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ENERGY STAR Top-Load Clothes Washer Naturally Occurring Baseline Review

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Background

This memo presents findings from the Apex Analytics team's review of NEEA's approach to estimating naturally occurring baseline (NOB) market shares for ENERGY STAR[®] top-load washers and the assumptions underlying NEEA's baseline estimates.

NEEA assumes the NOB share of top-load washer sales that are ENERGY STAR will decline slightly from 2019 to 2021 based on a linear forecast drawing on market share trends from 2015 to 2018 (Figure 1). NEEA anticipates NOB market share would remain flat from 2021 to 2022 and then begin to increase in 2023 due to an ENERGY STAR specification update.

Figure 1: NEEA Baseline Assumption and Forecast for ENERGY STAR Top-Load Washers



NEEA asked the Apex team to investigate two research questions related to its NOB assumptions for top-load washers:

- Is assuming the NOB continues to decline for two years without incentives (2020-2021) reasonable? If not, what are some alternative approaches?
- > Is assuming the NOB adoption starts increasing in 2023 reasonable?

Question 1: Is assuming the naturally occurring baseline continues to decline for two years without incentives (2020-2021) reasonable? If not, what are some alternative approaches?

NEEA's assumption that the NOB market share of ENERGY STAR top-load washers will continue to decline is based on historical sales data showing a decline from the time data became available, in 2015, through 2019, the year the ENERGY STAR Retail Products Platform (ESRPP) program began incentivizing top-load clothes washers. Understanding the cause of this decline could provide insight into whether it is likely to continue. The Apex team investigated three market characteristics – market concentration, capacity, and brand – to determine whether they might be contributing to declining market share of top-load clothes washers. Table 1 lists these characteristics and how they might impact the market share of efficient clothes washers.



Characteristic	Research Questions	Potential Impact on Efficient Market Share
Market Concentration	To what extent are sales driven by a small number of high-volume models? What is the efficient market share of those high-volume models?	In some product categories, a small number of models account for a large share of overall sales. Shifts in ENERGY STAR share of these models can have a disproportionate impact on ENERGY STAR market share of the category overall.
Capacity	Are clothes washer capacities trending larger, trending smaller, or staying the same? What relationship, if any, exists between capacity and efficiency?	For some products, there is a relationship between capacity and efficiency, and ENERGY STAR market share may be different between higher capacity and lower capacity models. If such a relationship exists, sales trends toward larger or smaller models could impact efficient market share for the category as a whole.
Brand	How, if at all, do efficient market shares vary by brand? How is each brand's market share changing?	Some manufacturers may prioritize energy efficiency more than others. Significant changes in market share by a brand with a higher or lower than average efficient market share, or significant changes in efficient market share for a brand with a high share of the market could impact the overall category market share.

Table 1: Market Characteristics with Potential to Impact Efficient Market Share

After identifying trends in one or more market characteristics driving the observed changes in market share, NEEA or its evaluator must determine whether those trends would likely continue in a baseline scenario. For example, how long will consumers continue to demand higher capacity units? Or why are fewer models that sell in high volumes meeting ENERGY STAR and is that expected to continue? It is important to note that the potential for sales data alone to address these questions is limited, as the questions require insight into customer demand and motivations. NEEA may need to consider additional research to address these issues.

Market Concentration

An analysis of top-load washer market concentration did not provide a clear signal to explain declines in ENERGY STAR market share. The decline in market share of ENERGY STAR top-load washers between 2015 and 2018 was driven by high-volume models, although this trend shifted in 2019 among notable turnover of available models.

A relatively small number of high-volume models can account for a disproportionate share of appliance sales. Each year from 2015 to 2020, the 10 highest-selling top-load washer models accounted for nearly half of all top-load washer sales and the five highest-selling



models accounted for nearly 30% of sales. Shifts in the energy efficiency of these high-volume models can have a disproportionate impact on overall efficient market share.

