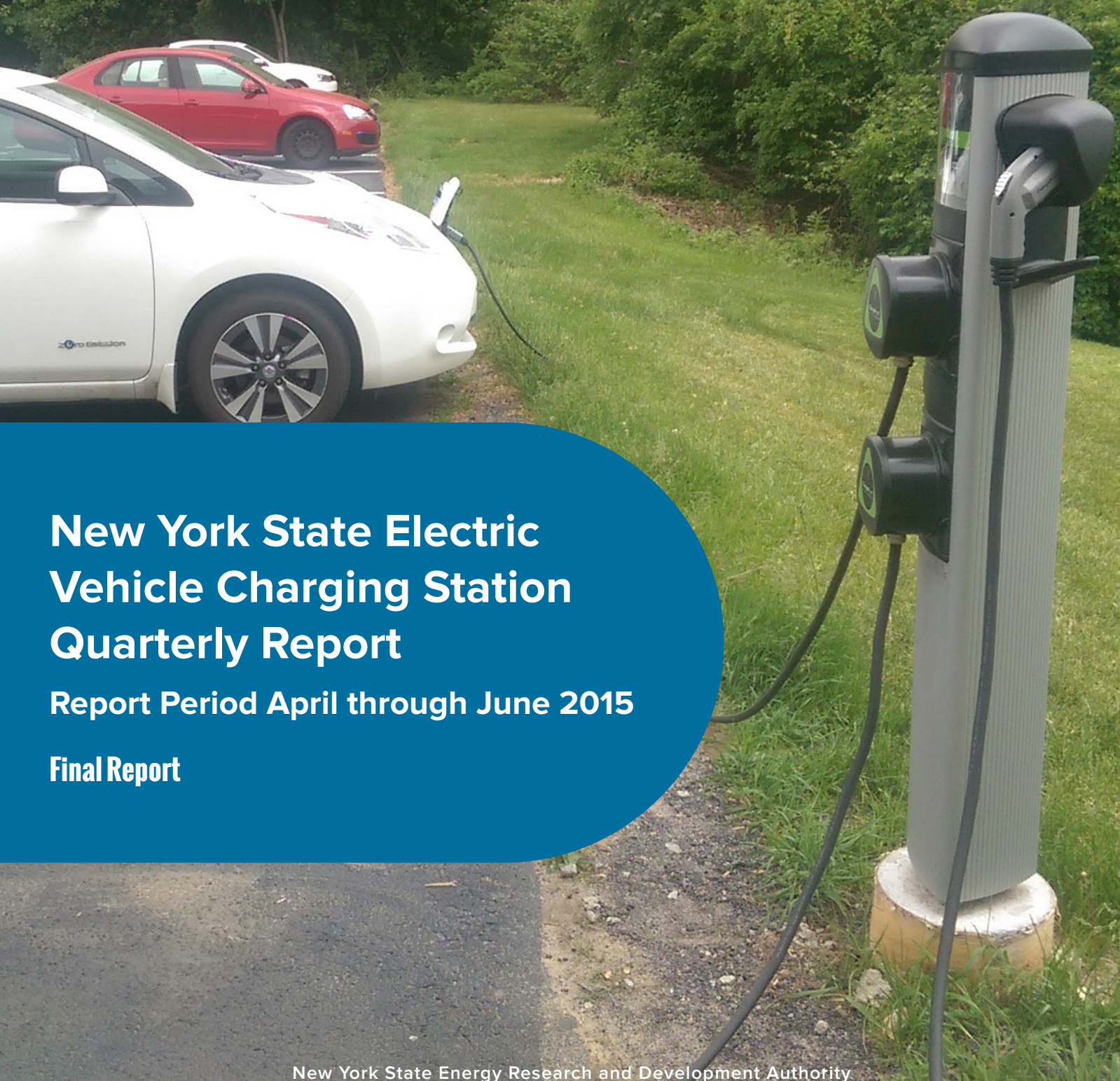




ChargeNY



# New York State Electric Vehicle Charging Station Quarterly Report

Report Period April through June 2015

Final Report

New York State Energy Research and Development Authority

September 2015

## **NYSERDA's Promise to New Yorkers:**

NYSERDA provides resources, expertise, and objective information so New Yorkers can make confident, informed energy decisions.

### **Mission Statement:**

Advance innovative energy solutions in ways that improve New York's economy and environment.

### **Vision Statement:**

Serve as a catalyst – advancing energy innovation, technology, and investment; transforming New York's economy; and empowering people to choose clean and efficient energy as part of their everyday lives.

# **New York State Electric Vehicle Charging Station Quarterly Report**

**Report Period April through June 2015**

*Final Report*

Prepared for:

**New York State Energy Research and Development Authority**

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September 2015

## Notice

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# Table of Contents

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Notice.....	ii
List of Figures .....	iii
List of Tables.....	iii
1 Introduction.....	1
2 Charging Station Usage in New York .....	2
3 Data Comparisons to Previous Quarter .....	4
Appendix A: NYSED A Electric Vehicle Charging Infrastructure Report.....	A-7

## List of Figures

---

Figure 1. Growth in Installed EVSE Ports Supported by NYSEDA Funding.....	4
Figure 2. Charging Stations with the Most Charging Events in the Second Quarter 2015 .....	6

## List of Tables

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Table 1. Percentage of Time with a Vehicle Connected with Access Type, Payments, and Land Use.....	4
Table 2. Percentage of Time with a Vehicle Connected by Region and Venue .....	5

# 1 Introduction

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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 New York State. These installations support Governor Andrew M. Cuomo's ChargeNY initiative. The initiative set the goal of 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 by 2018. Since the program's inception in 2013, New York State has supported the installation of over 500 charging stations (bringing the statewide total to more than 1,200), revised regulations to clarify charging station ownership rules, and supported research and demonstration projects on new PEV technologies and policies.

