Environmental Leadership Program

HONDA

Greenhouse Gas Intensity (GHGi) Benchmark Methodology

1.0 Overview and Objective

The objective of this benchmark is to create a fair and statistically robust system for evaluating the energy performance of dealership facilities in the context of AHM's decarbonization goals. This methodology moves beyond simple energy use intensity (EUI) thresholds by developing a predictive model that normalizes for key operational, climatic, and regional factors that are outside of a facility manager's direct control.

The output is a Predicted GHGi for each facility, which represents expected performance based on its specific operating characteristics. By comparing this prediction to the facility's Actual GHGi, we can generate a fair and equitable Environmental Leadership Program (ELP) Score to identify top performers and guide efficiency efforts. The predictive model and scoring methodology are designed to align closely with the principles established by ENERGY STAR Portfolio Manager's (ESPM) ENERGY STAR Score to ensure industry relevance and credibility.[1]

2.0 Data and Dealership Inclusion Criteria

A complete and accurate dataset is the foundation of a credible benchmark. The following sections detail the data required and the specific criteria for a dealership to be included in the analysis.

2.1 Required Data

DATA POINT	PERFORMANCE PERIOD	PURPOSE
Facility Address	The address of the facility in question	Used to determine the eGrid subregion for the emission factor and to derive regional climate data (HDD/CDD).
Electricity Use Data	At least one (1) year of electricity use data in kWh	A primary input for calculating a facility's Actual GHGi.
Natural Gas Use Data	At least one (1) year of natural gas use data (if applicable) in therms	A primary input for calculating a facility's Actual GHGi.
Gross Floor Area (GFA)	The total gross floor area of the facility in square footage	A key factor for calculating Actual GHGi and density metrics.
Vehicle Inventory	The average number of vehicles in inventory at the facility	A key business intensity metric for Honda and Acura automotive dealerships.
# of Main Shift Employees	The number of workers on main shift at the facility	A key business intensity metric for all brands.
% Heated Area	The percent of the facility gross floor area that is heated	Provides a more precise climate adjustment.
% Cooled Area	The percent of the facility gross floor area that is cooled	Provides a more precise climate adjustment.

[1] Please refer to the ENERGY STAR Score for Vehicle Dealerships in the United States: https://www.energystar.gov/buildings/tools-and-resources/technical-reference-energy-star-score-us-vehicle-dealerships

2.2 Dealership Inclusion Criteria

The criteria for including a dealership differ between the initial benchmark development and the ongoing evaluation for scoring and awards.

- **For Benchmark Development:**
  - Must be one (1) of the following brands:
    - Honda
    - Acura
    - Powerhouse
    - Powersport
    - PE Consumer
    - PE Engine
    - PE Marine
  - Must be enrolled in the Green Dealer program.
  - Must have at least one (1) full calendar year of complete electricity and natural gas (if applicable) use data.
  - ESPM-estimated (default) values for the following variables are permissible to ensure a sufficiently large and representative dataset.
    - Vehicle Inventory
    - # of Main Shift Employees
    - Percent Building Area Heated
    - Percent Building Area Cooled
- **For Dealership Evaluation (Scoring & Award Eligibility):**
  - Must be one (1) of the following brands:
    - Honda
    - Acura
    - Powerhouse
    - Powersport
    - PE Consumer
    - PE Engine
    - PE Marine
  - Must be enrolled in the Green Dealer program.
  - Must have at least one (1) full calendar year of complete electricity and natural gas (if applicable) use data.
  - Must have an Energy Current Date of 12/31/2025 or later
  - ESPM-estimated (default) values are NOT acceptable
  - Dealers must provide actual, validated data for all variables to be eligible to receive an ELP Score and be considered for an award.

3.0 Model Structure

The benchmark is a Weighted Ordinary Least Squares (WLS) Regression Model. The model predicts the natural log of GHGi (ln(GHGi)) based on the predictor variables listed below.

