Appliance Standards Awareness Project
American Council for an Energy-Efficient Economy
Earthjustice
New Buildings Institute
National Consumer Law Center

September 8, 2026

Mr. Peter Cochran
U.S. Department of Energy
Office of the General Counsel, GC-33
1000 Independence Avenue SW
Washington, DC 20585

RE: Docket Number EERE–2022–BT–OT–0004: Review of DOE's Analytic Methods for Setting Energy Conservation Standards

Dear Mr. Cochran:

This letter constitutes the comments of the Appliance Standards Awareness Project ("ASAP"), American Council for an Energy-Efficient Economy ("ACEEE"), Earthjustice, New Buildings Institute ("NBI"), and the National Consumer Law Center ("NCLC"), on behalf of its low-income clients, on the request for information (RFI) concerning the Review of Analytic Methods for Setting Energy Conservation Standards. 91 Fed. Reg 41578 (July 7, 2026). We appreciate the opportunity to provide input to the Department of Energy ("DOE" or "the Department").

In the RFI, DOE seeks comments regarding the assumptions, models, and methodology the Department uses in setting energy conservation standards. DOE also requests comments on recommendations issued in a report by a National Academies of Sciences, Engineering, and Medicine ("NASEM") committee.[1] DOE's analytical methodology has improved considerably over time, and we support the Department's continued efforts to refine that process and increase transparency around its underlying modeling assumptions. However, we urge the Department to ensure that any prospective changes do not introduce unnecessary analytical hurdles or compromise its ability to meet its statutory requirements under the Energy Policy and Conservation Act ("EPCA"). DOE has previously acknowledged that unnecessarily complex analyses can consume significant resources and contribute to rulemaking delays without improving regulatory outcomes.[2]

Many of the NASEM committee's recommendations would blur distinctions that EPCA itself establishes; substitute speculative refinements for approaches DOE has already validated through research and practice; or impose new analytical burdens without a clear benefit to the standards-setting process. In several instances, the recommendations rest on premises—such as treating market failure as a prerequisite for economic justification or treating retrospective analysis as a gating requirement for future rulemakings—that ignore EPCA's text. In others, they ask DOE to refine analyses, such as its

[1] National Academies of Sciences, Engineering, and Medicine, Review of Methods Used by the U.S. Department of Energy in Setting Appliance and Equipment Standards. https://www.nationalacademies.org/projects/DEPS-BICE-19-02/publication/25992.

[2] Dep't of Energy, Energy Conservation Standards Rulemaking Peer Review Report (Feb. 2007), at 42, available at https://www.energy.gov/sites/prod/files/2013/12/f5/peer_review_report021507.pdf.

treatment of variability or technology evolution, that are already well-developed and appropriately scoped. We address each of these points in more detail below. Given these concerns, many of the recommendations discussed in the RFI should not be treated as priorities for near-term implementation.

DOE's analysis has improved over time. DOE's rulemaking analyses are already rigorous, and the Department has incorporated significant analytical improvements over time. For example, in the analysis for the 1997 final rule for refrigerators, refrigerator-freezers, and freezers ("refrigerators"), DOE generally used energy consumption values obtained from manufacturers,[3] while for the 2011 final rule, DOE used the Residential Energy Consumption Survey ("RECS") and field metered data and developed usage adjustment factors ("UAFs") that related reported consumption for each RECS sample household to the energy consumption estimated from the test procedure.[4] DOE further improved the energy use analysis for refrigerators in the 2024 direct final rule by supplementing the field metering data developed for the 2011 final rule with additional metered data from the Northwest Energy Efficiency Alliance and the Florida Solar Energy Center.[5] As part of the analysis for the 2011 refrigerators final rule, DOE also introduced "experience curves" into forecasts of product prices, in recognition that an assumption of constant prices over time is conservative.[6] DOE now routinely includes experience curves in energy conservation standards analyses when available data supports their inclusion. As another example of how DOE's analysis has improved over time, while DOE historically used average energy (and water) prices in calculating operating cost savings, the Department now typically uses marginal prices, which "more accurately capture the incremental savings associated with a change in energy use from higher efficiency."[7]

EPCA already ensures that improved efficiency does not compromise performance. Recommendations 4-3 and 4-8 in the NASEM report encourage DOE to use consumer choice modeling to evaluate how consumers weigh efficiency against other features, and to assess real-world performance gaps—qualitatively or via *in situ* data collection. These recommendations appear to be based on an unfounded assumption that efficiency improvements routinely involve trade-offs in appliance performance. However, under EPCA, DOE is explicitly prohibited from setting a standard that results in the loss of performance characteristics or features that provide utility to the consumer (42 U.S.C. 6295(o)(4)).[8] DOE upholds this requirement by screening out technology options that impair product utility and ensuring that performance is preserved in evaluating Trial Standard Levels ("TSLs"). Recent rulemakings illustrate this in practice. For example, in the 2024 direct final rule for dishwashers, DOE screened out three

