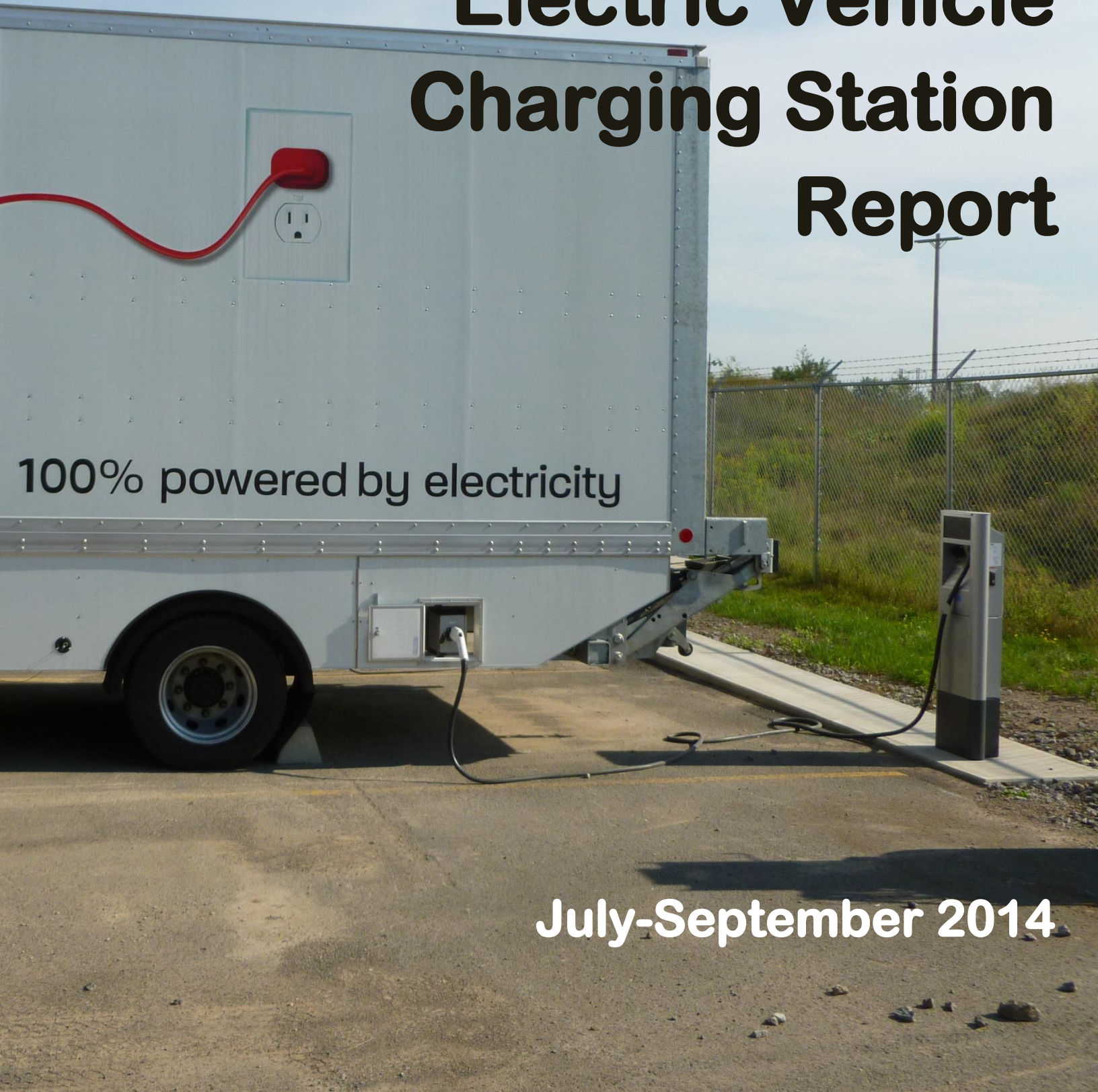


# New York State Electric Vehicle Charging Station Report



100% powered by electricity

July-September 2014

The New York State Energy Research and Development Authority (NYSERDA) made financial grant awards in 2012 and 2013 to more than a dozen organizations to install Level 2 electric vehicle (EV) charging stations (also referred to as electric vehicle supply equipment [EVSE]) across the state. These installations support New York Governor Andrew Cuomo's Charge NY initiative, which is focused on making New York ready for EVs by 2018. The initiative has the goal of creating a statewide network of up to 3,000 public and workplace charging stations to support up to 40,000 plug-in vehicles on the road. The NYSEDA-funded projects represent a wide range of business models and approaches for providing public charging infrastructure. One NYSEDA program goal is to learn how the stations are used, including which types of locations and business models are the most promising. Charging station usage data and analysis are shared with the public through these quarterly data reports. By doing so, NYSEDA is paving the way for future private sector charging station investment.

## **About This Report:**

The accompanying data pages summarize the usage of EVSE that were installed by the NYSEDA program. Only EVSE with at least one charging event during the past quarter were included in the analysis, which does not reflect the total number of charging stations installed to date through the NYSEDA program. The first data analysis page provides an overview that is most useful to electric utilities. Subsequent pages present usage statistics based on various station attributes, which are useful to current and future EVSE site owners. Data was collected for every charging port. This means that a charging station with two charging connections (a dual port station) was counted as two ports.

