Ridgefield CT Electric Vehicle (EV) Charging Infrastructure Assessment

Executive Summary of Recommendations

The Town of Ridgefield has three (3) publicly available, non-networked, AC level 2, EV charging stations at three distinct locations; Town Hall, Ridgefield playhouse, and at the Branchville train station. Each charging station has 2 charging outlets or ports and each location is registered on EV charging websites PlugShare, PluginAmerica, and SolvingEV. Ridgefield plans to add four (4) AC level 2 charging outlets during construction of a new municipal parking lot, located in close proximity to the shopping district.

The purpose of this analysis is to assess where the Town of Ridgefield needs additional EV charging infrastructure. Based on the analysis, which follows below, we recommend the Town of Ridgefield take the following seven actions:

1. Make limited additional investments in publicly available, AC level 2, charging stations.
    a. Select highly visible commercial locations with moderate parking space turnover (e.g. every 90 minutes or so). Examples include: Town owned parking lot on Governor place; Prospector/Library parking lot; Aldrich Museum; Lounsbury House; and Keeler Tavern
    b. Select locations for ADA compliance and wireless network connectivity;
    c. Select locations in close proximity to the power source to minimize trenching costs;
    d. Select Combined Charging System (CCS) station technology;
        i. Do not purchase auto manufacturer specific chargers (e.g. Tesla or Lucid)
        ii. Do not purchase CHAdeMO chargers
    e. Chargers should be free to use initially and convert to a pay for use system;
    f. Consider using Climate Mayors collaborative purchasing agreements for discount pricing on EV chargers.
    g. Add retractable reels to Branchville station to avoid damage to cord and plugs; consider retrofitting all existing stations accordingly. Limit future EV charging additions at the Branchville station to AC Level 1 options.

2. Ridgefield's town-owned parking lots are limited to: behind Town Hall, a small portion of the Bailey Ave. lot (adjacent to Bailey's Backyard), and the municipal lot on Governor Street. The remainder of the parking lots, patrolled by the Parking Administration, are leased by the town. See map in appendix. Ridgefield should negotiate with parking lot owners to include EV charging spots during lease agreements renewals.
    a. Use Climate Mayors negotiated purchasing agreements for discount pricing on chargers.
    b. This solution would provide uniform charging technology, reduced pricing, and consistent standards (e.g. retractable reels, Wi-Fi enabled, ability to charge for use, etc.)

This assessment was conducted in response to the Sustainable CT 2020 requirement 6.4.4 - Conduct an assessment of where ZEV charging infrastructure is needed in the community (public and private). Identify the areas within your town that have the appropriate characteristics to host charging and if not the exact properties, then the approximate neighborhoods.

3. Before purchasing a cost-competitive EV pursuit police vehicle, prioritize investments in one AC level 2 charging station at the existing police station and another at the Town Highway Department.
    a. Plan for a 3 to 6 month timeframe to complete installation
    b. Install a 40 Amp, Level 2 plug-in EV charging station (NEMA 6-50 plug) that can charge two vehicles simultaneously on one 50 Amp circuit.
    c. Cost estimate for each charger and installation is $3,000

4. Ensure that the needs analysis for the proposed new police / fire complex includes EV charging infrastructure and in particular the need for a DC fast charging station.
    a. At a minimum, infrastructure should be DC fast charging station capable

5. Budget for AC level 2 charging stations at publicly owned, low-income housing.
    a. Consider collaborating with a car share company to provide improved mobility access to the low-income community.
    b. Examples include Prospect Ridge and Ballard Green

6. The Ridgefield Public School (RPS) system contract with First Student expires on June 30, 2022 We recommend that RPS include electric school bus objectives in the request for proposals and discussions/negotiations with prospective school bus providers for the next contract.

7. Modify the town's building code to ensure that new buildings, as well as new parking lots, are AC level 2 charging infrastructure ready.

Analysis

Technological, legislative, and environmental mega trends are converging to shift gasoline and diesel powered vehicles to electric power. The shift to electric vehicles gained traction in 2010 with the introduction of production models of EVs and is now accelerating.

In 2010 there were about 17,000 EVs on the world's roads. By 2019, there were 7.2 million EVs, some of which were in use in Connecticut. As of December 31, 2019, there were 11,677 EVs registered in Connecticut. To date, there are nearly 2.4 million light-duty passenger cars and trucks registered in Connecticut. Annual sales of new light-duty vehicles in Connecticut fluctuate each year from roughly 150,000 – 180,000, and EVs account for only 2 percent of annual sales. DEEP April 2020 press release.