[3] Dep't of Energy, Technical Support Document: Energy Efficiency Standards for Consumer Products: Refrigerators, Refrigerator-Freezers, and Freezers, at 3-13 (July 1995), available at https://www.osti.gov/servlets/purl/90266 .
[4] Dep't of Energy, Technical Support Document: Energy Conservation Standards for Residential Refrigerators, Refrigerator-Freezers, and Freezers, at 2-8, 2-9 (Sept. 2011), available at https://www.regulations.gov/document/EERE-2008-BT-STD-0012-0060.
[5] 89 Fed. Reg. 3026, 3054 (January 17, 2024).
[6] 76 Fed. Reg. 9696, 9697-99 (February 22, 2011); 76 Fed. Reg. 57516, 57548-50 (September 15, 2011).
[7] 89 Fed. Reg. 19026, 19057 (March 15, 2024).
[8] EPCA also requires DOE, when determining the economic justification for a standard, to weigh any resulting loss of consumer utility that is insufficient to trigger the prohibition in 42 U.S.C. 6295(o)(4). 42 U.S.C. 6295(o)(2)(B)(i)(IV). However, in practice, DOE avoids this calculation by refusing to even consider design options that would lessen the utility or performance of covered products. See, e.g., 89 Fed. Reg. 104616, 104793 (Dec. 23, 2024) (refusing to consider design options that would lessen the utility or performance of walk-in coolers and freezers).

technology options[9] at least in part due to potential impacts on product utility.[10] In support of the 2024 direct final rule for clothes washers, DOE conducted extensive testing to evaluate any impacts of more stringent standards on performance characteristics and found that the adopted standards required no sacrifice in cycle duration, wash temperature, or cleaning performance, while more efficient models proved gentler on clothes.[11] Similarly, DOE found that the standards in the 2024 direct final rule for dishwashers would not negatively impact cleaning performance, drying performance, or cycle time,[12] while the standards in the 2024 direct final rule for clothes dryers would not necessitate an increase in cycle time.[13]

DOE's test procedures further support the statutory requirement to protect product utility by ensuring that test cycles are representative of actual consumer use. Since a cycle that fails to clean or dry adequately, for example, could result in consumers re-running the appliance or choosing a less efficient setting, DOE ensures that energy and water use are measured on cycles that deliver the performance consumers expect. For example, the updated clothes dryer test procedure (Appendix D2) requires that models meet a threshold for "final moisture content" in order to be certified as compliant, ensuring that compliant dryers adequately dry clothes. Similarly, the updated dishwasher test procedure (Appendix C2) requires that models meet a minimum "cleaning index" threshold at each of the soil loads for a test cycle to be considered valid, ensuring that compliant dishwashers are adequately cleaning the dishes.

In fact, efficiency gains are often accompanied by improvements in product utility. For example, a report by Taylor *et al*. showed that appliance performance, as tested by Consumer Reports, generally improved across multiple product categories even while being subject to increasingly stringent energy and water efficiency standards.[14] Similarly, Consumer Reports has found that dishwasher cleaning performance improved even as water and energy use dropped significantly over recent decades.[15] Contemporary Consumer Reports testing shows that ENERGY STAR top-loading washers are nearly three times as likely as non-qualifying models to earn top performance ratings.[16]

Finally, the NASEM committee acknowledged that obtaining sufficient data for a discrete choice model would be challenging as both the scope and timeliness of government surveys (e.g., RECS and the Commercial Buildings Energy Consumption Survey ["CBECS"]) and private sources of information (e.g., Nielsen) limit their usefulness for this type of modeling.[17] Given DOE's existing safeguards and the lack

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[9] Supercritical carbon dioxide washing, ultrasonic washing, and water re-use system.

[10] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Dishwashers, at 4-2 (Apr. 2024), available at https://www.regulations.gov/document/EERE-2019-BT-STD-0039-0061.

[11] Dep't of Energy, Clothes Washer Performance Characteristics Test Report, at 15-32, available at www.regulations.gov/document/EERE-2017-BT-STD-0014-0059.

[12] 89 Fed. Reg. 31398, 31465-67 (April 24, 2024).

[13] 89 Fed. Reg. 18164, 18226 (March 12, 2024).

[14] M. Taylor *et al*., Confronting Regulatory Cost and Quality Expectations: An Exploration of Technical Change in Minimum Efficiency Performance Standards, at 46-51, Lawrence Berkeley National Laboratory, LBNL Report #: LBNL-1000576, https://escholarship.org/uc/item/7cx273kd.