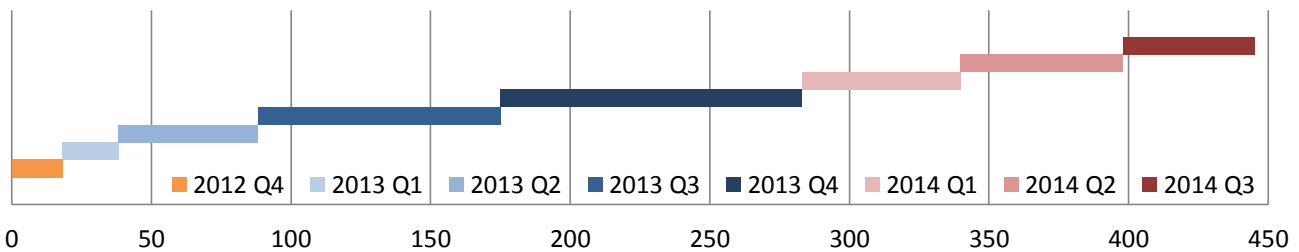
On the first page, the EVSE access types are defined as follows. **Public EVSE** are available to any EV. **Private EVSE** are exclusively for a company's fleet vehicles' use. **Limited EVSE** are installed specifically for, but may not necessarily be restricted to, a select group (e.g., employees, apartment building tenants, or hotel guests). EVs are likely **connected** to a charging station the entire time they are in EV dedicated parking spaces. However, the vehicles only **draw power** until the battery pack is finished charging. The **Charging Demand** plot shows the total electrical power used by all active NYSEDA-funded stations at different times of day. This indicates the total electrical grid impact from EVs charging at NYSEDA-funded public stations. It is important to note that this does not reflect all EV charging in New York State. Public charging stations not funded by the NYSEDA project and home charging were not included in this analysis.

The remaining five data analysis pages include the same table and charts for various charging station subsets including: **access type**, **required payment**, **land use type**, **region**, and **venue** (the last four subsets exclude private EVSE because their use is specific to the particular host site's operations). Site owners who are considering installing charging stations can use this data and analysis to understand how sites similar to theirs are used and which attributes may lead to better utilization. The data tables include summary results for **charging events** (total and average per week), **energy consumed** (total, average per week, and average per charging event), **average time with a vehicle connected** (percentage and hours), and **average time with a vehicle drawing power** (percentage and hours). The **energy consumed** is an indication of the electrical energy requirements provided by the host location. The **average time a vehicle is connected** is the duration drivers stay at the location as a consumer, client, or employee. If the **average time with a vehicle drawing power** is significantly less than the **average time a vehicle is connected**, then the EV is occupying the station longer than necessary, and should be moved to allow other EVs to charge. Site owners can use all of these metrics to help decide whether installing EVSE is a good investment (directly or indirectly). These results also provide insights

into whether or not to charge EV drivers for using the station, and if charging, the most appropriate fee structure to use (fees can be set by session, time, or energy consumed). The three line charts display the *differences in length of time a vehicle is connected*, *differences in length of time a vehicle is drawing power*, and *differences in energy consumed* to show variations in charging behavior within the EVSE groups (e.g., a large portion of retail location charging events are very short, compared to a more uniform distribution of charge events durations for parking lots/garages in New York City). The final bar chart displays the *range of charging events per port per week* which shows the difference between the most and least utilized ports as compared to the average for those charging stations.

### Data Trends and Significant Changes from the Past Quarter:

Between December 2012 and September 2014, the NYSDERDA EV Charging Station Program funded the installation of 447 charging ports, 51 of which were installed this past quarter.



The following table lists the station types with the highest average percentage of time with a vehicle connected this quarter.

Highest Average Percentage of Time with a Vehicle Connected This Quarter									
Access Type	Payment	Land Use	Region	Venue					
Private	37.1%	Free	4.4%	Urban	5.6%	Finger Lakes	7.0%	University/Medical	6.7%

This following table shows the station types with the greatest increased usage since last quarter.

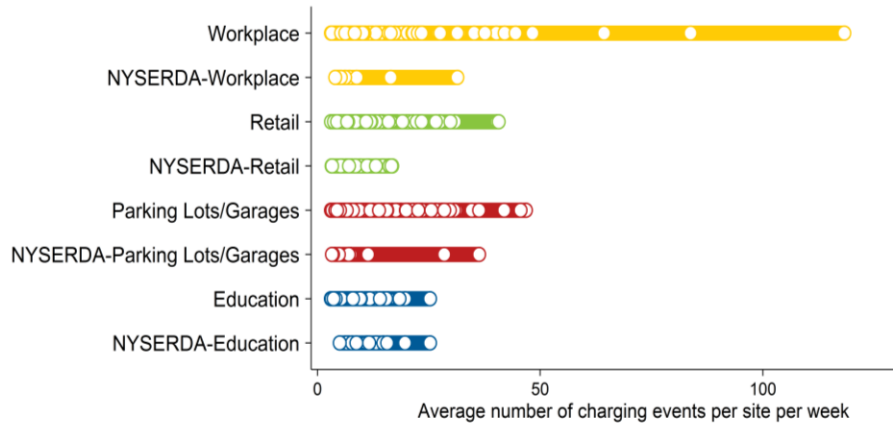
Greatest Increase in Average Percentage of Time with a Vehicle Connected Since Last Quarter									
Access Type	Payment	Land Use	Region	Venue					
Public	+8%	Free	+5%	Suburban	+24%	Central NY	+50%	Leisure Destination	+290%

Both public and limited access charging stations saw significant increased use since last quarter. The most frequently used Public EVSE averaged 14.8 charge events per week (compared to 9.4 last quarter). The most frequently used Limited EVSE averaged 10.5 charge events per week (compared to 6.6 last quarter).

New York City stations continue to have higher average electricity consumed per charging event than other regions (13.3 kWh in NYC as compared to 5.6 kWh during this past quarter). This is due to a larger population of Tesla EVs which have a much larger capacity battery pack than other EVs. The New York City charging station utilization (average percentage of time with a vehicle connected), however, decreased from 3.7% in the second quarter of 2014 to 3.2% in the third quarter of 2014. New York City has the largest percentage of charging stations that charge a fee, which may have influenced this utilization trend. For comparison, most other regions experienced increased station utilization. This indicates that the EV market is growing more in other regions of the state and charging stations can be successful across the state.

