



ELECTRIC VEHICLE WIDESCALE ANALYSIS FOR TOMORROW'S TRANSPORTATION SOLUTIONS

Data Privacy, Anonymization, and Categorization

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Driving Electrification Through the Power of Data

PEV AND CHARGING STATION DATA



Vehicles

- All-electric and plug-in hybrid electric vehicles
- Light-, medium-, and heavy-duty
- Trip-level, longitudinal vehicle data (from telematics)

Charging Infrastructure

- AC Level 2 and DC fast charge
- Various sites: corridors, workplace, multi-unit dwellings, curbside, fleet, commercial, etc.
- Session-level or interval-level data

Variety of geographic areas, climates, and topography



FROM RAW DATA TO RESULTS

Raw Data

- Uploads from partners (Quarterly)
- Data pulls from partner websites (APIs) (Weekly)

Data Validated

- Ensure all fields are present and date range is correct
- Ensure unique record
- Ensure each data field is within expected specifications

Categorization

- Derive categories for data based on key criteria
- Assign new fields based on category or bin

Remove Sensitive Information

- Create unique IDs
- Remove key identifiers:
 - EVSE ID
 - Name
 - Session ID
 - Trip ID

Results

- Develop summary statistics and metrics
- Perform key queries to determine data validity and generate visuals

PROTECTING DATA PROVIDER PRIVACY

Removing Sensitive Information

Replaced with Custom Project IDs

- **EVSE:** Station ID, Session/Event ID, Driver ID
- **Vehicle:** Vehicle ID, Trip ID

Removed From Dataset

- **EVSE:** Model Number, Station Name, Org Name, MAC Address, Serial Number
- **Vehicle:** VIN

Only Provided to Labs Under NDAs

- **EVSE:** Postal Code, Driver Postal Code, Lat/Long
- **Vehicle:** Lat/Long

Anonymizing Data

Characterize and Standardize

- **EVSE:** Pricing Policy, Station Access, Usable by, Customer Category, Customer Subcategory, Activation Date (Resolve to year or quarter)
- **Vehicle:** VIN, Lat/Long

Non-Sensitive Information

Available in Final Data Set

- **EVSE:** Duration, Power, Energy, Start/Stop Time
- **Vehicle:** Power, Energy, State of Charge, Fuel Use, Speed Ranges

DATA CATEGORIES FOR EVSE

Access

- Private
- Limited (Restricted by permit, employees, etc.)
- Public

Owner Type

- Federal Government Owned
- Jointly Owned
- Local/Municipal Government Owned
- Privately Owned
- State/Provincial Government Owned
- Utility Owned

