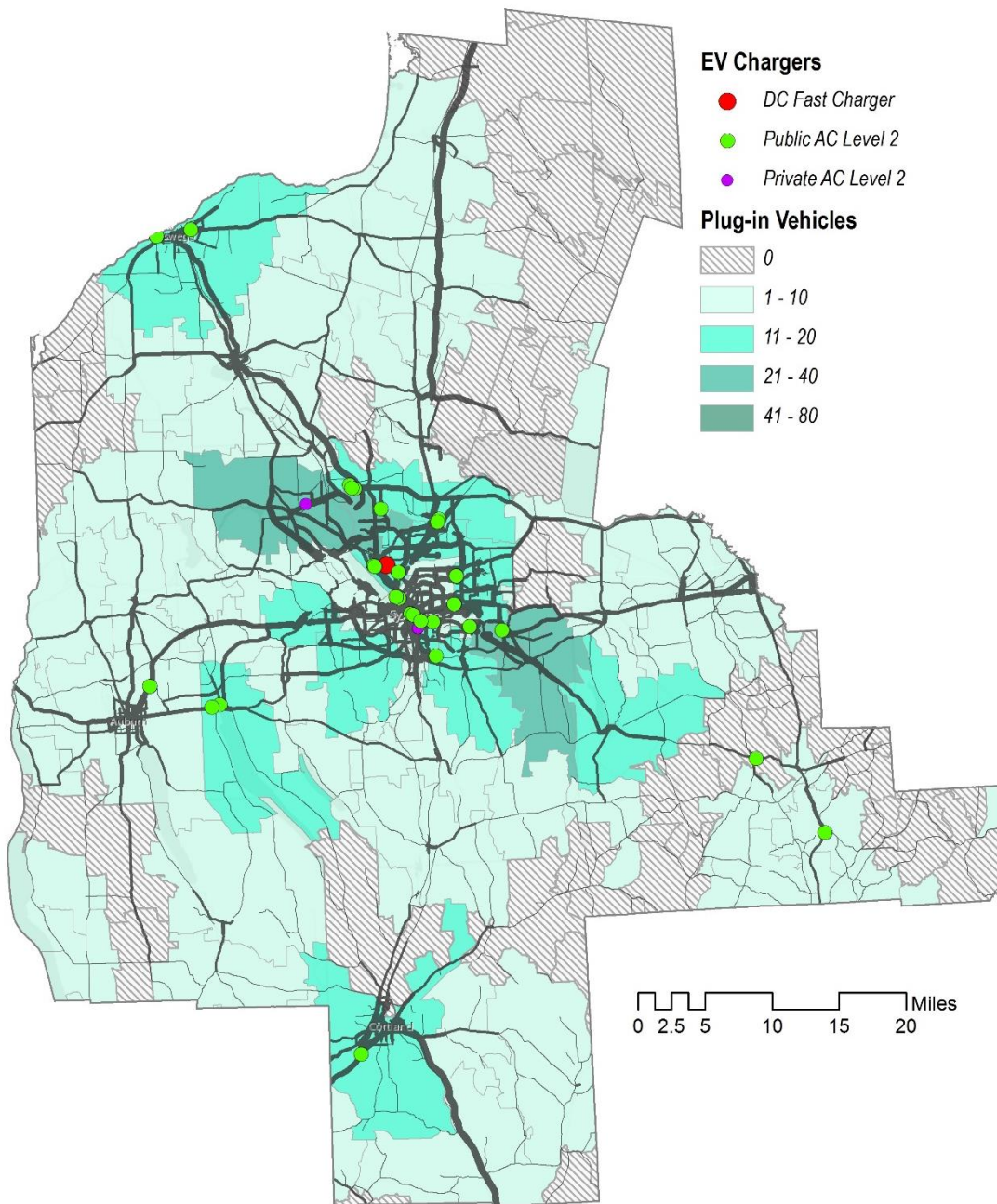
The map of Central New York to the right shows EV ownership (both PHEVs and BEVs) by zip code as of December 31, 2015. The zip codes with the most EV owners are:

- 13027 (Baldwinsville): 28 EVs
- 13090 (Liverpool): 27 EVs
- 13104 (Manlius): 26 EVs
- 13066 (Fayetteville): 23 EVs
- 13031 (Camillus): 18 EVs
- 13201 (Syracuse): 17 EVs
- 13045 (Cortland): 17 EVs
- 13078 (Jamesville): 16 EVs
- 13035 (Cazenovia): 16 EVs
- 13039 (Cicero): 15 EVs
- 13126 (Oswego): 15 EVs

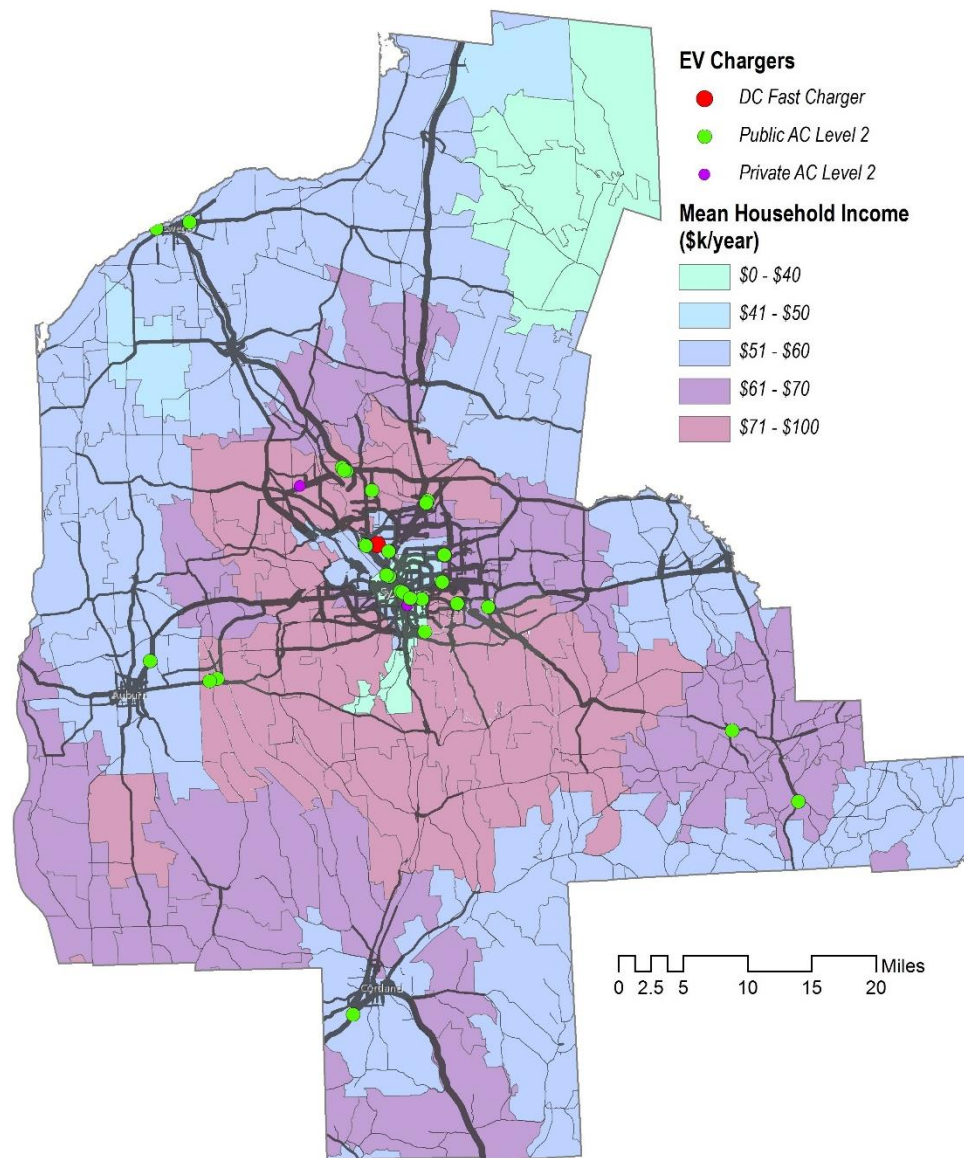
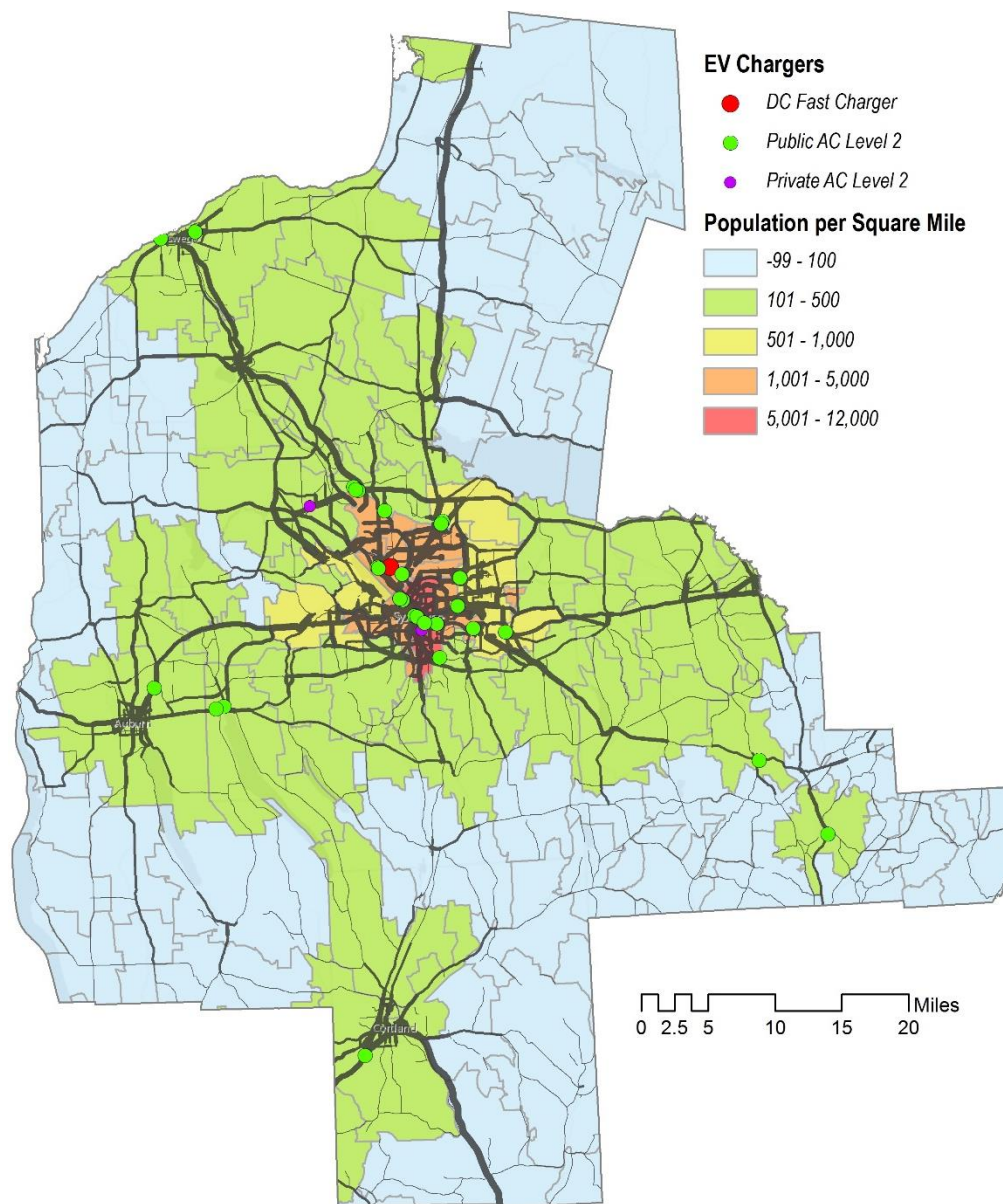
Note that by municipal boundaries, the City of Syracuse has the most EVs, but since there are numerous zip codes within the City limits only one Syracuse zip code appears in the top 11.