[15] advocacy.consumerreports.org/press_release/consumer-reports-new-dishwasher-standards-will-help-consumers-save-money-on-energy-bills-while-ensuring-shoppers-have-good-choices-that-perform-well/.

[16] See https://www.consumerreports.org/appliances/washing-machines/top-load-agitator-washer/c32002/; https://www.consumerreports.org/appliances/washing-machines/top-load-he-washer/c37107/. As of 8/27/26, 16 of 19 ENERGY STAR top-loading washers rated by Consumer Reports received a washing performance score of 4 or 5 (out of 5), while 15 of 51 non-ENERGY STAR top-loading washers received such scores.

[17] NASEM Report, at 61, https://www.nationalacademies.org/projects/DEPS-BICE-19-02/publication/25992.

of empirical evidence for performance trade-offs, developing a model to quantify how consumers value performance trade-offs is both unnecessary and unworkable.

The recommendations positioning market failure as a prerequisite for economic justification are inconsistent with EPCA, mischaracterize the energy efficiency gap, and carry damaging practical implications. Recommendations 2-2 and 4-13 suggest that DOE should prove concrete market failures or irrational consumer behavior before determining that a standard is "economically justified." For commercial products specifically, Recommendation 4-13 goes even further, asserting that DOE should presume market actors behave rationally "unless DOE can provide evidence or argument to the contrary"—effectively requiring DOE to prove why the market hasn't already solved the problem, rather than simply demonstrating that a standard would produce net economic benefits. These recommendations are deeply problematic for three reasons.

First, EPCA already specifies what "economically justified" means, and Congress did not include a market-failure finding among the criteria. The statute directs DOE to weigh seven factors—including the economic impact on manufacturers and consumers, operating cost savings relative to any increase in purchase price, total energy savings, and any lessening of utility or performance—to determine whether the benefits of a standard exceed its burdens.[18] Establishing a mandatory market failure test—as suggested in Recommendations 2-2 and 4-13—imposes a requirement that Congress never intended.[19] On the contrary, the evolution of EPCA from its initial focus on labeling to encompass mandatory standards for residential and then commercial products reflects Congress's deepening frustration with the market's failure to accomplish EPCA's goal of steadily improving the efficiency of these products.[20] Moreover Recommendations 2-2 and 4-13 appear to conflate generic executive guidance with DOE's binding statutory mandate under EPCA; Executive Order 12866 and OMB Circular A-4 operate within the executive branch's own review process but do not supersede the statutory framework Congress established under EPCA.

Second, these recommendations appear to mischaracterize how the energy efficiency gap operates. The literature on energy economics widely documents the "efficiency gap"—the persistent under-investment in technologies that pay for themselves in energy savings—as an established empirical reality.[21] However, researchers emphasize that the gap is driven by a complex, overlapping set of factors, including structural market failures (such as split incentives between landlords and tenants and information asymmetries), behavioral dynamics, and measurement or modeling errors. In fact, when DOE has had to justify assumptions underlying a standard, it identified multiple, overlapping factors rather than a single cause. In its supplemental response to comments on commercial packaged boilers following a D.C. Circuit remand, DOE did not identify a single market failure driving underinvestment in

[18] 42 U.S.C. § 6295(o)(2)(B)(i).

[19] Congress acknowledged the possibility that in some circumstances energy efficiency labels alone could lead to an optimal allocation of energy efficient appliances. For example, under 42 U.S.C. § 6295(l)(1)(D), DOE may prescribe standards for additional covered products only if DOE determines that "the application of [an energy efficiency] labeling rule . . . is not likely to be sufficient to induce manufacturers to produce, and consumers and other persons to purchase, covered products of such type (or class) which achieve the maximum energy efficiency which is technologically feasible and economically justified." However, Congress chose not to extend this inquiry to other rulemakings establishing standards, or to DOE's obligation to update standards under 42 U.S.C. § 6295(m).

[20] See *NRDC v. Abraham*, 355 F.3d 179, 184-187 (2d Cir. 2004) (discussing the evolution of EPCA's energy conservation approach).

[21] T.D. Gerarden *et al.*, Journal of Economic Literature, 2017, Vol. 55, No. 4, pp. 1486-1525. https://pubs.aeaweb.org/doi/pdfplus/10.1257/jel.20161360.

efficient boilers, but instead pointed to a cluster of overlapping explanations.[22] Recommendations 2-2 and 4-13 recommend that DOE isolate and affirmatively prove a specific market failure or consumer "irrationality" as a necessary precondition for setting standards—effectively calling for a specific explanation to a phenomenon the literature treats as multi-causal and difficult to decompose in practice.