Payment

- Free
- For Fee

Station Type

- Level 2
- DCFC

Land Use

- Urban
- Suburban
- Rural

DCFC Venues

- Interstate Corridor
- Highway Corridor
- Community

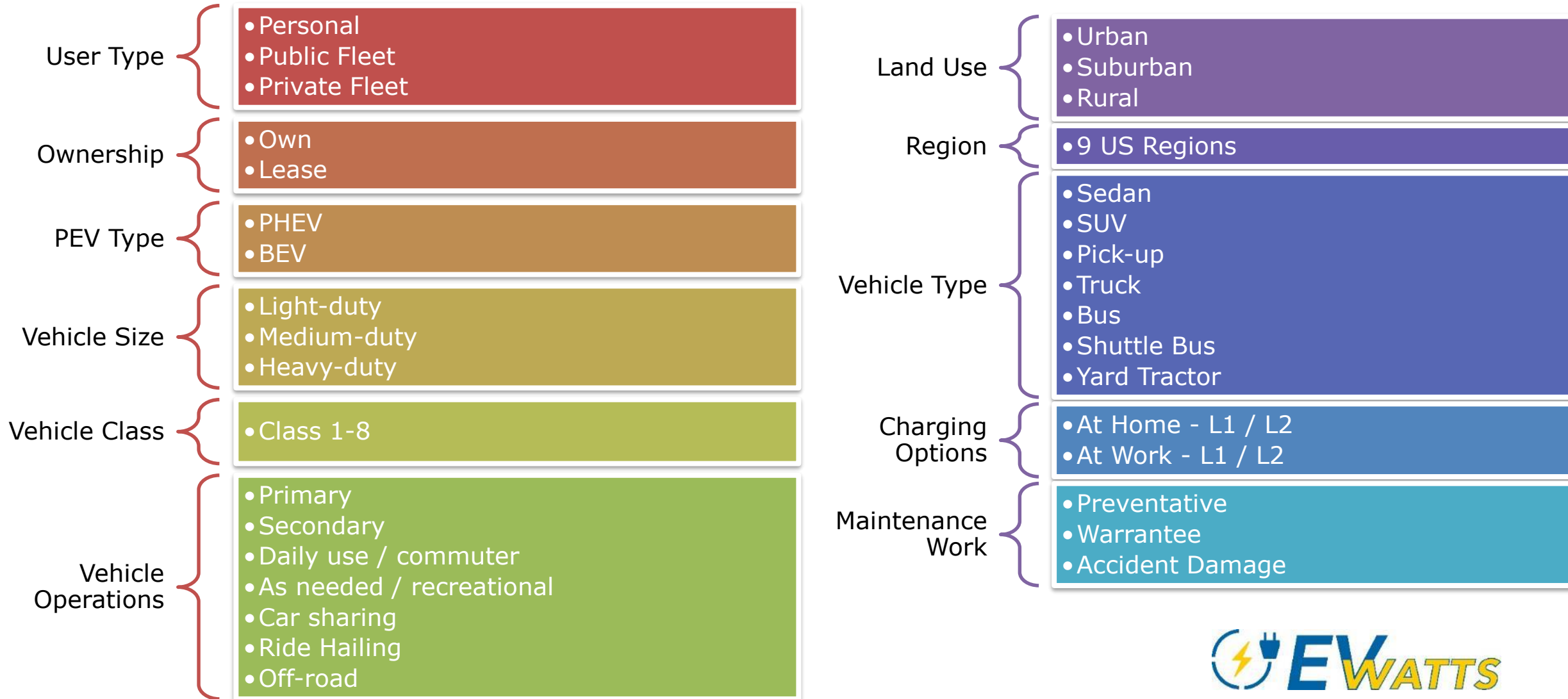
L2 Venues

- Business Office
- Multi-use Parking Garage/Lot
- Leisure Destination
- Retail/Restaurant
- Multi-Unit Dwelling
- Municipal Building
- Medical or Educational Campus
- Transit Facility
- Hotel
- Fleet
- Residential

Regions

- New England
- Middle Atlantic
- East North Central
- West North Central
- South Atlantic
- East South Central
- West South Central
- Mountain
- Pacific

