ENERGY STAR® Portfolio Manager® Technical Reference

Analysis and Key Findings from EPA's Review of the ENERGY STAR Model for Supermarket Properties

On August 26, 2018, EPA updated the ENERGY STAR score models and related performance metrics for buildings in ENERGY STAR Portfolio Manager® based on the most recent market data available. The data shows that energy use and business practices in U.S. commercial buildings have changed since EPA last updated the ENERGY STAR score models. These changes require that EPA update the score models so that they are as reflective as possible of current market trends and performance.

On September 13, 2018, EPA implemented a review period, during which we solicited feedback on the application of the models to various commercial building sectors and the resulting scores. The review period included three phases: gathering feedback; analyzing the models and evaluating score changes on buildings benchmarking in Portfolio Manager; and communicating the results. With this document, we are communicating the results and concluding our review period for the supermarket ENERGY STAR model.

During the feedback phase, we heard from several partners about trends they observed in the scores of their buildings. Four partners provided specific feedback about supermarket buildings, noting that scores of individual buildings changed in unexpected ways. This feedback was very helpful during the analysis phase in focusing our efforts on the factors that changed from the previous model. We looked at each of these factors extensively and determined that the model is scoring supermarket properties appropriately.

Background on Underlying Industry Data

The current model for supermarkets was developed using data collected for the Energy Information Administration's (EIA) 2012 Commercial Building Energy Consumption Survey (CBECS). The previous model was developed using data from both the 1999 and 2003 CBECS. EPA had planned to update the model in the intervening years, using data from a 2007 CBECS. However, EIA did not publish the 2007 survey data, after determining that it did not meet their rigorous quality standards.

Between 2003 and 2012, the average energy use of supermarkets in the United States decreased by 4% in terms of site energy use intensity (EUI) and 7% in terms of source EUI, as shown in the table below.

Changes in U.S. Grocery Store/Food Market Energy Use Intensity (CBECS Data)

CBECS Year	Average Site EUI	Average Source EUI*
2003	214.0	540.0
2012	205.8	503.0

*Calculated using new ENERGY STAR source factors from August 2018

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Review Period Key Findings

Key Finding #1: The model is working as intended

After extensive analysis, EPA has concluded that the supermarket model is working as intended to deliver appropriate energy performance metrics. Based on these results, no further changes have been made to the performance metrics released in August 2018. ENERGY STAR certification for supermarkets will resume on July 31, 2019.

Key Finding #2: Large supermarkets and those in warmer climates experienced greater score changes

Under the previous model, larger supermarkets and those located in warmer climates tended to have relatively high scores. Average scores in Portfolio Manager with the current model demonstrate that it scores supermarkets across the range of sizes and climates more evenly than the previous model.

Key Finding #3: A significant portion of supermarkets could raise their ENERGY STAR scores by entering the number of refrigeration/freezer units

Analysis showed that many supermarkets have not entered actual values in Portfolio Manager for the number of open or closed refrigeration/freezer units. With the introduction of the current model, this count of refrigeration and freezer units became a required use detail that contributes to a user's ENERGY STAR score. Users will see improvement in their supermarkets' scores when they enter actual values.

The rest of this document provides additional details about the ENERGY STAR model for supermarket properties and the results of the score review analysis.

Summary of Review Period Feedback, Analysis, and Findings

During the review period, we solicited feedback from all Portfolio Manager users and ENERGY STAR partners. In total, we received four survey responses from organizations that have supermarket properties as part of their building portfolio. All four of these responses provided substantive feedback on the supermarket model. The responses mentioned that certain properties experienced much larger drops than the average.

An individual supermarket's change in score is the result of interactions among the components of the model, and difficult to attribute to a single factor. The fuel mix of a building, the amount of energy used, the building activity level, and how the combination of these factors compares to the U.S. population of supermarkets on a percentile scale all influence the change in score.

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In developing the current supermarket model, EPA analyzed the potential impact of dozens of factors on supermarket energy use. The final model adjusts for those listed in the table below, which shows what changed from the previous model to the current model.

Changes in Supermarket Model Adjustments

Adjustments in Previous Supermarket Model Based on 2003 CBECS	Kept?	Adjustments in Current Supermarket Model Based on 2012 CBECS
Number of Workers per 1,000 square feet	✓	Number of Workers per 1,000 square feet
Weekly Operating Hours	✓	Weekly Operating Hours
Weather and Climate (HDD and CDD)	✓	Weather and Climate (HDD and CDD)
Percent of the Building that is Heated and Cooled	✓	Percent of the Building that is Heated and Cooled
Number of Walk-in Refrigeration Units per 1,000 square feet	△	Number of Open, Closed, and Walk-in Refrigeration Units per 1,000 square feet
Building Size	×	N/A
Whether or not there is Energy Used for Cooking	×	N/A

✓ Kept △ Kept with changes × Deleted

The 2012 CBECS data shows that both building size and the presence of cooking are no longer key contributors to the variation in energy use intensity among supermarket buildings.