Model Equation:

$$ln(GHGI) = \beta0 + \beta1(eGrid) + \beta2(HDD \times \%H) + \beta3(CDD \times \%C) + \beta4(Veh.Inv.) +$$
$$\beta5(Employees) + \beta6(MC) + \beta7(PE) + \varepsilon$$

4.0 Predictor Variables Used in Model

To create a fair benchmark, our model isolates a facility's operational efficiency from external factors such as location, business model, or activity level. The following predictors are included to normalize for these external differences.

4.1 Regional Generation Emission Factors

The GHGi of electricity from grid-supplied sources is not uniform across the country. A dealership in a region powered by renewable energy sources like solar and/or hydropower will have a lower greenhouse gas (GHG) footprint than an identical one in a region powered by coal, even if they use the same amount of energy.

- **eGrid Emission Factor:** This variable accounts for the GHGi of the local electricity grid. The factor represents the rate of carbon dioxide equivalent (CO2e) emissions produced per unit of electricity generated in a specific geographic subregion. This ensures facilities on "dirtier" grids are not unfairly penalized. The emission factor is determined for each record based on the facility address using the Emissions & Generation Resource Integrated Database (eGrid).[2]

4.2 Climate Variance

Climate is a primary driver of a building's energy consumption due to its direct impact on heating and cooling demand. It would be unfair to compare the energy use of a dealership in a hot, southern climate with one in a cold, northern climate without adjusting for climate-driven heating and cooling needs.

- **Heating Degree Days (HDD):** This metric quantifies the equivalent number of days a building owner would have to heat their building by 1 degree to accommodate the heating requirement. For example, if you have a day on which the temperature is 55°F degrees, that day is worth 10 Heating Degree Days because it is 10 degrees below 65°F. HDD is calculated in this way for each day of the year and summed up to get the total annual HDD.
- **Cooling Degree Days (CDD):** This metric quantifies the equivalent number of days a building owner would have to cool their building by 1 degree to accommodate the cooling requirement. For example, if you have a day on which the temperature is 80°F degrees, that day is worth 15 Cooling Degree Days because it is 15 degrees above 65°F. CDD is calculated in this way for each day of the year and summed up to get the total annual CDD.[3]
- **Climate Variables Used in Model:** The model uses HDD x % Heated and CDD x % Cooled. By interacting the base climate data with the percentage of the facility that is actively conditioned, we create a more precise predictor that accurately reflects a building's true heating and cooling load.

4.3 Business Intensity

A busy dealership with a high volume of Sales and Service operations will naturally use more energy than a slower one. The benchmark must account for this difference in business activity to fairly assess efficiency. To compare facilities of different sizes, the model uses density metrics.

- **Vehicle Inventory Density:** This is the average number of vehicles on the lot divided by the dealership's gross floor area (in thousands of square feet). The model uses Vehicle Inventory Density x Auto Indicator as a proxy for sales activity and showroom size at Auto dealerships.
- **Employee Density:** This is the number of main shift employees divided by the dealership's gross floor area (in thousands of square feet). The model uses Employee Density as a proxy for operational intensity (e.g., plug loads, office equipment use) across all brands.

4.4 Brand

Different brands have fundamentally different business models and facilities (e.g., traditional automotive dealership vs. engine distributor warehouse) that result in different baseline energy profiles.

- **Brand Indicator Variables (PE Indicator, MC Indicator):** These variables account for the significant differences in average GHGi between the brand types, establishing a fair and accurate baseline for each.

[2] https://www.epa.gov/egrid/summary-data
[3] https://portfoliomanager.energystar.gov/pm/glossary

5.0 Modeling Techniques

» **Log Transformation (ln(GHGI)):** We predict the natural log of GHGi to prevent the model from predicting illogical negative GHGi values and to help normalize the variable's distribution.

» **Weighted Least Squares (WLS):** To ensure our sample is representative of the entire dealership population, we apply a weighting system based on consolidated eGrid subregions. Subregions were consolidated based on geography to prevent small sample sizes from having an outsized influence.