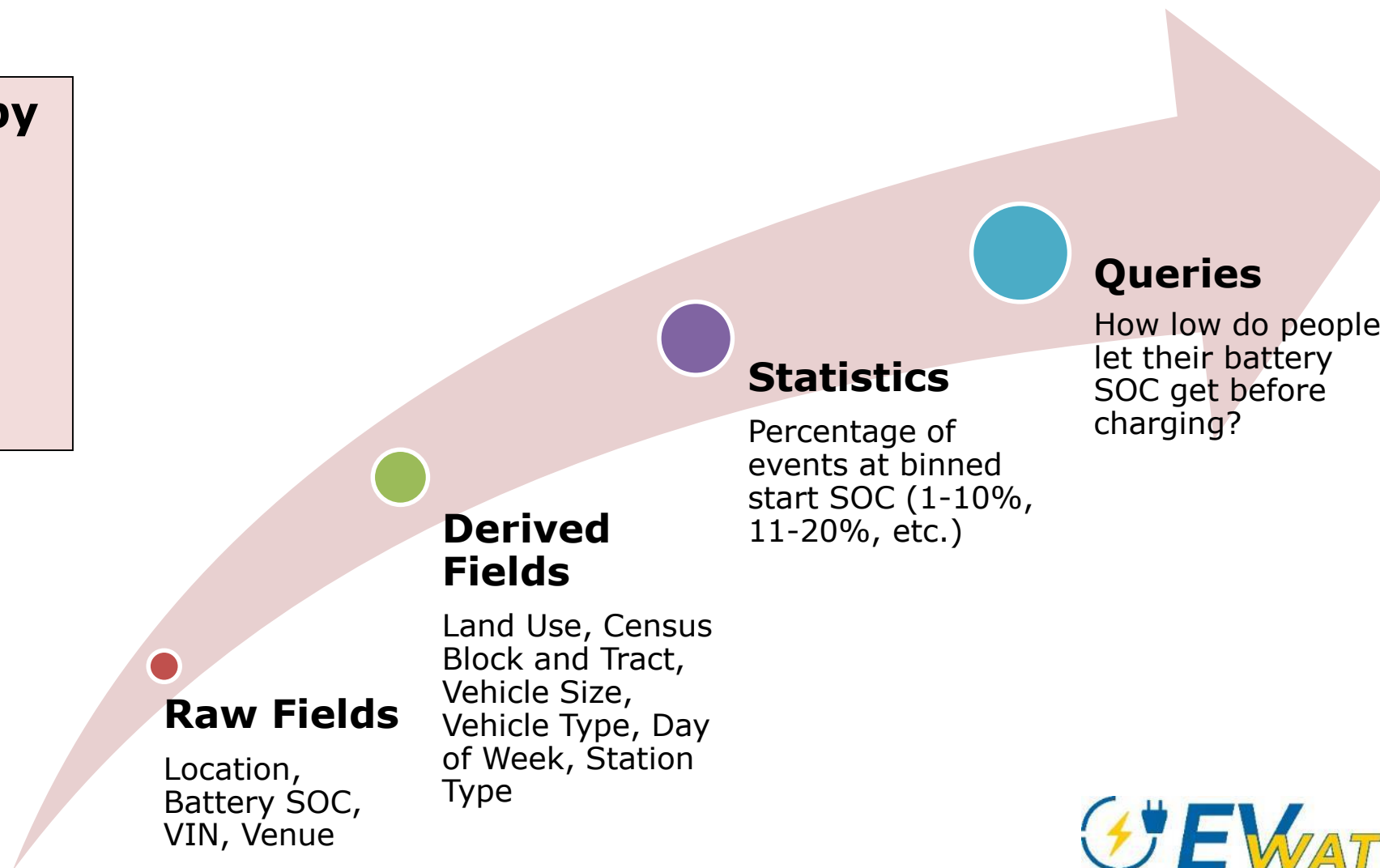
DATA CATEGORIZATION FOR VEHICLES



DEVELOPING INSIGHTS FROM THE DATA

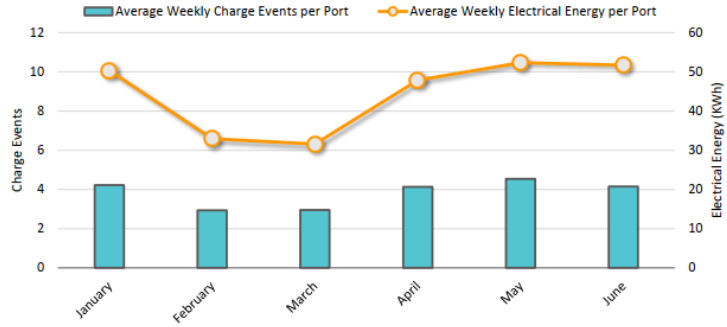
Filtering/Slicing by Characterizations

- Vehicle type
- Region
- Driver type
- Availability of DCFCs
- Day of the week



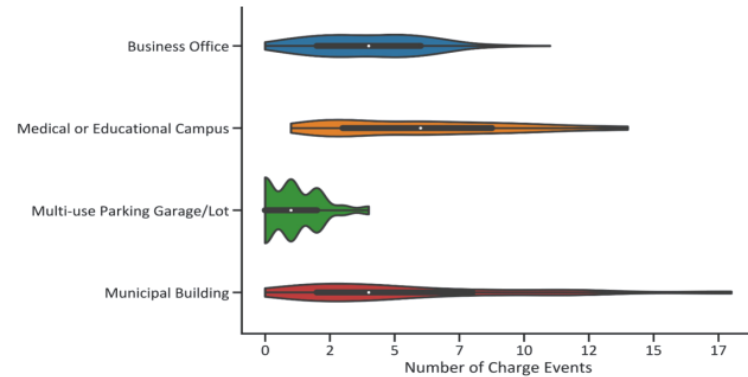
ANALYSIS SUMMARIES/DASHBOARD

Level 2 Port Utilization



Level 2 Weekly Charging Events by Venue Type

Stations at municipal building experience the broadest range of utilization levels, but stations at Medical or Educational Campus locations have the highest median of charging events per week.

