

Appendix B. ELECTRIC VEHICLE PLANNING FINAL

One strategy to support CWA's sustainability goals is to better accommodate electric vehicles (EVs). EVs and their associated charging infrastructure promote a shift away from less energy efficient fossil fuel vehicles. While an increase in EV charging at CWA will result in additional electricity use by the Airport, supporting a shift away from fossil fuel vehicles for its passengers, employees, tenants, and the Airport fleet is one way CWA can contribute to the FAA's goal of building a net-zero sustainable aviation system by 2050. This report focused on three areas of landside vehicle usage: fleet and employee vehicles, passenger vehicles, and the rental vehicles offered at CWA.

B.1 Data Gathering

B.1.1 Existing Electrical Service

The initial step of evaluating the potential for increasing EV usage at CWA involved investigation of the existing electrical power supply. Wisconsin Public Service (WPS) is the electrical utility provider for CWA and provided data describing historical usage. Discussions with CWA staff and review of previous record drawings revealed the total system capacity. CWA has eight different electrical service connections on the north side of the airfield. The main panel location that serves the terminal building, air traffic control tower, maintenance facility, rental car building, FBO building, and airfield lighting vault is located just east of the terminal along CWA Drive (Meter #3, Serial Number: 6006918). It has a service capacity of 500kVA as shown in **Table B-1**. This theoretical capacity will have to be multiplied by a power factor to account for practical inefficiencies in the system. It is assumed that the power factor for this system is between 0.8-0.9. That results in the available usable energy being between 400-450 kW. According to historical records supplied by WPS, recent peak demands have been 428 kW (2022) and 433 kW (2023 through July) and occurred in July of each year. The average demand for 2022 was about 390kW. This usage data shows that the service is currently utilized very close to capacity.

Table B-1 Existing Electrical Service

Account #	Meter #	Total Service Capacity (kVA)	Anticipated Available Capacity	Transformer Voltage
0402850508-00003	6006918	500	Minimal	480, 3-phase

B.1.2 Electric Vehicle Registrations

EV registrations from the entire state of Wisconsin have been collected for the years 2016-2021 from the US Department of Energy's Alternative Fuels Data Center. This data generates a trendline for the growth of EV market share in Wisconsin. Demographic data known to be good predictors of EV ownership such as annual household income, residence ownership, etc., has been collected from the 5-year American Community Survey and big data provider Replica.



B.2 Strategies

In addition to determining the number of EV chargers needed at CWA, it is also important to consider the various types of chargers available and how they meet the need of distinct types of EV drivers. EV chargers are broken down into three different types: Level 1, Level 2, and Direct Current (DC) Fast Chargers. General properties of each charger type are shown in **Table B-2** below.

Table B-2 EV Charger Types

Charger Type	Voltage (V)	Current (amps)	Charge Rate (kW)	Charging Duration*
Level 1 (AC)	120	12-20	1.5-2.0	23-31 hours
Level 2 (AC)	208-240	20-80	5-19	2.5-9.5 hours
DC Fast Charger	480	100-700	50-350	10-55 minutes

Note: *Assuming charging from 20 percent to 80 percent of the battery size of 78kWh, which is the median battery size of vehicles available on the US market in April 2022.

While charging times for a Level 1 charger are longer than what is required for a Level 2 or DC fast charger, they should still meet the needs of passengers utilizing long-term parking who leave their vehicles for an entire day or multiple days.

EVs that are parked for the day (but not overnight) or for a significant portion of the day are well served by Level 2 chargers. Examples of users in this category would be employees or daily visitors (not airline travelers) to the airport.

The DC fast chargers can serve a few different users. They can be utilized by those who have parked at the airport for a long period of time but have been unable to charge during that time and are now instead able to get a 10- to 15-minute charge to give them enough energy to reach their destination. These chargers can also be utilized in cases where a quick turnaround is needed such as a rental car operation or a service vehicle that uses up a large portion of its battery capacity between charging sessions.

Beyond personal vehicles, there are also opportunities for electrification of service vehicles and equipment. Except for the service vehicle situation described above, it is likely that most service vehicles and equipment would have dedicated chargers, thus enabling them to continuously replenish their battery charge level in between uses through a Level 1 or 2 charger. The level of charging speed required will be dependent on the time between uses and how depleted the batteries are after each use.

