EV FAST CHARGING & MHD GRANULAR FORECASTS FOR PLANNING

AEIC-WLRA CONFERENCE

SEPTEMBER 23, 2025

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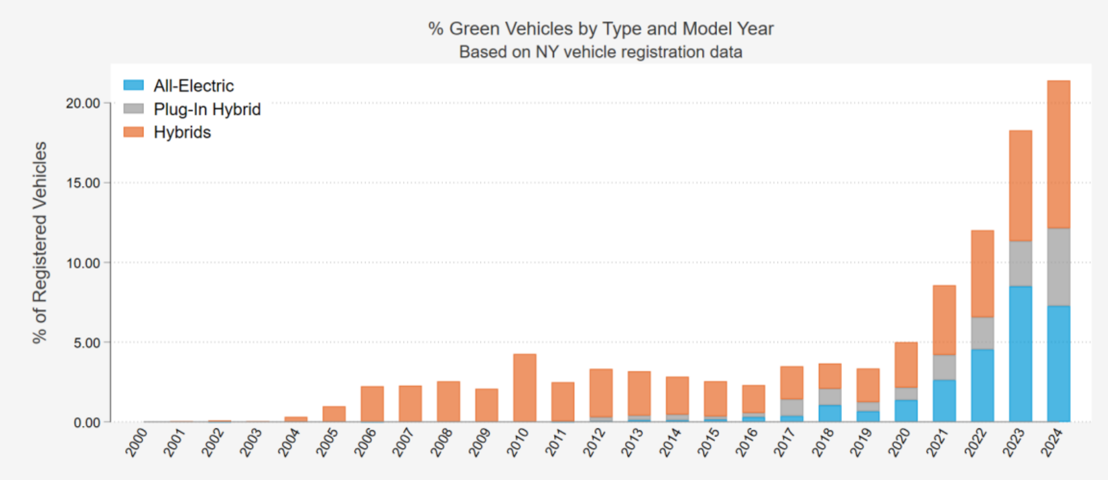
DATA DRIVEN RESEARCH AND INSIGHTS

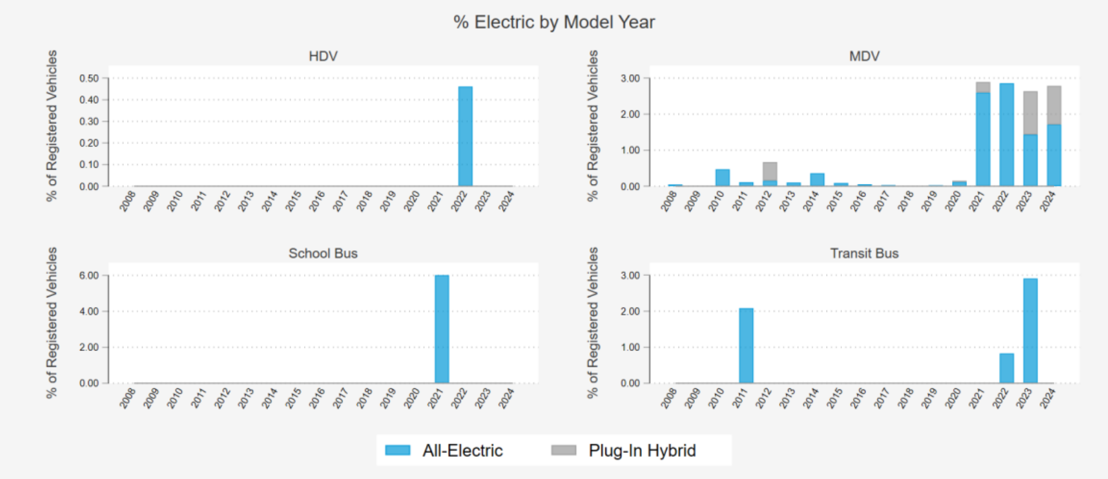
CONTENTS

MORE CHARGING STATIONS NEEDED TO SUPPORT GROWING NUMBER OF EVS

- Increasing share of new vehicle sales are battery electric vehicles (BEV)
    - ➢ More DCFC/L2 charging stations need to be built to support the growing demand
- Predicting EV charging and MHDV fleets is important to distribution planning:
    - ➢ Impacts from charging and fleets are more concentrated than impacts from residential EV charging
    - Certain states transitioning to 100% electric school bus fleets (New York)
- Predicting where future stations will be built and where fleets will electrify is difficult primarily due to a lack of data on charging ports and small number of electric fleets



Growing share of green vehicles among newer model years



Penetration of electric vehicles among all MHDVs remains low

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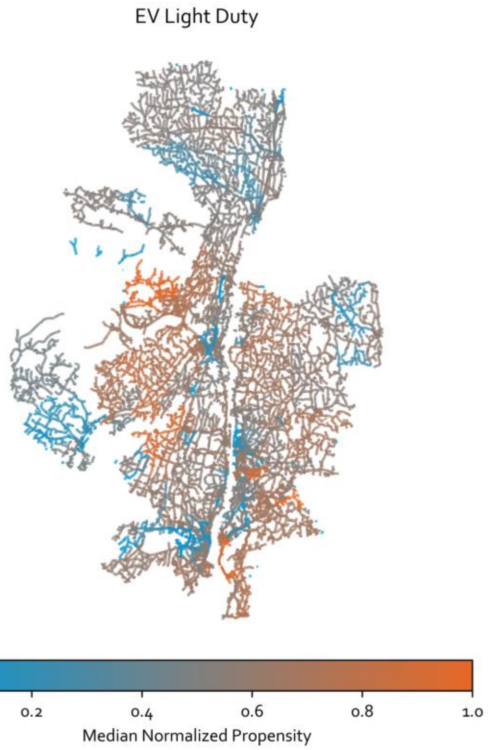
DSA'S APPROACH COMBINES TOP-DOWN FORECASTS AND BOTTOM-UP PROPENSITIES

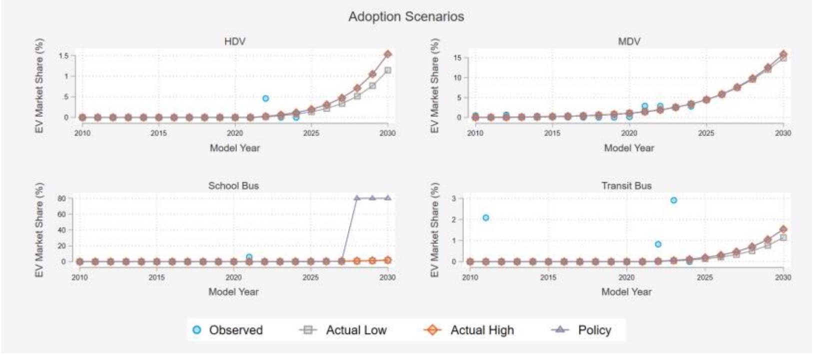
Propensity Scores

- Higher propensity scores indicates higher probability of adoption



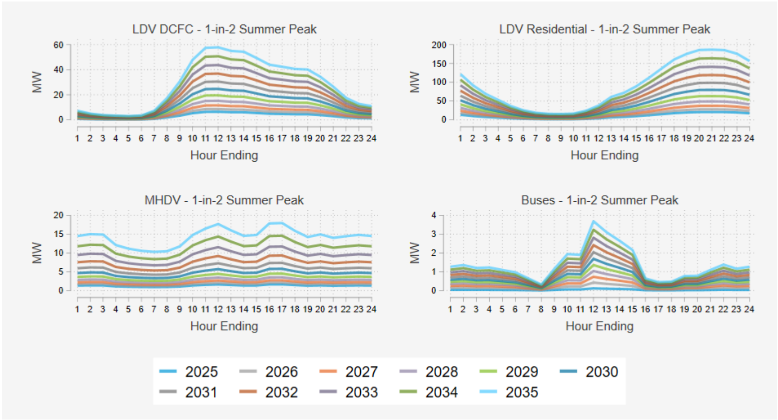
Territory-Wide Forecast

- Top-down forecast developed using historical, territory-wide adoption trends
- Can be produced for multiple scenarios (e.g., low adoption, policy scenarios)



Granular Forecast

- Calibrated forecasts can be scaled by 8760 normalized load shapes to estimate the hourly impact
- 8760 modifier forecast can be added to native load forecast
  - ➢ Quantifies how peak hours change with modifiers



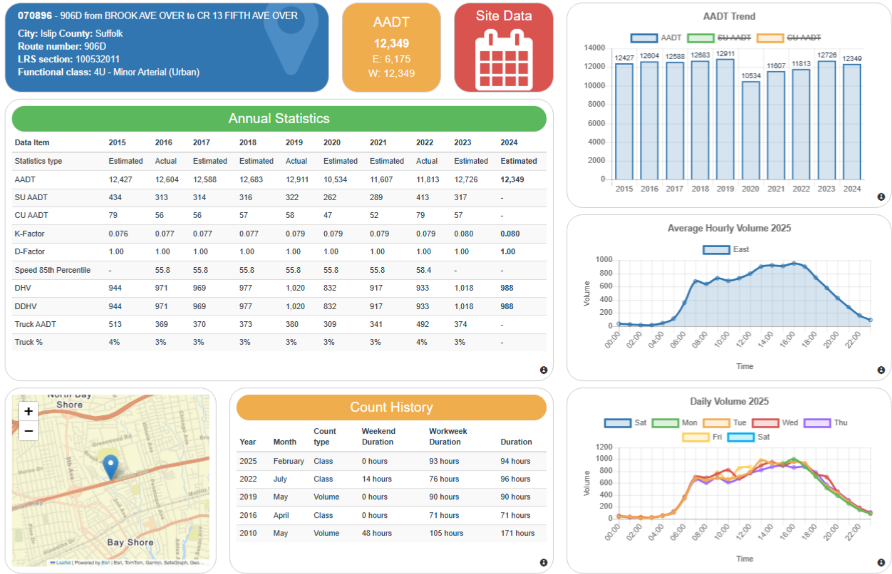
WE ADJUSTED OUR APPROACH FOR CHARGING AND FLEET PROPENSITIES

- While top-down bottom-up forecasting is still the core of how we predict impacts from stations and fleets, we take a slightly different approach for developing propensities
  - DCFC & L2 stations – use session data somehow to incorporate the fact that not all stations see the same amount of traffic
  - MHDV fleets – develop propensities for depots and rest stops separately, reflecting the fact that large trucks often refuel at rest stops during their journey