## Data Comparisons to Other Published EVSE Reports:

The Idaho National Laboratory released a report titled “Analyzing Public Charging Venues: Where are Publicly Accessible Charging Stations Located and How Have They Been Used?” that analyzed EVSE usage data gathered from three large U.S. Department of Energy (USDOE)-funded projects: The EV Project, ChargePoint America, and West Coast Electric Highway.<sup>1</sup> The report presents an analysis of EVSE usage by venue to compare of how public charging stations are used in different locations. The average number of charging events per week at each site was calculated as a measure of site usage. The figure on right presents the distribution of the average number of charging events per week per site for different venue categories for USDOE- and NYSERDA-funded sites. Only venues where at least 10 sites reported regular usage (i.e., averaging at least three charging events per week) were included.



The data sets have variations that may have influenced the results. For example, there were only 55 total NYSERDA-funded EVSE sites within the listed venues categories, compared to a total of 616 from the three USDOE-funded projects. Some USDOE-funded project sites had as many as 18 EVSE, whereas the NYSERDA-funded sites had three or fewer EVSE. Finally, USDOE-funded project data are from 9/1/2012 to 12/31/2013, compared to NYSERDA-funded usage data from 7/1/2013 to 10/1/2014. This may impact the results because there continues to be more EVs on the road to use public EVSE. However, there is also significant EV market variations among the regions included in the USDOE-funded projects as compared to all of New York State. The following observations were drawn from the data analysis and comparison:

- 1) A larger percentage of NYSERDA-funded sites (40%) averaged more than three charging events per week (USDOE-funded sites averaged 29%).
- 2) Some NYSERDA-funded sites, particularly education sites, were used as much as the highest use USDOE-funded sites of the same venue type.
- 3) The average number of charging events per site per week (see table) for retail, parking lots/garages, and education venues is higher for NYSERDA-funded sites than for USDOE-funded sites.
- 4) Both data sets have certain locations with a much higher average number of charging events per site per week than the remaining sites of that venue type. This indicates the potential for higher utilization by replicating the conditions at the high performing sites.

Average Number of Charging Events Per Site Per Week by Venue		
Venue	USDOE	NYSERDA
Education	6.0	11.4
Parking Lots/Garages	9.9	10.6
Retail	8.2	9.1
Workplace	12.7	9.3

<sup>1</sup> Idaho National Laboratory, “Analyzing Public Charging Venues: Where are Publicly Accessible Charging Stations Located and How Have They Been Used?”, September 2014, Report Number INL/EXT-14-33019, <http://avt.inel.gov/pdf/EVProj/AnalyzingEVSEVenuesSept2014.pdf>

# NYSERDA Electric Vehicle Charging Infrastructure Report



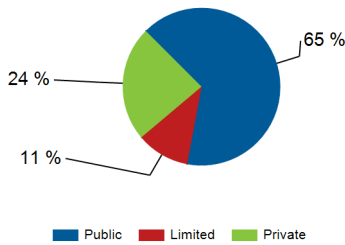
Report period: July 2014 through September 2014

New York State

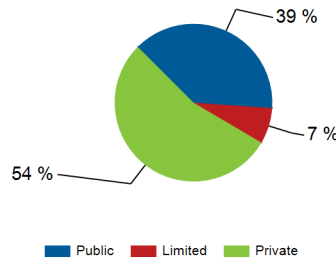
## EVSE Usage - By Access Type

	Public	Limited <sup>3</sup>	Private	Total
Number of charging ports <sup>1</sup>	262	86	29	377
Number of charging events <sup>2</sup>	5,900	985	2,131	9,016
Electricity consumed (AC MWh)	36.96	7.05	51.76	95.78
Percent of time with a vehicle connected	4.2%	2.7%	37.1%	6.8%
Percent of time with a vehicle drawing power	2.0%	1.4%	33.7%	4.6%