The 2021 to 2030 period will bring a tremendous increase in EVs on CT's roads. CT's current stated goal is to increase EVs by ten-fold (125,000 – 150,000 EVs) by 2025. More recently, CT joined the bipartisan Transportation and Climate Initiative Program (TCI-P), which guarantees that Connecticut will reduce carbon emissions by at least 26% in a 10-year period from 2022 to 2032. Increasing the number of EVs will be important to meeting that objective. Globally EVs should reach 245 million vehicles by 2030. Global EV Outlook 2020

The purpose of this assessment is to understand the Town of Ridgefield's role in the transition to EVs. In particular, investments in the charging infrastructure to prepare for an EV municipal fleet.

In preparing this EV charging infrastructure assessment for the Town of Ridgefield CT we reviewed publicly available literature on the following subjects:

- Advancements and trends in EV and EV charging technology;
- Legislative phase-out and bans on gasoline vehicles;
- EV sales trend and vehicle manufacturers plans for EV production models; as well as
- Lessons learned by those with extensive EV experience.

Four key conclusions about EV charging needs and behavior are:

1. EV range and charging speeds are demonstrably increasing; and as range and charging speeds increase the number of charging events decrease.

2. The predominant locations for charging infrastructure are the home, work, and along major transit routes. Technology advancements in EV range and charging speed reinforces this charging behavior.

3. Electricity rates influence choice of charging location. For example, charging at a free public or work station is preferable to charging at home. In CT we do not have time of use rates, so time-of-day charging is not a factor. We note, however that charging at night is environmentally preferable. Fortune Feb 2018

4. Although highly visible, chargers at commuter parking lots and train stations are relatively underutilized and further limit already limited parking spaces. During the typical workday, a sole commuter will monopolize the charger for a full workday. These charging locations are not

typically used in the evening hours or on weekends. Any additional chargers at commuter lots and train stations should be AC level one only with credit card payment capability.

EV technology trends pertinent to this assessment are in bullet form below.

EV range: 

- Other than long-distance travel, a 100-150 mile range EV will satisfy virtually all the driving needs for most people. Even in states with cold winters, a 200-250 mile range EV would more than suffice. Green car reports June 2020
- Most 2020 electric car models have a range of 200 miles or more. Consumer reports Nov 2020
- Median range of 2020 EVs is 250 miles. See range chart in appendix
- 21 electric car models already have a range in excess of 200 miles, some exceed a 400-mile range. CNET April 2020
- Range anxiety, which is the major barrier for first time EV buyers, significantly diminishes at a range of 300 miles. Green car reports August 2017
- By the 2025 model year, EV range will routinely exceed 300 miles. Car and Driver Aug 2020

EV charging speed & charging technology: 

- Other than Tesla and Lucid, there is now a widely adopted single standard for charging technologies. (Combined Charging System (CCS)). Nissan had promoted the CHAdeMO standard, but has now switched to CCS.
- Most electric car models have already adopted on-board charging technology to accommodate higher levels of charge and therefore faster charging. Inside EVs ; clipper creek
    - Acceptance rates have increased from 3.3 kW (Nissan Leaf 2013) to 6.6 kW (Chevy Bolt) to 10.5 kW (Ford Mustang Mach E 2021)
    - Tesla acceptance rates range from 11.5 to 19.2 kW
- In the next 2 to 3 years, EV fast charging rates will routinely exceed 150-kW, thereby significantly reducing charging times. Car and Driver Aug 2020
- The cost of charging stations is decreasing and speed and functionality of charging stations is increasing. Charging stations have added wi-fi and bi-directional charging capabilities.
- EVSE, LLC an Enfield, CT company is disrupting street and parking lot charging technology. They are able to convert street and parking lot lighting into charging stations with credit card payment capability.