PRIMARY DATA SOURCES

Commercial Parcel Characteristics

- Property data
  - ➢ Business type (e.g., restaurant, shopping mall, dealership, etc.), lot size, square footage
- NYSDOT:
  - ➢ Annual traffic volume by vehicle class



Annual Statistics

Data Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Statistics type	Estimated	Actual	Estimated	Estimated	Actual	Estimated	Estimated	Actual	Estimated	Estimated
AADT	12,427	12,604	12,588	12,683	12,911	10,534	11,607	11,813	12,726	12,349
SU AADT	434	313	314	316	322	262	289	413	317	-
CU AADT	79	56	56	57	58	47	52	79	57	-
K-Factor	0.076	0.077	0.077	0.077	0.079	0.079	0.079	0.079	0.080	0.080
D-Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Speed 85th Percentile	-	55.8	55.8	55.8	55.8	55.8	55.8	58.4	-	-
DHV	944	971	969	977	1,020	832	917	933	1,018	988
DDHV	944	971	969	977	1,020	832	917	933	1,018	988
Truck AADT	513	369	370	373	380	309	341	492	374	-
Truck %	4%	3%	3%	3%	3%	3%	3%	4%	3%	-

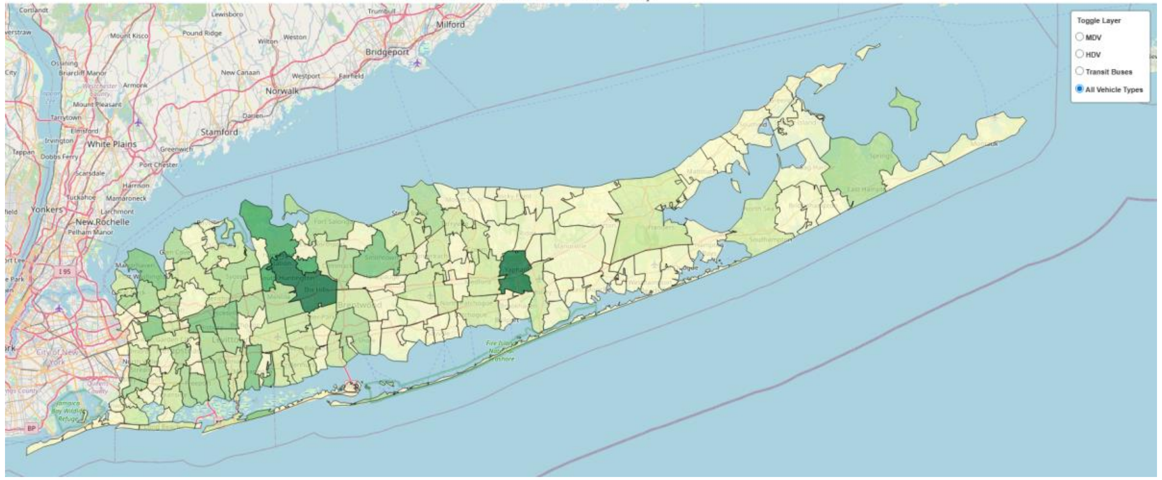
Count History

Year	Month	Count type	Weekend Duration	Workweek Duration	Duration
2025	February	Class	0 hours	93 hours	94 hours
2022	July	Class	14 hours	76 hours	96 hours
2019	May	Volume	0 hours	90 hours	90 hours
2016	April	Class	0 hours	71 hours	71 hours
2010	May	Volume	48 hours	105 hours	171 hours

Current Charging Station and Fleet Presence

- Alternative fuels data center (AFDC):
  - ➢ Current location of DCFC and L2 charging stations
- DMV Registration Data
  - ➢ Number of registered medium and heavy-duty vehicles, school and transit buses by zip code in territory

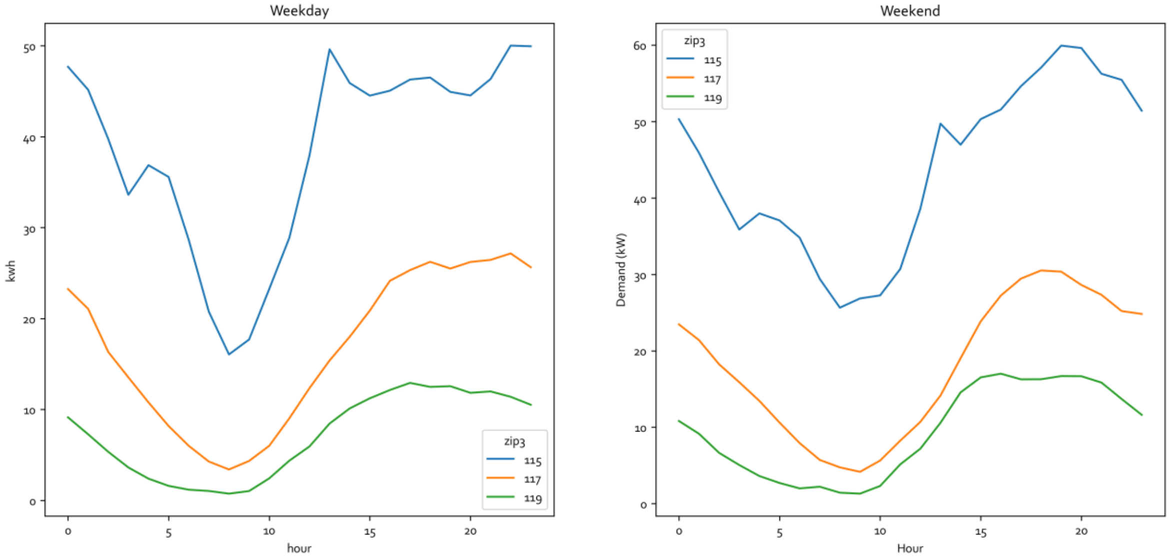
MHDV Penetration in the PSEG-LI Territory



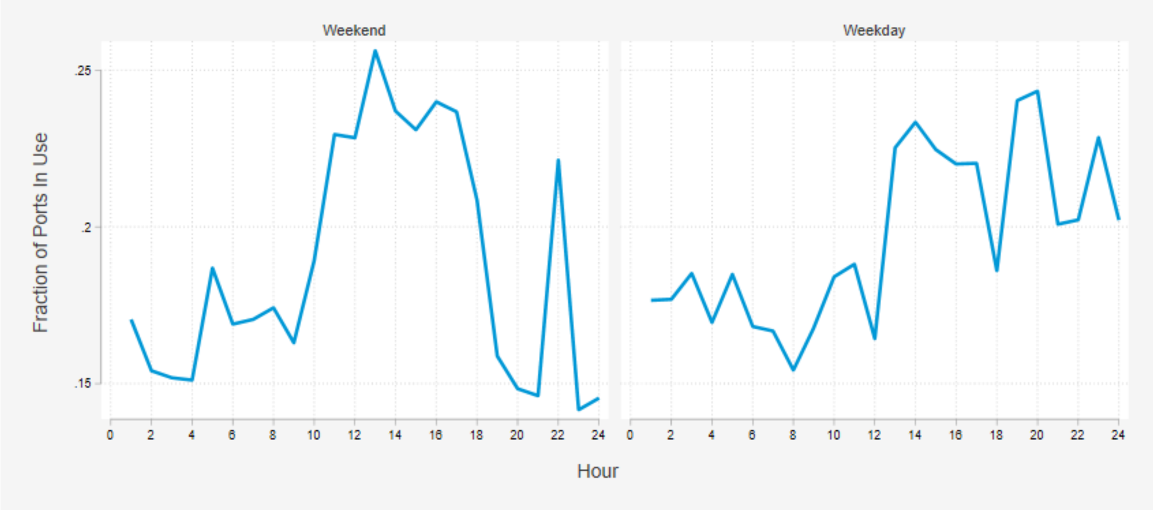
OTHER USEFUL DATA SOURCES

- Charging session data:
  - Telemetry data from charging stations
  - Google Places API can be used to ping availability of chargers at hourly intervals
- Survey data from businesses with MHDV fleets:
  - Fueling and dwelling times
  - Fueling patterns (i.e., depot vs. public charging)
  - % of fleet that will be electrified by 2030, 2035, 2045
  - Whether the company has an electrification target
  - Likelihood of developing an electrification target before 2030

Utilization – DCFC Session Data



Utilization – Google Places API



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CHARGING STATION PROPENSITY DEVELOPMENT

PREDICTING BOTH FUTURE LOCATIONS AND AVERAGE DEMAND IS KEY FOR DEVELOPING A CHARGING GRANULAR FORECAST

Charging Station Locations

- All chargers tied to a commercial property
- Certain commercial locations more likely to have a station built than others
- Probit model used to produce probabilities of a commercial property hosting a certain type of station (i.e., DCFC/L2)

Magnitude of Charging Demand

- Reflects the reality that certain stations may have more charging than others
- Linear model used to produce estimates of average hourly demand at each commercial site

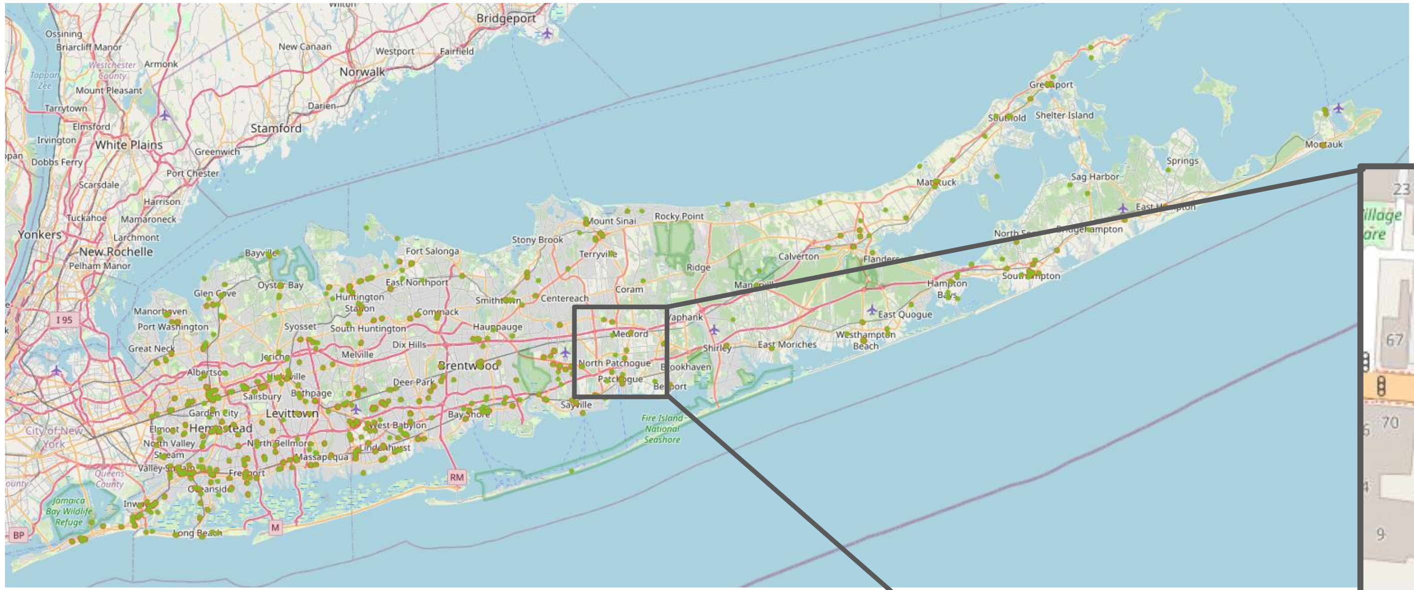
Important Features Explored:

(1) Traffic volume

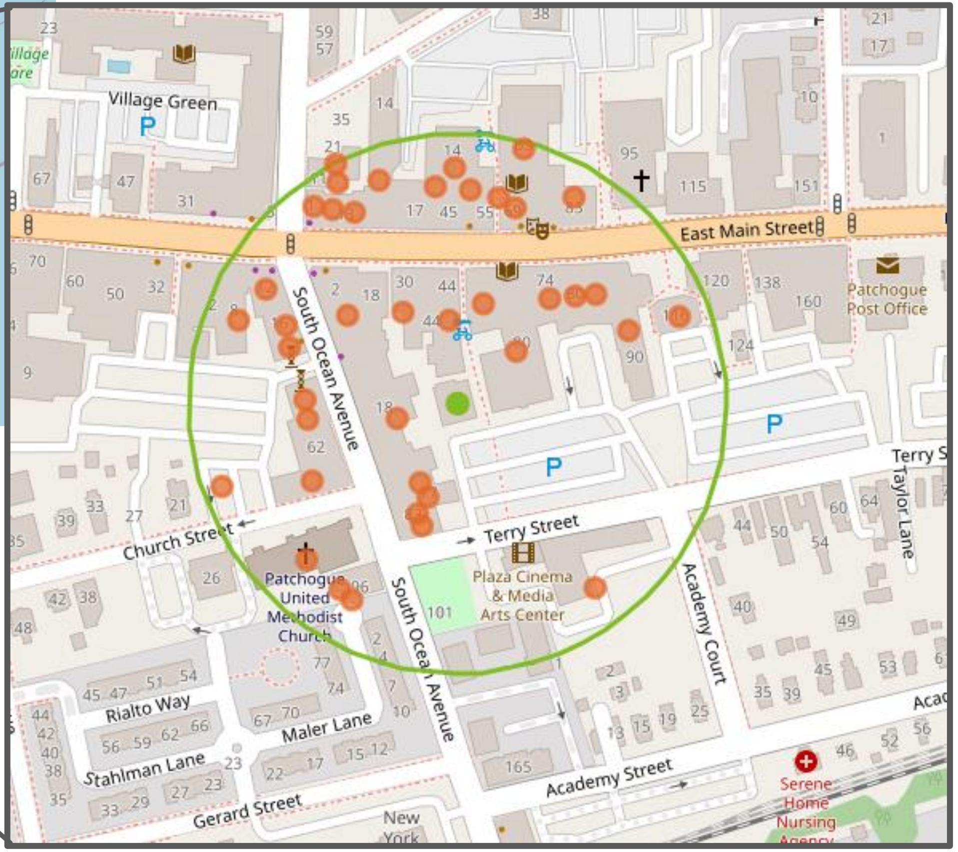
(2) Property characteristics (property type, market value, lot size)

(3) Surrounding business counts (i.e., dealerships, retail, restaurants)

BOTH MODAL PROPERTY TYPE AND COUNTS OF VARIOUS BUSINESS TYPES WITHIN 1 KM WERE IMPORTANT FEATURES



Orange dots represent the commercial properties within 1 km of the green dot



Important property types included:

1. Gas stations
2. Restaurants
3. Retail
4. Parking lots
5. Theaters
6. Dealerships

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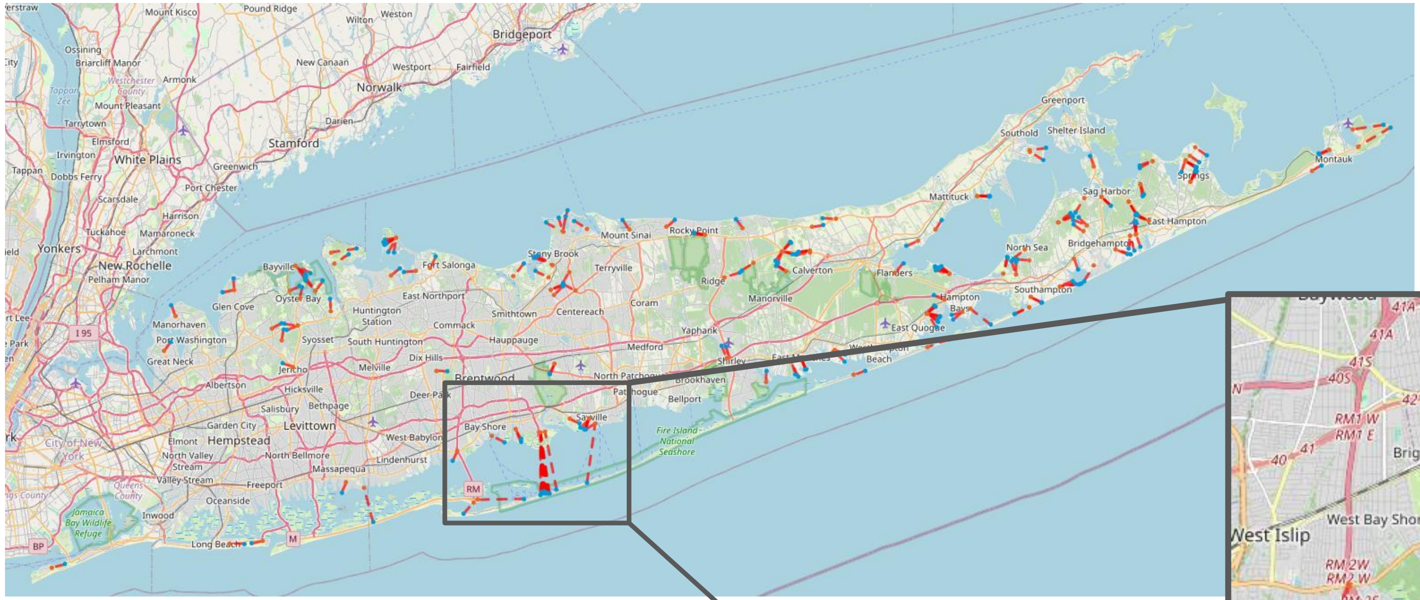
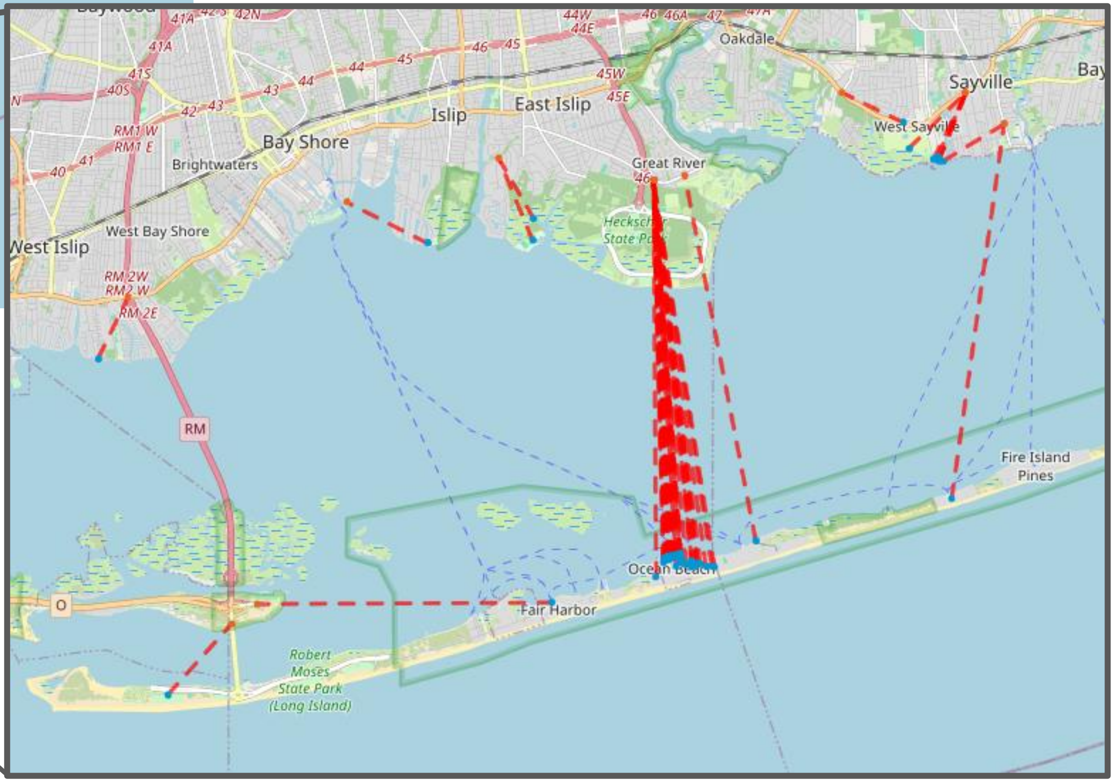
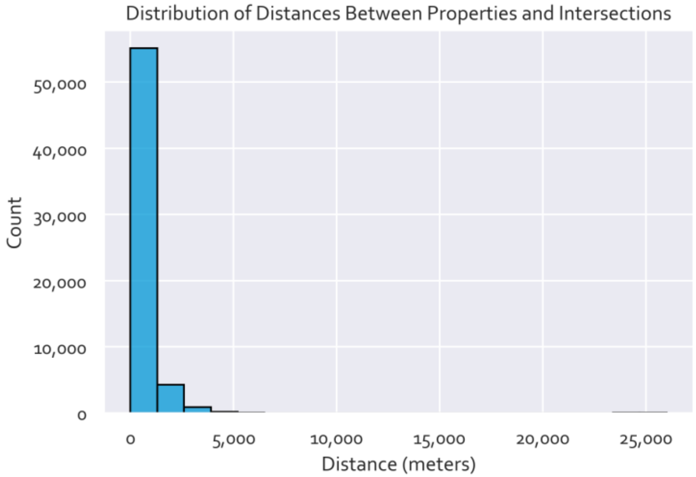
PROPERTIES MATCHED TO NEAREST MAJOR INTERSECTION TO ESTIMATE AVERAGE TRAFFIC VOLUME