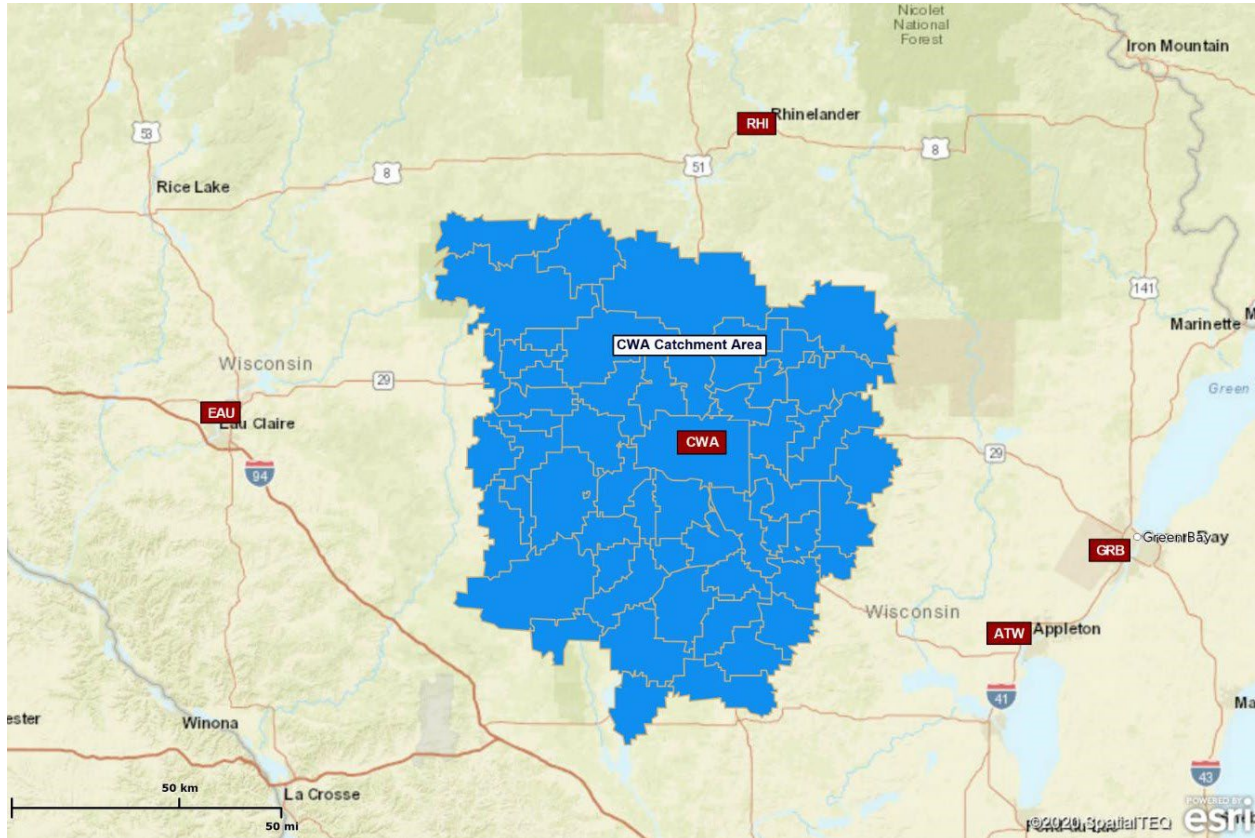
B.3 Analysis

Estimating the anticipated demand for EV charging at CWA is a complex effort with many different factors influencing the result. The analysis in this report has a planning horizon five years in the future so EV charging demand has been estimated for 2028. However, it is assumed that installation of EV chargers will occur sooner than that.



Most of the vehicles parking at CWA are assumed to come from a catchment area shown in blue in **Figure B-1**.