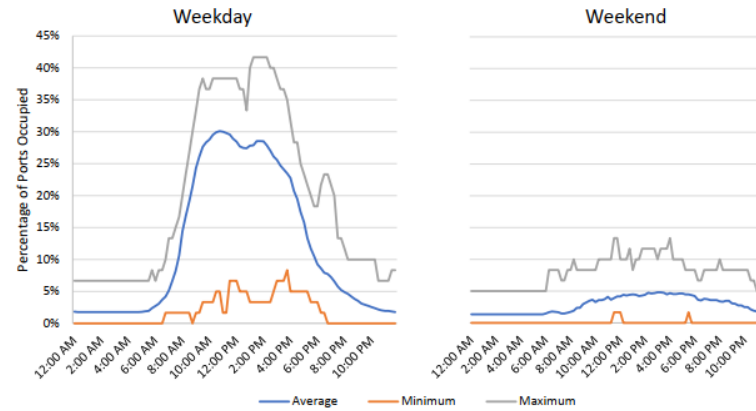


About Violin Charts

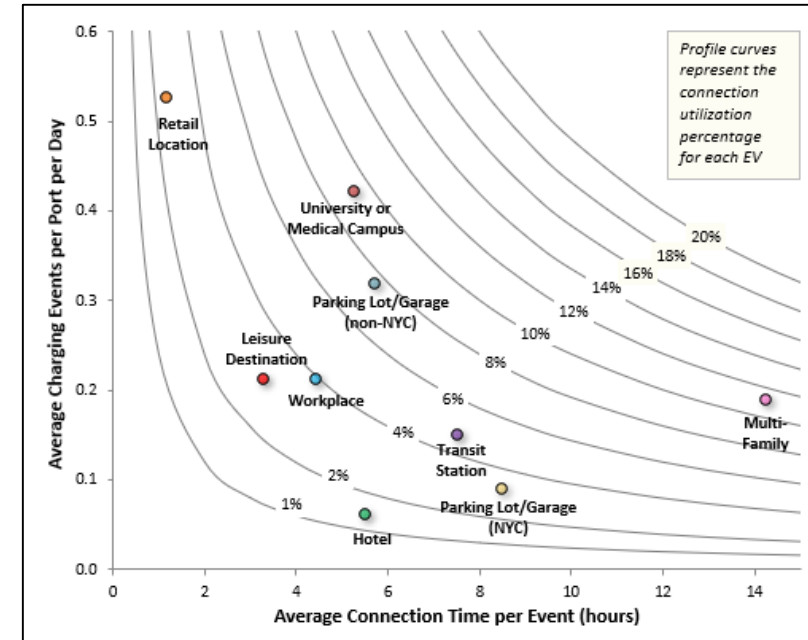
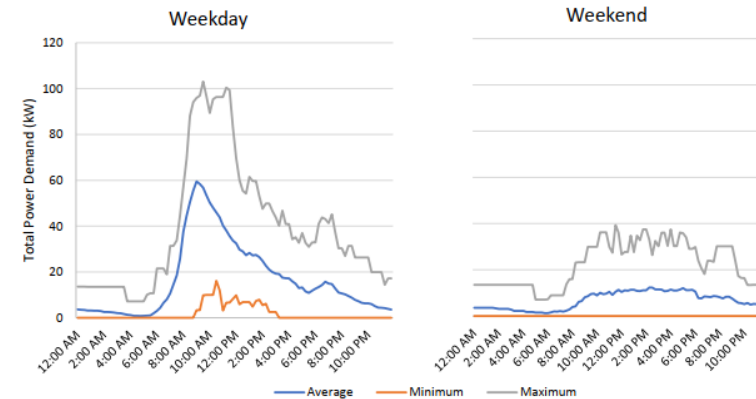
- 25th percentile
- median (50th percentile)
- 75th percentile
- min
- max
- more even distribution
- Frequently occurring data values are peaks
- The relative height represents the frequency of data at that value
- Few data points have these values
- skewed distribution

Grid Impacts due to Level 2 Charging Use

Port Availability: Percentage of active charging ports in use across the time of day for weekdays and weekends. Utilization is considerably higher during weekdays.