The NYSERDA-funded EVSE projects represent a wide range of business models and approaches for providing public charging infrastructure. One NYSERDA program goal is to learn how the stations are used, including which types of locations and business models are the most promising. By doing so, NYSERDA is paving the way for future private sector charging station investment. Charging station usage data and analysis are shared with the public through these quarterly data reports.

## 2 Charging Station Usage in New York

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The NYSERDA Electric Vehicle Charging Infrastructure Report in Appendix A summarizes the usage of EVSE that were installed by the NYSERDA 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 NYSERDA program. The first page overview in Appendix A 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, which means that a charging station with two charging connections (a dual port station) was counted as two ports.

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 that they are in EV dedicated parking spaces. However, the vehicles only draw power until the battery pack is finished charging. The Charging Demand plot on the first page of Appendix A shows the total electrical power used by all active NYSERDA-funded stations at different times of day. This data indicates the total electrical grid impact from EVs charging at NYSERDA-funded public stations. It is important to note that this data does not reflect all EV charging in New York State. Public charging stations that were not funded by the NYSERDA project and home charging were not included in this analysis.

The remaining five pages of data analysis in Appendix A 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).

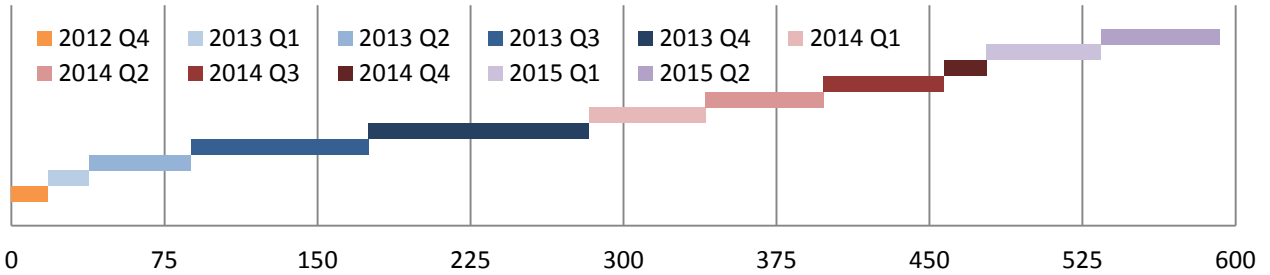
The three line charts on the last five pages of Appendix A display the **differences in length of time a vehicle is connected**, **differences in length of time a vehicle is drawing power**, and **differences in energy consumed** to show variations in charging behavior within the EVSE groups (e.g., a large portion of retail location charging events are very short, compared to a more uniform distribution of charge event 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.



### 3 Data Comparisons to Previous Quarter

Between December 2012 and June 2015, the NYSERDA EV Charging Station Program funded the installation of 592 charging ports, 58 of which were installed during the last quarter.

**Figure 1. Growth in Installed EVSE Ports Supported by NYSERDA Funding**



The data results for the percentage of time with a vehicle connected are shown on the following tables for the average this quarter and change from last quarter (highest results are highlighted in green).

**Table 1. Percentage of Time with a Vehicle Connected with Access Type, Payments, and Land Use**

Access Type	2015 Q2 Average	Change from 2015 Q1	Payment	2015 Q2 Average	Change from 2015 Q1	Land Use	2015 Q2 Average	Change from 2015 Q1
Private	29.8%	-37.7%	Free	4.9%	6.5%	Urban	6.1%	-7.6%
Limited	4.6%	48.4%	For Fee	2.5%	-7.4%	Suburban	3.7%	19.4%
Public	4.4%	-6.4%				Rural	1.5%	-31.8%

**Table 2. Percentage of Time with a Vehicle Connected by Region and Venue**

Region	2015 Q2 Average	Change from 2015 Q1	Venue	2015 Q2 Average	Change from 2015 Q1
Finger Lakes	7.0%	-22.2%	University/Medical	6.7%	19.6%
Capital District	5.5%	22.2%	Parking (non-NYC)	6.1%	-16.4%
Long Island	4.9%	48.5%	Workplace	4.6%	-22.0%
Western NY	4.4%	-21.4%	Multi-Family	4.6%	N/A
Hudson Valley	4.3%	53.6%	Leisure Destination	3.7%	-14.0%
New York City	3.7%	-7.5%	Parking (NYC)	3.5%	0.0%
Central NY	1.6%	45.5%	Hotel	3.4%	78.9%
North Country	1.0%	-28.6%	Retail Location	1.9%	-13.6%
Mohawk Valley	0.5%	N/A	Transit	1.4%	75.0%

The second quarter of 2015 saw the highest number of utilized charging ports since the onset of this program. This increase was primarily due to a significant increase in use of limited access charging stations, which are primarily for use by employees or tenants (including paying guests at hotels). Limited access charging stations are placed where employees or tenants would normally park, but others (such as visitors or customers) may be able to plug in on a more limited basis.