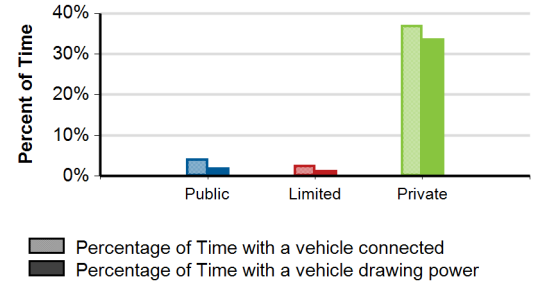
Number of Charging Events



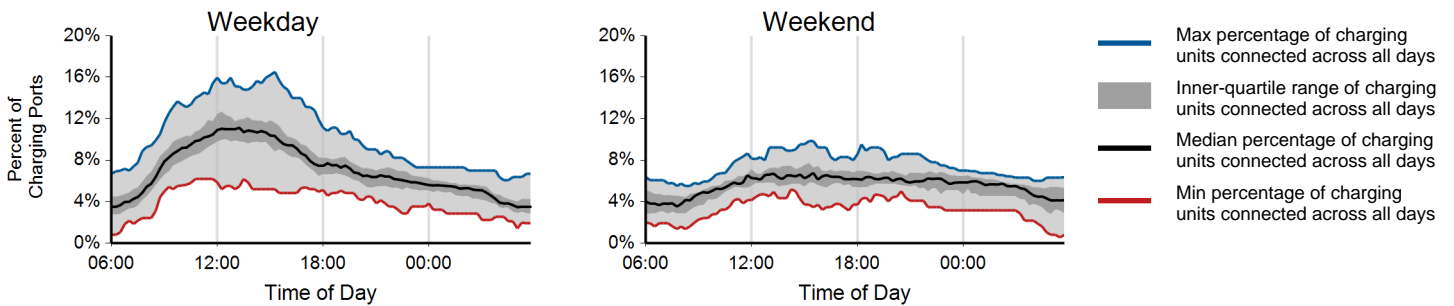
Electricity Consumed



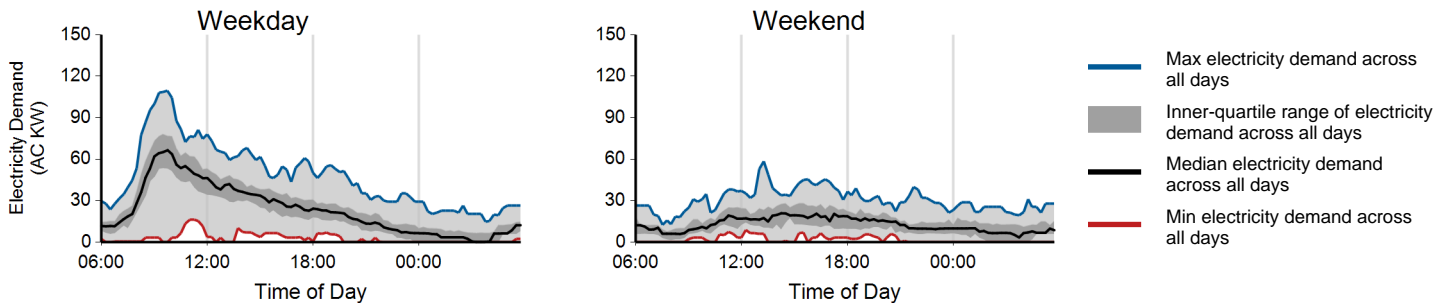
Charging Unit Utilization



## Charging Availability: Range of Percentage of All Charging Ports with a Vehicle Connected versus Time of Day<sup>4</sup>



## Charging Demand: Range of Aggregate Electricity Demand versus Time of Day<sup>4</sup> for All Charging Ports



<sup>1</sup> Includes all EVSE ports in use during the reporting period and have reported data to INL.

<sup>2</sup> A charging event is defined as the period when a vehicle is connected to a charging unit, during which power is transferred.

<sup>3</sup> Limited Access EVSE are primarily for use by employees or tenants (including paying guests at hotels) and are placed where these EV drivers would normally park, but others (such as visitors or customers) may be able to plug in on a more limited basis.

<sup>4</sup> Weekends start at 6:00am on Saturday and end 6:00am Monday local time.

# NYSERDA Electric Vehicle Charging Infrastructure Report

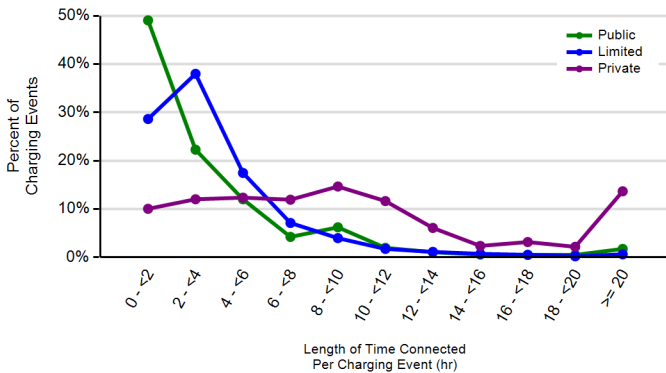


Report period: July 2014 through September 2014

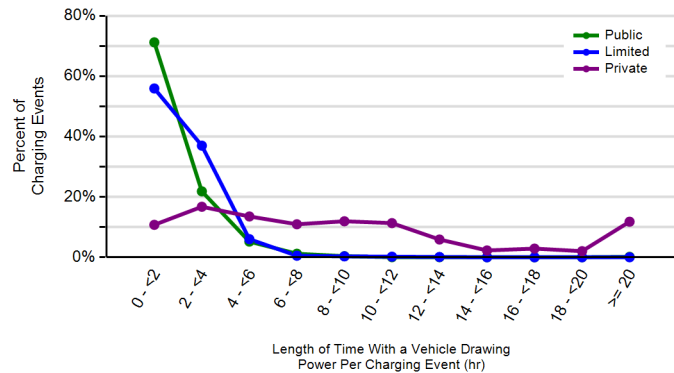
	Public	Limited <sup>3</sup>	Private
Number of charging ports <sup>1</sup>	262	86	29
Number of charging events <sup>2</sup>	5,900	985	2,131
Charging energy consumed (AC MWh)	37.0	7.1	51.8
Average percent of time with a vehicle connected per charging port	4.2%	2.7%	37.1%
Average percent of time with a vehicle drawing power per charging port	2.0%	1.4%	33.7%
Average number of charging events started per charging port per week	1.9	1.2	5.6
Average electricity consumed per charging port per week (AC kWh)	11.6	8.5	135.8
Average length of time with vehicle connected per charging event (hr)	3.8	3.9	11.2
Average length of time with vehicle drawing power per charging event (hr)	1.8	2.0	10.1
Average electricity consumed per charging event (AC kWh)	6.3	7.2	24.3

## EVSE Usage - By Access Type

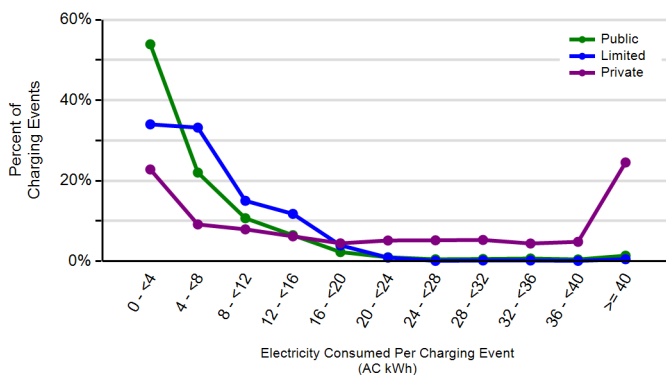
Distribution of Length of Time with a Vehicle Connected per Charging Event