Figure B-1 CWA Passenger Catchment Area

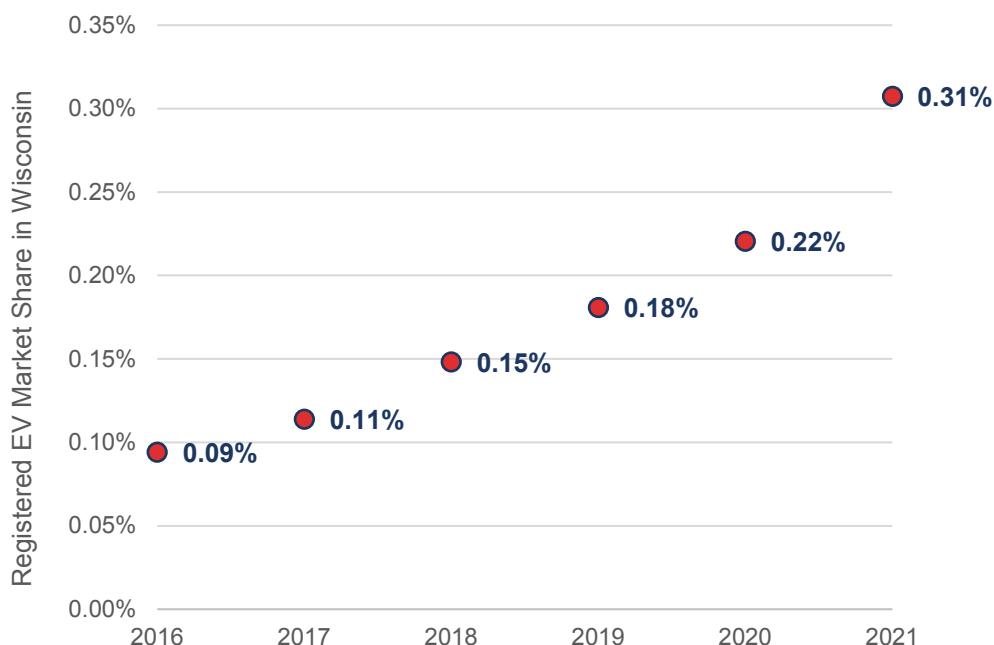


Source: Mead & Hunt.

Therefore, the analysis included in this report is based on historical EV market share in Wisconsin from 2016-2021 as shown in **Figure B-2**. These numbers are then adjusted for the population within the catchment area based on factors that have been found to be statistically significant indicators of EV ownership. Those factors include annual household income, home ownership, and private auto availability. As the EV market is still emerging, the historical rate of change in EV registrations may not accurately reflect future conditions. Unlike some other states, the State of Wisconsin does not have a set EV goal for light-duty vehicle market share by a specific date. If such a goal is adopted, it is possible that investments will be made in charging infrastructure throughout the state and in other programs incentivizing EVs, which could increase the growth rate of EV market share compared to historical trends.



Figure B-2 Registered EV Market Share in Wisconsin



Source: DOE AFDC.

As of 2021, the EV market share for registered light-duty vehicles in Wisconsin was about 0.3 percent. If the growth in market share is extrapolated, it is anticipated that in 2028 it will be 1.1 percent.

Numerous studies have shown that consumers who purchase an EV have higher than average annual household income. This analysis assumes that an EV owner is likely to have an annual household income greater than \$100,000. The number of households within the CWA catchment area with an annual household income greater than \$100,000 is 34.5 percent. This is lower than the average for the state of Wisconsin, which is 38.2 percent. This difference is expected to reduce the EV market share within the CWA catchment area when compared to the state average.

Individuals who live in and own a house have much easier access to charge an EV at their home. According to the 2021 American Community Survey, the percentage of residents within the CWA catchment area who owned their home was 73.3 percent. This is higher than the average for the state of Wisconsin, which is 67.4 percent. This difference is expected to increase the EV market share within the CWA catchment area when compared to the state average.

Similar to having a greater than average annual household income, studies have also found that most EV owners have more than one vehicle in the household. The number of households in the CWA catchment area that have two or more vehicles is 75.0 percent. This is 3.2 percent higher than the state average of 71.8 percent. This factor is assumed to slightly increase the EV market share within the CWA catchment area when compared to the state average.



When considering all the factors mentioned above, the estimated 2028 EV market share within the CWA catchment area is 2.35 percent. This number is used to determine the recommended number of EV chargers for the passenger parking lots. The West Passenger Lot is expected to be reconfigured so this report assumes the future lot configuration will accommodate 400 vehicles.