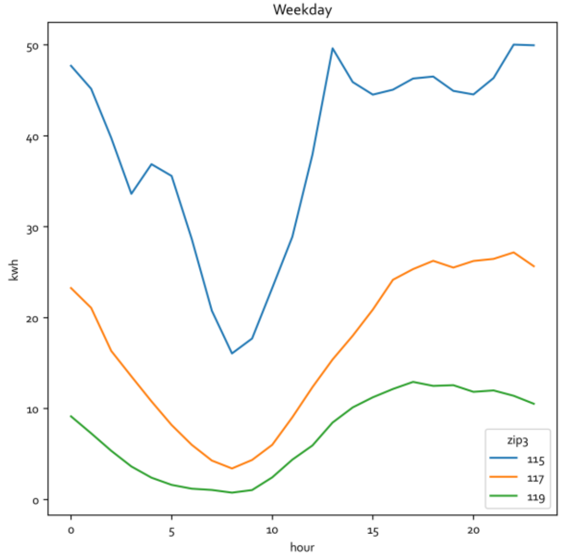
- Properties matched to the intersection within NYSDOT traffic geospatial data
- Most properties with the farthest distance to a major intersection are on outskirts of PSEG territory

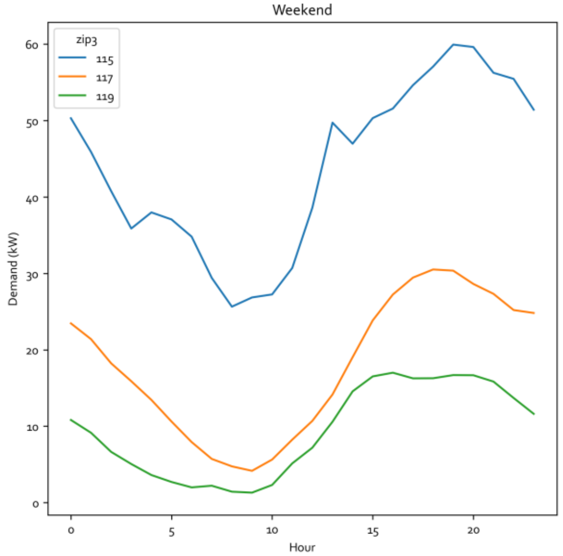




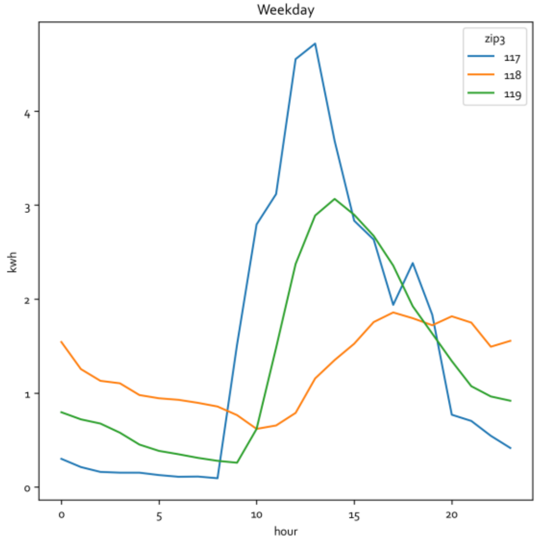
AVERAGE HOURLY DEMAND ESTIMATED FROM SESSION DATA

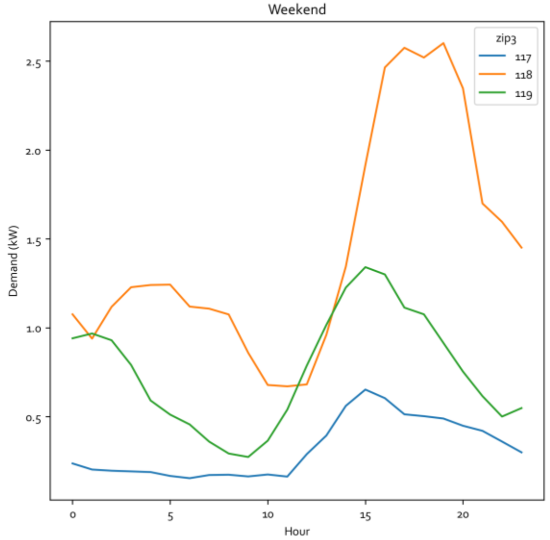
DCFC





L2





115 – Nassau County
118/117 – Central Long Island
119 – Eastern Long Island

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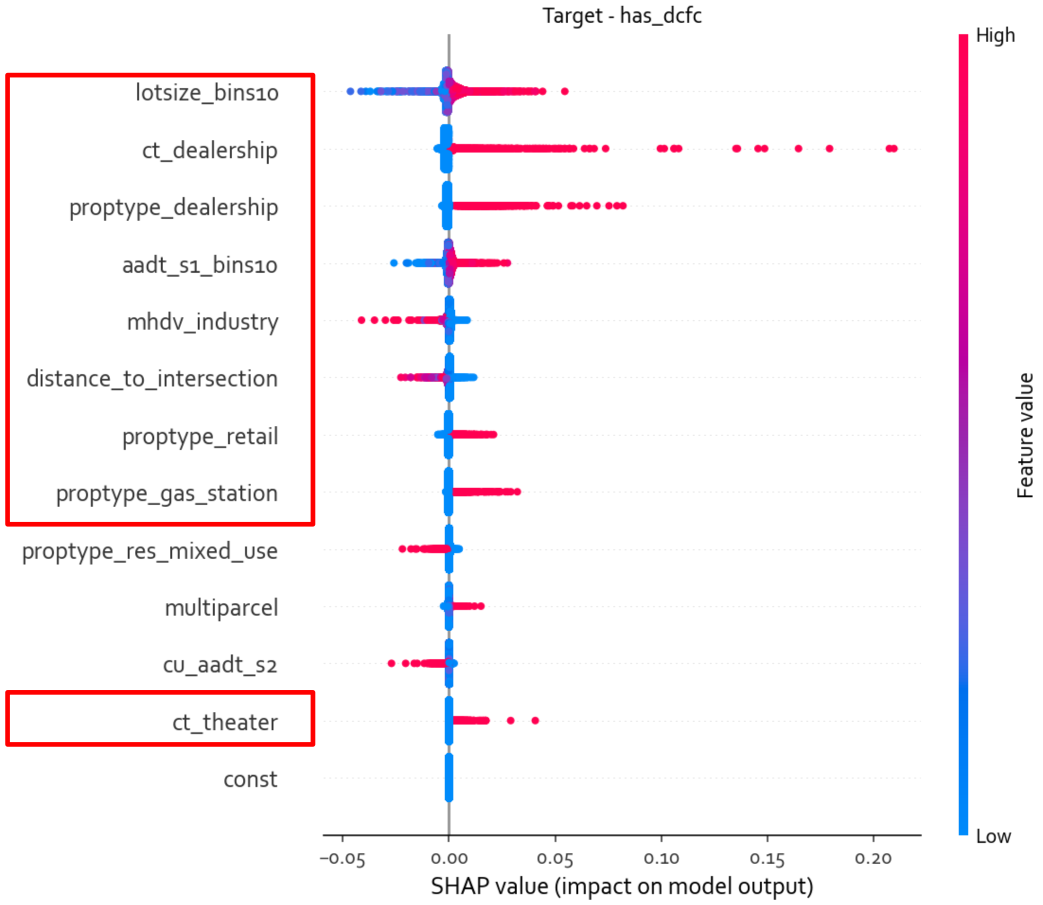
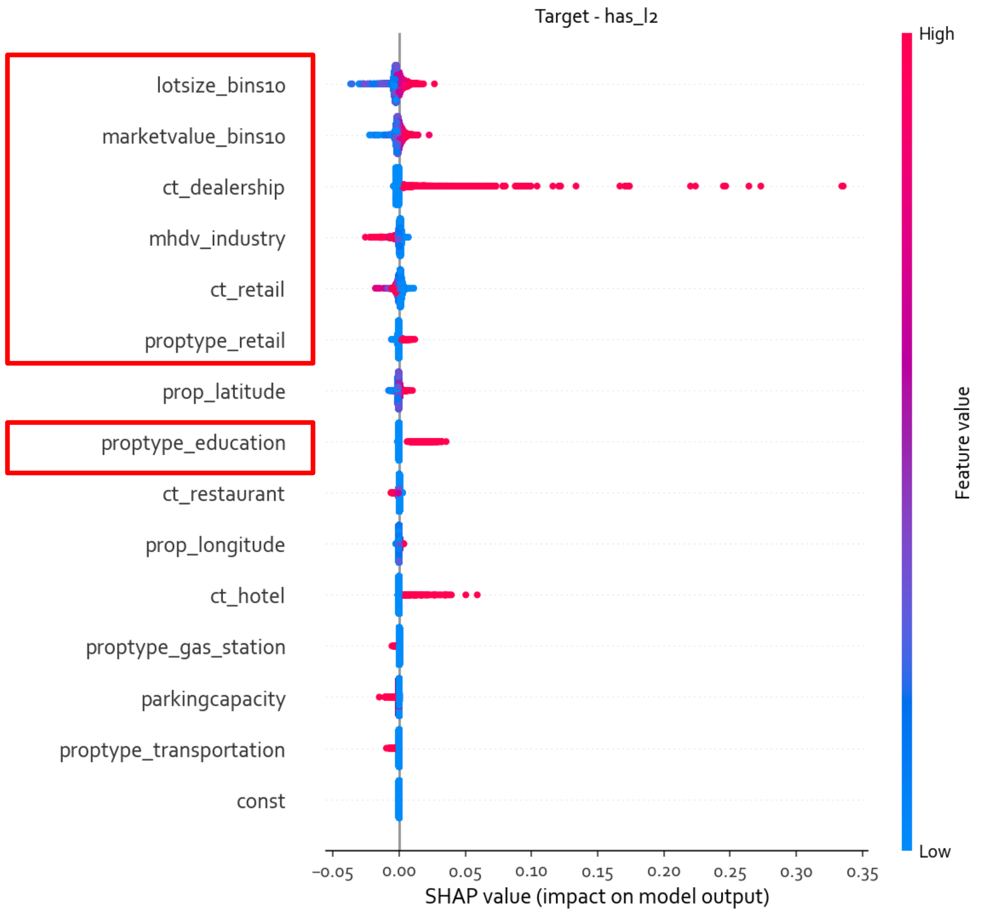
DIFFERENT SETS OF FEATURES WERE IMPORTANT FOR PREDICTING DCFC VS L2 STATION PRESENCE

