December 6, 2018
Via Electronic Mail

U.S. Environmental Protection Agency Office of Air and Radiation
1200 Pennsylvania Avenue NW
Washington, D.C. 20460
RoomAirCleaners@energystar.gov

Subject: ENERGY STAR® Room Air Cleaners Version 2.0 Discussion Questions

Dear Mr. Burchard,

This letter is submitted on behalf of the Northwest Energy Efficiency Alliance (NEEA), the Northeast Energy Efficiency Partnerships (NEEP), the Pacific Gas & Electric Company (PG&E), and the Sacramento Municipal Utility District (SMUD) in response to the request for comments on the Room Air Cleaners Discussion Guide. NEEA is a non-profit organization representing an alliance of more than 140 Northwest utilities and energy efficiency organizations working on behalf of more than 13 million energy consumers. NEEP is a regional energy efficiency organization collaboratively working with a network of stakeholders to advance efficiency in the Northeast and Mid-Atlantic US. PG&E is an investor-owned utility, focused on providing safe, reliable, clean and affordable energy to 16 million Californians. SMUD is a community-owned electric utility representing 1.5 million energy consumers. NEEA, NEEP, PG&E, and SMUD all participate in the ENERGY STAR Retail Products Platform (ESRPP) program, which is a national collaborative of utilities and efficiency organizations working with retailers to advance the efficiency of retail products in the market. Through ESRPP, these organizations encourage the development and adoption of energy-efficient products and services. The ESRPP program funders work with major retailers that serve roughly 18% of the US population.

We strongly support EPA's ENERGY STAR program. ENERGY STAR is a critically important federal program created with bi-partisan support that annually delivers billions of dollars of energy savings to consumers and business. As such, ENERGY STAR's leadership in setting appropriate product specifications plays a critical role in advancing the efficiency of consumer products by recognizing those products that are the 'best of the best' at meeting consumer's experiential expectations as well as save them energy and money.

As part of the ESRPP program, NEEA and PG&E routinely analyze the retail sales data and online product information to understand the air cleaners market and how it is evolving over time. This includes collecting data on hundreds of products through web-scraping of retail websites including important product features such as ENERGY STAR qualification, air cleaner size, product filter type, product dimensions, and brand.

We applaud EPA for opening this specification review process and seeking stakeholder input. After review of the Discussion Guide, we submit the following comments on the proposed topic areas.

Specification Scope

As the EPA considers refining the scope of the room air cleaners specification, we support providing additional clarification on the scope definition so that manufacturers reporting unit shipment data report the product shipments for only those products within the specification scope. Given that there is a significant discrepancy between the ENERGY STAR market share observed in ESRPP sales and the reported ENERGY STAR market share from the unit shipment data, it is possible that some manufacturers are unclear on the scope and include some out-of-scope shipments in their reports. In performing internet searches for room air cleaner products, the ESRPP program found products described as air cleaners that are excluded from the ENERGY STAR specification, such as absorbent air fresheners, passive filters, and ozone generators.

To avoid confusion while collecting the unit shipment data, we would like to ensure that the specification definition explicitly excludes these products, and we propose copying the scope definition into the unit shipment data collection form to ensure that unit shipment data does not include these sales in the market penetration calculations. If this specification revision *changes* the scope, clearly communicating the scope change to manufacturers who report shipment data is even more important.

Efficiency and Performance

1. Technological Advancements

In looking at technological advancements and efficiency, we provide data that suggest that many non-ENERGY STAR air cleaners already attain a CADR/W efficiency level close to the current ENERGY STAR requirement. We therefore recommend that the CADR/W efficiency level be made more stringent. The same web-scraped dataset also provides some evidence that DC motor technology has low market prevalence, and we advocate for collecting information on motor technology as a qualified products list field in the upcoming specification revision.

We have collected information on a range of air cleaner products by web-scraping retailer websites. In total, we collected product information for over 4,000 air cleaner product listings from 12 retailers, most of whom have both online and brick-and-mortar

presence. Within this dataset, we found a total of 20 products that were not ENERGY-STAR certified that had both dust CADR and wattage information listed online. These 20 products, displayed in Figure 1, cover two retailers and eleven brands. Sixty percent of the models met the 2 CADR/Watt ENERGY STAR requirement in spite of being non-ENERGY-STAR products. Based upon these findings, we urge EPA to account for the whole market in their product analysis, not only the products in the ENERGY STAR database. We are happy to provide web-scraped data for non-ENERGY STAR products to EPA in the development of this specification.