EV charging locations: 

- Most EV car owners have level 2 charging stations in their homes. US news and world report Sept 2020.
- The number of charging outlets is increasing at a rapid pace. There are now more than 78,000 charging outlets in the US. Statista March 2020
- There are 710 EV charging stations within a 30-mile radius of Ridgefield CT. SolvingEV
- The Danbury Mall has 10 Tesla superchargers and 9 EVgo chargers
- John F. Kennedy International Airport has a ten-port charging station compatible with all current fast-charging EV models. Also, level 2 charging is available at Terminal 5
- ChargePoint and Electrify America are both expanding their network of public fast charging stations in our area. These public DC fast chargers can charge up to 350 kW.
- Fleet owners converting to EVs are also installing EV charging infrastructure and a return-to-base strategy Fleetowner March 2019

EV legislation: 

The global marketplace is shifting to EVs.

- The sale of new gasoline vehicles is being phased out around the world. Coltura.
    - India: set a target of 100% electric vehicles by 2030, and is considering a ban on gas-powered 2- and 3-wheeled vehicles by 2025
    - California: On September 23, 2020, Governor Gavin Newsom issued an Executive Order to stop selling new fossil fuel cars by 2035.
- Multiple local jurisdictions, including CT, will likely increase the taxes on gasoline and diesel fuel to raise funds needed to encourage motorists to convert to EV ownership. See the bipartisan Transportation and Climate Initiative Program (TCI-P).
- CT has expanded subsidies for the purchase of new and used EVs. Connecticut Hydrogen and Electric Automobile Purchase Rebate.
- CT provides subsidies for the purchase and installation of EV chargers
- EVs are now on the state bid list, which many towns use to buy goods and services

This assessment considers 3 groups of EV ownership pertinent to Ridgefield. EV private ownership, EV municipal fleet, and school buses.

EV private ownership --

Given the trends noted above, confirmed by interviews with existing EV owners, we are confident that the infrastructure needs for most EV private ownership will be fully addressed by the EV owner with their own level 2 charger and increased number of public and private EV charging stations. EV car owners with a range of 200 plus miles and a level 2 charger can fully satisfy their charging needs at home. Only when taking long trips would they need or rely on public or private charging stations.

Since EV charging at night is the user and environmentally preferable method of charging, efforts to encourage home charging should be considered. For example, electricity rates for evening charging should be reduced; and subsidies for chargers increased and expanded. CT Green Bank and the State of Connecticut have the lead roles for making these pricing and policy changes.

EV owners without home charging capabilities will more routinely utilize charging locations at work or public or private charging stations. The private charging infrastructure has considerable momentum. Major players include ElectrifyAmerica, Chargepoint and EVgo. There are multiple smartphone apps which provide the EV driver with information on location, charger level and type, and restrictions of EV chargers. SolvingEV is one such program and the Town of Ridgefield's chargers are part of its system.

Given that much of the charging infrastructure needs for private EV ownership will be addressed by home, work and the expanding private infrastructure, the town of Ridgefield's additional investment in public charging should be limited, focused, strategic, and use only standardized charging technology. Locations for additional public investment should be selected based two criteria sets:

- Visible locations – helps to reduce range anxiety for future EV owners. Most potential new EV owners are concerned about running out of battery power. One of the major objectives of this type of investment is to demonstrate to future EV owners that charging infrastructure is available and reliable. Seeing and knowing that there are charging stations about helps to reduce this barrier to ownership.
- Moderate parking space turnover – locations where people will spend an hour or two to conduct their business allows sufficient time to charge and free up the space for another user.
- Public places primarily utilized by low-income tenants. It is and will be difficult for Low-income tenants to find a landlord willing to invest in level 2 charging stations. Therefore, although the used EV market is expanding and will continue to expand, the lack of charging infrastructure for low income tenants will become a significant barrier to entry.

With those criteria in mind, we propose additional investments in public charging stations at the following locations:

1. Attractions, which bring people from outside of Ridgefield (e.g. longer range journeys); which typically have visits in excess of an hour, but also have frequent parking space turnover (e.g. museums, plays, movies, shopping).

    a. Ridgefield town-owned lots: An example of a focused and strategic infrastructure investment is the planned level 2 charging stations for the new parking lot in the center of Ridgefield's shopping district.
    b. Ridgefield town-leased lots: A location adjacent to Prime Burger is close to power supply, visible to main street traffic, close to in-town shopping and sidewalk system and time restricted to ensure parking space turnover.
    c. Privately-owned lots: Other locations to consider are the Aldrich Museum, Keeler Tavern, and Prospector Theater.