Existing public EV charging locations are also included for reference. There is a correlation between the public EV charging station locations and EV ownership, but it is not clear whether the charging stations encourage EV ownership or EV ownership encourages the installation of public EV charging stations.

When compared to Central New York maps showing population and income per household on the following page, EV ownership is more closely tied to income rather than population.



Central New York Electric Vehicle Charging Station Plan

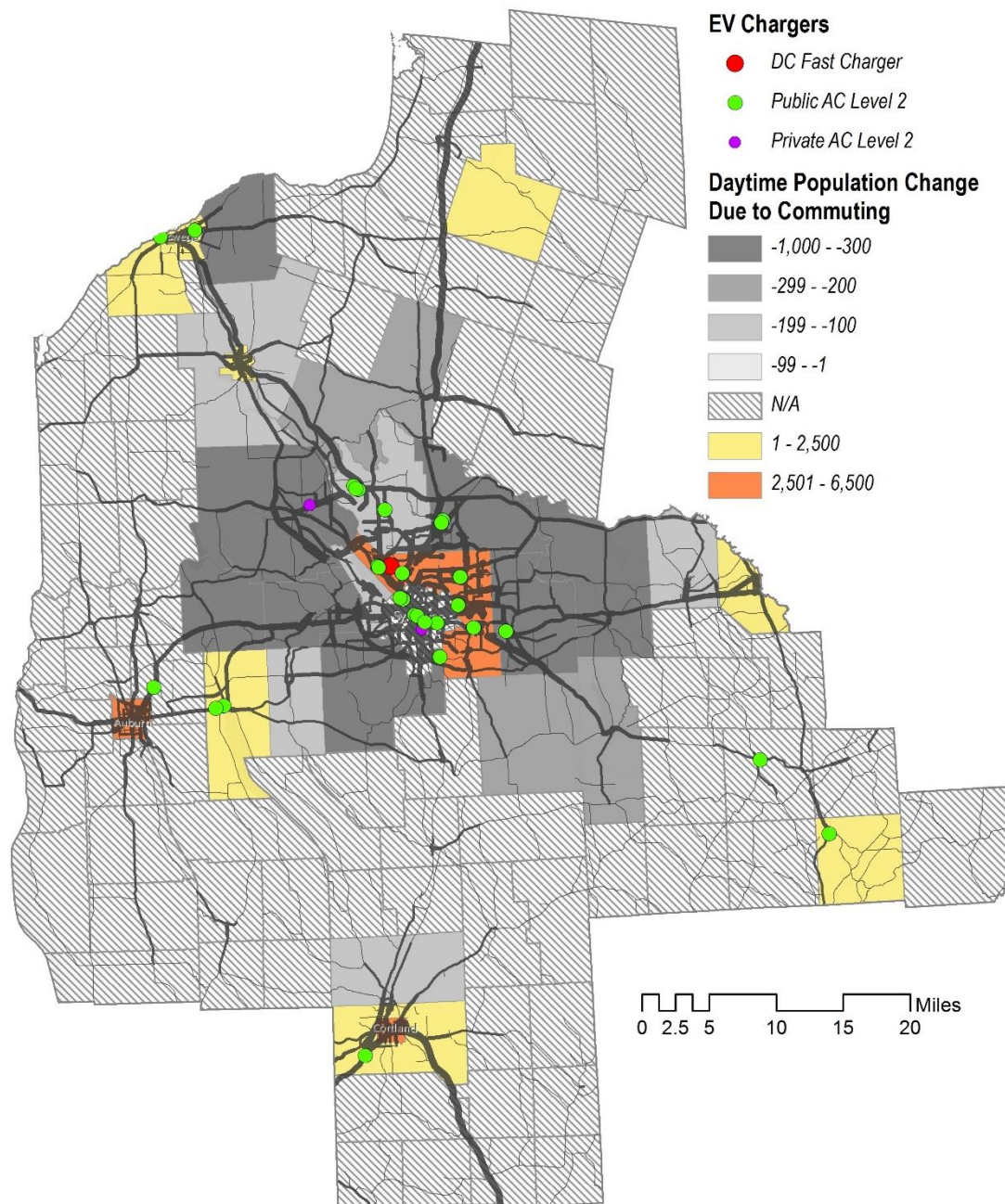


Central New York Electric Vehicle Charging Station Plan

This map shows the daytime population change during weekdays. Workplace or public chargers are likely needed more in areas that experience an influx of people each day, rather than other areas that are more residential and EV owners would charge at their home overnight.



This AC Level 2 Charging Station at Hobart & William Smith in Geneva can be used by staff or visitors that drive an EV.





Recommendations for Additional EV Infrastructure

Central New York does not currently have a comprehensive network of charging stations that would allow an EV driver to easily travel throughout the region. There are numerous areas where an EV driver passing through the area would not have a feasible option to charge.

Some municipalities and organizations in Central New York have taken the initiative to install EV charging stations which has made those locations very supportive of EV drivers. However, most of the existing public charging stations in this region have experienced very minimal use which has made it hard to justify further investments in infrastructure.

Continuing to expand the public charging network is needed to support residents that could use EVs, along with EV drivers that visit our region. Five additional charging station installations are recommended at key locations throughout Central New York to help create a more comprehensive network to support current and future EV drivers.

Dewitt is a first-tier suburb of Syracuse that has a strong employment base and jobs/housing ratio.

Dewitt has experienced moderate population growth and has a high number of EVs in its surrounding zip codes.

Syracuse is the region's largest municipality and the center of employment and entertainment. The city has the most registered EVs in the region.

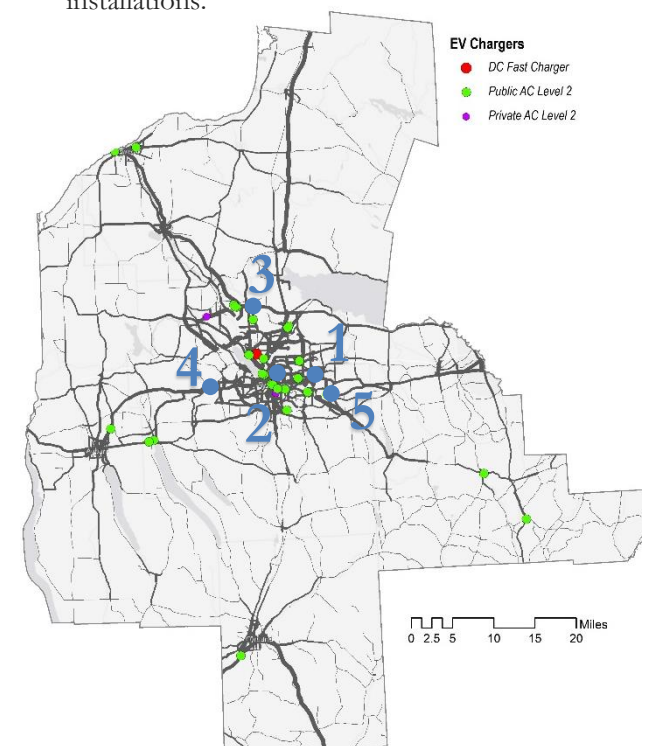
Clay is the second largest municipality in the region. The town is an affluent suburb of Syracuse and contains the major retail center of Onondaga County's northern suburbs.

Camillus is an affluent community located in the fast-growing western suburbs of Onondaga County with good access to the Interstate 90 and 690 corridors.

Fayetteville is an affluent bedroom community and is located in the eastern suburbs of Syracuse. The village has experienced moderate population growth and has many residents and neighboring residents that own a EVs.

Overviews of the five recommended locations are provided on the following pages with some potential sites for the actual charging station installations. Holding key stakeholder meetings at these locations will enable the municipality or

businesses to capitalize on the available tax credit or other funding that might support new installations.



Central New York Electric Vehicle Charging Station Plan

DeWitt is a suburb of Syracuse located in east-central Onondaga County, immediately east of the City of Syracuse. The town has a total area of approximately 34 square miles.

Overview

The northern portion of DeWitt is developed with a mixture of industrial, commercial and residential sections; while the central portion of the town is primarily residential. The southern, hilly portion of DeWitt is generally mixed forests and fields with limited residential development and stone quarry operation. The town is the site of most of the campus and all of the academic buildings of Le Moyne College.

Approximately 5% of DeWitt's residential land use is classified as low-density, 86% as medium density, and 9% is classified as high density. The highest residential density areas in DeWitt are located near LeMoyne College where numerous multifamily apartments are located.

Interstate 481 is the major highway in DeWitt, which intersects with I-690 in the eastern part of town and I-90 (New York State Thruway) in the northern part. Other major roads include NYS Route 92 (East Genesee Street) and NYS Route 5 (Erie Boulevard East) which conjoin in the eastern part of DeWitt where they intersect with I-481. Other state routes of note include NYS Route 91, NYS Route 598, NYS Route 173, NYS Route 298, NYS Route 290, and NYS Route 635.

Demographics

As of the 2013 census, there were 25,735 people living in DeWitt. The population density was 765 people per square mile, which ranks in the top 25% of municipalities in Central New York. The median household income is approximately \$63,175 annually, which is one of the highest in the region. The median home value (single-family owner-occupied) was \$149,866 in 2013. Residents in DeWitt are well-educated, with 39% having a

bachelor's degree and 19% having a graduate or professional degree.

According to information from the U.S. Census, DeWitt has one of the region's largest concentration of employment and the jobs/housing ratio was approximately 1.28/1. This shows considerably more jobs than housing opportunities within the town, which contributes to many workers commuting into DeWitt from neighboring communities each day.



DeWitt Town Hall with a 50kW Solar PV Array

Central New York Electric Vehicle Charging Station Plan

EV Factors

As of 2015, there were approximately seventeen EVs owned by residents of DeWitt, with an additional 65 EVs in neighboring towns. The number of large employers, hotels, and public attractions throughout the town creates an opportunity to provide charging for employees and visitors driving EVs and to enhance tourism throughout the area. Additionally, local residents may become more familiar with the technology with the addition of the stations and, due to the higher income rates, purchase EVs for the environmental and energy benefits. The town is a

Climate Smart Community and adopted a Sustainability Plan in 2014 with the support of the CNYRPDB. The town's plan included several sustainability strategies that support increased use of EVs including installing charging stations, purchasing EVs for municipal use, and educating the community about low-carbon transportation options. Altogether, these strategies account for more than one-half of the targeted greenhouse gas emissions reductions to be achieved from the community at large.

One possible location for EV charging stations is the Willis Carrier Recreation Center, an outdoor

recreation complex that will include Little League baseball diamonds, soccer and football fields, and basketball and tennis courts. A fully handicapped-accessible sports facility for youth and adults, the Willis Carrier Recreation Center will be the first of its kind in the country and will provide a home for those with special needs to participate in tournament level competitions in baseball, soccer and lacrosse. It is expected to draw thousands of visitors each year from all across the state and beyond. DeWitt recently approved \$4 million in funding through a bond to complete the first phases of the project.