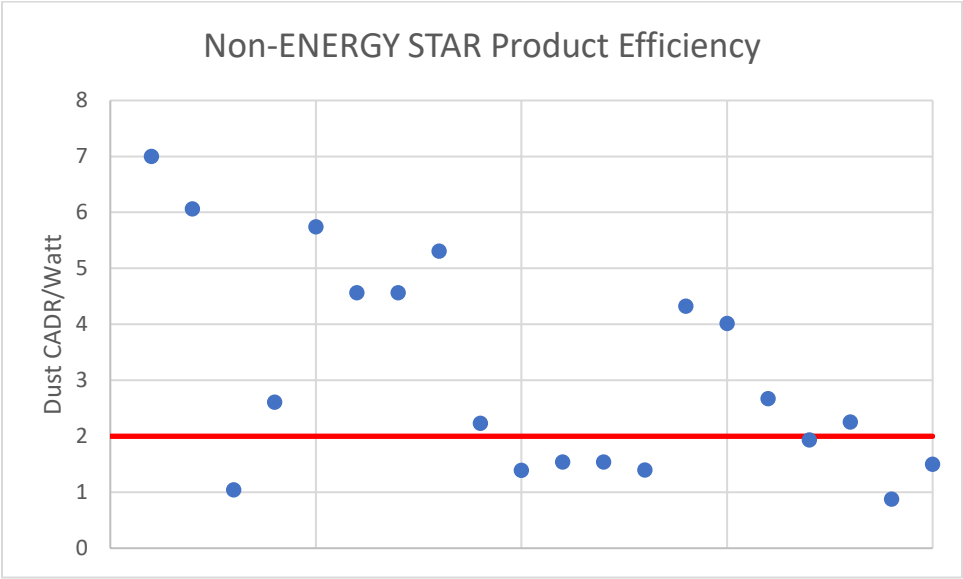

FIGURE 1: CADR/WATT FOR NON-ENERGY STAR PRODUCTS COMPARED TO THE ENERGY STAR LEVEL

Most of the web-scraped product listings did not describe the motor technology used; only 5% mentioned the motor in the product description. Of the listings that did mention the motor, 3% described a DC motor and 32% described another type of efficient motor technology, such as a variable-speed motor. This suggests that products with DC motors are being sold but are not prevalent in the current market. To better understand the prevalence and efficiency impacts of DC motors, we suggest EPA adds a reporting requirement for manufacturers to report the motor technology used when qualifying a product to ENERGY STAR.

2. Network-Connected Products

We support establishing optional connected criteria/active load management criteria to give guidelines for partners on how their products should respond to utility signals. Network connected devices may help reduce a product's overall energy use, flatten peak demand, and/or add grid flexibility to align with renewable energy generation. To ensure that these benefits may be best realized, we support establishing and including criteria for the communication of products and utility signals, similar to other ENERGY STAR products.

In addition, we support including a reporting field to note if a product has network connection capability when submitting a product for ENERGY STAR certification. This reporting field will support future data collection and analysis of the market share for future specification development

3. Efficiency and Product Size

Though we do not have data on what motivates consumer purchases of specific air cleaner sizes, we support binning products by size to reflect inherent differences in efficiency associated with size. Based on ESRPP sales, we observe that the sales-weighted average CADR/W for products that deliver < 150 CFM is 2.5 CADR/W, whereas the average for products between 150 and 250 CFM is 3.4 CADR/W, and the average for larger products is 2.7 CADR/W. If different efficiency levels are set for different sizes, we urge EPA to ensure the efficiency levels are a continuous equation that is a function of size. In addition, if different efficiency levels are set for different size bins, we hope the EPA will ensure that all of the efficiency levels are at least as stringent as the Version 1.2 specification. The relationship between efficiency and product size is further discussed in the Market Assessment section.

4. Smoke and Pollen CADR and Filter Performance

As efficiency advocates, we support products that achieve their intended use while maintaining efficient operation. Consumer perspective on how products are used is valuable to ensure that products are operating efficiently while being used for their intended purpose.

We support EPA's intention to update the specification based upon the ways in which users interact with air cleaning products. When determining which clean air delivery rate metric is most relevant, EPA should consider that the filtration of larger particles will require less energy than the filtration of smaller particles. For example, the pollen-free clean air delivery rate is on average [14] cfm higher than the dust-free CADR. This is due to the significantly larger particle sizes of pollen compared to smoke and dust.[1] Figure 2 below shows the how the different CADR ratings compare. Thus, the efficiency of air filters can vary widely based on the size of the particles filtered by the device.