Free charging stations are occupied about double the amount of time EVs are plugged into For Fee charging stations. However, For Fee charging stations average more than double the amount of electricity consumed per charging event, which indicates that some EV owners likely use For Fee charging stations as a primary means of charging (most For Fee stations are in New York City garages).

Compared to charging stations in a suburban environment:

- Urban-based charging stations are used more (average 2.0 charging events per port per week versus 1.8).
- EVs are plugged into the urban stations longer (average 6.1% of the time with a vehicle connected vs. 3.7%).
- Urban stations dispense almost 1.5 times as much energy per week (average 15.7 AC kWh vs. 10.9 AC kWh).

Charging stations in a rural environment are used considerably less than suburban or urban stations.

For the third consecutive quarter, charging stations in the Hudson Valley have experienced significant increases in the amount of time that EVs are plugged in. The three regions with the highest average number of charging events started and highest average amount of electricity consumed are:

- Rochester/Finger Lakes (3.1 events and 16.1 AC kWh per charging port per week).
- Capital District (2.5 events and 15.2 AC kWh).
- Western New York (2.1 events and 13.4 AC kWh).

Universities or medical campuses and parking lots outside of New York City continued to be the most highly utilized charging station location venues. Significant increases in charging station utilization were seen by hotels, transit stations, and multifamily dwellings—venues where EV drivers tend to park for longer periods of time.

**Figure 2. Charging Stations with the Most Charging Events in the Second Quarter 2015**

Stations were (from left) University of Buffalo's Bonner Hall (15.1 charge events per week), Vent Fitness in Guilderland (11.3), and University at Albany's lot on Western Ave (10.5).

*Source: Energetics Inc.*



# **Appendix A: NYSERDA Electric Vehicle Charging Infrastructure Report**

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# NYSERDA Electric Vehicle Charging Infrastructure Report

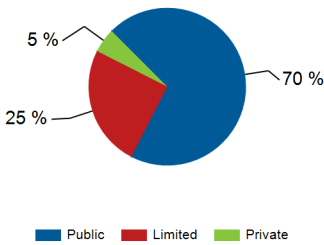
Report period: April 2015 through June 2015

New York State

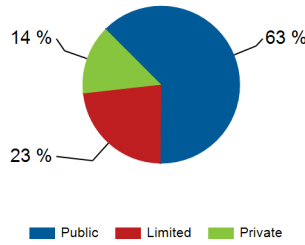
## EVSE Usage - By Access Type

	Public	Limited <sup>3</sup>	Private	Total
Number of charging ports <sup>1</sup>	262	119	24	405
Number of charging events <sup>2</sup>	6,269	2,230	451	8,950
Electricity consumed (AC MWh)	42.30	15.54	9.64	67.47
Percent of time with a vehicle connected	4.4%	4.6%	29.8%	6.0%
Percent of time with a vehicle drawing power	2.0%	2.0%	27.9%	3.6%