From 2015 through 2018, the ENERGY STAR V8 market share of the highest-volume topload washers fell, while the market share of lower-volume models gradually rose (Figure 2). This trend reversed in 2019, when two ENERGY STAR V8 models new to the market that year were among the ten highest-volume models. At the same time, several ENERGY STAR models that had previously sold in moderate volumes left the market, resulting in a decline in efficient market share of models selling in lower volumes that offset this gain in efficient market share among models selling in higher-volumes.





Sales data suggests there was notable turnover among top-load washer models in 2019. While in 2018, models in their first year on the market accounted for 10% of top-load washer sales, in 2019, models in their first year on the market accounted for 25% of top-load washer sales (Figure 3: Share and Efficiency Level of Models Entering, Leaving, and Staying on Market 2018-2019). The share of sales from models in their last year on the market also rose between 2018 (11%) and 2019 (14%), although the increase was less dramatic.



Figure 3: Share and Efficiency Level of Models Entering, Leaving, and Staying on Market 2018-2019



The difference in model turnover between 2018 and 2019 may reflect clothes washer buying cycles (Figure 4). A laundry merchant included in prior ESRPP retailer interviews indicated that clothes washer models typically remain on the market for approximately 18 months, although there could be exceptions. The ESRPP retailer mix was largely stable from 2018 to 2019, but changes to the retailer mix in prior years prevent us from identifying longer-term patterns in the share of models entering and leaving the market in a given year.

Capacity

Although clothes washer capacity has shown a gradually increasing trend, this increased capacity did not contribute to the decline in ENERGY STAR market share. RPP sales data indicates a slight trend of increasing clothes washer capacity from 2016 to 2020, with sales weighted average capacity increasing by 4% (0.17 cubic feet) over that period (Figure 4).



Figure 4: Sales-Weighted Average Top-Load Clothes Washer Capacity 2015-2020



There is a relationship between clothes washer capacity and efficiency, but it is a positive relationship: larger clothes washers tend to have higher Integrated Modified Energy Factors (IMEFs), indicating that they are more efficient. Thus, trends toward increasing capacity do not appear to be causing declining ENERGY STAR market share.



Figure 5: Relationship Between Top-Load Washer Efficiency and Capacity

Brand

There are notable differences in ENERGY STAR V8 market share between clothes washer brands. However, with sales spread across multiple brands, these differences are unlikely to be at the root of the observed declines in market share. As Figure 6 shows, Brand E and Brand C have notably higher market shares than other major brands. While some brands showed trends of either growing or declining market share between 2015 and 2019, these trends were generally not dramatic.



Figure 6: Top-load Washer Market Share by Brand

* Includes ENERGY STAR Most Efficient models.



Top-load washer sales are distributed relatively evenly across several major brands. While market share shifted among brands between 2015 and 2020 (Figure 7), no single brand either gained or lost dominance to the extent that it would have a significant impact on overall market share. Brand G's sales gradually declined during the period, effectively disappearing in 2019. However, the efficient market share of Brand G models is relatively close to the market average. As a result, this decline in Brand G sales is likely not a key driver of the overall decline in market share between 2015 and 2019.



Figure 7: Top-Load Washer Market Share by Brand

Conclusion

We were unable to identify the root cause of the decline in ENERGY STAR V8 market share observed between 2015 and 2019 through an assessment of the elements examined for this review, using the available sales data. Other factors not captured in this analysis or not apparent in the available sales data may explain the decline. Nonetheless, our analysis did not identify any indication that the trend was likely to change between 2019 and 2021 absent NEEA's intervention. As a result, we conclude, based on the data available, that it is reasonable to assume the naturally occurring baseline would continue to decline for two years.

NEEA's assumption that market share would remain flat between 2021 and 2023 is also reasonable. As noted above, we found no indication, based on the factors examined and the data available, that the trend of declining ENERGY STAR V8 market share would change absent program intervention. However, assuming a flat baseline market share is a more conservative approach than assuming a declining one, and that greater caution is appropriate given the increasing uncertainty as a baseline forecast extrapolates market shares further from the observed baseline period.