2. We would discourage additional investment in level 2 charging stations at railway stations. Although highly visible, these charging stations are relatively underutilized and further limit already limited parking spaces. During the typical workday, the charger is used by a sole commuter who returns to their vehicle at the end of a workday. In the evening hours and on the weekends these charging locations are usually not engaged. The existing level 2 charger should be upgraded with retracable cords to better protect cords and plugs. Any additional chargers at the Station should be AC level one only.

3. Publicly owned, multi-family, low-income residences. Examples include Prospect Ridge and Ballard Green. Further by partnering with a ride sharing program such as Zipcar, Ridgefield can increase mobility access to the low income community residing in Town Housing.

EV municipal fleet ownership --

For the purposes of this assessment, we have divided Ridgefield's municipal fleet into the following categories:

- Emergency cars (e.g., police vehicles, ambulances and fire trucks).
- Non-emergency cars (e.g., housing inspectors, school administrators, etc.). Other than vehicles purchased by the Board of Education, the town's non-emergency vehicles were formerly the town's emergency vehicles.
- Trucks and emergency trucks – although EV truck models are emerging, this technology is not yet available. As more becomes publicly known we will assess use, range, and charging needs.

Please note that automobiles in the Ridgefield municipal fleet usually begin as police vehicles. Therefore, we recommend prioritizing the charging infrastructure investment to support the police operations.

Emergency cars (e.g., police vehicles)

Assuming that Ridgefield does not purchase a used Tesla police car, there are currently no cost competitive EV models proven as suitable for pursuit police duty. GM and Ford are 2 to 3 years away from production models for EV pursuit police vehicles.

At least one police department has trialed the Chevy Bolt as a police vehicle. Hyattsville MD. We have interviewed the principal officer involved about the suitability of the Bolt for active police duty, range, and charging needs. The Chevy Bolt is not designed as a police pursuit vehicle. The results of that interview are included in this assessment.

The Tesla Model S has been used by a number of police departments, including the Westport, CT Police Department. The Model S is not designed as a pursuit police vehicle and has a brand specific charging technology. More recently, Ann Arbor, MI has decided to purchase 2 all-electric Ford Mustangs as patrol vehicles. The 2021 Mach-E is an all-electric, small crossover vehicle is new on the market. Ann Arbor is purchasing all-wheel-drive models for winter weather conditions. In addition, the city is purchasing and installing level 2 chargers.

Since cost competitive EV pursuit police models will be on the market in the next 2 to 3 years, it is incumbent on Ridgefield to plan and budget for its charging infrastructure. This will ensure a smooth transition of its municipal fleet to EV models.

The first priority is to ensure that the EV charging infrastructure is included in the needs assessment for the proposed police / fire complex. At a minimum, it should consider the installation of:

- 2 or more level 2 charging stations at the proposed complex;

- given back to back shift use of the vehicles; at least one DC fast charging station at the proposed complex.

Prior to purchasing an EV as a pursuit vehicle, charging stations should be installed as follows:

- one level 2 charging station at Town Hwy Department, since Police vehicles are maintained at the Town Hwy location.

- one level 2 charging station at the existing police station (assuming the proposed complex does not become a reality)

In addition, the town should petition the State of CT to install:

- 4 or more level 2 charging stations at the Danbury Courthouse. We spoke with the Administrative Services office for the State of CT Judicial Branch. There are no current plans for charging stations.

Emergency EVs:

GM and Ford have active plans to produce cost-competitive police vehicles in the next 2 – 3 years. EV ambulances and fire trucks are expected to follow. However, given the attenuated timeframe for cost competitive ambulances and fire trucks we will revisit this assessment when that technology is readily available in the market.

School Buses:

The Ridgefield Public School system contracts with First Student for student transportation. The School buses are owned and maintained by the school bus company. First Student does not have any EV school buses serving the Ridgefield School system at this time.

The contract with First Student expires on June 30, 2022. We recommend that the Ridgefield Public School system include electric school bus objectives in the request for proposals and discussions/negotiations with prospective school bus providers for the next contract. Our hope is to encourage companies to add electric busses to their fleet and to include adequate charging.

Ridgefield Public Schools – Note: Due to the Pandemic – the Ridgefield Public Schools are prioritizing efforts to make the schools safe from virus transmission.