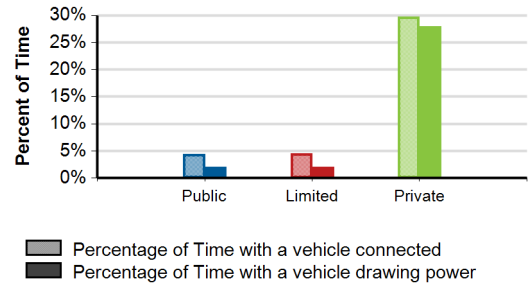
Number of Charging Events



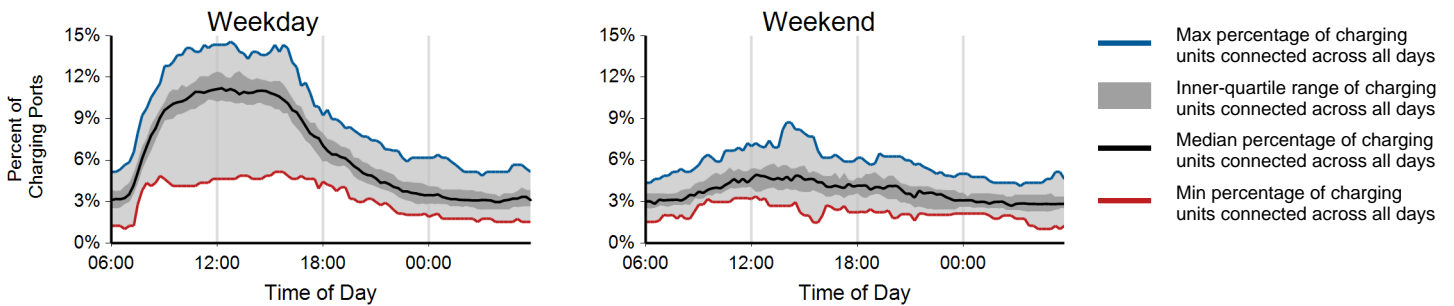
Electricity Consumed



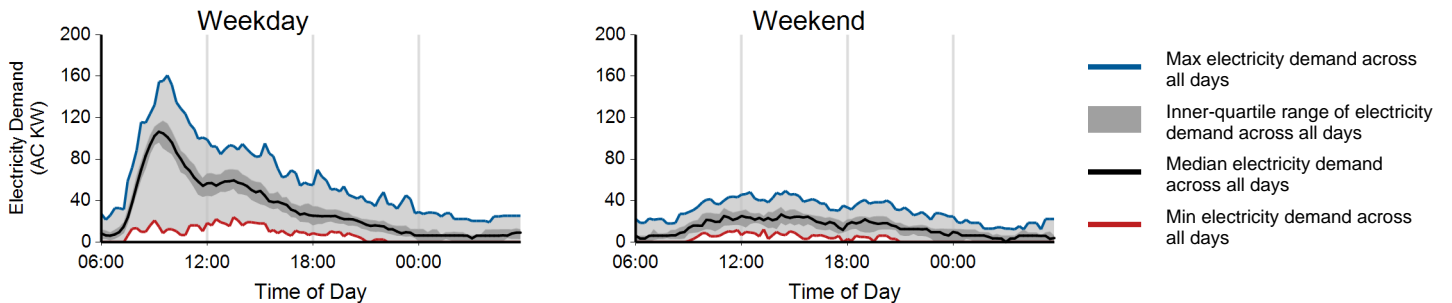
Charging Unit Utilization



## 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.

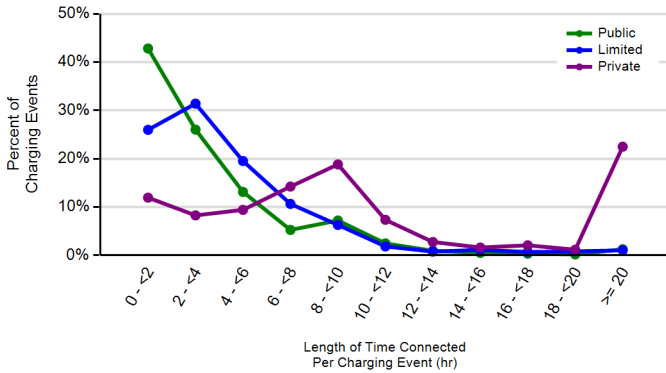
# NYSERDA Electric Vehicle Charging Infrastructure Report

Report period: April 2015 through June 2015

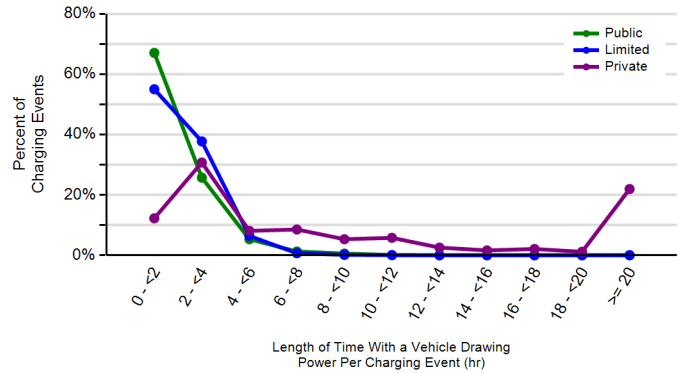
## EVSE Usage - By Access Type

	Public	Limited <sup>3</sup>	Private
Number of charging ports <sup>1</sup>	262	119	24
Number of charging events <sup>2</sup>	6,269	2,230	451
Charging energy consumed (AC MWh)	42.3	15.5	9.6
Average percent of time with a vehicle connected per charging port	4.4%	4.6%	29.8%
Average percent of time with a vehicle drawing power per charging port	2.0%	2.0%	27.9%
Average number of charging events started per charging port per week	1.9	1.6	1.5
Average electricity consumed per charging port per week (AC kWh)	12.6	11.4	30.9
Average length of time with vehicle connected per charging event (hr)	4.0	4.7	34.6
Average length of time with vehicle drawing power per charging event (hr)	1.8	2.0	32.5
Average electricity consumed per charging event (AC kWh)	6.7	7.0	21.4

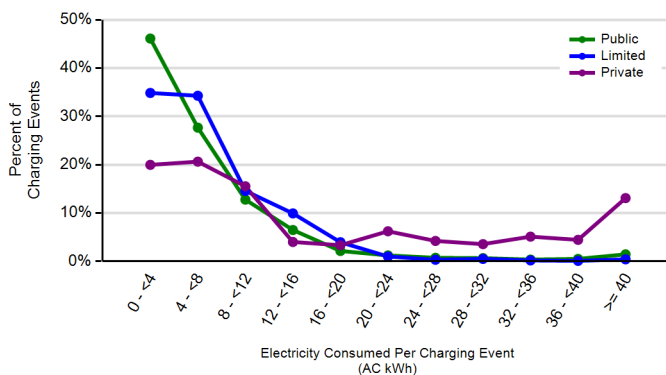
**Distribution of Length of Time with a Vehicle Connected per Charging Event**