DCFC



L2



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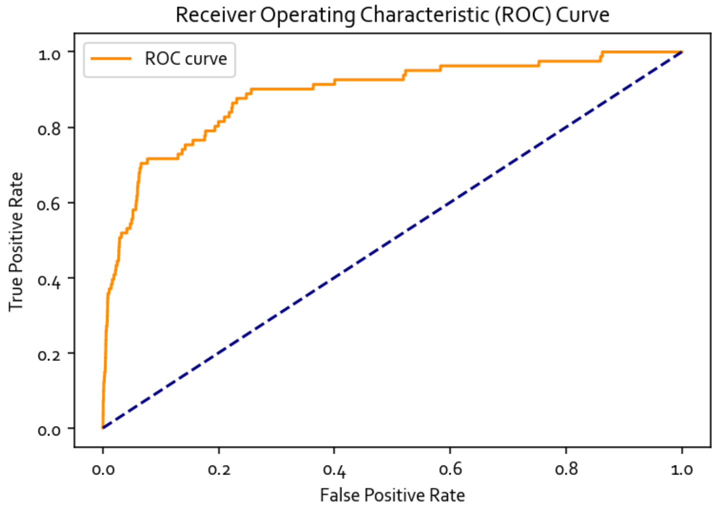
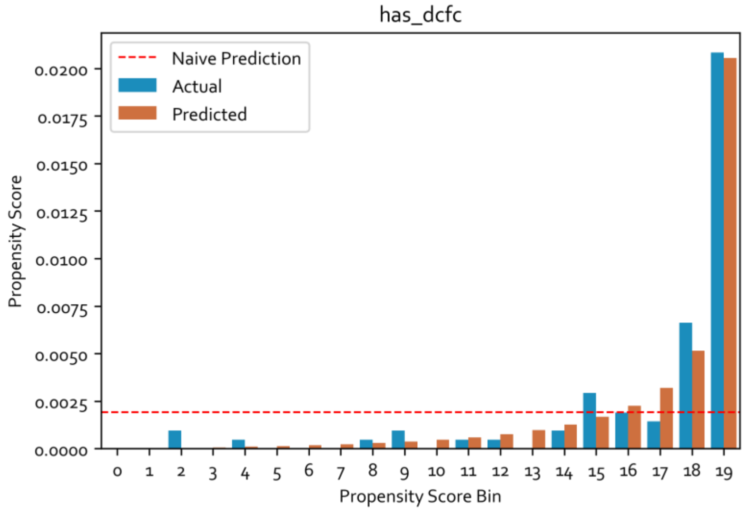
Variables boxed in red indicate significant features

MODEL PERFORMANCE FOR PREDICTING DCFC AND L2 STATION PRESENCE

DCFC

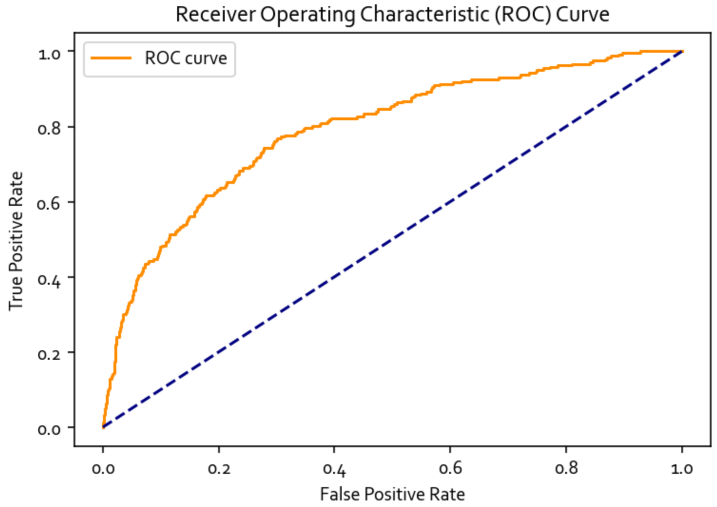
AUC: 0.91

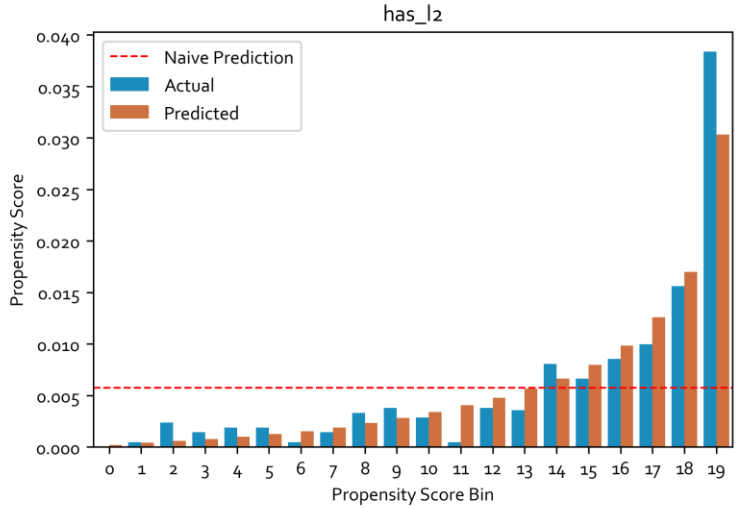




L2

AUC: 0.81





We use the area under the curve (AUC) score to evaluate model performance.

AUC score is the area under the ROC curve. The closer the AUC score is to 1, the better the model.

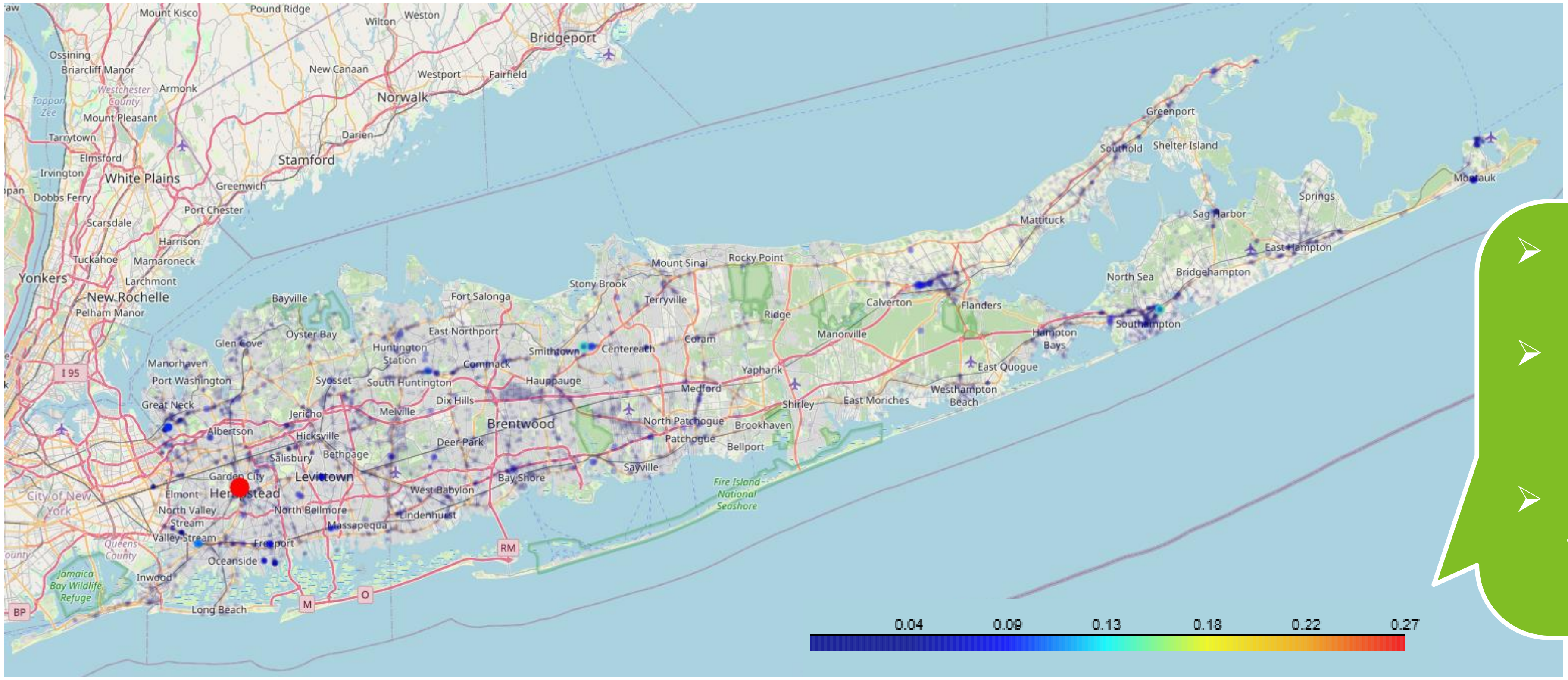
In our analysis, the DCFC model performed better than the L2 model.