Need fleet information;

Need information on how the fleet is used;

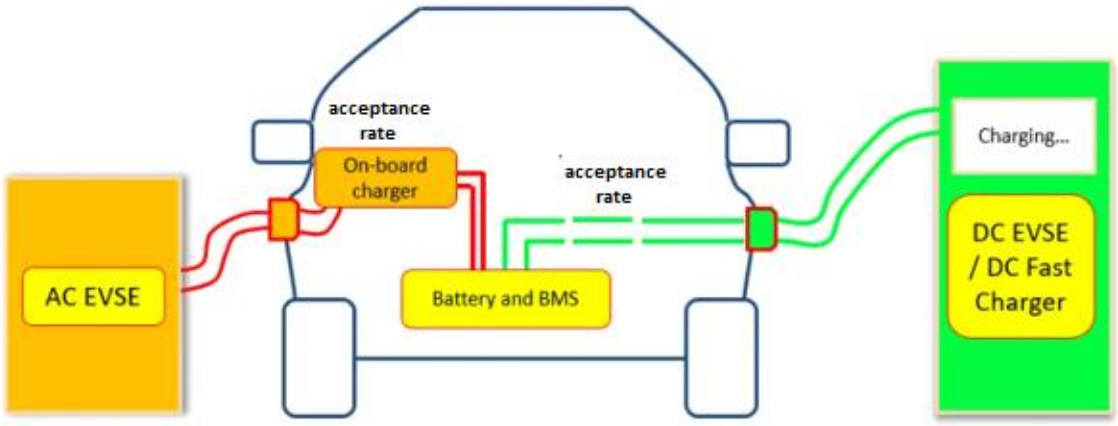
Need information on whether Ridgefield Public Schools has any plans to add charging infrastructure;

Terminology appendix

"charging station" is used to describe electric vehicle supply equipment (EVSE).

A charging station can either be AC (alternating current) or DC (direct current).

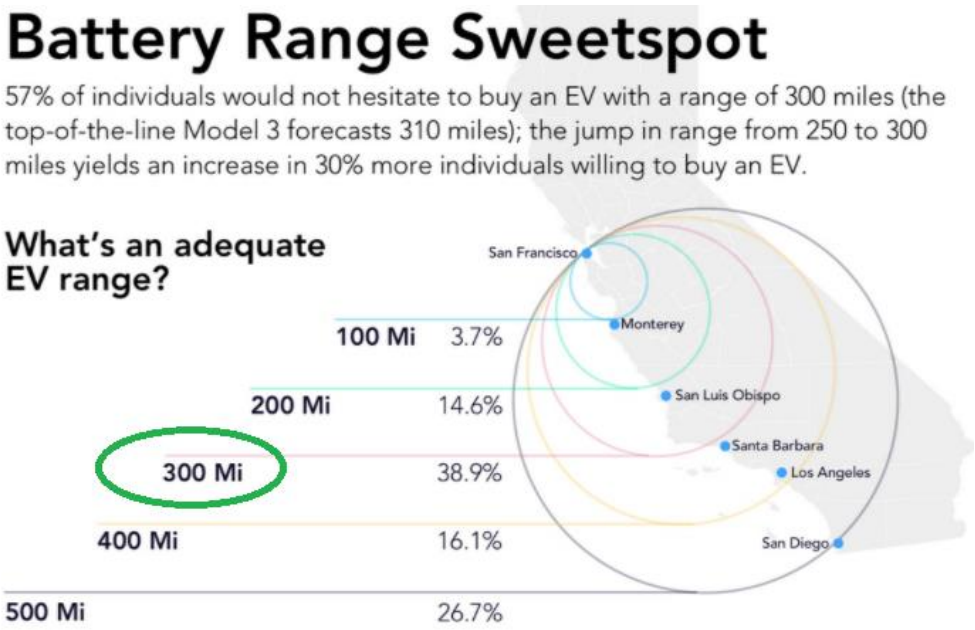
"acceptance rate" is the ability of a battery to accept and store energy under given external parameters like time, temperature, state-of-charge, charging voltage or battery history.