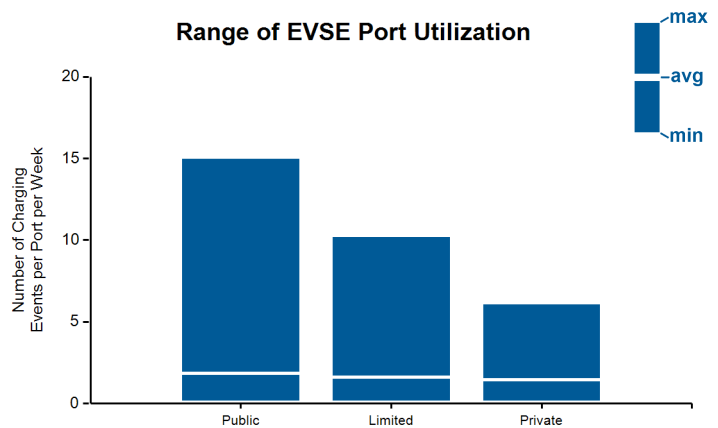
**Distribution of Length of Time with a Vehicle Drawing Power per Charging Event**



**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.

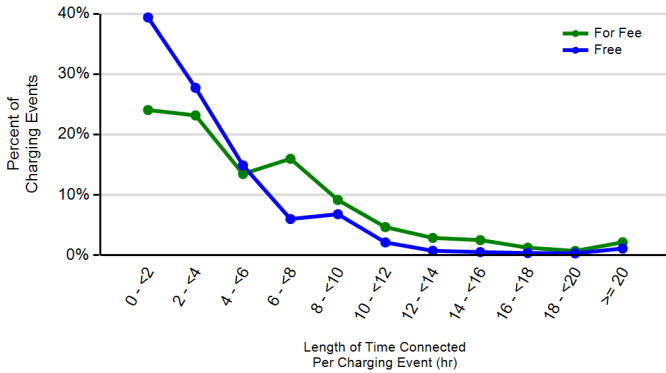
# NYSERDA Electric Vehicle Charging Infrastructure Report

Report period: April 2015 through June 2015

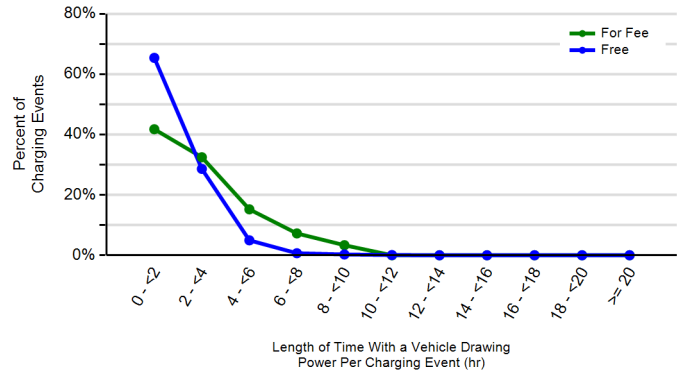
## EVSE Usage - By Required Payment<sup>3</sup>

	For Fee	Free
Number of charging ports <sup>1</sup>	64	317
Number of charging events <sup>2</sup>	557	7,942
Charging energy consumed (AC MWh)	7.3	50.5
Average percent of time with a vehicle connected per charging port	2.5%	4.9%
Average percent of time with a vehicle drawing power per charging port	1.2%	2.2%
Average number of charging events started per charging port per week	0.7	2.0
Average electricity consumed per charging port per week (AC kWh)	8.8	13.0
Average length of time with vehicle connected per charging event (hr)	6.3	4.0
Average length of time with vehicle drawing power per charging event (hr)	2.9	1.8
Average electricity consumed per charging event (AC kWh)	13.1	6.4

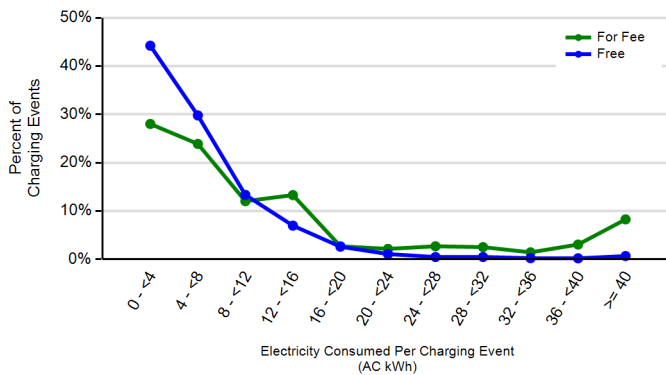
**Distribution of Length of Time with a Vehicle Connected per Charging Event**



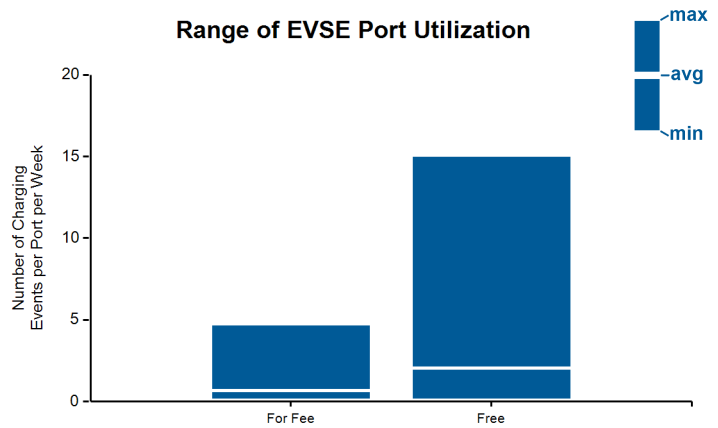
**Distribution of Length of Time with a Vehicle Drawing Power per Charging Event**