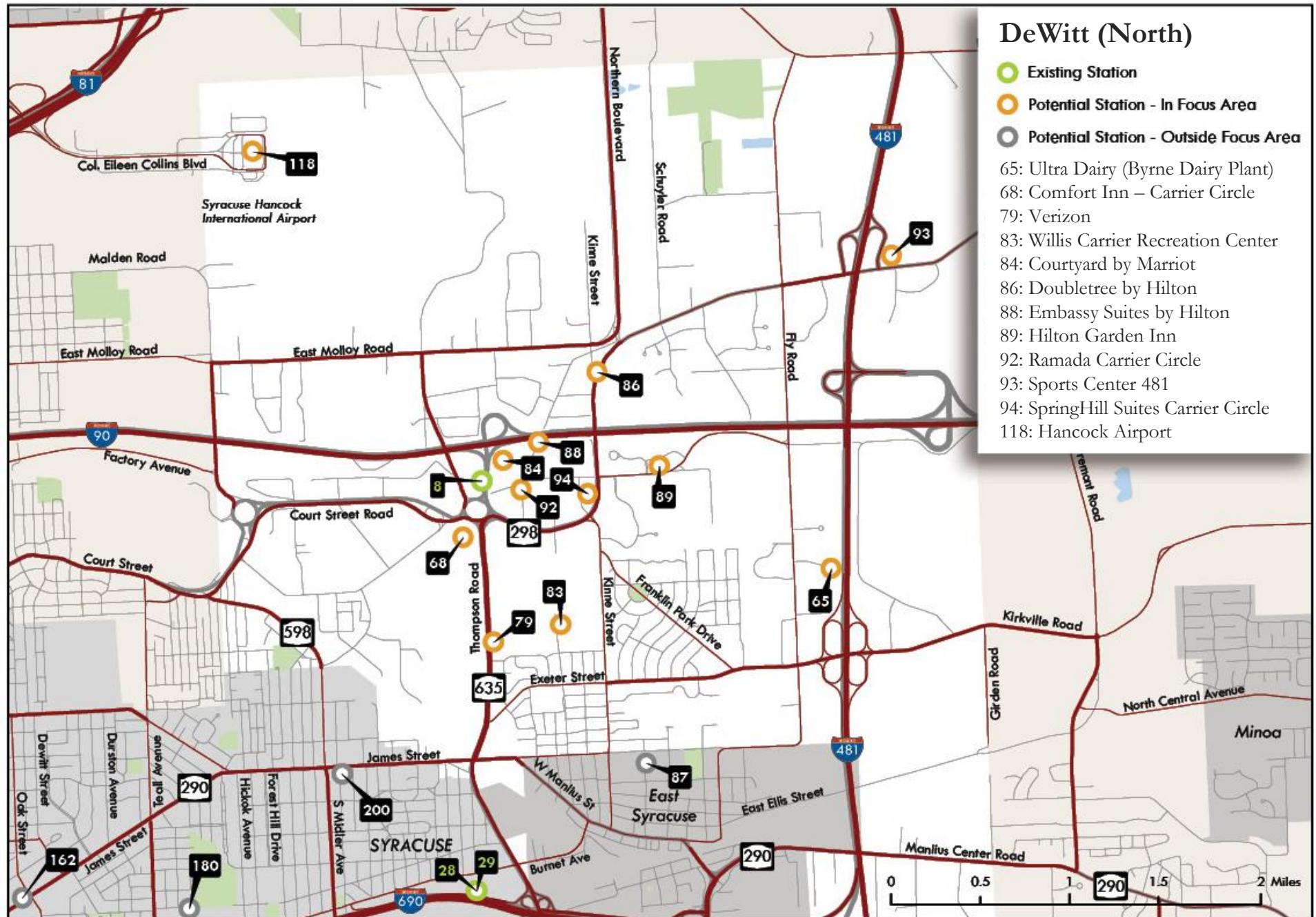


Ryder Park

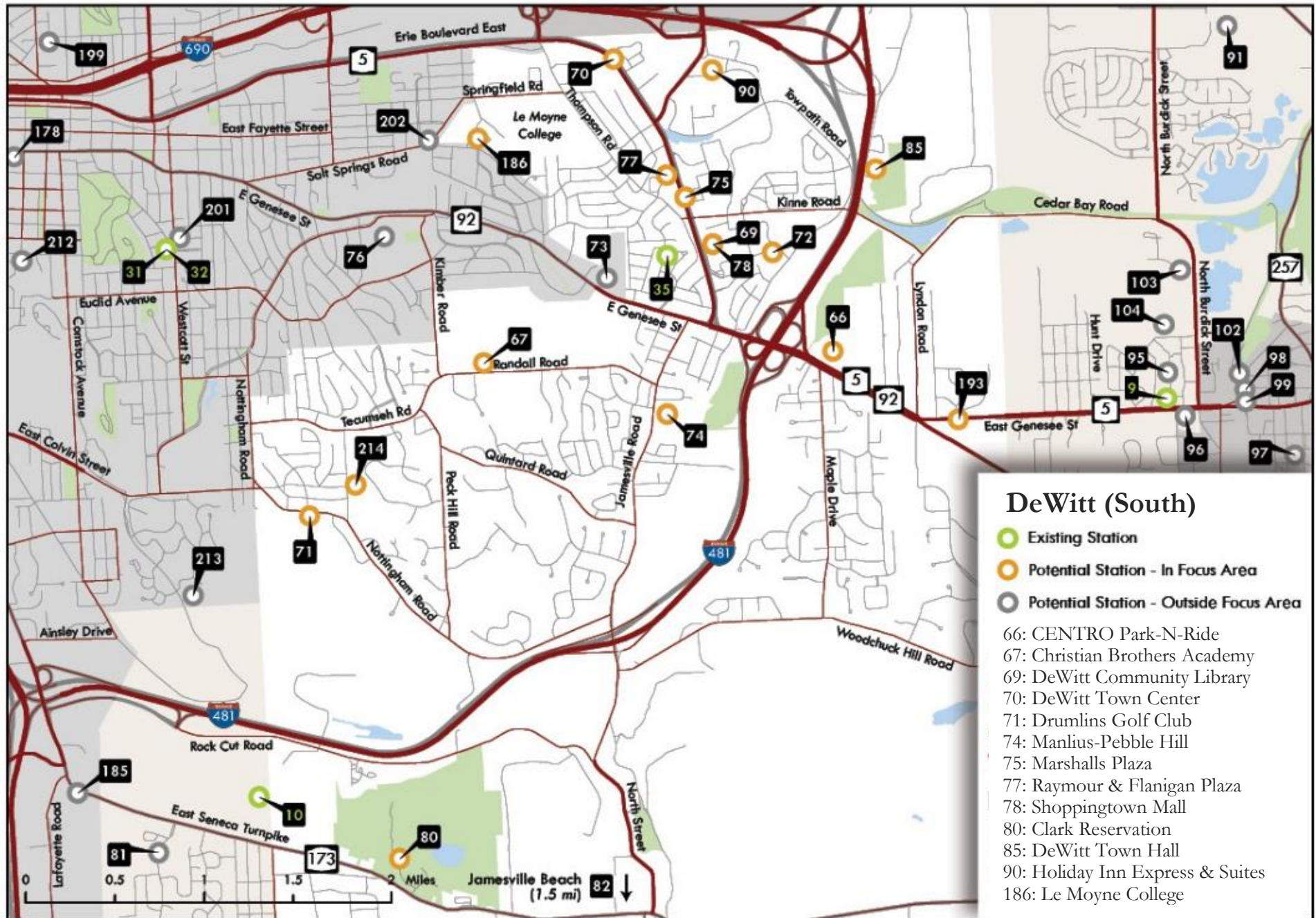


Pavilion at DeWitt Willis Carrier Recreation Center
(courtesy of Friends of DeWitt Parks and Recreation)

Central New York Electric Vehicle Charging Station Plan



Central New York Electric Vehicle Charging Station Plan



Central New York Electric Vehicle Charging Station Plan

Syracuse is the fifth largest city in New York State and is the county seat of Onondaga County. The city is the region's metropolitan hub and has the largest concentration of employment, health care, higher education, and entertainment.

Overview

The City of Syracuse is located on the south edge of Onondaga Lake. The city has functioned as a major crossroads over the last two centuries, first between the Erie Canal and its branch canals, then of the railway network. Syracuse is located by the intersection of Interstates 90 and 81, and its airport is the largest in the region. The City is home to Syracuse University, a major research university, as well as several smaller colleges and professional schools. Syracuse stands at the northeast corner of the Finger Lakes Region and is the geographic center of New York State.

Syracuse serves as the regional center of employment within the region and is home to major employers including National Grid and Time Warner Cable. According to the City of Syracuse Comprehensive Plan 2040 (published in 2013), one of the city's top economic development priorities is to reinforce University Hill and Downtown as the core of regional employment and business. University Hill is the location of Syracuse University, SUNY-ESF, SUNY Upstate Medical University, University Hospital, Crouse Hospital, the VA Medical Center, Hutchings Psychiatric Center, and Rosewood Heights Medical Center. The total number of people working on University Hill is

estimated to be over 20,000. Downtown contains a variety of professional offices, government offices, assorted businesses, and non-profits, which cumulatively employ about 27,000 people. Destiny USA is a super-regional retail and entertainment facility that employs approximately 4,700 people.

Downtown Syracuse serves as the cultural entertainment center for the City, Onondaga County, and the entire region with its numerous civic spaces and museums, as well as its convention and cultural centers and Destiny USA. The Syracuse Convention & Visitors Bureau (SCVB) attributes the continued growth in tourism in Onondaga County to "the significant impact of our recent product changes including Destiny USA and the revitalization of downtown Syracuse."

According to the annual *Economic Impact of Tourism in New York State* report, visitor travel spending in Onondaga County increased from \$764.3 million in 2011 to \$791.1 million in 2012 (an increase of 3.5%). Overall, the tourism sector supported more than 16,700 jobs, or 7.0% of total employment in Onondaga County in 2012, generating \$60.3 million in local tax revenues.

The expansion of the former 1.6 million square foot Carousel Center to what is now known as Destiny

USA, with an additional 800,000 square feet of retail space, has clearly been one of the commercial highlights of the last several years in Syracuse. Improvements have been made and a dynamic array of new stores, restaurants, and even entertainment venues have been brought in, adding to an existing mix of more than 200 retail stores and premium outlets. The changes have made Destiny USA not only a retail destination, but also a family entertainment center.

While Destiny USA has become a focal point for visitors, they are traveling all over the county for lodging and activities. I-81 provides a direct link between Ottawa and Onondaga County and Destiny USA attributes 38-40% of its sales to Canadian consumers. Canadian visitors often spend a day or two at the mall before going off in search of other things to do and see. Popular



Central New York Electric Vehicle Charging Station Plan

activities include attending athletic events at Syracuse University, viewing exhibits at the Everson Museum of Arts, renting bikes to ride around Onondaga Lake Park, cruising the Erie Canal on a tour boat, and visiting Finger Lakes wineries.

Demographics

While the City of Syracuse has decreased in population over the past 60 years (it lost 34.2% of its population since its peak in 1950), the population of the County has remained relatively stable, sprawling outward. The city's population has only slightly declined since 2000, more or less stabilizing at 145,170. The city has the highest population density in the region with 5,707 people per square mile. While median household income is among the lowest in the region at \$31,566 annually, more than 44,000 workers commute into the City each day.

EV Factors

As of 2015, there were 63 known EV owners in the City of Syracuse with 88 in the surrounding area, representing the largest concentration of EVs in Central New York.