[1] https://www.sentryair.com/filter-particle-size-chart.htm

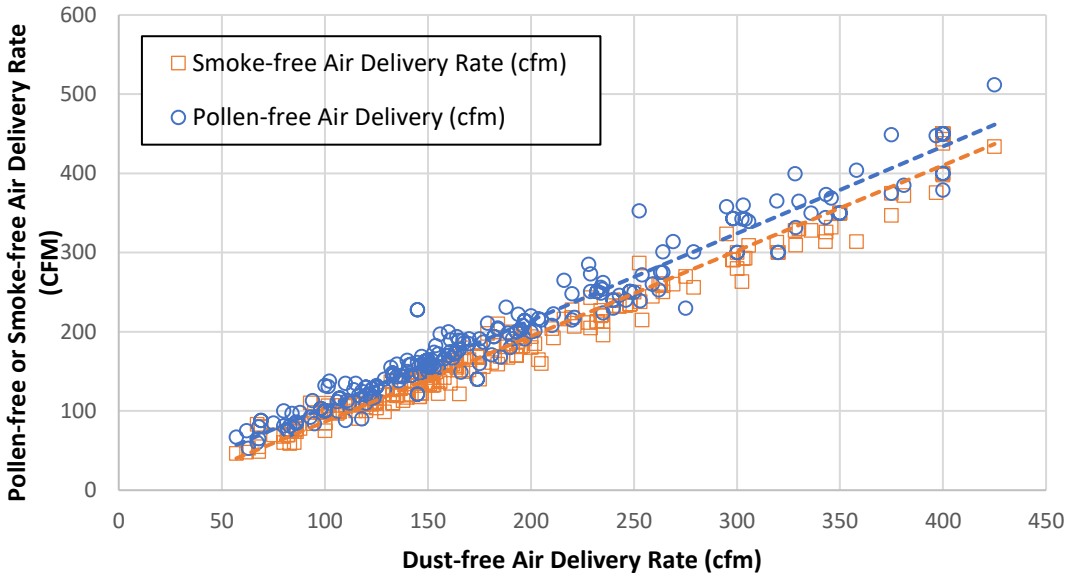

FIGURE 2: DUST-FREE CADR COMPARED TO POLLEN-FREE AND SMOKE-FREE CADR

A study of the filters used in the top-selling products in the ESRPP sales data shows that certain filter types are present in certain sizes (cfm) and efficiencies (CADR/W), as displayed in Figure 3. The team did not study the different filter types, only the filtration percent of 0.3 micron particles as advertised by retailers. In removing these particles, a filtration percent of 0.99 offers less filtration than a filtration percent of 0.9997.