The amount of charging stations needed in the rental car parking lot is less dependent on the demographics within the CWA catchment area and primarily influenced by the rental car companies' plan for including EVs in their fleets and the willingness for consumers to rent such vehicles. However, consumers are expected to be reluctant to rent an EV if the charging options in the area are not convenient and easily accessible. According to the Department of Energy's Alternative Fuels Data Center Fueling Station Locator, there are a total of 31 Level 2 and 16 DC fast charger ports within the CWA catchment area. Half of the DC fast chargers are Tesla chargers. Although recent agreements are now in place between Tesla and other auto manufacturers that will allow the vehicles of those other manufacturers to access the Tesla charging system, it will take some time to implement these agreements and the impact on rental car consumers is likely to be delayed. Therefore, it is anticipated that the number of chargers in the vicinity of CWA will still be a drag on consumer enthusiasm for renting EVs. However, it is expected that the number of charging stations will eventually increase and reduce this concern.

According to rental car representatives, there are no EVs currently being offered for rent at CWA. This is partly because there are no EV chargers at the airport. However, with the addition of chargers at the airport it is anticipated that some of the rental car companies will add EVs to the rental car fleet within the next five years. During this timeframe, demand for EVs is not expected to rise to the level where a vehicle would be rented out the same day it is returned. That will allow vehicles to be recharged overnight, which can be accomplished by a Level 2 charger. It is expected the EV share of the rental fleet can be serviced by two Level 2 chargers. This is comparable to rental car companies at other Wisconsin airports, such as Madison and Appleton, that are relying on 2-4 Level 2 chargers to service their fleets.

The rental car lot is accessible to the public and would therefore be a suitable location to install any chargers intended for public use. There are only three other locations that offer DC fast charging within a 50-mile radius of CWA. Adding such a station would help expand the EV charging infrastructure network of central Wisconsin and could be a new revenue source for CWA.

Employees at CWA are expected to leave their cars parked for periods of 4-8 hours each workday. During this time, their charging needs can be met with Level 2 chargers. It is also possible that these chargers could serve airport fleet vehicles that would require charging overnight between work shifts.

CWA also serves general aviation (GA) users who mostly operate from a GA terminal building located to the east of the commercial passenger terminal. Similar to commercial passengers, it is anticipated the needs of these users can be met with Level 1 chargers.



B.4 Recommendations

Based on the analysis described in this report, the recommended EV charging infrastructure is described below and summarized in **Table B-3**.

The planned reconfiguration of the West Passenger Lot presents a good opportunity to install EV charging infrastructure in this location. It is recommended that at least 10 Level 1 charging ports be included in the new configuration. It is further recommended that at least two of the charging ports be in spaces that are accessible to individuals with disabilities as defined by the Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA). These spaces do not have to be reserved for drivers with disability placards but can be identified as used only if all other charging ports are occupied.

It is recommended that four Level 2 charging ports be installed in the rental car parking lot. These would be available to the rental car companies and airport employees. In addition to the Level 2 charging ports, it is also recommended that two DC fast charging ports be considered in the rental car lot. These would be available to the public but could also be utilized by the rental car companies if they had an intermittent need for a quick turnaround of an EV in their fleet. It is recommended that the DC fast charging spaces be designed to meet ADA/ABA requirements without any signage restricting the use of the chargers.

It is recommended that two Level 1 charging ports be located adjacent to the general aviation terminal. These should also be designed to meet ADA/ABA requirements without any signage restricting the use of the chargers.

Table B-3 Recommended Number of EV Charging Ports

Parking Location	Number of Charging Ports	Charger Type
West Passenger Lot	10	Level 1
Rental Car/Public Lot	4 / 2	Level 2 / DC Fast
General Aviation Terminal	2	Level 1

Given the minimal remaining capacity at the main electrical service, it is recommended that a new electrical service be established to provide power to the recommended chargers located in the West Parking Lot and the Rental Car Lot. The design of this service should be performed in close cooperation with WPS. While there currently is not a special utility rate for EV charging, it is anticipated that WPS will establish one soon. Because this new service will only serve the EV charging stations, it will allow CWA to make use of this new utility rate when it becomes available. It will also allow CWA to more easily track how much electricity is used for EV charging.

Figure B-3 depicts the recommendations contained in this report for locations, quantities, and types of EV chargers along with the proposed new electrical service line.



Figure B-3 Proposed Electric Vehicle Infrastructure & Potential Solar Sites