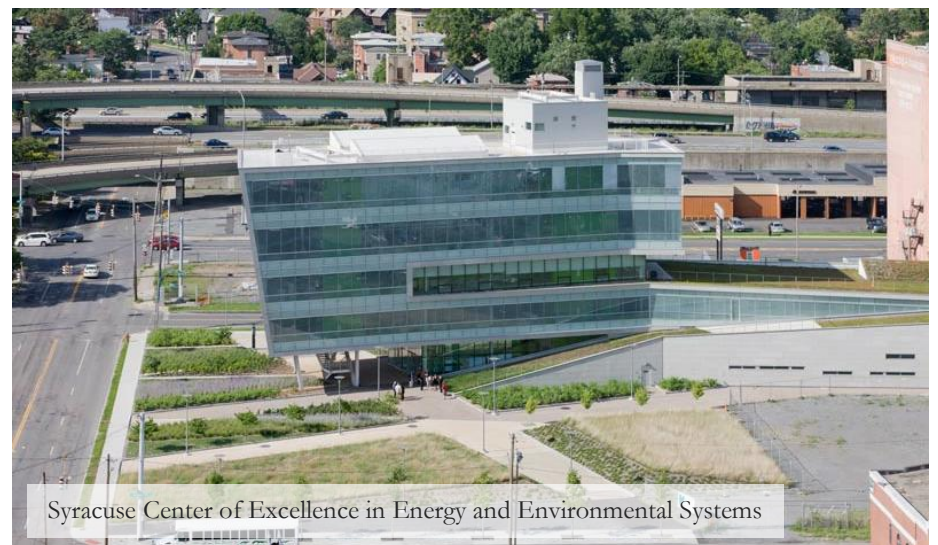
Syracuse is a leader in electric vehicle infrastructure. During the last few years, electric vehicle infrastructure has significantly increased in and around the City. There are 16 electric charging stations in Syracuse and three in nearby Liverpool. The city is well positioned for further expansion, especially as EVs become more common.

The City completed a Sustainability Plan in 2012 with the input of the Central New York Regional Planning and Development Board, Clean Communities of CNY and other stakeholders and an Energy Master Plan in 2015 with the support the New York Power Authority Five Cities

Energy Plans Program. Both plans identify green fleets and alternative fuel vehicles, including EVs, as an important strategy to achieve the City's climate protection goals of reducing greenhouse gas emissions by 40% below 2002 levels for municipal operations and 7% below 2002 levels community-wide by 2020. Through these plans, the city committed to evaluate the feasibility of integrating EVs into its fleet with the purchase of five plug-in hybrid electric medium duty trucks, four midsize electric cars, and one small electric SUV to replace comparable conventional vehicles. In addition, the city will lead by example by publicizing its alternative vehicle program to provide awareness to the public about the benefits of clean air vehicles and provide information on resources. Syracuse will also facilitate the placement of "EV Charging Station" signage in street rights-of-way.

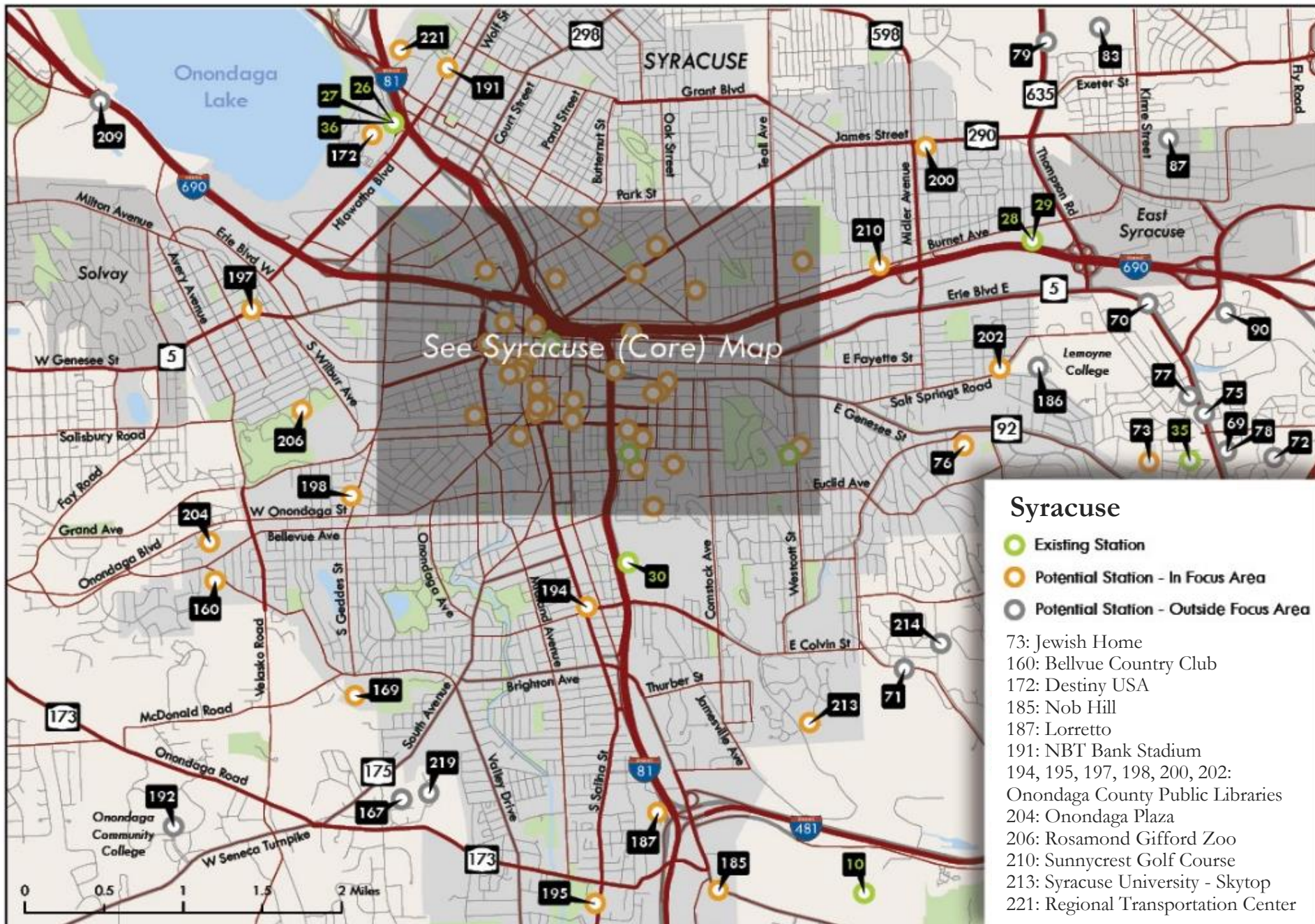


Upstate University Hospital

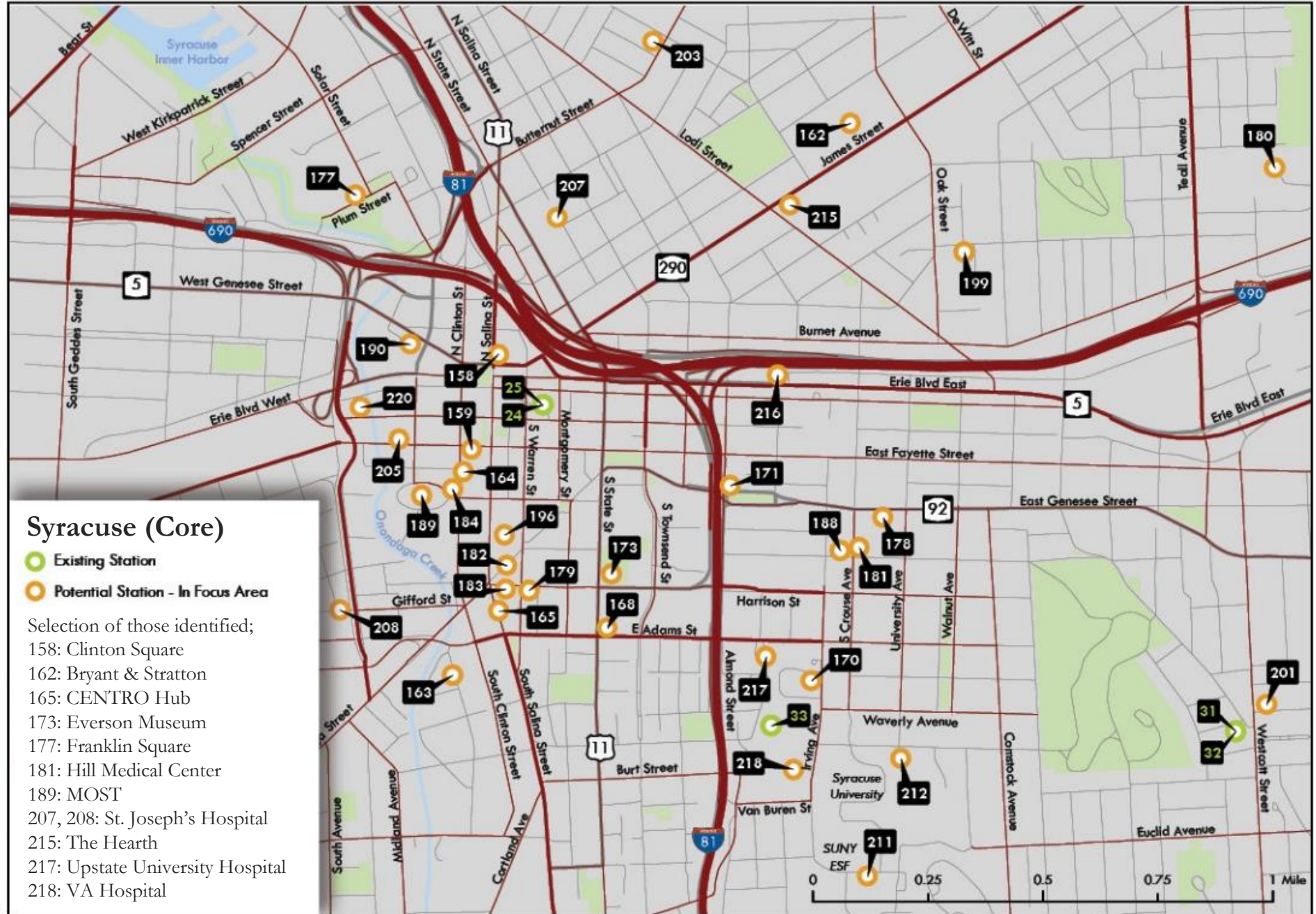


Syracuse Center of Excellence in Energy and Environmental Systems

Central New York Electric Vehicle Charging Station Plan



Central New York Electric Vehicle Charging Station Plan



Central New York Electric Vehicle Charging Station Plan

Clay is located on the northern border of Onondaga County, approximately 2.5 miles north of the City of Syracuse and 1 mile northwest of Onondaga Lake. It is the largest town in the county (almost 50 square miles) and contains part of the Village of North Syracuse.

Overview

A suburb of Syracuse, Clay is close to Syracuse Hancock International Airport and Interstates 81 and 90. NYS Route 31 is a major east-west travel route through the Town of Clay and the neighboring Town of Cicero. Route 31 is an emerging node of large-scale commercial development near the Route 481 interchange.

In the town's 2013 draft Northern Land Use Study, the Syracuse Metropolitan Transportation Council (SMTC) found that the total number of households in the town could increase by approximately 15% by 2025 based on Traffic Analysis Zones data. It is estimated that there are approximately 9,500 developable acres in the town.