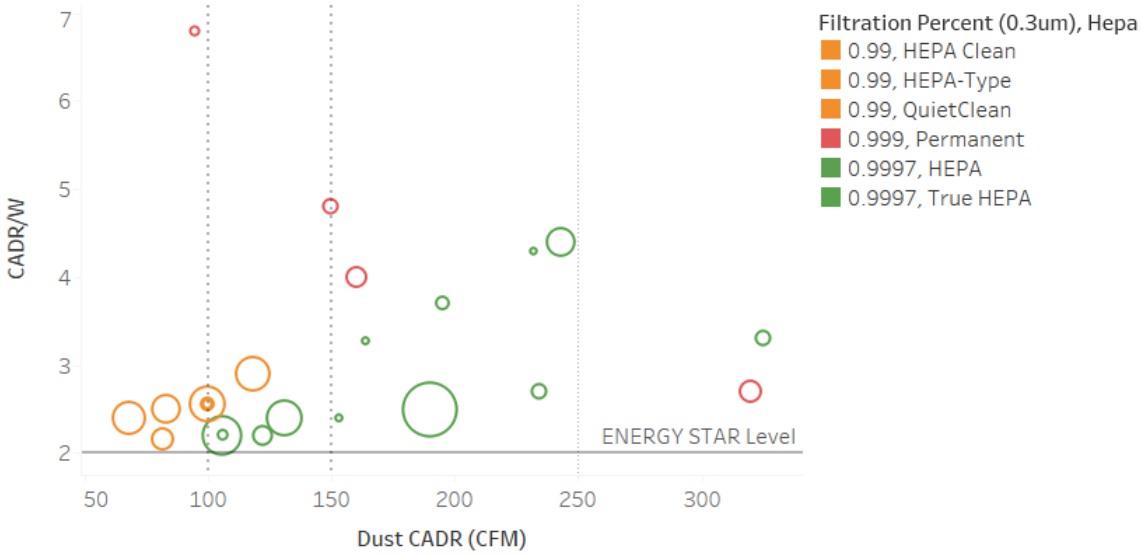

FIGURE 3: FILTER PERFORMANCE COMPARED TO DUST-CADR AND EFFICIENCY

The size of the circles in Figure 3 represent ESRPP sales, with larger circles indicating more sales. The clustering of the different filtration types around different sizes and efficiencies suggest that the different filter types may have different use cases. EPA should consider the various use cases for each filter type and set certification requirements so to not inadvertently promote a worse-performing filter. EPA may consider product classes based on the filters required for each use case.

We urge EPA to increase the specification efficiency requirements so that the market may be pushed to meet higher efficiency levels. The need for these increased requirements is discussed further in the Market Assessment section below.

5. Room Air Cleaners Fan Noise

Based on our observations, most retailers do not list noise-related information, but if they do provide it, the information is either given as a decibel rating or a qualitative description (e.g., "quiet operation"). An analysis of product information scraped from websites revealed that only 25 out of 4027 (<1%) products had an explicit specification relating to the noise level. These products typically provided the noise level on high speed, in decibels (db), and the average was approximately 50 db. The lowest value was 1 db and the highest was 571 db. About 600 products (~15%) included a reference to noise, quiet, or decibels in the product description. Although most products did not include a reference to the noise level in the product description, more than half of the listings that highlighted the motor also included a reference to the noise level. All the listings that described a DC motor also indicated that the product operates quietly. Considering this information, there may be a correlation between motor advancements and noise levels. When considering development of the next specification, we support EPA collecting noise level data and considering the usability of products with respect to noise level as well as the product efficiency.

6. Standby Power

The ESRPP program sponsors collect sales data that includes the standby power of the products. Figure 4 below shows that a majority of products sold from all the ESRPP Program participating stores for these sponsors have a standby power draw of 0.5 W or less, and for each sponsor's retailers at least 70% of sales had standby power use of 1 W or less. Some products do not have a listed standby power draw, so the actual market share using less than 1 W could be even higher. We support EPA updating the specification to a lower standby power draw requirement of 1 W or less, particularly due to the long hours of operation in standby mode.