One opportunity to refine NEEA's approach would be to factor clothes washer buying cycles into baseline estimates. Between 2015 and 2019, clothes washer market share followed a pattern of remaining relatively stable for two years (2016 and 2018) and then declining more steeply in the third year (2017 and 2019). The analysis of models entering and leaving the market between 2018 and 2019 and limited retailer interview data suggest this may be related to buying cycles that result in turnover of washer models every 18 months or two years. Taking this approach, NEEA could assume that baseline market share in 2020 would be relatively close to 2019 market share before declining again in 2021.

Question 2: Is assuming the naturally occurring baseline adoption starts increasing in 2023 reasonable?

NEEA assumes that the NOB would begin to increase in 2023 when EPA would adopt an updated ENERGY STAR specification for top-load washers. The Apex team investigated two aspects of this assumption: first, the likelihood of an ENERGY STAR specification update occurring in 2023; second, the potential impact of that specification update on ENERGY STAR V8 market share.

Timing of ENERGY STAR Specification Update

Both the time elapsed since the last update and the overall market share of ENERGY STAR clothes washers indicate that the clothes washer specification is due for an update. Since the Version 2 ENERGY STAR specification in 2004, EPA has updated the ENERGY STAR specification for clothes washers every three years or less. The V8 specification took effect in 2018, and EPA is currently in the process of making a minor revision to expand the specification to include certain all-in-one washer-dryers. The 2019 ENERGY STAR Unit Shipment Data Summary Report lists residential ENERGY STAR clothes washer market share at 50% (including both top- and front-load units), which is above ENERGY STAR's target for specification revision. Nonetheless, a full specification revision is not yet underway. Thus, it is possible that a revised ENERGY STAR specification would be adopted in 2023.

The next ENERGY STAR specification revision will likely increase efficiency requirements for top-load washers. The V8 ENERGY STAR specification increased efficiency requirements only for front-load washers; it retained the requirements for top-load washers included in the V7 specification, which took effect in 2015 and was the first to differentiate between front- and top-load units. In the V8 update, manufacturers argued that top-load market share was lower than front-load market share and did not justify a specification revision. In its response to these manufacturer comments, EPA wrote that "EPA anticipates that market conditions will have changed in time for the V9.0 revision process such that top-load criteria can be strengthened in a more meaningful way."¹

¹<u>https://www.energystar.gov/sites/default/files/asset/document/Draft%202%20Comment%20Response%20Matrix.pdf</u>



Effect of ENERGY STAR Specification Update on Market Share

Historical clothes washer data provides limited insight on the impact of an ENERGY STAR specification update on the market share of models meeting the prior specification. Because 2015 is the first year of available sales data, the Apex team is not able to assess the impact of the V7 specification update, which took effect in 2015, on market share of top-load washers meeting the V6 specification. The Apex team also reviewed the market share of front-load washers meeting the ENERGY STAR V7 requirement to see how it changed when the ENERGY STAR V8 specification took effect in 2018. However, the market share of front-load washers meeting the ENERGY STAR V7 specification at the time of the specification update was close to 100%, making it impossible to identify any meaningful increase due to the specification update.

Conclusion

It is reasonable to assume that naturally occurring baseline adoption will start increasing in 2023. An ENERGY STAR specification update is due, based on both historical update cycles and market share, but as the update process has not yet begun, a new specification is unlikely to take effect before 2023. Because top-load market share has not increased substantially since the V8 revision in 2018 – and in fact has decreased – manufacturers may again argue that an increase in top-load requirements is not called for. However, stakeholders advocated for more stringent top-load requirements in the V8 revision process. Given that it would have been more than six years since the top-load specification had been revised, EPA may be more inclined to heed their arguments and update the top-load specification in a V9 specification update.

While we were unable to assess the impact of an ENERGY STAR specification update on the market share of models meeting the previous specification, it is reasonable to assume that market share would increase. Manufacturers would likely leave at least some of their models meeting the previous specification on the market while releasing new models that meet the new specification. It may be worthwhile, however, for NEEA to conduct additional research to confirm this effect and assess its size. For example, NEEA could analyze sales data for other products to identify typical changes in market share associated with an ENERGY STAR specification update or conduct research with manufacturers to assess their response to a specification update.