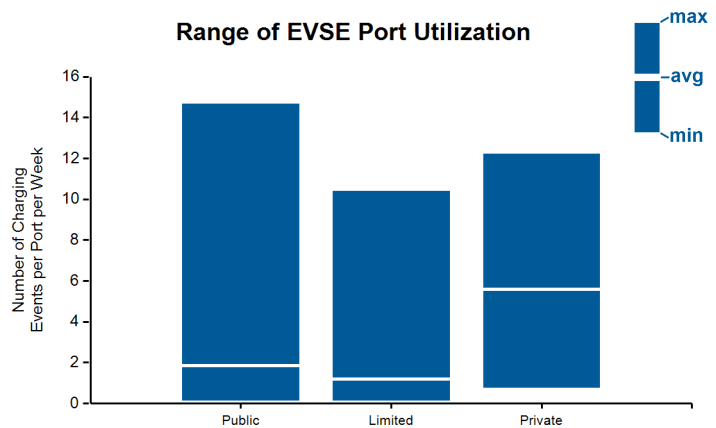
Distribution of Length of Time with a Vehicle Drawing Power per Charging Event



Distribution of AC Energy Consumed per Charging Event



Range of EVSE Port Utilization



<sup>1</sup> Includes all EVSE ports in use during the reporting period and have reported data to INL.

<sup>2</sup> A charging event is defined as the period when a vehicle is connected to a charging unit, during which power is transferred.

<sup>3</sup> Limited Access EVSE are primarily for use by employees or tenants (including paying guests at hotels) and are placed where these EV drivers would normally park, but others (such as visitors or customers) may be able to plug in on a more limited basis.

# NYSERDA Electric Vehicle Charging Infrastructure Report

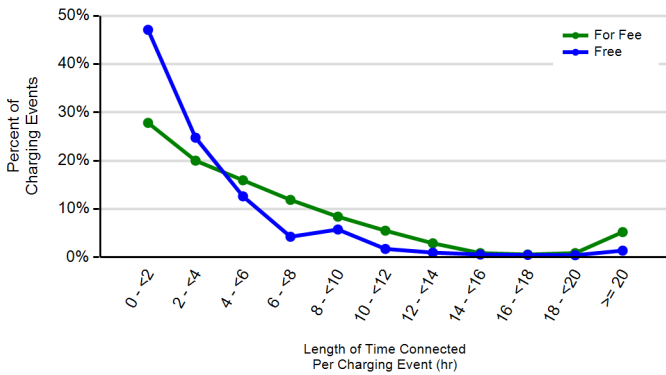


Report period: July 2014 through September 2014

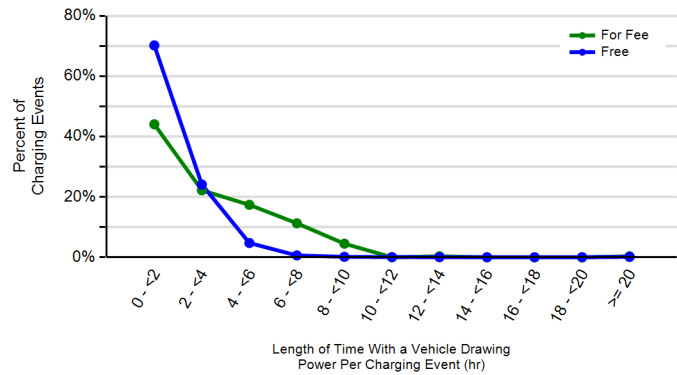
## EVSE Usage - By Required Payment<sup>3</sup>

	For Fee	Free
Number of charging ports <sup>1</sup>	62	286
Number of charging events <sup>2</sup>	345	6,540
Charging energy consumed (AC MWh)	5.6	38.4
Average percent of time with a vehicle connected per charging port	2.0%	4.4%
Average percent of time with a vehicle drawing power per charging port	0.9%	2.1%
Average number of charging events started per charging port per week	0.5	2.0
Average electricity consumed per charging port per week (AC KWh)	7.9	11.6
Average length of time with vehicle connected per charging event (hr)	6.8	3.7
Average length of time with vehicle drawing power per charging event (hr)	3.2	1.8
Average electricity consumed per charging event (AC kWh)	16.4	5.9

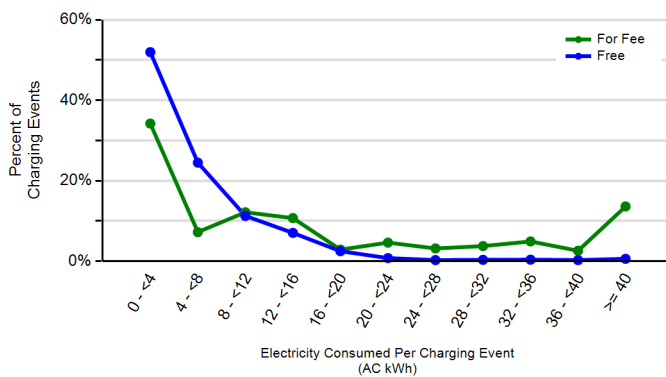
**Distribution of Length of Time with a Vehicle Connected per Charging Event**



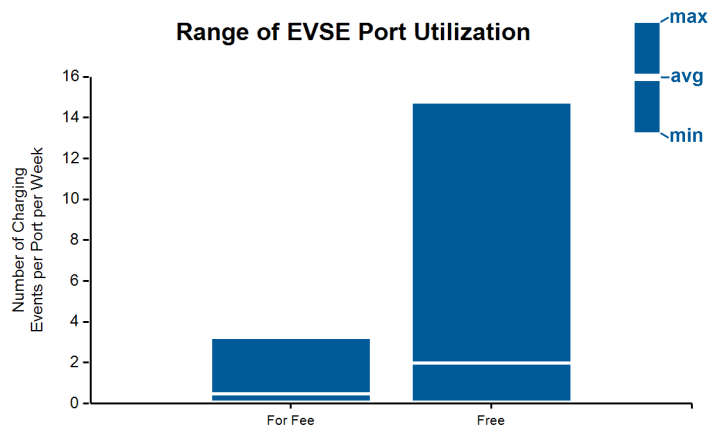
**Distribution of Length of Time with a Vehicle Drawing Power per Charging Event**



**Distribution of AC Energy Consumed per Charging Event**



**Range of EVSE Port Utilization**



<sup>1</sup> Includes all EVSE ports in use during the reporting period and have reported data to INL.