NEW CONSOLIDATED REGION	EGRID SUBREGIONS TO COMBINE	RATIONALE
SERC (Southeast)	SRMV, SRMW, SRSO, SRTV, SRVC, FRCC	Combines all subregions of the SERC Reliability Corporation, a major region in the Southeast. FRCC is also geographically and functionally part of this area.
RFC (Mid-Atlantic/Midwest)	RFCE, RFCM, RFCW	Combines all subregions of the ReliabilityFirst Corporation, covering the Ohio Valley and Mid-Atlantic.
NPCC (Northeast)	NEWE, NYCW, NYLI, NYUP	Combines all subregions related to New England and New York.
WECC (West)	CAMX, AZNM, NWPP, RMPA	Consolidates the large and diverse Western Electricity Coordinating Council, including California, the Southwest, the Northwest, and parts of the Rockies.
SPP (Southwest Power Pool)	SPNO, SPSO	Combines the subregions of the Southwest Power Pool, covering the central plains.
MRO (Midwest)	MROE, MROW	Combines the subregions of the Midwest Reliability Organization.
ERCOT (Texas)	ERCT	The Electric Reliability Council of Texas operates as its own distinct region and should remain separate.
AK (Alaska)	AKGD, AKMS	Combines the two Alaska-based subregions into a single group.
HI (Hawaii)	HIMS, HIOA	Combines the two Hawaii-based subregions into a single group.

6.0 Exclusions and Programmatic Alignment

Certain variables were intentionally excluded to align with the programmatic goals of encouraging specific sustainable actions and to maintain a focus on core operational efficiency.

» **On-site Renewable Capacity (Solar/Battery):** This benchmark is intended to promote the decarbonization of dealership facilities. If onsite renewable energy capacity is included as a predictor for GHGi, the model would learn to expect lower GHGi values from facilities with solar and/or batteries, thus reducing their ELP Scores. Therefore, we do not include onsite renewable energy capacity as a factor to avoid penalizing dealerships for generating and using renewable energy.

» **Facility Electrification ("Electric Only"):** The long-term benefit of electrification is its ability to power a building with 100% clean, renewable electricity. However, in the short term, many regional electricity grids have a higher GHGi than the direct combustion of natural gas. Forcing or rewarding electrification in these regions could temporarily increase a facility's GHG footprint. Therefore, we do not include an "electric-only" factor to ensure we don't prescribe a specific technology, and instead reward the ultimate outcome of a lower GHG footprint, however it is achieved.

» **EV Charging Capacity:** This is excluded to align with ENERGY STAR's methodology. Excluding EV charging capacity avoids penalizing dealers who are investing more in EV infrastructure and keeps the focus on the efficiency of the core facility operations.

7.0 Scoring and Award Tiers

The scoring system translates the model's output into an actionable performance metric.

» **Efficiency Ratio Calculation:** The regression equation yields a prediction of GHGi based on a facility's operating characteristics. Some facilities in the data sample have a higher GHG footprint than predicted, while others have a lower one. The Actual GHGi of each facility is divided by its Predicted GHGi to calculate a GHG Efficiency Ratio.

$$\textit{GHG Efficiency Ratio} = \frac{\textit{Actual GHGi}}{\textit{Predicted GHGi}}$$

» **ELP Score Assignment (1-100):** A scoring curve is e stablished based on the percentile distribution of the GHG Efficiency Ratios from the benchmark population. A dealership's ratio is compared to this curve to assign a score from 1 to 100. For example, a dealership whose ratio is at the 5th percentile (meaning 95% of dealerships have a higher, less efficient ratio) would receive an ELP Score of 95. A complete score lookup table will be included in this documentation once requisite data has been acquired.

» **Award Tiers:** This 1-100 score allows for the creation of tiered awards. As an example, if the goal is to award the top 5% of performers, a threshold can be set for any dealership achieving an ELP Score of 95 or greater.

8.0 Limitations

» **Sampling Bias:** The model is built exclusively on data from dealerships enrolled in the Green Dealer program. This population may be more predisposed to energy efficiency than the general dealership population. Therefore, the results and scoring thresholds are representative of this specific cohort.