Our analysis of Portfolio Manager data found that three factors had a relatively large influence on score variation:

1) Absence of building size (square feet) from the current model
2) The change in magnitude of the CDD (cooling degree days) adjustment
3) The number of open and closed refrigeration units

Each of these is discussed below.

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The new model produces a more balanced distribution of scores for supermarkets of all sizes

In the table below, the second column shows that the previous ENERGY STAR score for supermarkets in Portfolio Manager increased with supermarket size. Buildings under 40,000 square feet had an average score of 57, while buildings above 60,000 square feet had an average score of 74 under the previous model. The average scores for supermarkets of all sizes in Portfolio Manager are more consistent under the current model. While larger supermarkets benchmarking in Portfolio Manager experienced the biggest score drops on average, the current model rates them as somewhat more energy efficient than smaller supermarkets.

ENERGY STAR Score vs. Building Size (Portfolio Manager Buildings)

Building Size (sq. ft.)	Average Score Previous Supermarket Model	Average Score Current Supermarket Model	Percent scoring 75 or above (Previous Model)	Percent scoring 75 or above (Current Model)
0 - 40k	57	58	38%	21%
40k to 60k	59	60	32%	23%
60k +	74	67	56%	38%

The new model produces a more balanced distribution of scores for supermarkets in different climates

In the table below, the second column shows that the previous ENERGY STAR score for supermarkets in Portfolio Manager increased with cooling degree days (CDD). CDD is a term used to capture the cooling needs of a building based on geographical location. Buildings with CDD values less than 800 had an average score of 59, while buildings with a CDD value above 1,800 (i.e., in very warm climates) had an average score of 72 under the previous model. This trend is less pronounced under the current model.

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ENERGY STAR Score vs. CDD (Portfolio Manager Buildings)

Cooling Degree Days	Average Score Previous Supermarket Model	Average Score Current Supermarket Model	Percent scoring 75 or above (Previous Model)	Percent scoring 75 or above (Current Model)
0 – 800	59	61	36%	28%
800 – 1,200	58	59	35%	23%
1,200 – 1,800	64	63	43%	28%
1,800 +	72	65	52%	27%

Users should enter actual values for number of open or closed refrigeration/freezer units

An entry for "number of open or closed refrigeration/freezer units" is now required to calculate an ENERGY STAR score. Previously, this was an optional field that users had not filled in for about 20% of supermarket properties. With the new model, Portfolio Manager assigns a value of "0" if this field is blank. By updating the field with an actual value, these users will see a more accurate — and higher — score for their properties.

Zero values for number of open or closed refrigeration/freezer units may contribute to the slight trends observed with the new model seen in the tables above. We found that a higher proportion of small properties (0 - 40k square feet) or that experience low CDD (0-800) have a zero value for the number of open or closed refrigeration/freezer units. Entry of actual values would likely eliminate or dampen any trends in score by size or climate.

Other variables were studied and found to be accounted for appropriately in the model

Prior to releasing the current score model in August 2018, EPA evaluated many other building and operating characteristics to ensure the model scores different types of supermarket properties appropriately. During the review period, we verified that the current model produces more balanced scores than the previous model for supermarket properties across various hours of operation, number of workers, regions, and more.

The results fall within the expected average score and percentile distribution

The ENERGY STAR score is intended to represent a percentile ranking of the nationwide supermarket building population, with a score of 50 indicating a supermarket with median energy performance, and a score of 75 – 100 indicating performance in the top 25% of the supermarket building population.

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In the current supermarket ENERGY STAR model, the average score of buildings benchmarking in Portfolio Manager is 62, and 27% of supermarkets score 75 or above. In the previous model, the average score was 63, and 41% of supermarkets were scoring 75 or above, as illustrated in the table below. While the average score did not change by much, the percent scoring 75+ decreased significantly. The new model results in fewer supermarkets being rated exceptionally high in the 90-100 range.

Average Supermarket Score and Percent Scoring ≥75 (Portfolio Manager buildings)

	Average ENERGY STAR Score	Percent scoring 75 or above
Previous Supermarket Model	63	41%
Current Supermarket Model	62	27%

Additional Resources

- General Information on ENERGY STAR Score Updates
- ENERGY STAR Score for Retail Stores and Supermarkets Technical Reference
- Definition of Number of Open or Closed Refrigeration/Freezer Units