<sup>2</sup> A charging event is defined as the period when a vehicle is connected to a charging unit, during which power is transferred.

<sup>3</sup> Only includes data from EVSE providing Public or Limited access.

# NYSERDA Electric Vehicle Charging Infrastructure Report

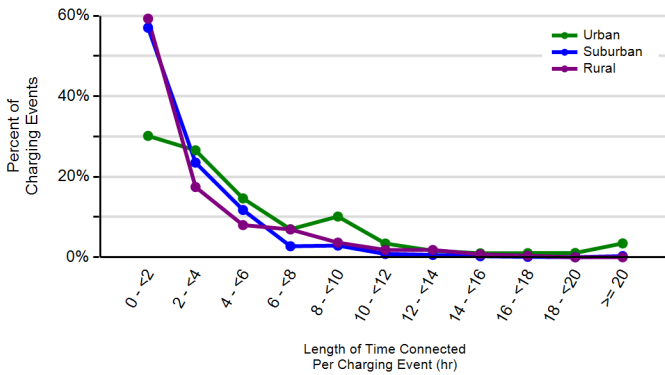


Report period: July 2014 through September 2014

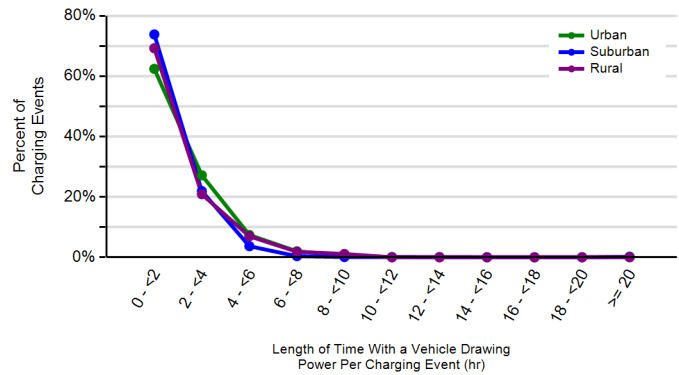
	Urban	Suburban	Rural
Number of charging ports <sup>1</sup>	140	172	36
Number of charging events <sup>2</sup>	2,816	3,794	275
Charging energy consumed (AC MWh)	22.9	19.1	2.0
Average percent of time with a vehicle connected per charging port	5.6%	3.1%	1.1%
Average percent of time with a vehicle drawing power per charging port	2.2%	1.9%	0.7%
Average number of charging events started per charging port per week	1.7	2.0	0.6
Average electricity consumed per charging port per week (AC kWh)	13.5	10.2	4.7
Average length of time with vehicle connected per charging event (hr)	5.7	2.6	2.9
Average length of time with vehicle drawing power per charging event (hr)	2.3	1.6	1.8
Average electricity consumed per charging event (AC kWh)	8.1	5.0	7.4

## EVSE Usage - By Land Use Type<sup>3</sup>

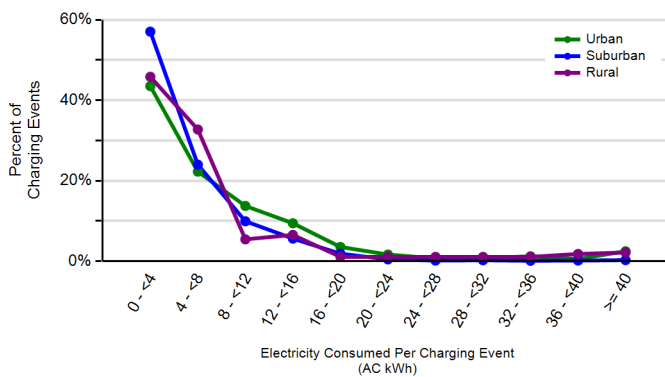
Distribution of Length of Time with a Vehicle Connected per Charging Event



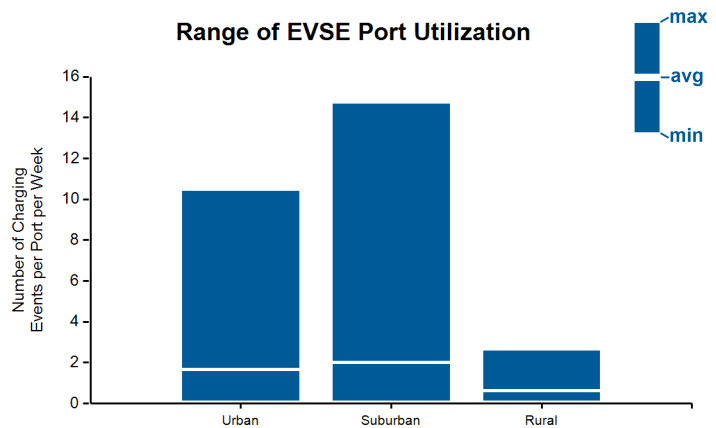
Distribution of Length of Time with a Vehicle Drawing Power per Charging Event



Distribution of AC Energy Consumed per Charging Event



Range of EVSE Port Utilization



<sup>1</sup> Includes all EVSE ports in use during the reporting period and have reported data to INL.

<sup>2</sup> A charging event is defined as the period when a vehicle is connected to a charging unit, during which power is transferred.

<sup>3</sup> Only includes data from EVSE providing Public or Limited access.