Finally, these recommendations would impose real practical harms on DOE's rulemaking process. As discussed above, pinpointing a specific market failure or instance of consumer irrationality is empirically difficult to establish with confidence and, even where theoretically possible, is a time-consuming and resource-intensive analytical exercise. When the D.C. Circuit required DOE to better explain why it randomly assigned commercial boiler efficiencies to buildings rather than basing that assignment on payback period, the Department's response involved compiling an extensive academic literature review and searching out multiple existing third-party datasets—government building records, municipal permit data, and industry studies. DOE already has a long history of missing statutory deadlines for setting standards, and imposing this evidentiary burden for all rulemakings would only compound that problem.

DOE should preserve the clear distinction between the Regulatory Impact Analysis ("RIA") and its statutory decision-making process under EPCA. Recommendation 2-1 proposes reorganizing DOE's analytical structure by placing the RIA at the center of the rulemaking analysis and relegating core technical evaluations of potential standards to supporting appendices. In practice, this approach would demote the analyses DOE relies on to determine whether a standard is technologically feasible and economically justified—the lifecycle cost ("LCC") analysis, national impact analysis ("NIA"), and manufacturer impact analysis ("MIA")—to supporting material.

This recommended restructuring is particularly concerning because it appears to frame federal efficiency standards as one option among several, alongside non-regulatory alternatives like labeling or utility rebate programs. DOE has historically maintained a clear boundary between Executive Order review frameworks, where the RIA is grounded in OMB Circular A-4 guidance, and its primary statutory mandate under EPCA. For example, in the 2024 final rule for cooking products, DOE stated that "notwithstanding the requirements of E.O. 12866, as discussed, DOE is required by EPCA to establish or amend standards for a covered product that are designed to achieve the maximum improvement in energy efficiency, which the Secretary determines is technologically feasible and economically justified."[23] EPCA contains no requirement that DOE weigh standards against non-regulatory alternatives. The RIA should therefore remain a secondary evaluation published alongside the rule, not the central framework guiding the standards rulemaking process.

Retrospective analysis of past standards is valuable but must not be a prerequisite for future rulemakings. Recommendations 4-1 and 4-17 state that DOE should put greater weight on *ex post* analysis to improve forward-looking outcomes, including using market-based evidence of markups to project a more realistic range of likely price effects of a standard. In the NASEM report, the committee describes the value of *ex post* analysis, particularly regarding equipment costs; they cite empirical evidence that projected price increases from amended standards often did not materialize and reason that if standards can lead to lower prices, more stringent standards might be justified.[24] A LBNL study, for example, found that historical efficiency gains following standards produced smaller price increases than

[22] 87 Fed. Reg. 23421, 23423-27 (April 20, 2022).
[23] 89 Fed. Reg. 11434, 11503 (February 14, 2024).
[24] NASEM Report, at 55-57, https://www.nationalacademies.org/projects/DEPS-BICE-19-02/publication/25992.

DOE's own forecasts predicted, an effect attributed to innovation, learning curves, and market adjustments such as lower markups and economies of scale.[25]

However, the NASEM committee's discussion of this evidence illustrates why translating observed price changes into improved rulemaking analysis is not straightforward. In the case of price declines for clothes washers, the committee reasons that "learning-by-doing"—where, as cumulative production grows, the manufacturer gains more experience in making the product and finds ways to lower production costs—plays a role but cannot account for the entire observed price decline.[26] Other possible explanations include a reduction in market power that altered manufacturers' strategic pricing and product differentiation, as well as standards correcting for manufacturers' prior underinvestment in efficiency-related research and development. Even here, researchers have not fully sorted out which explanation matters most for a single, well-studied product category.

Retrospective analysis also takes significant time and analytical resources. DOE operates under statutory deadlines to amend standards, and *ex post* analysis competes directly with new rulemakings for that same time and analytical capacity. Thus, while retrospective analysis is useful in informing DOE's approach, it should not be treated as a prerequisite or as more important than completing rulemakings on schedule.

DOE could reconsider the markup scenario used in the LCC analysis. As discussed above, retrospective analysis suggests that DOE's price forecasts often overestimate the increased costs associated with standards. Yet DOE's LCC analysis typically uses the higher of the two markups calculated in its MIA—typically the "preservation of gross margin" markup. DOE could consider whether using the lower markup (typically the "preservation of operating profit"), or the average of the two, would better align the LCC analysis with the available market-based evidence.