PROPENSITY SCORES FOR DCFC STATION LOCATIONS

Opacity and bubble size increase with higher propensity scores

- Highest propensity locations in Hempstead
- A few moderately likely locations for DCFC stations in Levittown, Smithtown, Riverhead
- Distribution of propensities extremely skewed

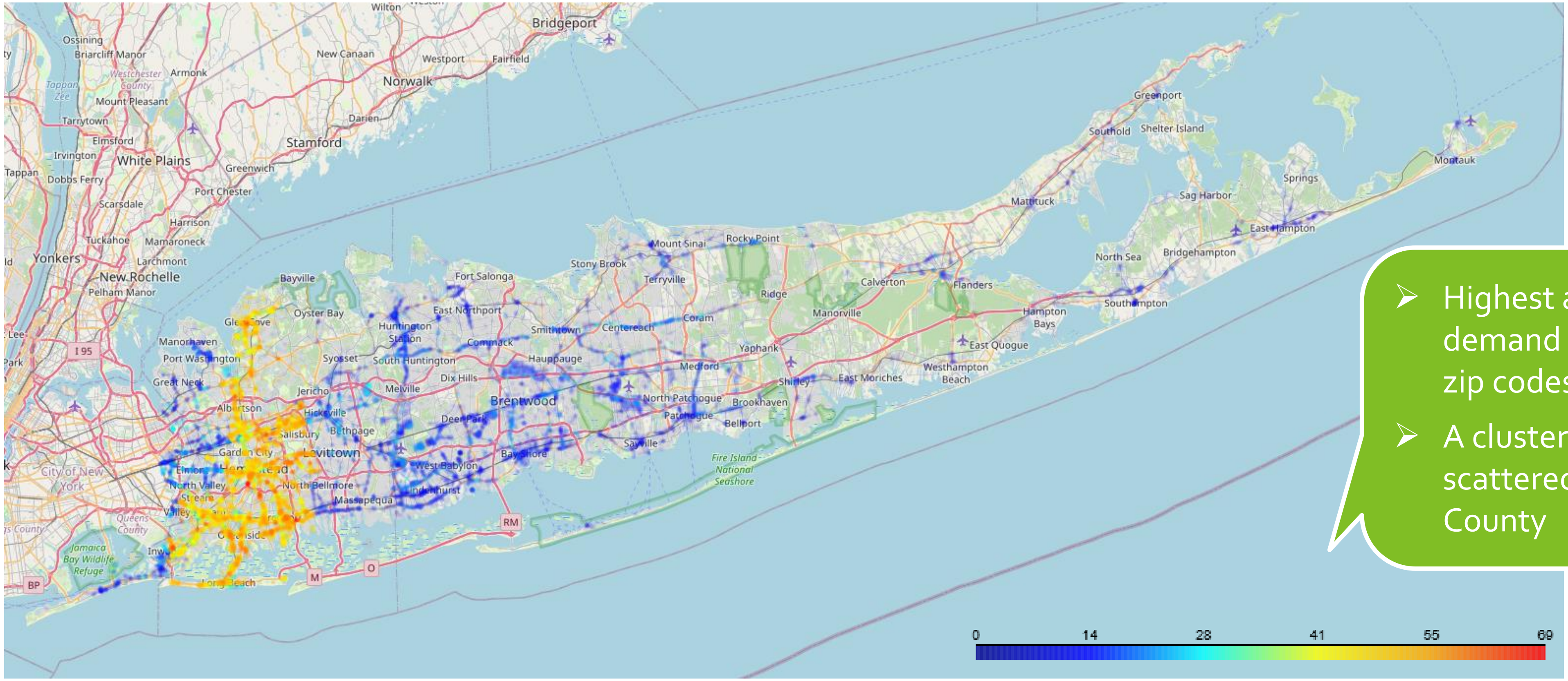
PROPENSITY SCORES FOR L2 STATION LOCATIONS



Opacity and bubble size increase with higher propensity scores

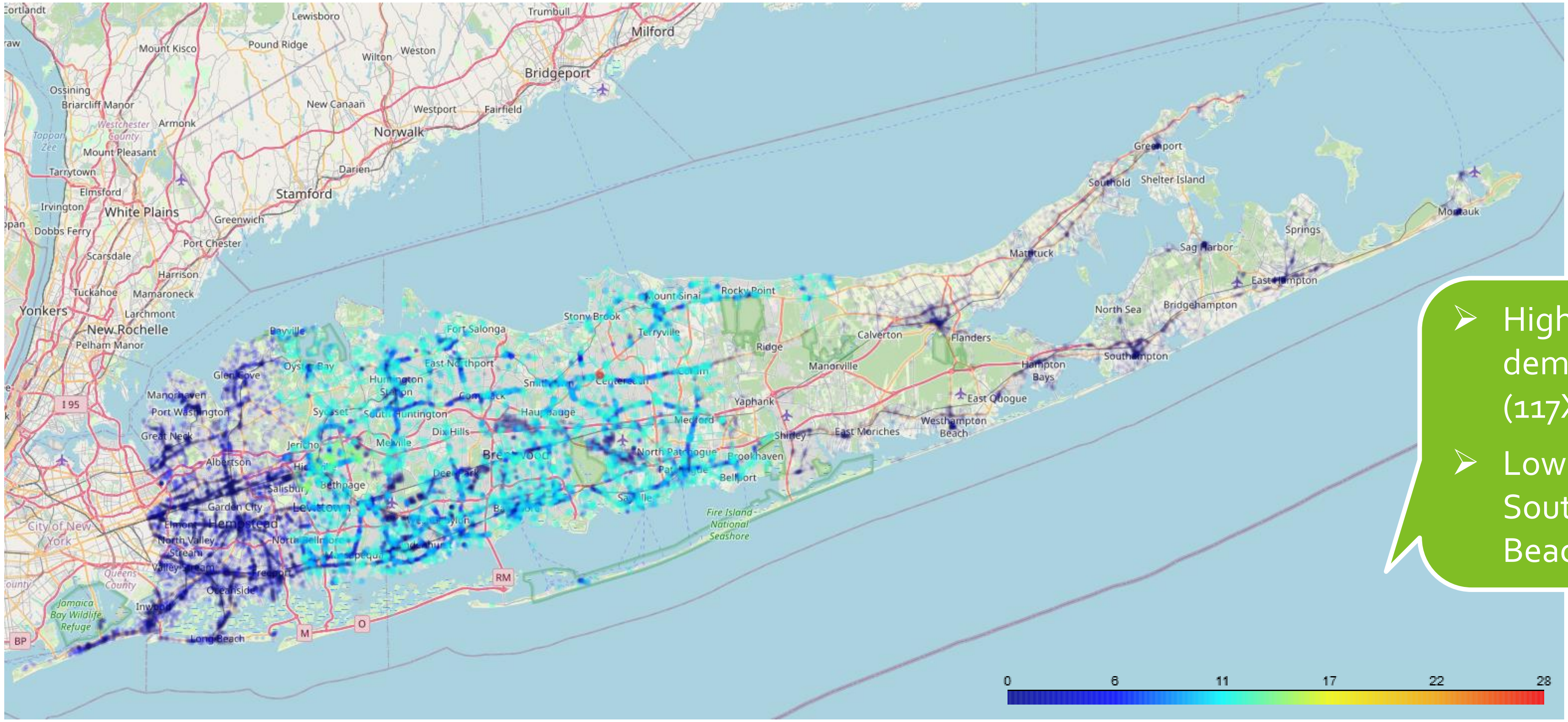
- Highest propensity locations in Hempstead
- A few moderately likely locations for DCFC stations in Smithtown, Southampton
- A lot more locations with low-to-mid propensity scores along highways and in city centers

PREDICTED DCFC HOURLY DEMAND FOR COMMERCIAL LOCATIONS



- ➢ Highest average hourly DCFC demand in Nassau County (115XX zip codes)
- ➢ A clusters spots medium demand scattered throughout Suffolk County

PREDICTED L2 HOURLY DEMAND FOR COMMERCIAL LOCATIONS



- Highest average hourly L2 demand in Suffolk County (117XX,118XX zip codes)
- Low average hourly demand in Southampton, Westhampton Beach, Riverhead

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PREDICTED STATION BUILD AND DEMAND ARE INPUTS FOR CALIBRATION

- Annual consumption estimated from predicted average hourly demand for each location
- Highest propensity locations are assumed to be built first
- Stations are built until the annual consumption across all stations roll up to the total, system-wide forecast

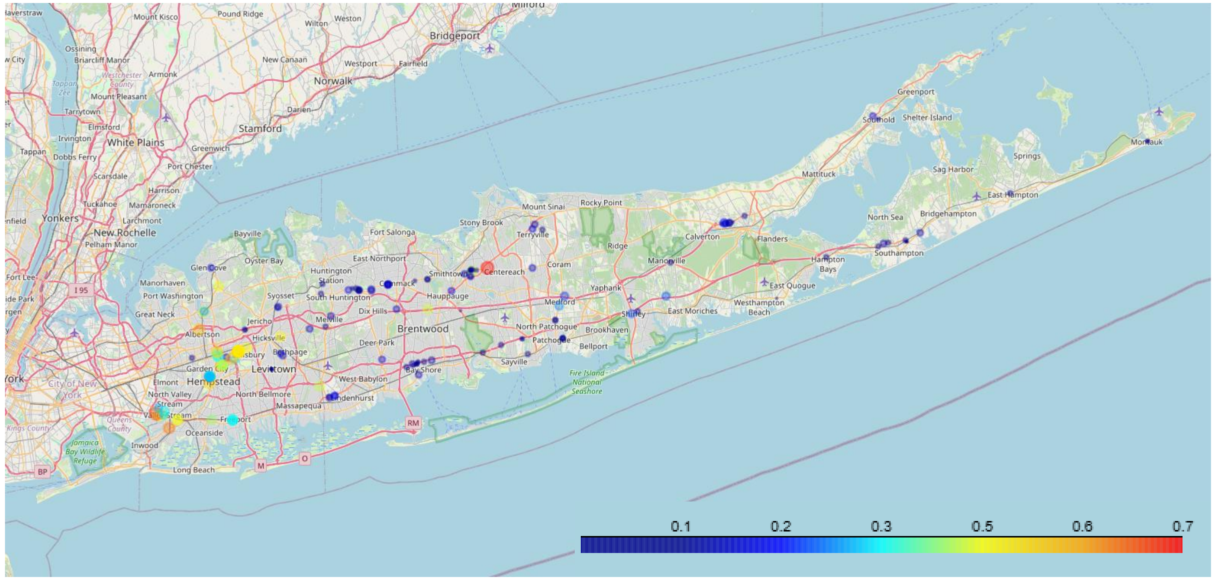
2025 Cumulative Forecast (DCFC)