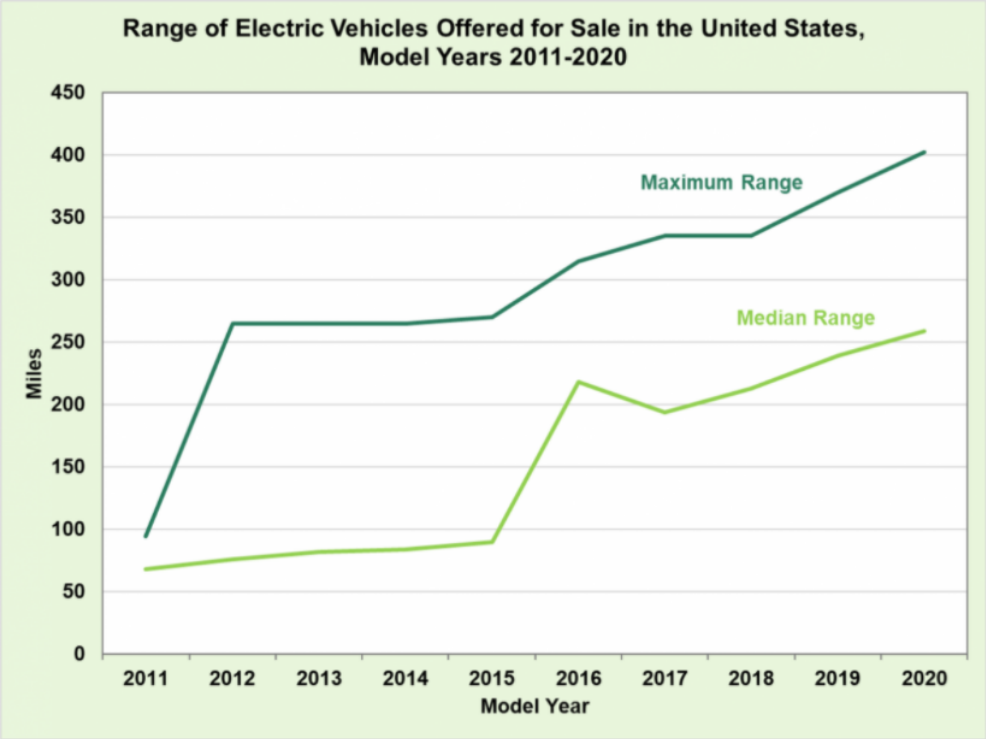
AC level one charging stations are the slowest method for charging an EV and DC fast charging stations are the fastest

AC Level One	AC Level Two	DC Fast Charge
Voltage 120v 1-Phase AC	**Voltage** 208V or 240V 1-Phase AC	**Voltage** 208 or 480V 3-phase AC
Amps 12-16 Amps	**Amps** 12-80 Amps (typ. 32 Amps)	**Amps** <125 amps (typ. 60 amps)
Charging loads 1.4 to 1.9 KW	**Charging loads** 2.5 to 19.2 kW (typ. 7 kW)	**Charging loads** <90 kW (typ. 50 kW)
Charge time 3-5 Miles of range per hour	**Charge time** 10-20 miles of range per hour	**Charge time** 80% Charge in 20-30 minutes

Charging time for an EV is dependent on a number of factors, including charging station type and charging loads, and EV charging acceptance rate. Examples of charging time expressed in miles per hour see charging poster from clipper creek Page 1 / Page 2



Sweet spot in electric-car battery range, from Autolist survey (14,500 individuals, issued Aug 2017)