DOE's current analytic approach already incorporates significant variability. DOE further examines the bounds of potential impacts via sensitivity analysis. DOE has requested comment on which critical inputs DOE should prioritize in incorporating variability. DOE has also requested comment on how DOE should propagate probabilistic assessment throughout the analysis.[27]

DOE's current analytic methodology already incorporates variability across nearly all of the inputs to the life-cycle cost (LCC) analysis. For example, in the analysis for the 2024 dishwashers direct final rule, DOE included distributions for the number of dishwasher cycles per year per household, derived from the RECS 2020 data, and the product lifetime, described by a survival function. DOE also incorporated variability in markups, reflecting different distribution channels; sales tax, reflecting variation by state; electricity, gas, and oil prices, including reflecting regional and seasonal variation; water/wastewater prices, reflecting variation by region and system type (urban or rural and public or private); and discount rates, reflecting differences among income groups.[28]

DOE included even greater analytical complexity in the analysis for the 2024 final rule for residential furnaces, reflecting the additional variability associated with furnace installations. For example, DOE

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[25] R.D. Van Buskirk *et. al.* Environmental Research Letters, 2014, Vol. 9, No. 11, 113010. iopscience.iop.org/article/10.1088/1748-9326/9/11/114010.

[26] NASEM Report, at 56, https://www.nationalacademies.org/projects/DEPS-BICE-19-02/publication/25992.

[27] 91 Fed. Reg. at 41582.

[28] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Dishwashers (Apr. 2024), at 8-5, available at https://www.regulations.gov/document/EERE-2019-BT-STD-0039-0061.

included installation cost distributions since factors like the location of the furnace and venting requirements can significantly impact the installation costs associated with higher efficiency levels.[29]

For inputs for which DOE does not incorporate variability, typically either there is no basis for incorporating variability, or incorporating variability would not influence the results. For example, in the case of dishwashers, the manufacturer production cost ("MPC") estimates are single-point values at each efficiency level, which reflect DOE's teardown analysis and detailed bill of materials ("BOM"). Based on manufacturer input, DOE determined that installation cost would not vary with efficiency level; there was therefore no need to incorporate variability in installation cost.[30]

The variability in inputs to the LCC analysis is reflected in the output of the Monte Carlo analysis. Using a Monte Carlo analysis allows DOE to present not just average impacts, but also the distributions of impacts.

In addition to incorporating significant variability in LCC inputs, in most rulemakings DOE also conducts a sensitivity analysis to evaluate impacts using alternative economic growth scenarios. DOE typically considers the high and low economic growth scenarios from the Energy Information Administration's Annual Energy Outlook, which have implications for energy prices, in addition to the reference case. For furnaces, DOE also conducted several sensitivity analyses to evaluate how the average LCC savings and distributions of impacts would vary with different input assumptions, including sensitivity analyses evaluating alternate lifetime estimates, product price forecasts, distribution-channel markups, product switching scenarios, venting scenarios, and sizing scenarios.[31] For the analysis for the 2024 final rule for general service lamps ("GSLs"), DOE evaluated a scenario with a higher penetration of lighting controls in addition to the reference case.[32] DOE's current approach to the LCC analysis and sensitivity analysis within the LCC framework appropriately considers sources of variability, and DOE already has the flexibility to add additional complexity when necessary. We therefore do not believe that the methodology warrants any further additions that would make DOE's already lengthy process even longer.

For the NIA and MIA analyses, the scenario analysis approach allows DOE to examine the range of possible outcomes associated with the uncertainty of the input parameters. While variability typically has an estimated probability distribution that can be handled through Monte Carlo sampling, uncertainty stems from many sources and may not be well understood. DOE explains that in scenario analysis, "model inputs are modified to take different values, and models are re-analyzed, in a set of different model scenarios. Because only selected inputs are changed in each scenario, the variability in the results for each scenario helps to quantify the impact of uncertainty in the input parameters."[33]

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[29] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Consumer Furnaces (Dec. 2023), at 8-6 and 8C-1 to 8C-27, available at https://www.regulations.gov/document/EERE-2014-BT-STD-0031-4100.

[30] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Dishwashers (Apr. 2024), at 8-12, available at https://www.regulations.gov/document/EERE-2019-BT-STD-0039-0061.

[31] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Consumer Furnaces (Dec. 2023), at Appendices 8C, 8D, 8G, 8J, 8K, 8L, 8M, 8N, available at https://www.regulations.gov/document/EERE-2014-BT-STD-0031-4100.

[32] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: General Service Lamps (Apr. 2024), at 7B-4, available at https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0201.

[33] *Id*. at 7B-2.