Population density within the town is fairly low with 1,214 people per square mile on average. However, there are some fairly densely populated areas in the southern part of the town where there are many residential subdivisions. In these parts of the town, there are over 5,000 people per square mile, which is comparable to some residential neighborhoods in the City of Syracuse.

Demographics

Clay has an estimated population of approximately 59,806 in 2014, representing modest growth of nearly 2% since 2000. The U.S. Census Bureau's data on the number of authorized residential building permits indicates considerable new construction activity with 1,309 new single-family housing units built between 2001 and 2012.

As compared to the Onondaga County average, Clay has higher median household income, lower poverty rate, lower proportion of elderly people, slightly higher average household size, slightly higher median home value, and almost equivalent mean commute times.

The community is fairly affluent, with a median household income of \$65,856 annually and a median home value (single-family owner-occupied) of \$132,400 in 2013. Clay's residents are also well-educated, with 28% having a bachelor's degree or higher and 10% having a graduate or professional degree.

EV Factors

As of 2015, there were thirteen EVs owned by residents of Clay, with an additional 104 EVs owned by individuals that live in bordering areas.

Clay is a bedroom community of Syracuse, with nearly 11,000 residents working in other communities across the county and region. According to the SMTC's Clay-Cicero Route 31 Transportation Study, the single most common place of employment for Clay residents is the City of Syracuse, representing nearly one-third of all residents. In total, over 80% of residents work in nearby communities including Syracuse, Salina, Dewitt, Cicero, or within Clay. This indicates significant potential EV uptake for commuters.

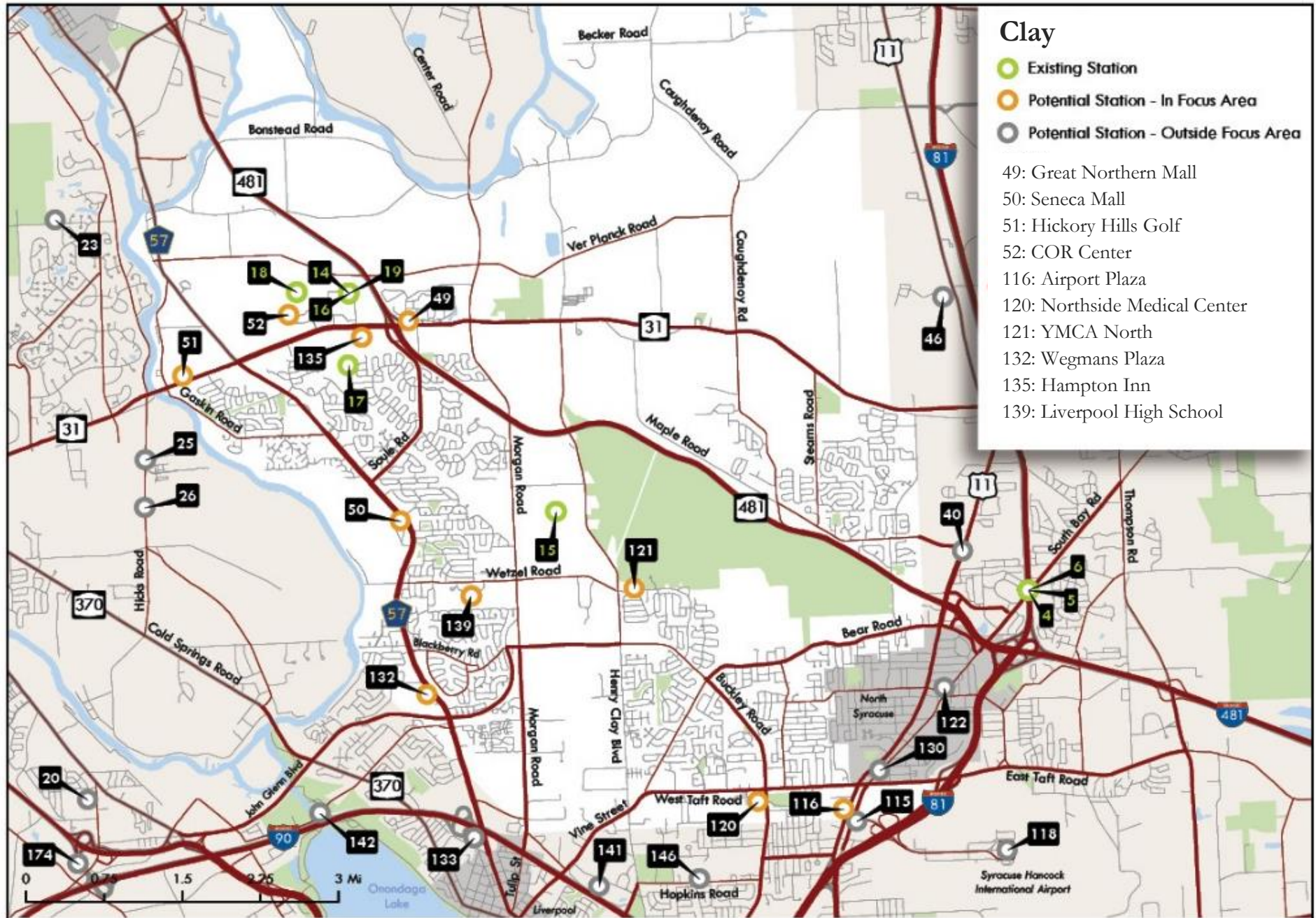


Clay Town Hall on Route 31



Great Northern Mall on Route 31

Central New York Electric Vehicle Charging Station Plan



Central New York Electric Vehicle Charging Station Plan

Camillus is in west-central Onondaga County, just to the west of the City of Syracuse. The 35 square mile town includes Fairmount, Amboy-Belle Isle, Warners, and the Village of Camillus.

Overview

Camillus is predominantly a residential suburban community and while portions of it are significantly developed, much is still rural with little infrastructure and available commercial services. According to the Camillus Comprehensive Plan, it is the town's intent to balance future development by not only preserving its several established working farms and rural land but also building upon its commercial and residential needs in an environmentally sensitive way.

The Town of Camillus is the proud home to many museums, historical sites, and excellent recreational facilities including the Octagon House, Erie Canal Park/Sims Store Museum, Martisco Station Railway Museum, School House #1, and an Agricultural Museum. Camillus is within close proximity to the City of Syracuse and Interstates 90, 690 and 81, providing easy access to Central New York locations, as well as other regions of the state.

Demographics

Camillus population density is approximately 672 people per square mile. The community has seen modest population growth of approximately 5% between 2000 and 2014, growing to 24,285.

The community is fairly affluent with a median household income of \$64,217, which ranks 29th in the five-county Central New York region. About 4% of Camillus' total population were below the poverty line, compared to 12% of total population for Onondaga County as a whole.

EV Factors

As of 2015, there is approximately 18 EVs owned by residents of Camillus, with an additional 38 EVs owned by individuals that live in bordering communities.

There has been significant commercial development in recent years which should facilitate more EV traffic and cost effective opportunities to install charging infrastructure. Most notably is the 66-acre Township 5 located off Hinsdale Road exit of Route 5. This \$58 million project consists of a mixture of residential apartments and retail stores in a "town center" setting. It will provide an array of shopping, dining

and indoor recreational activities that will result in having most of the services its residents require within the town. This project will also attract new residents to Camillus because of its easy access via the Route 5 highway.

The Township 5 project has spurred additional development including medical offices and a 96-unit luxury apartment complex nearby. The 119-unit Camillus Senior Pointe Apartments located across Route 5 is expected to be completed in 2016, and a small shopping center across the street from the Fairmount Fair shopping center will also be completed in 2016.

Another developing commercial corridor is the area along Milton Ave and Hinsdale Road. On the Northeast corner are Home Depot, Staples, a few smaller stores, and a motor vehicle tire center. On the Southwest corner is the revitalized Elm Hill Plaza which houses a number of smaller commercial establishments.



Township 5 Shopping Center



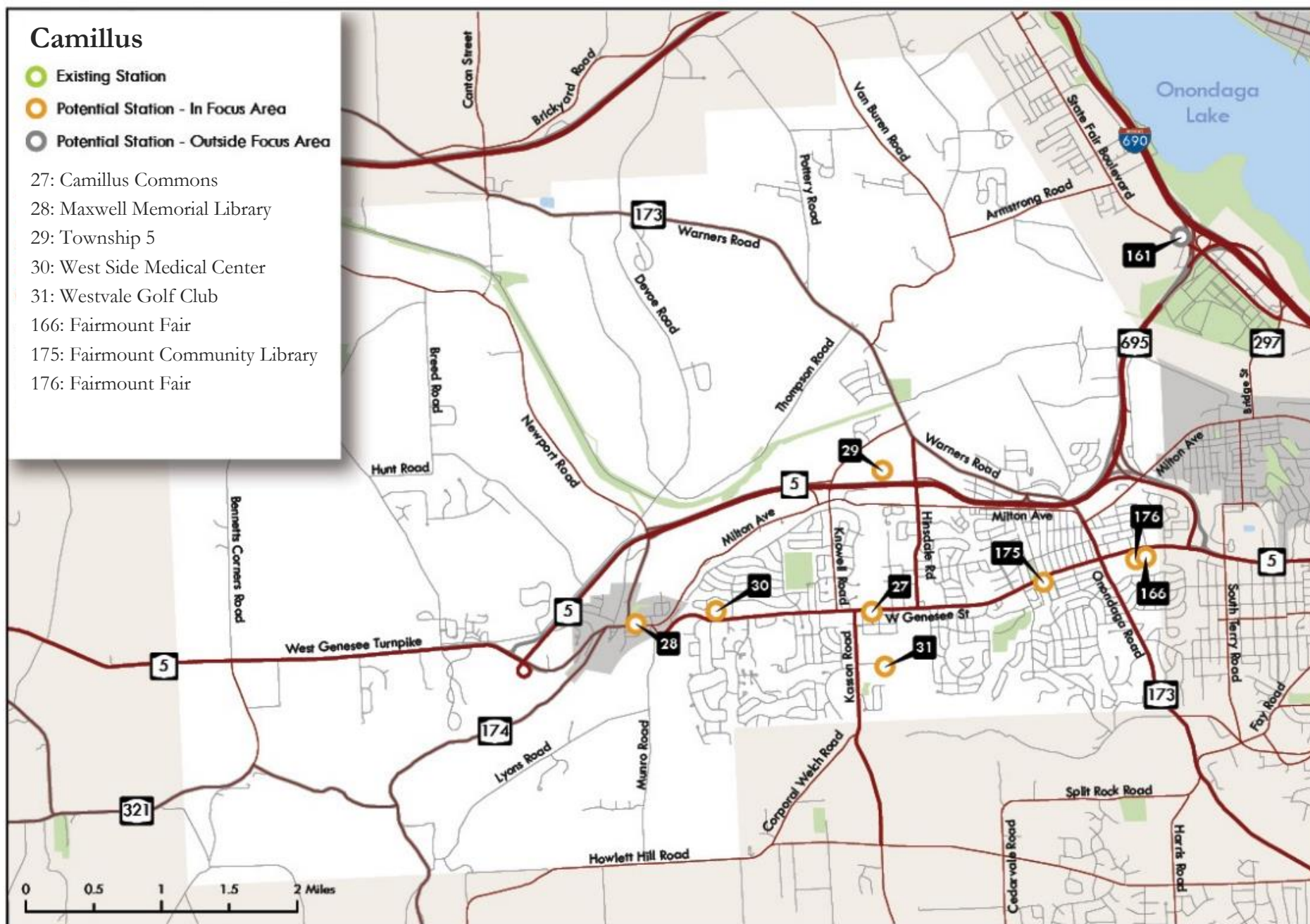
Sims Store at Camillus Erie Canal Park

Central New York Electric Vehicle Charging Station Plan

Camillus

- Existing Station
- Potential Station - In Focus Area
- Potential Station - Outside Focus Area

- 27: Camillus Commons
- 28: Maxwell Memorial Library
- 29: Township 5
- 30: West Side Medical Center
- 31: Westvale Golf Club
- 166: Fairmount Fair
- 175: Fairmount Community Library
- 176: Fairmount Fair



Central New York Electric Vehicle Charging Station Plan

Fayetteville is a village located in the east-central portion of Onondaga County within the Town of Manlius. It is located approximately eight miles east of downtown Syracuse. Fayetteville lies on both sides of the State Route 5, which was the main route across New York until the New York State Thruway was constructed.