**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.

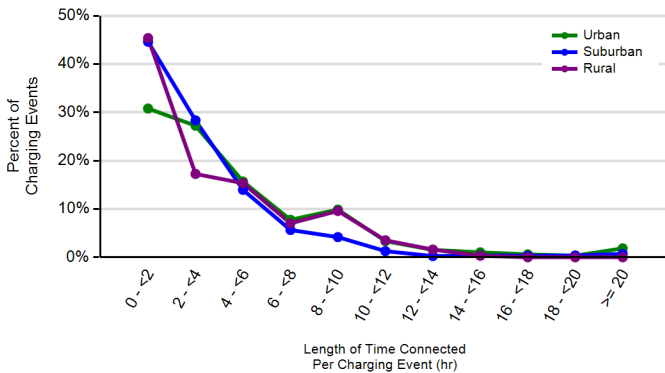
<sup>3</sup> Only includes data from EVSE providing Public or Limited access.

# NYSERDA Electric Vehicle Charging Infrastructure Report

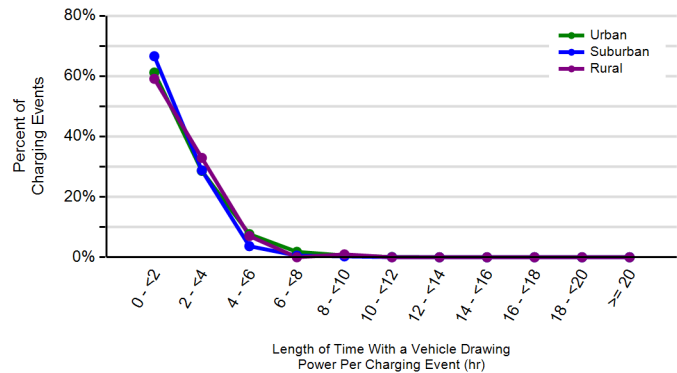
## EVSE Usage - By Land Use Type<sup>3</sup>

	Urban	Suburban	Rural
Number of charging ports <sup>1</sup>	150	196	35
Number of charging events <sup>2</sup>	3,852	4,334	313
Charging energy consumed (AC MWh)	30.0	25.8	2.0
Average percent of time with a vehicle connected per charging port	6.1%	3.7%	1.5%
Average percent of time with a vehicle drawing power per charging port	2.5%	1.9%	0.8%
Average number of charging events started per charging port per week	2.0	1.8	0.7
Average electricity consumed per charging port per week (AC kWh)	15.7	10.9	4.5
Average length of time with vehicle connected per charging event (hr)	5.1	3.4	3.6
Average length of time with vehicle drawing power per charging event (hr)	2.0	1.7	1.9
Average electricity consumed per charging event (AC kWh)	7.8	6.0	6.5

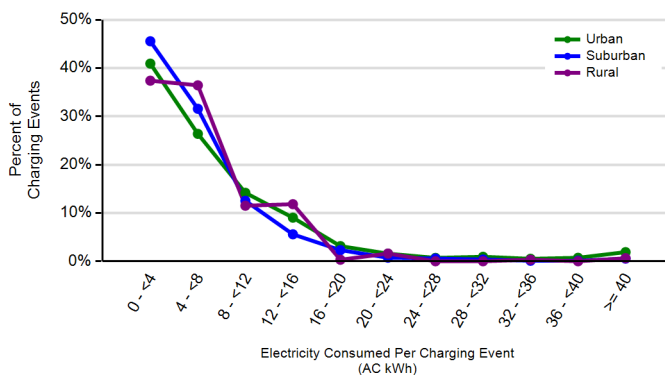
**Distribution of Length of Time with a Vehicle Connected per Charging Event**



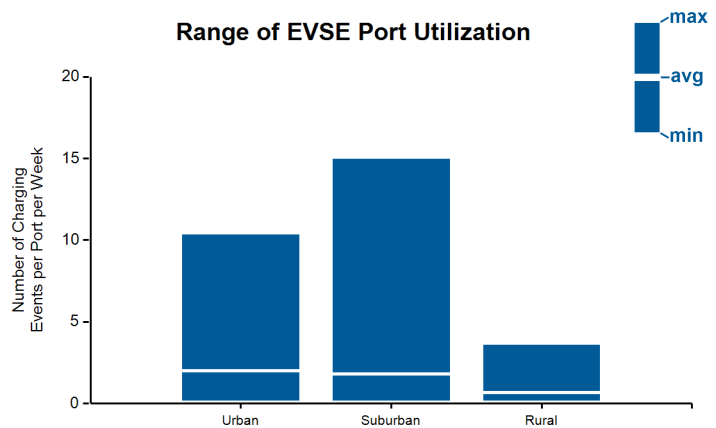
**Distribution of Length of Time with a Vehicle Drawing Power per Charging Event**



**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.



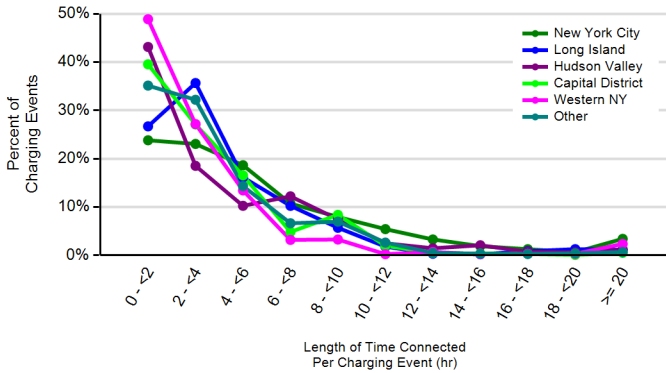
# NYSERDA Electric Vehicle Charging Infrastructure Report