# NYSERDA Electric Vehicle Charging Infrastructure Report

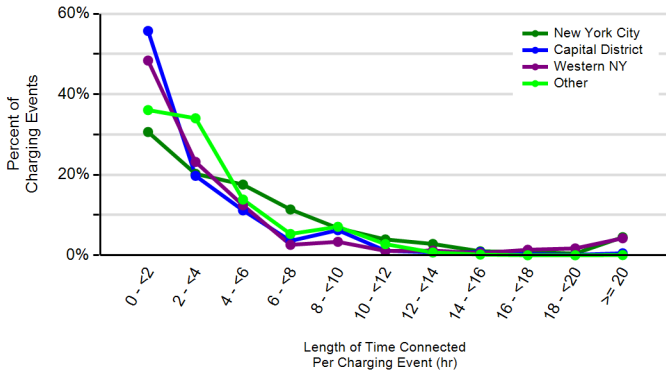
Report period: July 2014 through September 2014



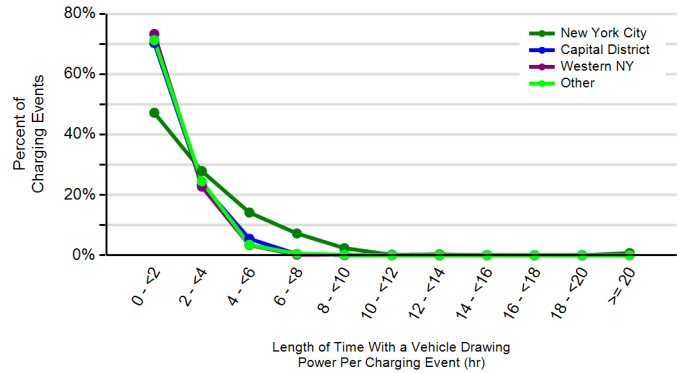
## EVSE Usage - By Region<sup>3</sup>

	New York City	Long Island	Hudson Valley	Capital District	Syracuse/Central NY	Rochester/Finger Lakes	North Country	Western NY	Other <sup>4</sup>
Number of charging ports <sup>1</sup>	70	23	33	95	17	29	17	54	10
Number of charging events <sup>2</sup>	712	378	192	2,660	178	1,039	161	1,466	99
Charging energy consumed (AC MWh)	9.5	2.8	0.8	14.5	1.3	5.1	0.8	8.0	1.1
Average percent of time with a vehicle connected per charging port	3.2%	4.0%	0.8%	4.0%	1.5%	7.0%	1.4%	6.4%	1.0%
Average percent of time with a vehicle drawing power per charging port	1.6%	2.1%	0.5%	2.1%	1.0%	3.1%	0.8%	2.5%	1.1%
Average number of charging events started per charging port per week	0.8	2.0	0.7	2.3	0.9	2.9	0.8	2.3	0.8
Average electricity consumed per charging port per week (AC kWh)	11.1	14.9	2.9	12.3	6.9	14.4	4.3	12.7	8.4
Average length of time with vehicle connected per charging event (hr)	6.5	3.4	2.1	3.0	2.7	4.0	2.9	4.6	2.2
Average length of time with vehicle drawing power per charging event (hr)	3.2	1.8	1.2	1.6	1.8	1.8	1.6	1.8	2.5
Average electricity consumed per charging event (AC kWh)	13.3	7.5	4.3	5.5	7.5	4.9	5.2	5.4	11.1

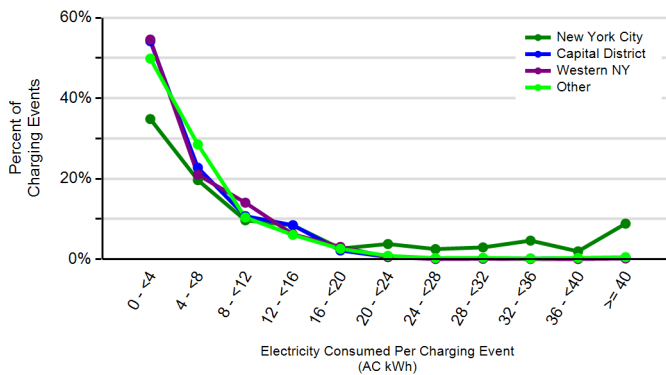
Distribution of Length of Time with a Vehicle Connected per Charging Event<sup>5</sup>



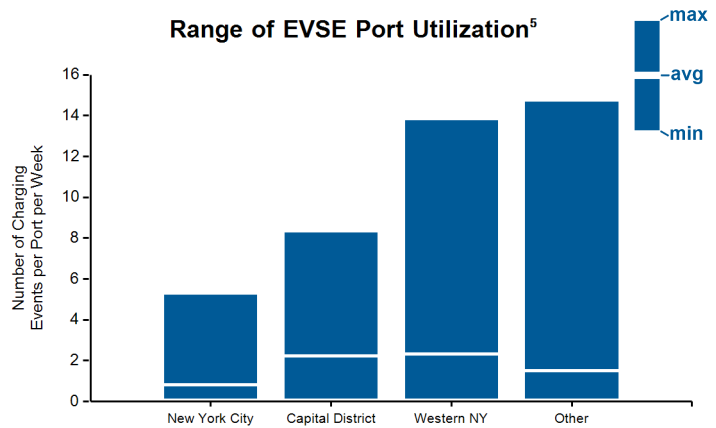
Distribution of Length of Time with a Vehicle Drawing Power per Charging Event<sup>5</sup>



Distribution of AC Energy Consumed per Charging Event<sup>5</sup>



Range of EVSE Port Utilization<sup>5</sup>



<sup>1</sup> Includes all EVSE ports in use during the reporting period and have reported data to INL.

<sup>2</sup> A charging event is defined as the period when a vehicle is connected to a charging unit, during which power is transferred.

<sup>3</sup> Only includes data from EVSE providing Public or Limited access.

<sup>4</sup> Regions with less than 10 EVSE ports are not individually represented, and are combined and reported as 'Other'.

<sup>5</sup> Only the 3 regions with the most EVSE ports are individually represented, with the remaining regions combined and shown as 'Other'.