Overview

The name "Fayetteville" was chosen to honor the hero of the American Revolution, Marquis de Lafayette. Growth in Fayetteville is attributed to its proximity to the City of Syracuse. Fayetteville has been a center of trade and business since the first settlers arrived in 1792.

Fayetteville's earliest industries used water power from Limestone Creek which flows north through the western portion of the village. After 1845, the Ledyard Dyke, a man-made shallow power canal, was a more dependable source. The prosperity of the local quarries, mills, farms, stores, warehouses, and canal boats led to the building of many of the Greek Revival style homes that still line Fayetteville's Genesee Street Hill and are part of the Fayetteville Historic District which was entered on the National Register in 1983.

Easy, fast transportation -- first by electric trolley and later by buses and automobiles -- helped make Fayetteville home to commuters who worked in Syracuse offices and at Syracuse University. In the years since World War II, businesses such as General Electric, Bristol-Myers, Carrier, and now the medical centers are the primary work places.

Demographics

Fayetteville has grown in population since 2000, after a number of decades of modest population decline. The village's population has increased by about 3% in this period to 4,324 in 2013.

Households in this area have the highest education and income levels in Onondaga County. Median household income was \$72,099 and per capita income was \$45,265 in 2014 according to the U.S. Census. Approximately 57% of adults have received bachelor's degree or higher, and 29% of residents have received a graduate or professional degree. Median house value was estimated to be \$167,727 in 2013.

The composition of the community's population has remained relatively stable, although the age distribution has shifted substantially older over the past two decades. This trend is consistent with age distribution patterns throughout much of the metropolitan Syracuse region, as well as upstate New York as a whole. The village's 2014 update to its Comprehensive Plan identifies potential impacts on the community from this shift, including increasing demand for dedicated senior

housing, for essential services within walking or short driving distance of senior residential facilities, and for traffic controls that accommodate aging and mobility-impaired pedestrians such as countdown timers, wide crosswalks, and median refuges. Shifting demographics within the community may influence the uptake of EVs.

EV Factors

As of 2015, there were approximately 23 EVs owned by residents of Fayetteville, with an additional 62 EVs owned by individuals that live in bordering areas. Fayetteville has a reputation as a desirable suburban community in the Syracuse metropolitan area. The village is primarily a commuter community set in the midst of suburban development surrounding the City of Syracuse. Today, homes fill the farm fields and orchards that once surrounded the village center. In each neighborhood, parks provide play space. The Erie Canal has become a recreational hiking trail and Green Lakes State Park on the eastern edge of the village preserves part of a primeval forest and two unusual lakes that provide year-round enjoyment.

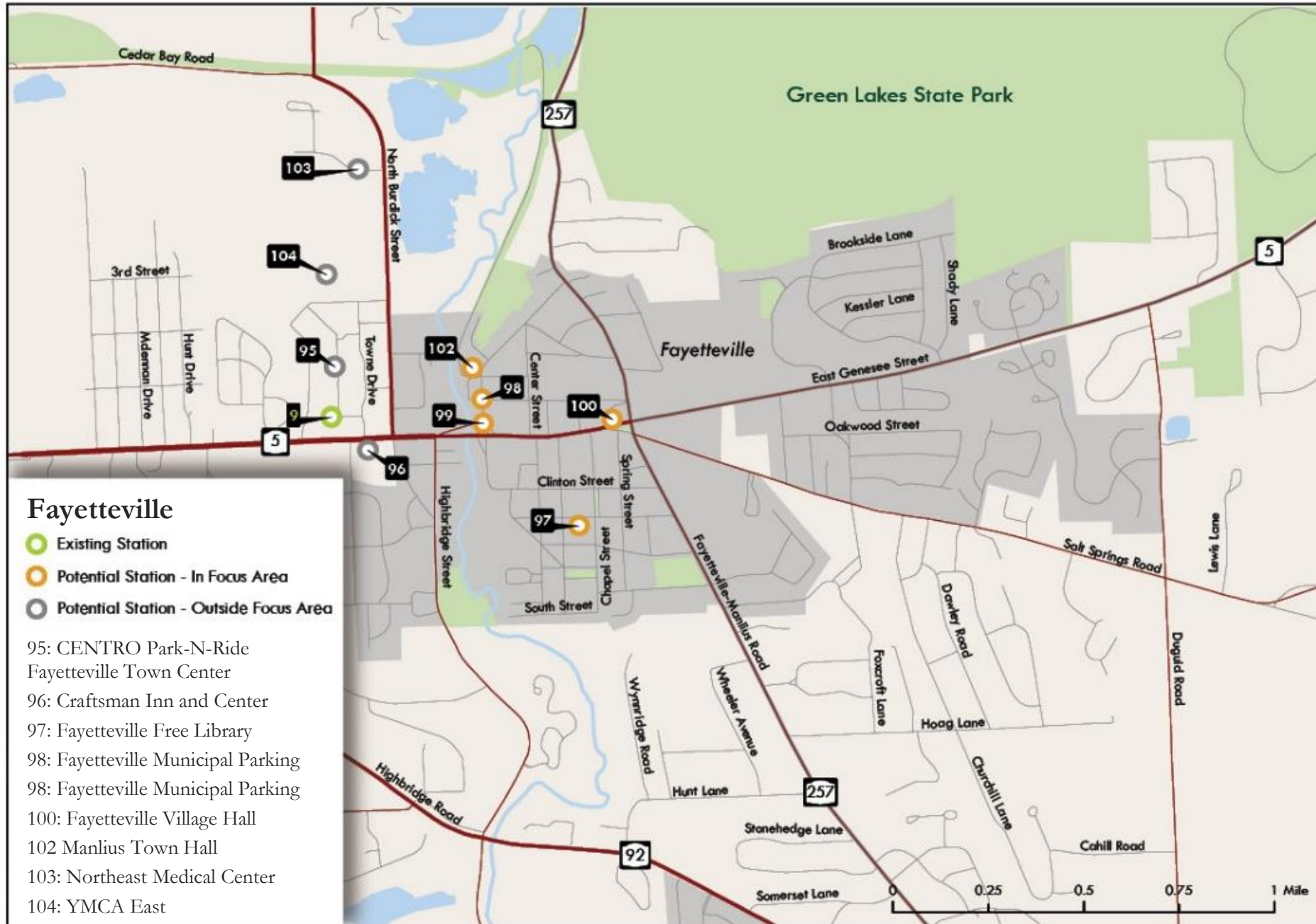


Fayetteville Village Hall and Fire Station



Green Lakes State Park

Central New York Electric Vehicle Charging Station Plan



Central New York Electric Vehicle Charging Station Plan

Other Potential Level 2 Charging Station Installation Locations

Five additional locations have good potential for installing charging stations. As EV use expands in this region, these locations should be considered.

Cazenovia was founded in 1793 and evolved from its initial industry of mills and manufacturing companies along its waterways and as a farming community that utilized the rich agricultural soils into a small bedroom community with a total population of 6,481. Nestled among rolling hills, edged by Cazenovia Lake to the west and blanketed by agricultural fields to its north, south, and east, the Village is framed by its abundant natural beauty. The community has retained much of its historic character, both in its residential, commercial, and institutional buildings and in the settlement pattern of neighborhoods surrounding the central business district. Cazenovia College is one of the community's major employers, along with engineering company GHD and Marquardt Switches. When knitted together by natural threads of Chittenango Creek, Cazenovia Lake, rolling hillsides, and agricultural landscapes, the Village and Town comprise a dynamic quilt of natural, cultural, historic, and scenic resources.

Auburn is located approximately 35 miles west of Syracuse. It is the county seat of Cayuga County and its largest community. The City of Auburn is rich in culture, arts, and history, offering a great array of museums, historic sites, and national landmarks such as the Harriet Tubman Home and

the William Seward House. Auburn is also home to the Auburn Doubledays, a professional minor league baseball team. The Auburn Public Theater presents professional entertainment year round. There are many older established residential neighborhoods surrounding Auburn's traditional small downtown, which has a number of major revitalization projects underway. As the County seat, Auburn is the location of many countywide government services, banking and finance, legal and medical services. Auburn Community Hospital is the only hospital in the County, providing a broad spectrum of health care services. The city's major employers include light manufacturing industries such as precision metalworking, plastics and fiber optics, and a range of service-related institutions in education, government, and health care.

Cortland is Cortland County's sole city and is known as the "Crown City" due to its location at the apex of seven valleys. Cortland is located along Interstate 81, between the cities of Binghamton to the south and Syracuse to the north. As the County seat, Cortland has long been the center of government, culture, and commerce for the area. The City's Central Business District is "downtown" for much of the County and the County's only hospital, Cortland Regional Medical Center, is located in the City, as are most major social service providers and many of the area's largest employers including the hospital and SUNY Cortland. Most of Cortland County's recreational parklands are in the City. Cortland is

virtually built out, in that nearly all developable properties within the City boundaries have been developed. Most development in recent years has been through demolition and reconstruction, or adaptive reuse of existing businesses.

Liverpool is a village bordered on three sides by the Town of Salina in the north-central part of Onondaga County. It is immediately north of the City of Syracuse on the eastern shore of Onondaga Lake. The village covers an area less than one square mile and is mainly residential, with some commercial use and park development running along the entire Onondaga Lake shoreline. Onondaga Lake Park, one of the most prominent locales in Liverpool, attracts over one million visitors each year. NYS Route 370 is an east-west highway that runs through the village, while the NYS Thruway (Interstate 90) passes through the northern part of the village.

North Syracuse is a village located in the Towns of Cicero and Clay in Onondaga County approximately 7 miles north of the City of Syracuse. U.S. Route 11 passes right through the village and Interstate 81 passes along the eastern edge. Its 6,862 residents have access to five parks, Heritage, Lonergan, Centerville, Sleeth and Kennedy. These parks host sporting events, concerts, youth camps, nature trails, and a swimming pool. The historic Community Center serves numerous, local groups as the site for organizational meetings, recreational programs, and private parties.