For the main NIA and MIA results, DOE typically assumes single-point values for the inputs (e.g. shipments, shipment-weighted energy and/or water consumption). However, the outputs of the scenario analysis allow DOE to assess whether the impact of an adopted standard level is robust across a range of conditions. Specifically, for each rulemaking, DOE presents the national consumer net present value (NPV) using both 3% and 7% discount rates. In certain analyses, DOE bounds the consumer NPV with different product price forecasts (e.g., high price decline and constant price over the analysis period).[34] In the GSLs analysis, DOE also bounded the NPV (at 3% and 7% discount rates) using low and high benefits scenarios as well as a low linear lamp attrition scenario.[35] DOE also commonly conducts scenario analysis to evaluate industry impacts (i.e. industry net present value [INPV]). For example, DOE typically evaluates two manufacturer markup scenarios—a preservation of gross margin scenario (reflecting an upper bound of industry profitability) and a preservation of operating profit scenario (reflecting a lower bound of industry profitability)—to reflect uncertainty in the impacts on profitability in response to a standard.[36] DOE sometimes adjusts the markup scenarios to reflect particular market dynamics. For example, for the 2024 dishwashers direct final rule analysis, DOE evaluated a tiered markup scenario to estimate the lower bound of profitability that reflected different markups for different "tiers" of products (e.g., different ENERGY STAR levels).[37] The necessity of constraining the uncertainty of inputs relevant to the NIA and MIA differently is not clear, and we therefore believe that DOE should continue to follow this basic approach.

DOE appropriately presents the range of outcomes of household and business impacts from updated standards. DOE has requested comment on how the Department should present results taking into account the variabilities and uncertainties of key inputs.[38] We believe that DOE should continue to present results in the way that the Department typically does, including presenting the central estimates (e.g., average LCC savings and fraction of affected consumers with net costs), which are core to the decision making process, while also presenting the range/distributions/sensitivities as supporting context.

In presenting consumer impacts as part of the LCC analysis, DOE publishes (for each product class, and by product capacity, as necessary) average values at each efficiency level ("EL") including installed cost, first-year and lifetime operating costs, LCC savings, and simple payback period as well as the percent of consumers with a net cost. DOE also typically presents distributions of LCC savings for the households in the sample and box-and-whisker plots showing the median and range of LCC savings. In addition, DOE typically presents separate results for consumer subgroups that may be disproportionally affected by a standard (e.g. senior-only households, low-income households, or well-water households). For national

[34] *See, e.g.*, Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Dishwashers (Apr. 2024), at Appendix 10C, available at https://www.regulations.gov/document/EERE-2019-BT-STD-0039-0061.

[35] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: General Service Lamps (Apr. 2024), at 9D-1, available at https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0201. The low benefits scenario has a lower energy price projection relative to the AEO reference case and a higher price learning rate. The high benefits scenario has a higher energy price projection relative to the AEO reference case and a lower price learning rate. The low linear lamp attrition rate scenario reflects a larger market share of linear lamp shipments throughout the analysis period compared to the reference case.

[36] See, e.g., *Id.* at Chapter 11.

[37] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Dishwashers (Apr. 2024), at 12-18, available at https://www.regulations.gov/document/EERE-2019-BT-STD-0039-0061.

[38] 91 Fed. Reg. at 41582

impacts and manufacturer impacts, DOE presents the results of the scenario analyses described above to evaluate the bounds.

Overall, we believe that DOE's current approach to presenting the range of outcomes, which reflects uncertainty and variability of key inputs, is appropriate to support decision making in determining an updated standard level.

DOE should continue its current approach of reflecting technology evolution in the market when there is a basis to do so. DOE has requested comment on how the Department can reflect technology evolution that would have occurred absent efficiency standards and whether the modeling of TSLs and ELs reflect technology adoption caused by the standards.[39] DOE has also solicited comment on how the Department should meet the NASEM report recommendations suggesting that DOE should consider early technologies.[40]

Where DOE has information to estimate efficiency trends in the market in the no-new-standards case and standards cases, DOE incorporates those trends in the NIA. DOE typically determines future trends based on historical trends in efficiency and assumptions about factors, such as ENERGY STAR market penetration, that would impact the efficiency distribution over time. For example, in the analysis for the 2024 direct final rule for residential clothes washers, DOE estimated annual efficiency improvements of 0.4% and 0.1% for top-loading standard-size and front-loading clothes washers, respectively, in the no-new-standards case based on assumptions about ENERGY STAR and efficiency trends of the models certified to the DOE Compliance Certification Database ("CCD").[41] In the analysis for the 2024 final rule for consumer water heaters, DOE estimated an annual efficiency improvement in the no-new-standards case by extrapolating historical trends.[42] Specifically, DOE presumed an increase in the market share of heat pump water heaters (as a percentage of all electric storage water heaters) from about 12% in 2030 to about 25% in 2059 (compared to a heat pump market share of about 4% at the time of the rulemaking).[43] And in the analysis for the 2023 final rule for commercial water heaters, DOE used industry shipment data to estimate that 75% of purchasers of gas-fired storage water heaters and 85% of purchasers of gas-fired instantaneous water heaters would purchase condensing-level models by 2055 in the no-new-standards case, representing a significant increase compared to the market share at condensing levels at the time of the rulemaking, about 50%.[44]

In other cases, where there is no basis for DOE to incorporate growth in the no-new standards case, DOE typically assumes a fixed efficiency distribution throughout the analysis period. We think that it is appropriate for DOE to continue the approach of incorporating efficiency trends in the no-new-standards case when there is an informed basis to do so. Introducing complexity when there is no evidence to support such complexity would likely introduce uncertainty into the analysis.