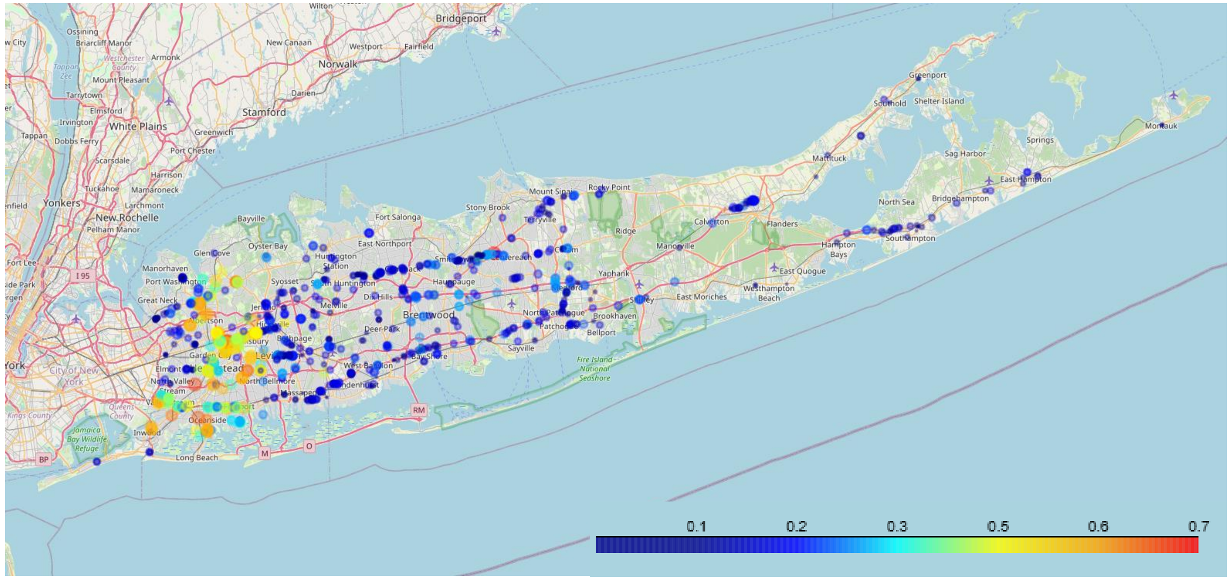
dsa_propertyid	propensity	gwh	cumm_gwh
13149	0.264851	0.154437	0.154437
13091	0.263901	0.179099	0.333536
13287	0.258192	0.254534	0.588071
13138	0.225909	0.102858	0.690929
13022	0.189045	0.176494	0.867424
13109	0.183107	0.144285	1.01171
14899	0.174238	0	1.01171
13143	0.154382	0.223913	1.23562
13188	0.150864	0.166375	1.402
14830	0.149312	0	1.402
17548	0.140786	0.259499	1.6615
12994	0.140268	0.221857	1.88335
12974	0.136197	0.191823	2.07518
13067	0.134462	0.221857	2.29703

Top 14 locations for DCFC stations and the associated total GWh in consumption

DCFC STATION BUILD FORECAST (BASE SCENARIO)

2025	2035



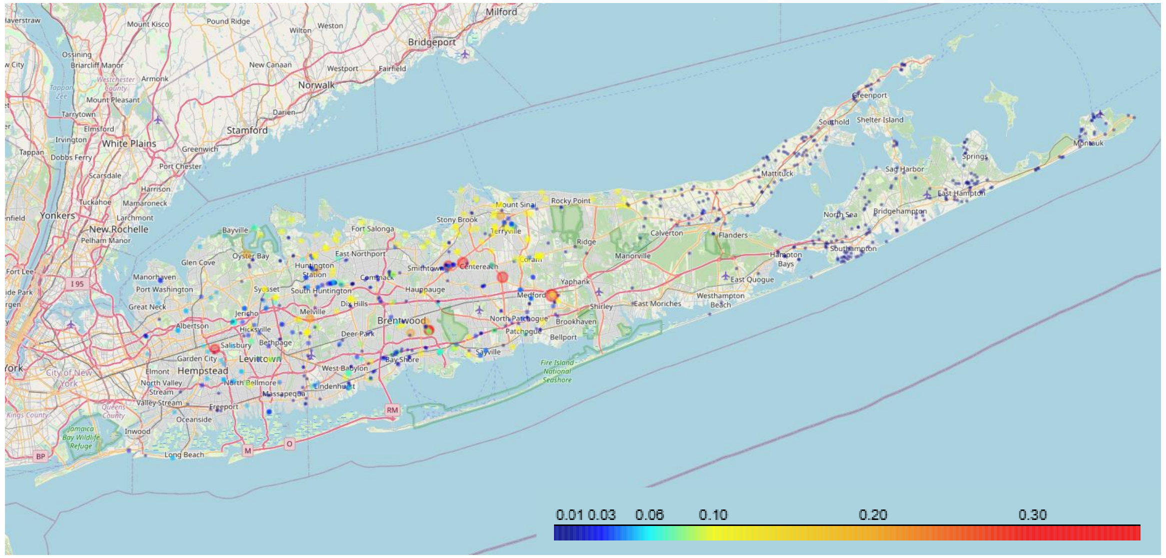


- Stations with highest consumption predicted to be built in Nassau County predominately
- Less utilized stations pop up along major highways

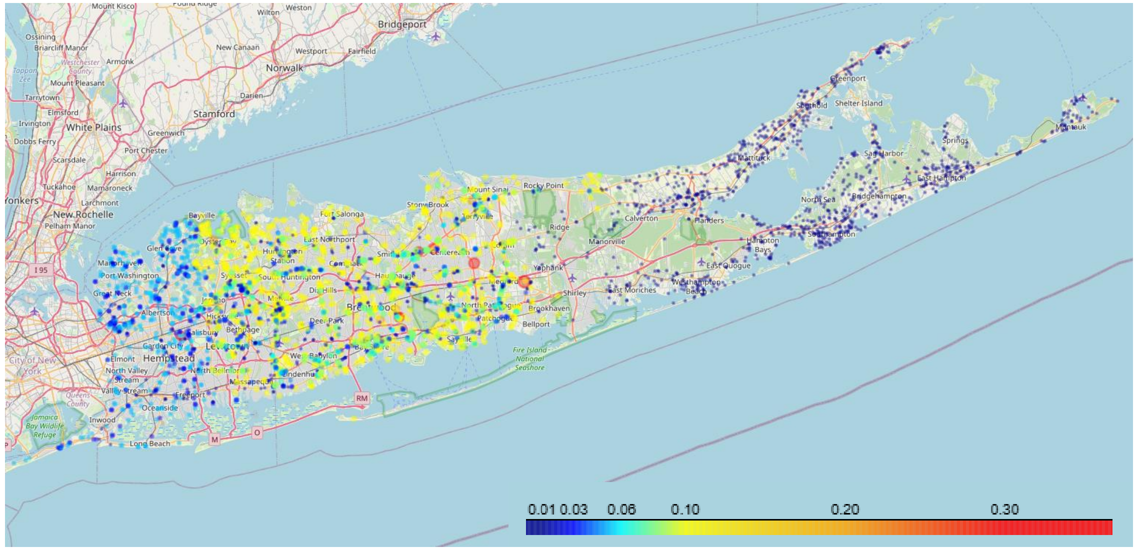
L2 STATION BUILD FORECAST (BASE SCENARIO)

2025	2035

2025



2035



- Stations with highest consumption predicted to be built in Nassau County, and the western portion of Suffolk County
- Cluster of L2 stations show up in Riverhead, Southampton and Westhampton Beach areas, although these stations are predicted to have much less demand

MHDV DEPOTS AND FLEETS PROPENSITY DEVELOPMENT

SEPARATE APPROACHES TAKEN FOR DEVELOPING DEPOT AND REST STOP PROPENSITY SCORES

Depots

- Share of MHDVs registered by zip code
- Commercial parcel lot size
  - Lot sizes used to split up MHDV registrations within one zip code to multiple commercial parcels – larger parcels assigned more MHDVs
- Likelihood of fleet electrification from
  - % of fleet that will be electrified by 2035
  - Likelihood of company developing electrification target before 2030

Rest stops

- Propensity scoring based on single-unit and combination unit traffic flow at nearest intersection to existing rest stops

Vehicle Classification

1. Motorcycles 2 axles, 2 or 3 wheels.	33	0.07%
2. Passenger cars 2 axles. Can have 1- or 2-axle trailers.	34,438	75.78%
3. Pickups, panels, vans 2-axle, 4-tire single units. Can have 1- or 2-axle trailers.	8,365	18.41%
Passenger Vehicles	42,836	94.26%
4. Buses 2- or 3-axle, full length.	719	1.58%
5. Single-unit trucks 2-axle, 6-tire, (dual rear tires), single-unit trucks.	1,536	3.38%
6. Single-unit trucks 3-axle, single-unit trucks.	188	0.41%
7. Single-unit trucks 4 or more axle, single-unit trucks.	8	0.02%
Medium Weight Trucks	2,451	5.39%
8. Single-trailer trucks 3- or 4-axle, single-trailer trucks.	24	0.05%
9. Single-trailer trucks 5-axle, single-trailer trucks.	89	0.2%
10. Single-trailer trucks 6 or more axle, single-trailer trucks.	17	0.04%
11. Multi-trailer trucks 5 or less axle, multi-trailer trucks.	0	0%
12. Multi-trailer trucks 6-axle, multi-trailer trucks.	0	0%
13. Multi-trailer trucks 7 or more axle, multi-trailer trucks.	0	0%
Heavy Weight Trucks	130	0.29%