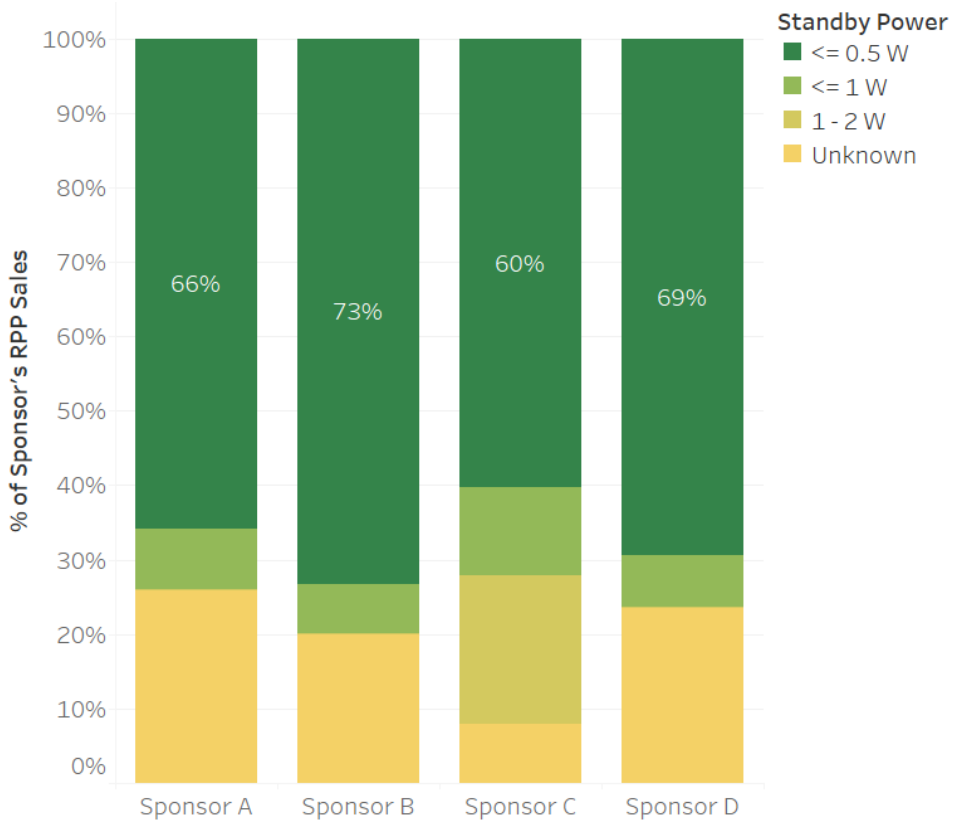

FIGURE 4: PERCENT OF ESRPP SALES FOR EACH STANDBY POWER RATING

From web searches, we identified many features that would use power in standby or other power not used for cleaning:

- Filter change/clean indicator light or other alerts
- Accent light
- Air quality indicator light
- App-controlled
- UV lamp
- Heater capability / heating rating /thermostat heat control
- IoT hub
- Remote access / remote control
- Touchscreen control
- Wifi capable

We urge the EPA to consider these functionalities as potential adders when setting a new standby power draw limit.

Market Assessment

We support EPA's decision to revise this specification, particularly after observing ENERGY STAR penetration rates of over 90% in the ESRPP sales data for room air cleaners.

40 – 50% of air cleaners sold through ESRPP retailers have a CADR between 100 and 150, the vast majority of which qualify for ENERGY STAR (see Figure 5). Weighting the web-scraped data according to the number of reviews left by consumers, we see a similar trend in online retail (see Figure 6).