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[39] 91 Fed. Reg. at 41583.
[40] *Id.*
[41] 89 Fed. Reg. 19026, 19065 (March 15, 2024).
[42] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Consumer Water Heaters (Apr. 2024), at 10-5, available at https://www.regulations.gov/document/EERE-2017-BT-STD-0019-1416.
[43] *Id.*at 10-6; ENERGY STAR Unit Shipment and Market Penetration Report: Calendar Year 2023 Summary, available at https://www.energystar.gov/sites/default/files/2024-11/2023%20USD%20Summary%20Report%20Revised%20111224_508_2.pdf.
[44] 88 Fed. Reg. 69686, 69770 (October 6, 2023); ENERGY STAR Unit Shipment and Market Penetration Report: Calendar Year 2023 Summary, available at https://www.energystar.gov/sites/default/files/2024-11/2023%20USD%20Summary%20Report%20Revised%20111224_508_2.pdf.

The question of whether DOE's modeling of TSLs and ELs reflects technology adoption due to standards is seen readily in DOE's engineering analysis. In the design-option approach,[45] the ELs are defined based on specific components or technology options that the Department anticipates would be incorporated in equipment meeting each EL. For example, in the analysis for the 2024 direct final rule for refrigerators, DOE assumed that a refrigerator with a side-mounted freezer (PC7) meeting the adopted standard level (EL3) would incorporate brushless-DC evaporator fan motor and the highest-EER variable-speed compressor.[46] And in the analysis for the 2024 final rule for consumer water heaters, DOE assumed that gas-fired storage water heaters (20≤V≤55 gallons, where V is effective storage volume) meeting the adopted standard level (EL2) would use either gas-actuated, non-powered, flue dampers, or electrically powered flue dampers and electronic ignition.[47]

Regarding the NASEM committee's recommendation that DOE should consider early technologies, we note that DOE already considers early technologies in its screening of design options. When DOE screens out a technology in a previous rulemaking, the Department typically re-screens it as a potential design option in the subsequent standards rulemaking. We think it is appropriate for the Department to continue with this practice.

DOE's analysis already captures uncertainty in product energy use, and it would be unnecessary and impractical to attempt to incorporate uncertainty in the efficiency ratings. Recommendation 3-3 suggests that DOE should characterize the uncertainty on the efficiency rating in its analyses and that, rather than providing a "point" estimate of efficiency, DOE should provide a range that reflects the variability in energy consumption under different uses and consumer behavior. Recommendation 4-8 suggests that DOE should capture *in situ* energy performance data.

DOE currently captures ranges in energy (and water) use in the LCC analysis. However, there is no need to capture uncertainty in the efficiency level itself, and any attempt to do so would be impractical. DOE ultimately sets standards at a single efficiency level (i.e. levels are not represented by ranges). The DOE test procedures are carefully developed to measure the efficiency (or energy/water use) of equipment during a representative use cycle. Efficiency as measured by the test procedure is ultimately a single-point value that manufacturers use to certify their products.[48] Given this framework, we do not see a purpose in introducing efficiency level ranges to the analysis.

Furthermore, DOE's analysis already accounts for different use patterns across equipment operation. For example, in the energy and water use analysis for the 2024 direct final rule for dishwashers, DOE's distribution of cycles per year reflected more than an order of magnitude difference between the lowest

[45] DOE also employs the efficiency-level approach to setting potential ELs, in which DOE defines ELs based on clusters of products on the market at similar efficiency. DOE may also use the efficiency-level approach in tandem with a design option approach to introduce gap fill ELs.

[46] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Refrigerators, Refrigerator-Freezers, and Freezers (Dec. 2023), at 5-17, available at https://www.regulations.gov/document/EERE-2017-BT-STD-0003-0108.

[47] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Consumer Water Heaters (Apr. 2024), at 5-12, available at https://www.regulations.gov/document/EERE-2017-BT-STD-0019-1416.