Single-unit

Combination-unit

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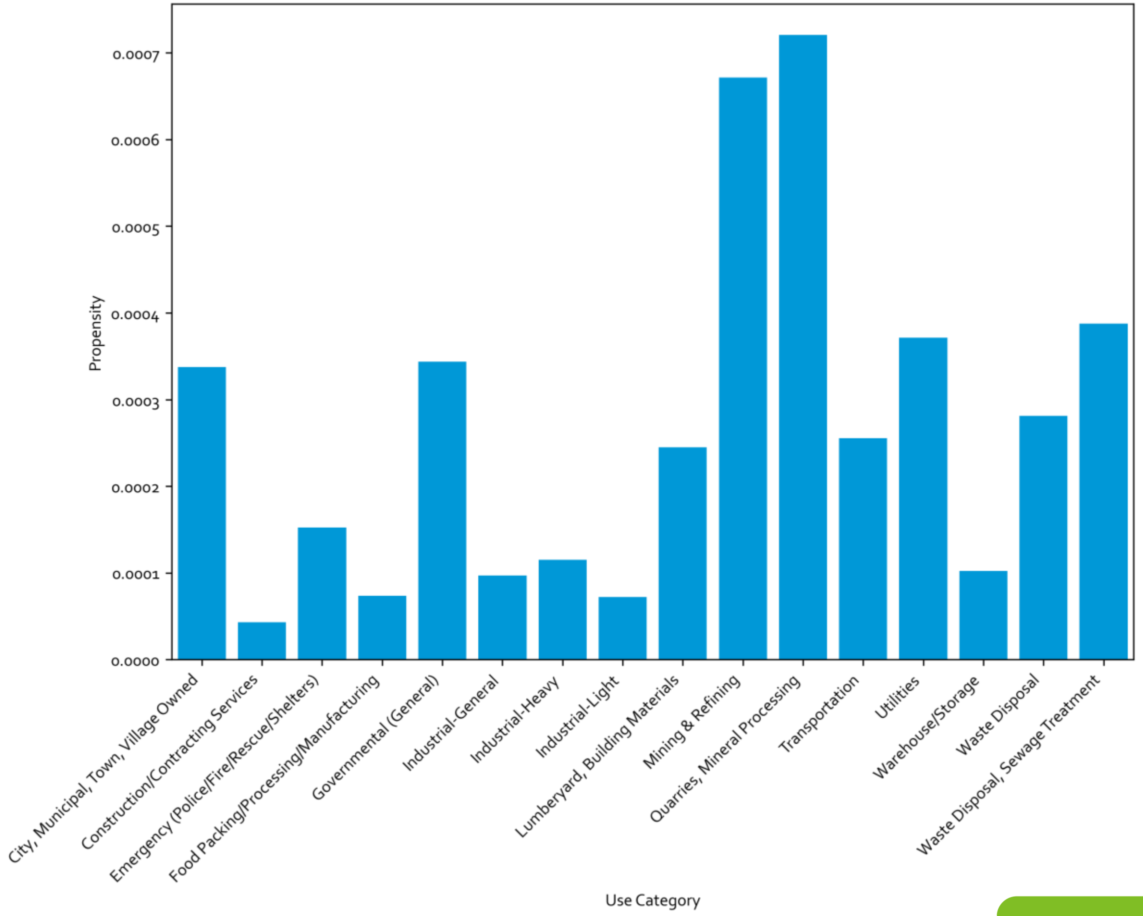
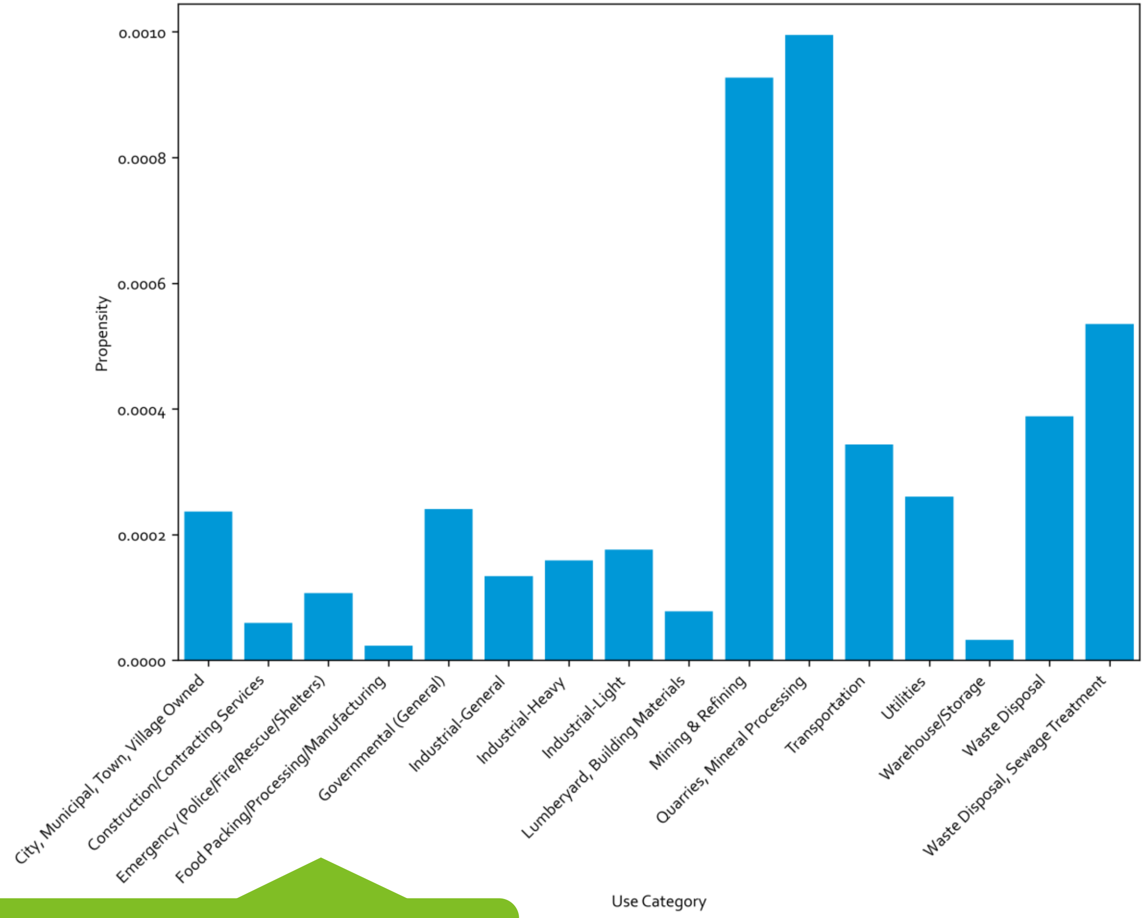
INCORPORATING SURVEY RESULTS LED TO DECREASE IN ALLOCATION FOR MUNICIPAL/GOVERNMENTAL INDUSTRIES

Propensity Based Only Current Fleet Locations	Adjusted Using Survey Results





Government/municipal fleet propensities decrease as a result

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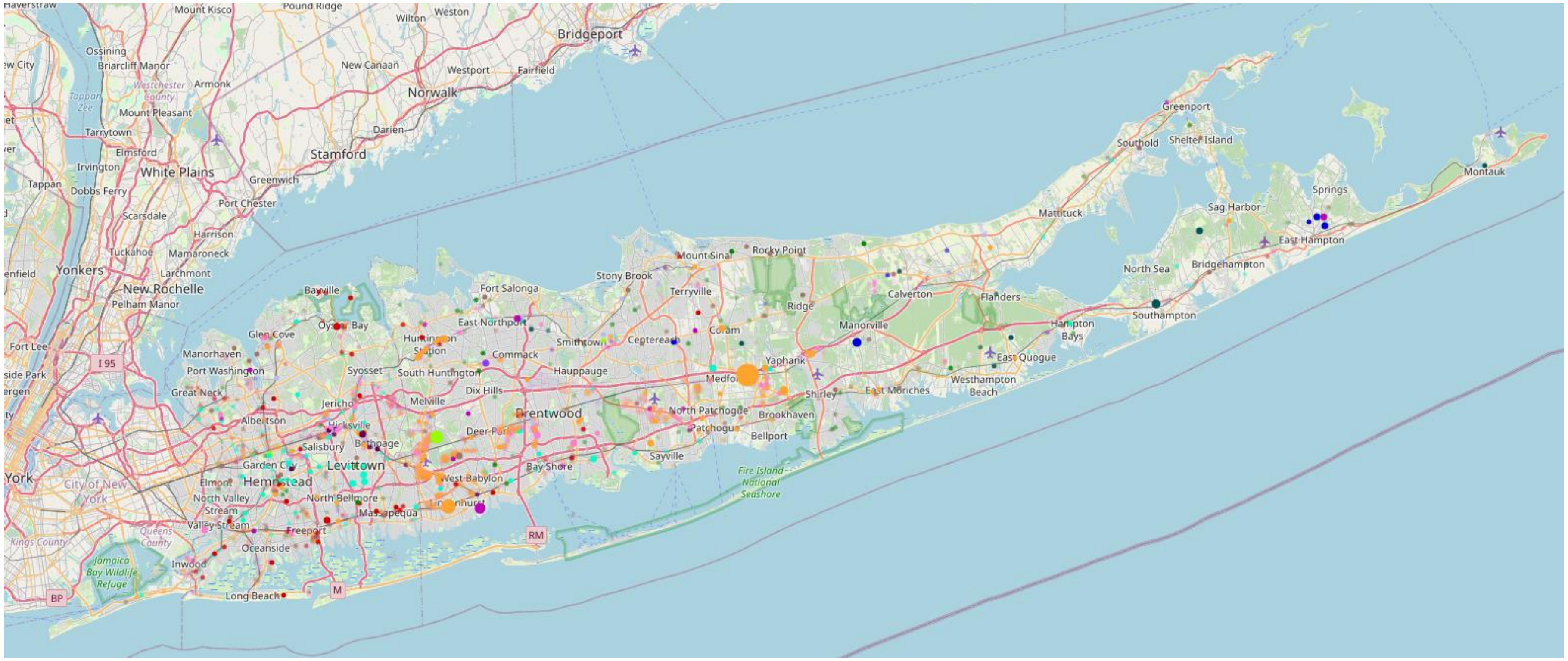
MHDV DEPOT PROPENSITIES SCORES



- City, Municipal, Town, Village Owned
- Construction/Contracting Services
- Emergency (Police/Fire/Rescue/Shelters)
- Food Packing/Processing/Manufacturing
- Governmental (General)
- Industrial-General
- Industrial-Heavy
- Industrial-Light
- Lumberyard, Building Materials
- Mining & Refining
- Quarries, Mineral Processing
- Transportation
- Utilities
- Warehouse/Storage
- Waste Disposal
- Waste Disposal, Sewage Treatment

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REST STOP PROPENSITY SCORES

- Propensities allocated among 14 existing rest stops in Long Island territory
- Allocation performed according to amount of CU/SU truck traffic at the nearest intersection of rest stop

KEY TAKEAWAYS

KEY TAKEAWAYS

- Building use (e.g., gas station, restaurant, retail) and traffic volume data are important characteristics for predicting station presence
- Charging session data is still lacking. It is difficult to parse out the relationship between commercial parcel characteristics (i.e., traffic flow, property type) and utilization with so few data points
- Need to adjust approach based on what is available and leverage public data
  - For Central Hudson, there was not much session data available. We pivoted to pinging Google Places API for determining hourly utilization
  - For PSEG-LI, we were able to leverage survey data to adjust propensities to reflect the reality that not all MHDV fleets will electrify

QUESTIONS?

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