# NYSERDA Electric Vehicle Charging Infrastructure Report

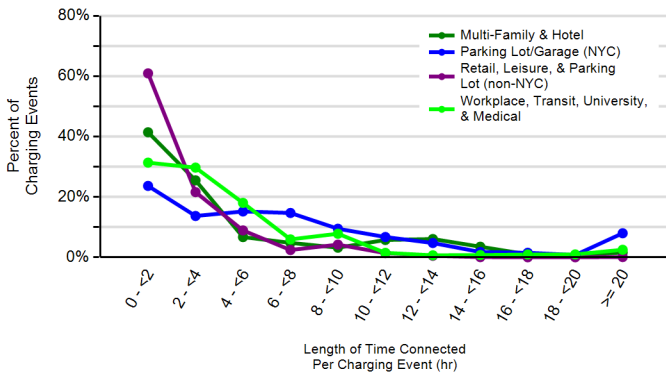
Report period: July 2014 through September 2014



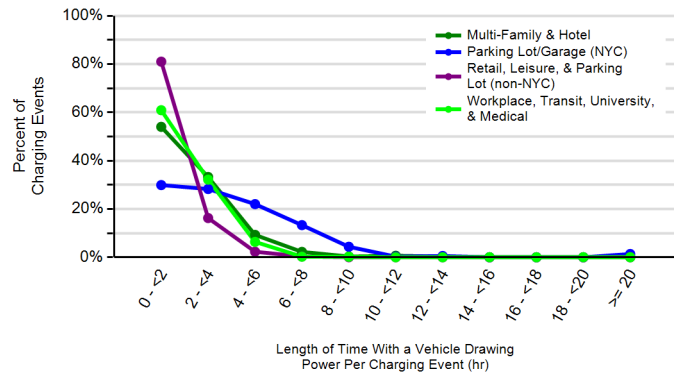
## EVSE Usage - By Venue<sup>3</sup>

	Parking Lot/Garage (non-NYC)	Parking Lot/Garage (NYC)	Retail Location	Workplace	Hotel	University or Medical Campus	Leisure Destination	Transit Station
Number of charging ports <sup>1</sup>	41	62	58	57	29	57	21	17
Number of charging events <sup>2</sup>	931	402	1,924	729	266	1,945	583	57
Charging energy consumed (AC MWh)	4.9	8.0	7.1	5.0	2.3	13.2	3.0	0.2
Average percent of time with a vehicle connected per charging port	4.6%	2.9%	2.2%	5.7%	1.9%	6.7%	3.9%	0.5%
Average percent of time with a vehicle drawing power per charging port	1.9%	1.4%	1.8%	1.5%	0.9%	3.4%	2.2%	0.3%
Average number of charging events started per charging port per week	2.0	0.5	2.5	1.3	0.7	2.8	2.1	0.6
Average electricity consumed per charging port per week (AC kWh)	10.3	10.6	9.3	9.2	6.2	19.3	10.8	1.7
Average length of time with vehicle connected per charging event (hr)	3.9	9.2	1.5	7.1	4.3	4.0	3.1	1.5
Average length of time with vehicle drawing power per charging event (hr)	1.6	4.4	1.2	1.9	2.2	2.0	1.8	0.8
Average electricity consumed per charging event (AC kWh)	5.2	19.8	3.7	6.9	8.6	6.8	5.1	2.9

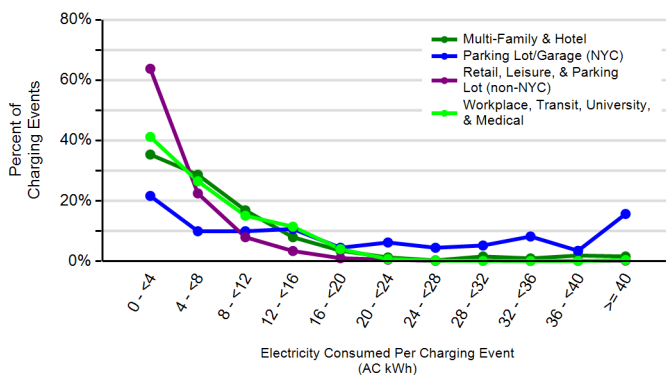
**Distribution of Length of Time with a Vehicle Connected per Charging Event**



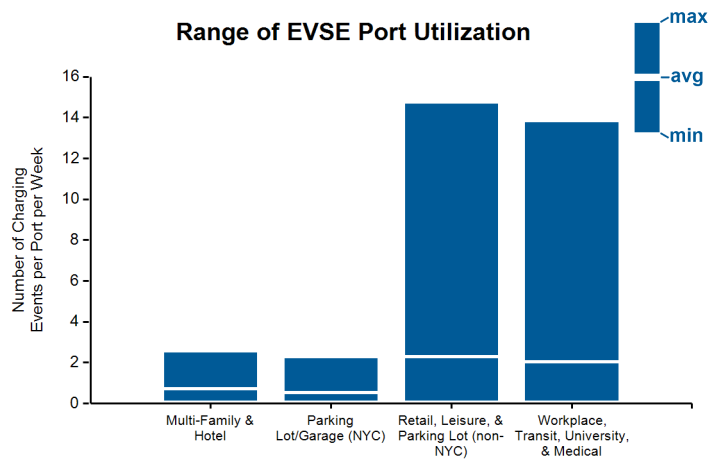
**Distribution of Length of Time with a Vehicle Drawing Power per Charging Event**



**Distribution of AC Energy Consumed per Charging Event**



**Range of EVSE Port Utilization**



<sup>1</sup> Includes all EVSE ports in use during the reporting period and have reported data to INL.

<sup>2</sup> A charging event is defined as the period when a vehicle is connected to a charging unit, during which power is transferred.

<sup>3</sup> Only includes data from EVSE providing Public or Limited access.

<sup>4</sup> Venues with less than 10 EVSE ports are not individually represented, and are combined and reported as 'Other'.