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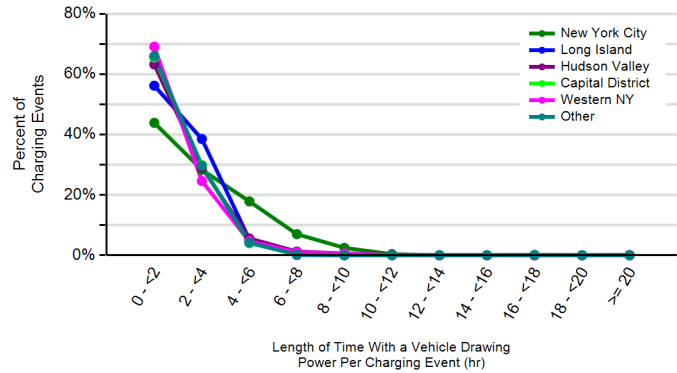
## EVSE Usage - By Region<sup>3</sup>

	New York City	Long Island	Hudson Valley	Capital District	Syracuse/Central NY	Rochester/Finger Lakes	Mohawk Valley	North Country	Western NY
Number of charging ports <sup>1</sup>	69	51	49	80	17	34	10	17	48
Number of charging events <sup>2</sup>	794	948	967	2,545	254	1,350	67	115	1,318
Charging energy consumed (AC MWh)	10.3	6.3	6.6	15.8	1.4	6.9	0.3	0.6	8.3
Average percent of time with a vehicle connected per charging port	3.7%	4.9%	4.3%	5.5%	1.6%	7.0%	0.5%	1.0%	4.4%
Average percent of time with a vehicle drawing power per charging port	1.5%	2.1%	1.8%	2.6%	1.2%	3.1%	0.4%	0.5%	2.2%
Average number of charging events started per charging port per week	0.9	1.8	1.6	2.5	1.2	3.1	0.6	0.6	2.1
Average electricity consumed per charging port per week (AC kWh)	11.5	12.0	11.0	15.2	6.5	16.1	2.5	3.0	13.4
Average length of time with vehicle connected per charging event (hr)	7.1	4.5	4.5	3.7	2.2	3.8	1.4	3.1	3.5
Average length of time with vehicle drawing power per charging event (hr)	2.8	1.9	1.9	1.8	1.7	1.7	1.3	1.6	1.8
Average electricity consumed per charging event (AC kWh)	13.0	6.6	6.8	6.2	5.5	5.1	4.5	5.4	6.3

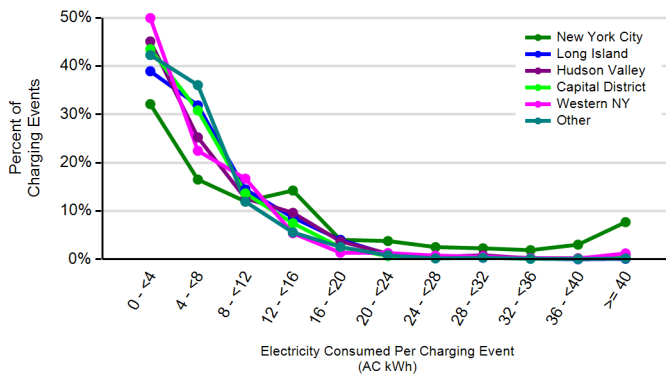
Distribution of Length of Time with a Vehicle Connected per Charging Event<sup>4</sup>



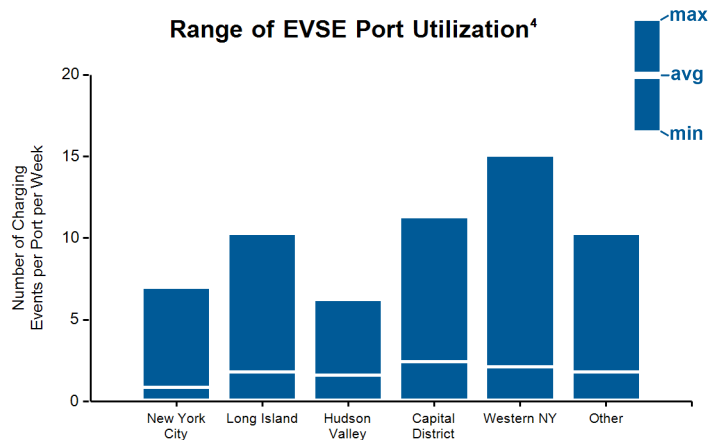
Distribution of Length of Time with a Vehicle Drawing Power per Charging Event<sup>4</sup>



Distribution of AC Energy Consumed per Charging Event<sup>4</sup>



Range of EVSE Port Utilization<sup>4</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> Only the 4 regions with the most EVSE ports are individually represented, with the remaining regions combined and shown as 'Other'.