Central New York Electric Vehicle Charging Station Plan

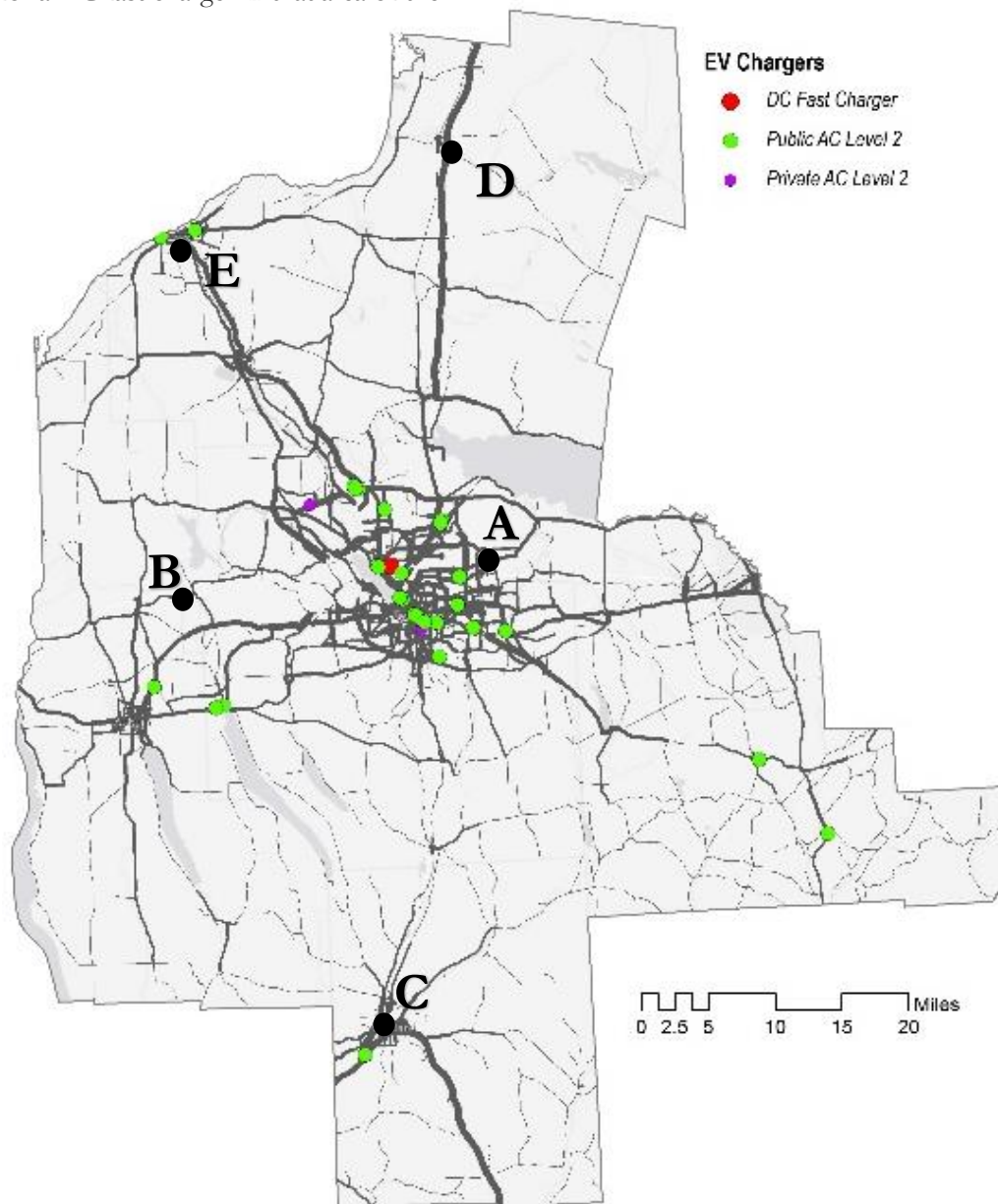
DC Fast Charging Infrastructure

AC Level 2 charging stations are useful for extending the daily use of EVs, but they are not practical for enabling inter-regional travel. DC fast chargers, which can provide an 80% charge in about 20 minutes, are needed to further extend the use of EVs throughout NYS. Strategically placing DC fast chargers in Central New York along Interstate 90 and 81 could support transient EV drivers as well as local EV drivers.

Installing DC fast chargers in Dewitt [A] near exit 35 of the NYS Thruway, and Weedsport [B] near exit 40 of the NYS Thruway could enable most EVs in good weather to travel from Utica to Rochester (Utica-Dewitt is 49 miles, Dewitt-Weedsport is 27 miles, and Weedsport-Rochester exit 45 is 52 miles). There are a number of possible locations in Dewitt at Carrier Circle that includes several hotels and restaurants within a few miles of I-90. This is also near the Syracuse Airport and could potentially be configured adjacent to the Thruway plaza to serve EVs on and off I-90. Possible locations in Weedsport include the Days Inn Hotel and the NYSDOT Park and Ride facility.

Cortland [C], 35 miles south of Syracuse is a logical location for a DC fast Charger on I-81 towards Binghamton. Outside of Onondaga County, there are no major towns north of Syracuse on I-81, but a DC fast charger would likely need to be placed halfway to Watertown [D] which is 75 miles from Syracuse. Oswego [E], 40 miles north of Syracuse on 481 is likely more of a

final destination than a stopping point on the way to another location, but it would serve as a logical choices for a DC fast charger in that area of the state.





Central New York EV Charging Station Plan

Recommendations for Community EV Readiness

Although gasoline-powered vehicles will be around for many years, a shift in the transportation industry toward electrification will change how people drive and fuel vehicles. EVs can be very beneficial to communities and their residents. Unlike gasoline-powered vehicles, EVs are quiet, emit no direct air pollution, and do not require imported fuel that must be transported with the risk of spills or leaks.

To enjoy these benefits and support residents who make the investment in cleaner cars, communities can promote the use of EVs by becoming EV-ready. Municipalities can prepare for EVs and the infrastructure that is used to charge them with the following best practices guides for amending local rules and regulations to be EV-friendly.

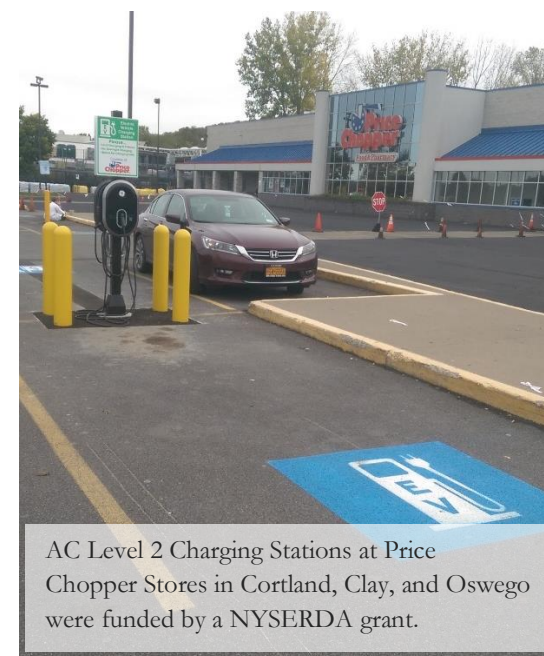
Understanding which level and how many charging stations are feasible for different settings based on expected EV use is critical. The type and number of EVs in a community will help shape how many and what kind of charging station an EV owner might need. The different types of charging stations will charge EV batteries at

different rates. The type of EV charging infrastructure at each site should correspond with the amount of time a vehicle might be parked there while the driver is shopping, working, or enjoying entertainment. As a municipality, zoning laws must permit the installation of each charging station type in an appropriate setting.

Zoning and parking ordinances have a wide impact on how and where public charging stations are installed and used. Zoning rules can help determine what types of land uses are appropriate for AC Level 1, AC Level 2, and DC fast charging stations and how they should be sited. Parking rules dictate who is allowed to park in parking spaces adjacent to charging stations, and whether cars parked there illegally can be fined or towed. One of the most frustrating situations for an EV driver in need of a charge is to pull up to a charging station, only to find it is occupied by a conventional vehicle.

Examples of zoning and parking policies from across the country can be found in the [Planning Policy Tool Guide](#), which also addresses local permitting practices and building codes. This guide highlights best practices and introduces policy options for public officials and private-

sector leaders to prepare their communities, jurisdictions, states, or organizations for EVs.



AC Level 2 Charging Stations at Price Chopper Stores in Cortland, Clay, and Oswego were funded by a NYSEDA grant.

Simple and consistent EV charging station *permitting processes* can make installing EV infrastructure much easier. Current national building and electrical codes neither inhibit nor facilitate the implementation of EV charging stations. But at a municipal level, the adoption of

Central New York Electric Vehicle Charging Station Plan

certain provisions in local codes has successfully encouraged EV-readiness in some jurisdictions.

[EV Ready Codes for the Built Environment](#)

provides current codes for charging stations and what code provisions could be incorporated into local code to encourage a basic or advanced level of EV-readiness. It highlights best practices from around the world to make recommendations for jurisdictions in the Northeast and mid-Atlantic.

How charging station installation work is classified within a jurisdiction can impact the time and cost of the permitting process. An overview on [Permit Process Streamlining](#) reviews best practices for charging station permitting and presents sample

application forms. While residential installations were the focus on this investigation, the results and findings also apply to commercial charging station installations.

Residential EVSE Permit Process Best Practices



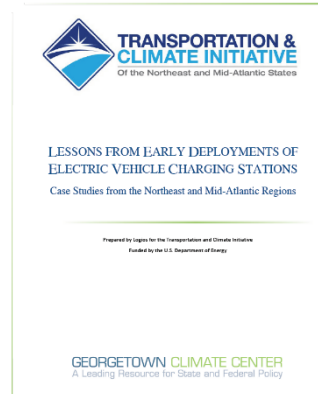
Prepared by:
Energetics Incorporated
Prepared for:
New York State Energy Research
and Development Authority
April 2013

NYSERDA has funding available for communities to amend their permitting, zoning, and parking ordinances so they are more EV-friendly, along with other opportunities available to support EV

and charging station use. Through the [Cleaner, Greener Communities program \(Phase 2, Category 1\)](#), up to \$5,000 per municipality is available.

[Lessons from Early Installations of Charging Equipment](#)

documents EV charging infrastructure installations in the Northeast and Mid-Atlantic, and uncovers some of the related challenges and opportunities.



- In general, preparing the charging sites as part of a new development is more cost effective than incorporating EV charging infrastructure into an existing structure. The cost of electric system upgrades also tends to increase with the age of the building.
- Installations in public spaces, such as sidewalk right of way, can be administratively burdensome and formalizing clear procedures for permitting and approval will help expedite installations.
- Standardization of signs, both regulatory (on-site) and directional (wayfinding) will not only improve communication to drivers but also reduce the burden on site owners and designers.

- Site owners, current and prospective, often struggle with the question of return on investment on EV charging equipment.
- Cords without a management system are often left spread about on the ground and may potentially become a hazard for users or the equipment.
- The Northeast and Mid-Atlantic regions have not yet formally adopted guidelines or recommendations on the definition of ADA-accessible charging space and the minimum number of charging stations that need to meet that definition.
- A careful evaluation of the possible spaces where the EV charging equipment could be located and their impact on the economics of the installation should be part of the planning process before a commitment to installing the equipment is made.
- Public-private partnerships to fund the installation of charging stations help the host construct a more attractive economic case to install the equipment, while enabling government to pursue their community goals.
- Before entering into agreements to install charging stations, prospective hosts should make sure they understand who will pay for maintenance, electricity, and other ongoing costs after installation.

Central New York Electric Vehicle Charging Station Plan

Barriers and Solutions

Establishing a more comprehensive network of AC Level 2 charging stations, as recommended in the prior section, is one key strategy to encourage more drivers to consider owning an EV. Public charging stations could make EV ownership more feasible for some, while the exposure to this technology from having public charging infrastructure will expose others to EV options.

Public AC Level 2 charging stations may also allow current EV drivers to use their vehicle more, rather than relying on a secondary conventional ICE vehicle for trips that require charging while in route. More electric miles results in cost savings for the EV owner and more environmental benefits for the community.

Five barriers were determined to be critical issues limiting the expanded use of EVs in Central New York. For each, potential solutions and strategies for addressing these are presented and it is strongly recommended that municipalities, counties, and the region as a whole lead or support initiatives that follow these recommendations.