Estimated Total Charging Demand: Total power draw (calculated using average power per charging event for the charging duration) from all stations in the Program across the time of day for weekdays and weekends.



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ANALYSIS REPORTS

Examples from Idaho National Laboratory EV Project Reports

How much are Chevrolet Volts in The EV Project driven in EV Mode?

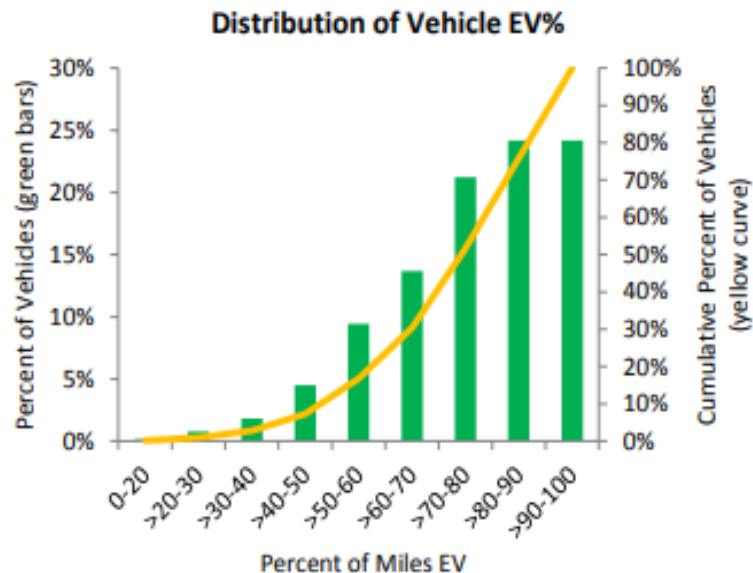


Figure 1: Histogram of EV% on a per-vehicle basis with cumulative distribution curve

What Kind of Charging Infrastructure Did Nissan Leaf Drivers in The EV Project Use and When Did They Use It?

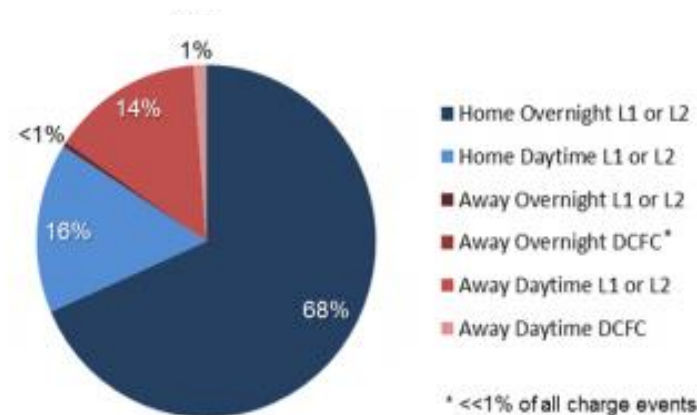


Figure 1. Percent of charging events performed by location, power level, and time of day.

Where do Nissan Leaf drivers in The EV Project charge when they have the opportunity to charge at work?

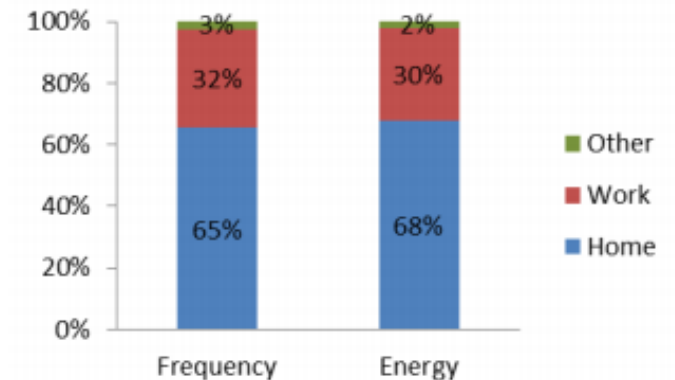


Figure 3: Charging frequency and energy consumption by location for workplace vehicles in 2012 and 2013.