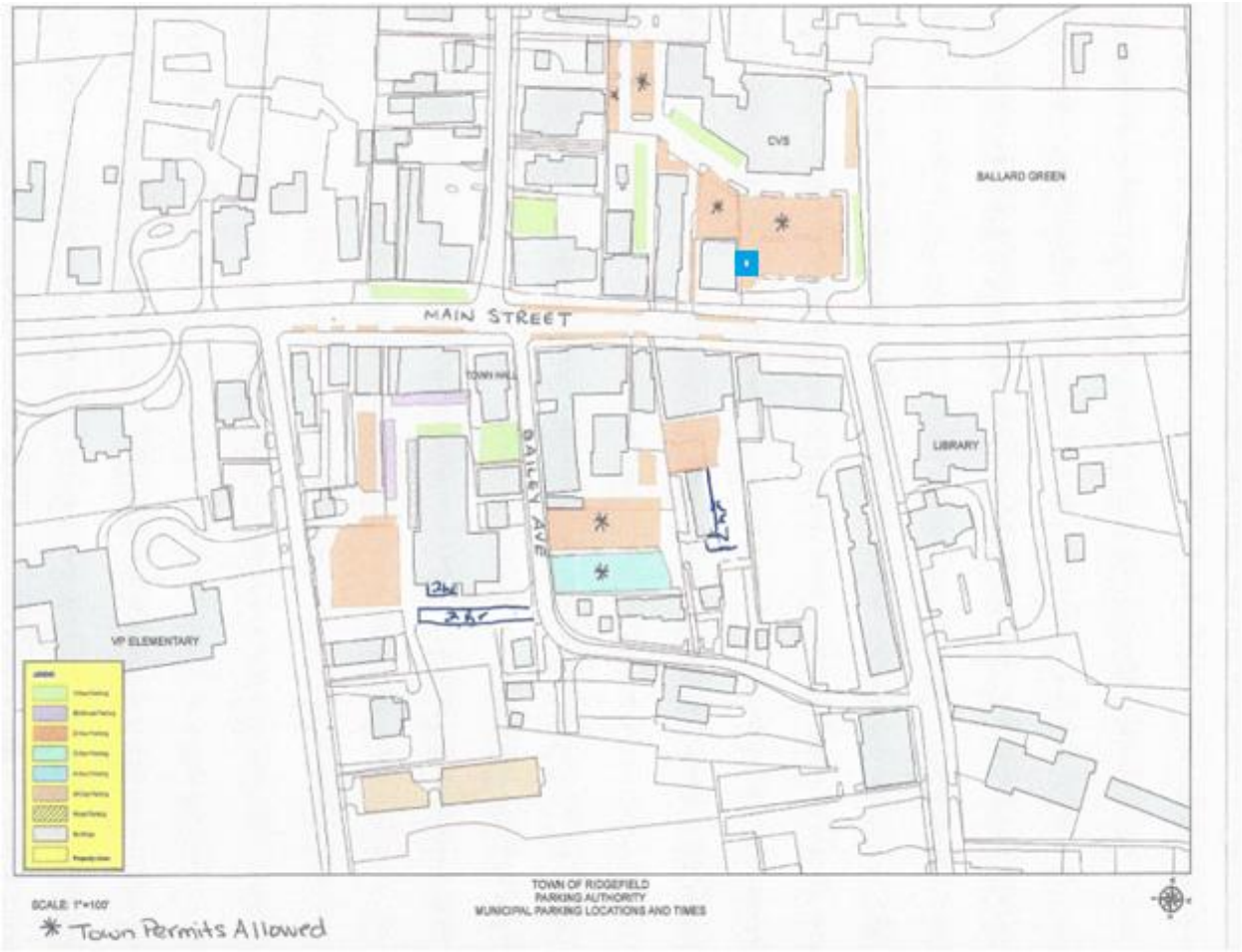
Source: U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy website. Data accessed October 30, 2020.

Town of Ridgefield
Municipal Parking Locations appendix

Area marked in dark blue is adjacent to Prime Burger. This location is:

- visible to main street traffic,
- close to in-town shopping and street lighting for power
- adjacent to the sidewalk system, and
- parking is time restricted to ensure parking space turnover

This is a Ridgefield-leased location. Consider negotiating leases to include EV chargers. Use Climate Mayors negotiated agreements to standardize technology and obtain discounted pricing.



Ridgefield charging stations appendix

Note need for retractable cords to protect cords and charging handles

Ridgefield Town Hall

Branchville EV charging station

Ridgefield Playhouse

Q and A responses from Ridgefield Police Department

1. Are the police officers permitted to keep the vehicle home overnight?

Police Officers are not allowed to take marked police cars home over night. On occasion they can be parked at a training class for an extended period of time.

2. During a typical shift, how many miles (average or range) would an officer travel?

On an average shift a officer may travel 70-100 miles however the vehicle is almost always running so idle time would have to be considered.

3. Are vehicles used in a semi-continuous fashion (e.g. back to back shifts)?

Yes vehicles are used on back to back shifts with very little downtime to recharge. Especially since covid-19 we have 3 officers assigned per vehicle that covers three continuous shifts.

4. Are there places where vehicles would be stationed for an extended period of time (e.g. court house in Danbury; at the police station)?

Vehicles are parked at the Police Station for the most part, however they do go to court, and the SRO's vehicles are parked at the school for the majority of the day. The overwhelming majority of time they are parked at PD.

5. Where are the vehicles usually maintained?

Our vehicles are maintained at Town Hwy however at times they are sent to the Dealership for warranty or major repairs.