Car Dealership Support

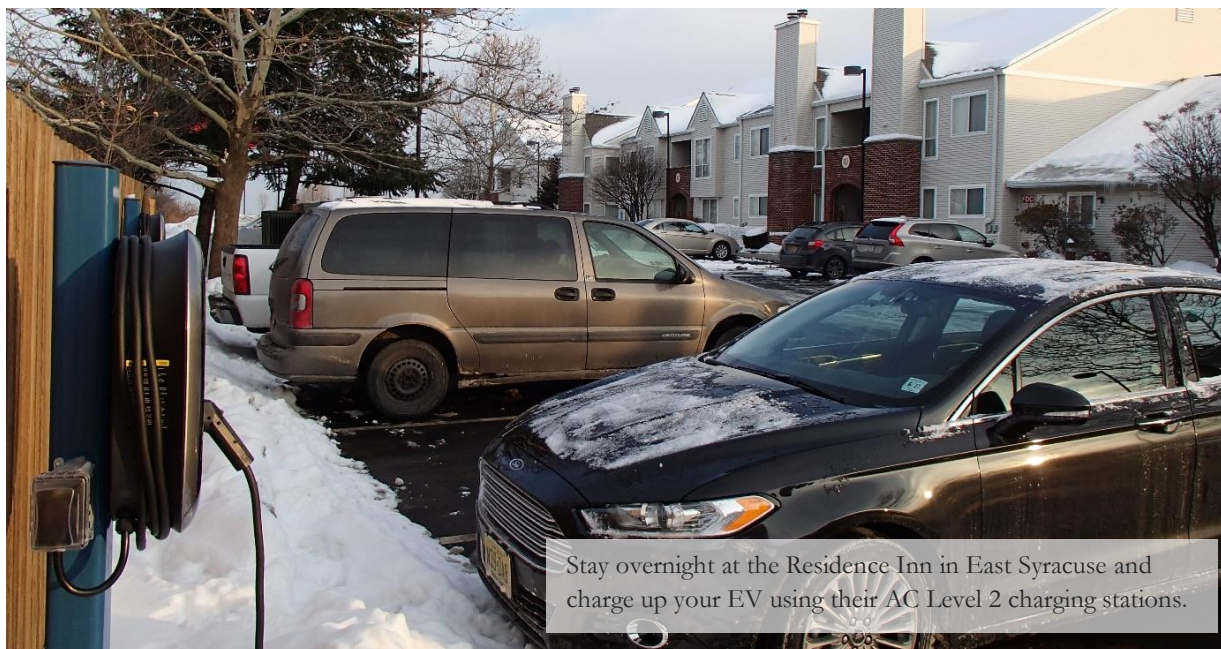
Car dealership support is needed to improve dealer knowledge of EVs, which has been uneven and insufficient to address consumer questions and concerns. Consumers have traditionally relied on dealers to provide vehicle information, so dealer knowledge is one of many factors that contribute to consumer uncertainty and create a

perceptual hurdle that negatively affects EV purchases. Improving market penetration rates will not only be a function of the cost, quality, and availability of EVs themselves. It will also be influenced by simultaneous improvements to the entire industry ecosystem including product technologies such as low-cost batteries, downstream infrastructure such as repair facilities, and complementary infrastructure such as charging stations. Dealer education regarding the range, function, electricity consumption, fuel costs and environmental benefits, and service needs of various EVs, as well as determining charging infrastructure needs and costs is needed. Dealers should be a source of information about incentives but are unlikely to have all the necessary information. Dealers might also not want to

provide information on incentives for fear of being held accountable if they provide inaccurate information. Dealers can refer customers to credible internet sources that provide accurate and timely information if they are properly educated on the available resources.

Vehicle and Charging Station Costs

Vehicle and charging station costs are still a barrier to market development and widespread adoption. Cost-effective and successful charging station installations will benefit EV drivers while parked at that location and can help businesses increase visits, keep customers for longer durations, and serve as a good perk for employees or customers. EV drivers often seek out charging locations as they go about their everyday routines at, for



Central New York Electric Vehicle Charging Station Plan

example, restaurants, stores, and entertainment venues. Installing EV charging stations at workplaces can be very successful at the right businesses and have benefits for employers and their employees alike by attracting and retaining desirable employees. Started in 2013, New York State provides an income tax credit for 50% of the cost, up to \$5,000, for the purchase and installation of EV charging stations. This New York State Alternative Fuel Vehicle Recharging Tax Credit for commercial and workplace charging stations is available through December 31, 2017. NYSERDA is facilitating a rebate program to provide up to \$2,000 off the purchase or lease of a new eligible zero-emission vehicles, including EVs. Rebates are expected to be available starting in the fall of 2016.

Zoning Rules

Zoning rules that are amenable to the installation of public EV charging stations on private property and in the public right of way should be developed by municipalities. Zoning ordinances have a wide impact on how and where public charging stations are installed and used. Zoning rules can help determine what types of land uses are appropriate for AC Level 1, AC Level 2, and DC fast charging stations, along with how they should be sited. At a minimum, zoning laws should permit the installation of each charging station type in an appropriate setting. NYSERDA has funding available up to \$5,000 through its Cleaner, Greener Communities program for

communities to amend their zoning, permitting, and parking ordinances so they are EV-friendly.

Educating potential EV owners

Educating potential EV owners through large scale awareness efforts coordinated with EV manufacturers and local dealerships is needed. These efforts should be directed towards key demographics of potential EV buyers rather than a broad audience. EV projects involving students in college or younger could be effective, as well as efforts that draw a connection between EVs and ongoing electricity generation initiatives (e.g., solar power installations and regional Solarize campaigns). A dedicated webpage for promoting EVs should be developed, since online resources are excellent for providing information.

DC Fast Charging Stations

DC fast charging stations will be needed to facilitate longer EV travel distances, including inter-regional trips. They should be placed in strategic locations that are convenient for drivers traveling on Interstates and in larger cities where there is a concentrated population of EV drivers so the stations can also be used by local residents. The planning on fast charging stations should be coordinated at a state level and attempt to align with regular routes for government or private fleets of EVs. Logical locations to consider in Central New York for fast chargers include Dewitt and Weedsport on Interstate 90, Cortland on Interstate 81, and Oswego on NYS Route 481.

More EVs will be utilized by Central New York residents in the near future because they provide benefits for the entire community. While current EV adoption rates are too low to pursue any charging station requirements or regulations, gradually expanding the charging network in the region and supporting the recommended strategies to help our communities become more EV-ready will prepare us for the future. Even today, attracting EV drivers from other areas of the state can complement the efforts to promote tourism in Central New York. EVs also attract highly educated and technology savvy individuals who can help drive our emerging technology industries.

The *key next steps to implementing this EV Charging Station Plan* are:

- 1) Holding meetings with key stakeholders in the recommended locations for additional charging stations to prepare for, and encourage, new installations
- 2) Participate in any efforts to plan or deploy DC fast chargers
- 3) Distribute or post EV information at meetings, in newsletters, or on websites
- 4) Regularly discuss or bring up the topic of EVs at relevant or related activities to increase awareness
- 5) Pursue funding opportunities or other options to create a new EV website or establish a network of EV drivers
- 6) Offer assistance or support any effort promoting EV technology

Central New York EV Charging Station Plan



Appendix A: EV Models Available in NYS

PHEVs

Audi A3 Sportback e-tron

Starting MSRP: \$37,900
Federal Tax Credit: \$4,168
MPG Equivalent: 95
Electric Range (miles): 31

BMW i3 w/ Range Extender

Starting MSRP: \$46,250
Federal Tax Credit: \$7,500
MPG Equivalent: 117
Electric Range (miles): 81

BMW i8

Starting MSRP: \$136,500
Federal Tax Credit: \$3,793
MPG Equivalent: 76
Electric Range (miles): 15

BMW X5 xDrive40e

Starting MSRP: \$62,100
Federal Tax Credit: \$4,168
MPG Equivalent: 59
Electric Range (miles): 13

Cadillac ELR

Starting MSRP: \$65,000
Federal Tax Credit: \$7,500
MPG Equivalent: 82
Electric Range (miles): 37

Chevrolet Volt

Starting MSRP: \$33,170
Federal Tax Credit: \$7,500
MPG Equivalent: 106
Electric Range (miles): 53



Ford C-Max Energi

Starting MSRP: \$31,770
Federal Tax Credit: \$4,007
MPG Equivalent: 88
Electric Range (miles): 21



Ford Fusion SE Energi

Starting MSRP: \$33,900
Federal Tax Credit: \$4,007
MPG Equivalent: 88
Electric Range (miles): 21



Honda Accord PHEV

Starting MSRP: \$39,780
Federal Tax Credit: \$3,626
MPG Equivalent: 115
Electric Range (miles): 13

Hyundai Sonata PHEV

Starting MSRP: \$34,600
Federal Tax Credit: \$4,919
MPG Equivalent: 93
Electric Range (miles): 22

Mercedes-Benz S-Class PHEV

Starting MSRP: \$95,650
Federal Tax Credit: \$4,168
MPG Equivalent: 58
Electric Range (miles): 20

Porsche Cayenne S E-Hybrid

Starting MSRP: \$77,200
Federal Tax Credit: \$5,335
MPG Equivalent: 47
Electric Range (miles): 14

Porsche Panamera S E-Hybrid

Starting MSRP: \$96,100
Federal Tax Credit: \$4,751
MPG Equivalent: 50
Electric Range (miles): 16

Toyota Prius PHEV

Starting MSRP: \$29,990
Federal Tax Credit: \$2,500
MPG Equivalent: 95
Electric Range (miles): 11



Central New York Electric Vehicle Charging Station Plan

BEVs

BMW i3 BEV

Starting MSRP: \$42,400
Federal Tax Credit: \$7,500
MPG Equivalent: 124
Electric Range (miles): 81

Chevrolet Bolt

Starting MSRP: N/A
Federal Tax Credit: \$7,500
MPG Equivalent: N/A
Electric Range (miles): 200

Ford Focus Electric

Starting MSRP: \$29,170
Federal Tax Credit: \$7,500
MPG Equivalent: 104
Electric Range (miles): 76

Kia Soul EV

Starting MSRP: \$31,950
Federal Tax Credit: \$7,500
MPG Equivalent: 112
Electric Range (miles): 105

Mercedes B Class Electric Drive

Starting MSRP: \$41,450
Federal Tax Credit: \$7,500
MPG Equivalent: 84
Electric Range (miles): 87

Mitsubishi i MiEV

Starting MSRP: \$22,995
Federal Tax Credit: \$7,500
MPG Equivalent: 112
Electric Range (miles): 62

Nissan Leaf

Starting MSRP: \$29,010
Federal Tax Credit: \$7,500
MPG Equivalent: 115
Electric Range (miles): 84

Smart Electric Drive

Starting MSRP: \$25,000
Federal Tax Credit: \$7,500
MPG Equivalent: 107
Electric Range (miles): 68

Tesla Model S

Starting MSRP: \$71,070
Federal Tax Credit: \$7,500
MPG Equivalent: 95
Electric Range (miles): 265

Tesla Model X

Starting MSRP: \$80,000
Federal Tax Credit: \$7,500
MPG Equivalent: 89
Electric Range (miles): 230

Volkswagen e-Golf

Starting MSRP: \$28,995
Federal Tax Credit: \$7,500
MPG Equivalent: 116
Electric Range (miles): 83



Smart Electric Drive BEV



Tesla Model S BEV



Ford Focus BEV



Nissan Leaf BEV