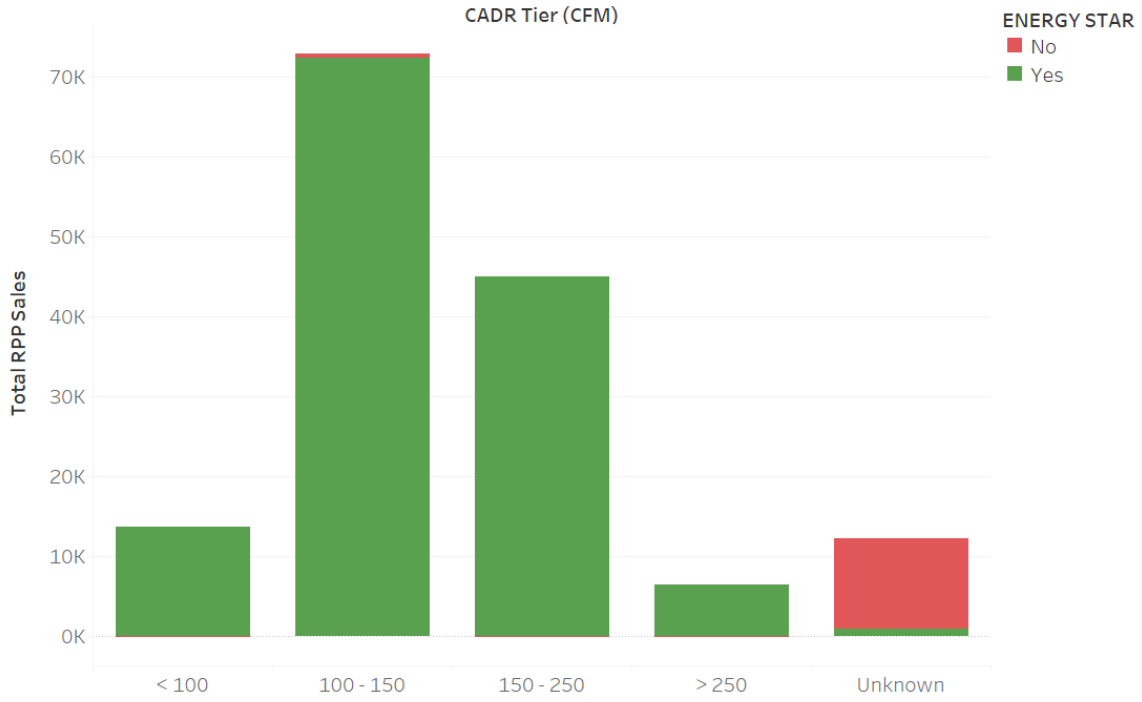

FIGURE 5: CADR SALES DISTRIBUTION OF ESRPP SALES FOR 4 SPONSORS, 2015-2018

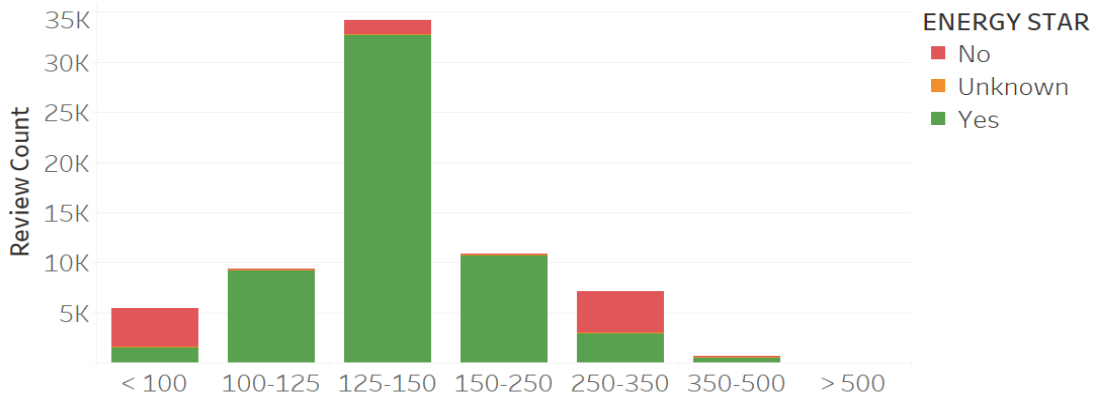

FIGURE 6: CADR SALES DISTRIBUTION OF WEB-SCRAPED PRODUCTS

Although most air cleaner models sold through these channels qualify for ENERGY STAR, non-qualifying products are particularly concentrated below 100 CADR and above 250 CADR (see Figure 7). This suggests optimal savings might be achieved with different efficiency qualification levels for models in different CADR bins.

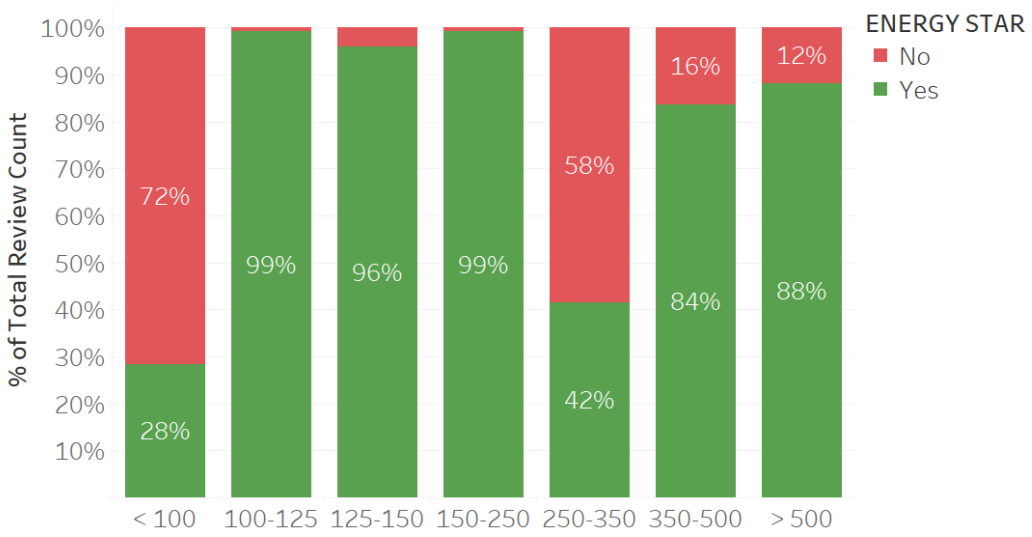

FIGURE 7: ENERGY STAR DISTRIBUTION BY CADR FOR WEB-SCRAPED PRODUCTS

The small-CADR units' low ENERGY STAR penetration does not seem to be motivated by price differences, suggesting that there may be technical challenges in meeting the ENERGY STAR requirements for low-CADR units or that ENERGY STAR products might compromise on availability of other features to compete on cost. On average, ENERGY STAR models are less expensive or on par with non-ENERGY STAR models in price for every CADR size bin except the 500+ category and the 250 – 350 range. The price difference in the 250 – 350 CADR range could be a cause of that category's low ENERGY STAR penetration.

Testing

We support test methods that have a setup that is most closely representative of typical consumer conditions. We thank EPA for looking into refining the testing conditions and methods to better reflect actual product performance.

We thank EPA for the opportunity to comment on these changes to the air cleaners product specification. We look forward to continuing to work with the ENERGY STAR program.

Sincerely,

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