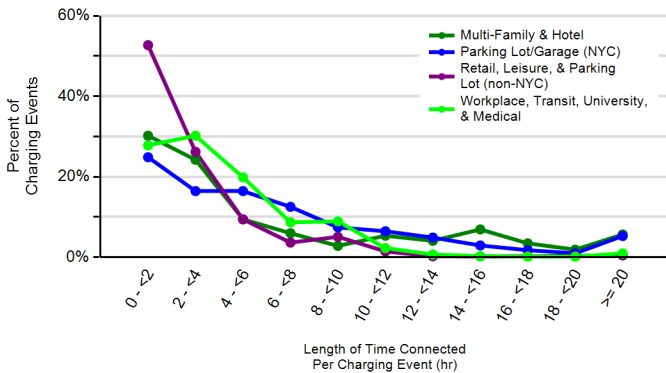
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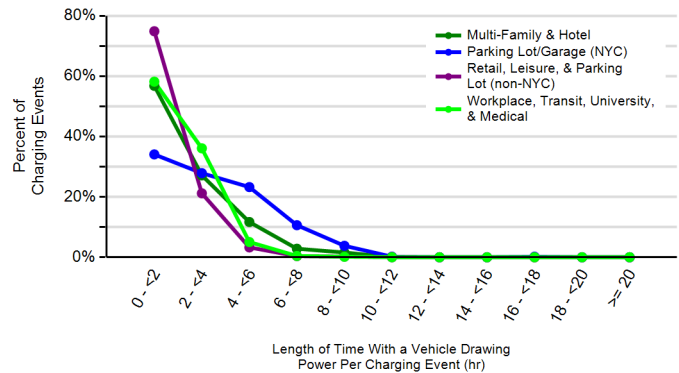
## EVSE Usage - By Venue<sup>3</sup>

	Parking Lot/Garage (non-NYC)	Parking Lot/Garage (NYC)	Retail Location	Workplace	Multi-Family	Hotel	University or Medical Campus	Leisure Destination	Transit Station
Number of charging ports <sup>1</sup>	53	58	51	61	15	15	88	21	19
Number of charging events <sup>2</sup>	1,820	511	1,262	1,160	148	170	2,754	560	114
Charging energy consumed (AC MWh)	9.5	8.7	7.1	7.4	1.9	1.4	18.4	3.0	0.6
Average percent of time with a vehicle connected per charging port	6.1%	3.5%	1.9%	4.6%	4.6%	3.4%	6.7%	3.7%	1.4%
Average percent of time with a vehicle drawing power per charging port	2.6%	1.3%	1.6%	1.7%	1.3%	1.1%	3.3%	2.0%	0.5%
Average number of charging events started per charging port per week	2.7	0.7	1.9	1.5	0.8	0.9	2.8	2.1	0.5
Average electricity consumed per charging port per week (AC kWh)	14.1	11.5	10.7	9.3	10.7	7.0	18.8	10.8	2.7
Average length of time with vehicle connected per charging event (hr)	3.8	8.8	1.7	5.2	9.4	6.5	4.0	3.0	4.5
Average length of time with vehicle drawing power per charging event (hr)	1.6	3.3	1.4	2.0	2.6	2.1	2.0	1.6	1.7
Average electricity consumed per charging event (AC kWh)	5.2	17.0	5.6	6.4	13.0	8.0	6.7	5.3	5.3

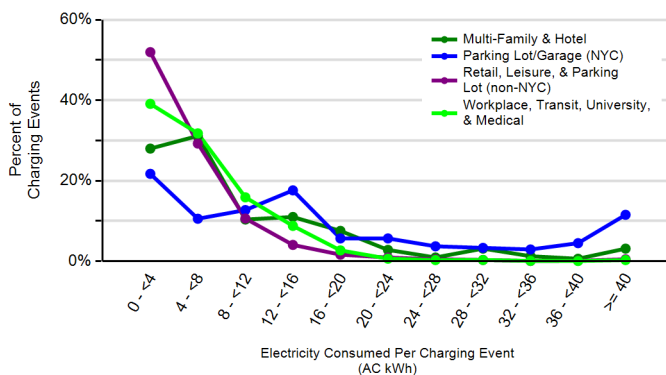
**Distribution of Length of Time with a Vehicle Connected per Charging Event**



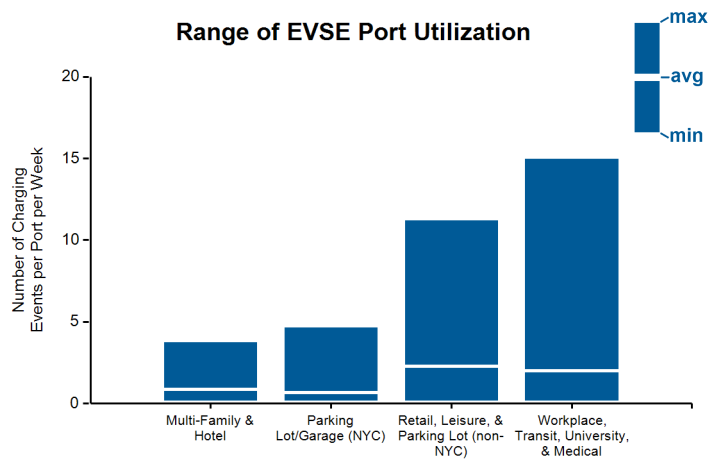
**Distribution of Length of Time with a Vehicle Drawing Power per Charging Event**



**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.

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