[48] Often DOE test procedures involve multiple measurements of performance or energy usage at different conditions that are ultimately combined to represent the efficiency or energy usage of a representative use cycle of an appliance. For example, for air cleaners, the efficiency metric is PM2.5 CADR/W where PM2.5 is a geometric average of the smoke clean air delivery rate and the dust clean air delivery rate. 10 C.F.R. part 430, subpart B, appendix FF.

and highest usage.[49] As another example, DOE's analysis for the 2023 final rule for furnaces captured the range of energy use due to different climate zones and building characteristics (which influence heating load hours) and whether the furnace was a primary or secondary heating source. For non-weatherized gas furnaces in the residential sector, for example, the adjusted heating load ranged from 0.6 MMBtu/year to 318 MMBtu/year. (DOE also presented separate ranges for the "North" and "Rest of Country.") [50]

In addition, DOE often uses *in situ* data to inform the energy use analysis. For example, in the analysis for the 2024 direct final rule for refrigerators DOE used field-metered data to derive UAFs that are the ratio of the metered energy use to the energy use measured by the DOE test procedure.[51] In the 2024 water heater final rule analysis, DOE considered factors such as tank temperature set point to determine the hot water use, which DOE found were similar to recent field data and hot water draw models.[52] And in the 2024 cooking products direct final rule analysis, DOE used field-metered data from California, New York, and Texas households to calculate a weighted-average national energy use.[53]

While additional field data is always useful, notably, the NASEM committee confirmed the difficulty in obtaining this type of data, stating that "a sufficiently large number of units of the same product/appliance needs to be installed and metered to characterize the range of performance encountered in deployment. This may be costly and impose unworkable delays when an accurate performance estimate for an appliance population is needed." Therefore, any time-consuming undertaking to conduct additional field studies should not be treated as a prerequisite to conducting rulemakings.

DOE's existing approach to supply-side economic evaluation is well-grounded, and Recommendation 4-14 appears inconsistent with EPCA's division of statutory responsibilities. Recommendation 4-14 urges DOE to give greater attention to supply-side market failures, including how standards might impact technology diffusion, price discrimination, and collusion risk. First, we note that standards play an important role in accelerating technology diffusion while mitigating unfair competition, addressing one of the NASEM committee's central concerns. As Porter and van der Linde emphasize,[54] well-designed standards level the playing field by preventing laggard firms from opportunistically gathering market share through underinvestment in technology improvements. By setting a uniform baseline, standards guarantee a predictable, large-scale market for efficient products; this market certainty mitigates supply-side investment risks, giving manufacturers the confidence to retool factories and optimize supply

[49] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Dishwashers (Apr. 2024), at 7-7, available at https://www.regulations.gov/document/EERE-2019-BT-STD-0039-0061. The distribution of cycles per year ranged from 52 to more than 1,000.

[50] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Consumer Furnaces (Dec. 2023), at Chapter 7, available at https://www.regulations.gov/document/EERE-2014-BT-STD-0031-4100.

[51] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Refrigerators, Refrigerator-Freezers, and Freezers (Dec. 2023), at 7-1 to 7-9, available at https://www.regulations.gov/document/EERE-2017-BT-STD-0003-0108.

[52] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Consumer Water Heaters (Apr. 2024), at 7-10, available at https://www.regulations.gov/document/EERE-2017-BT-STD-0019-1416.

[53] 89 Fed. Reg. at 11472.

[54] M. E. Porter & C. van der Linde, Journal of Economic Perspectives, 1995, Vol. 9, No. 4, pp. 97-118. https://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.9.4.97.

chains—driving down unit costs rapidly through scale. The net impact is a continuous cycle of innovation and cost reduction across the market spurred by standards.

More fundamentally, Recommendation 4-14 appears to overlook the explicit statutory framework Congress established for evaluating supply-side impacts. Under EPCA, the responsibility for assessing anti-competitive risks is specifically assigned to the Department of Justice ("DOJ"), not DOE. Following the publication of a Notice of Proposed Rulemaking ("NOPR"), the DOJ Antitrust Division solicits market input and the Attorney General provides a formal written determination on whether the proposed standard threatens competition—a statutory requirement DOE must weigh in its final rule.[55] Thus, expecting DOE to expand its analytical framework into complex antitrust modeling for collusion or price discrimination would needlessly duplicate the DOJ's designated statutory function and exceed DOE's core mandate under EPCA.

DOE's MIA is informed by significant research and industry input, and the government regulatory impact model ("**GRIM") appropriately characterizes key financial inputs.** DOE has requested comment on whether additional data collection is necessary to support any changes in the manufacturing analysis and whether a re-examination of modeling cost impacts should be undertaken.[56] The MIA, which includes the GRIM, characterizes the likely range of financial impacts on manufacturers (including small businesses) due to a standard. The GRIM model was originally developed by and provided to DOE by industry associations,[57] and the MIA is informed by thorough data collection and industry input.

DOE uses best-available data sources to develop an initial industry profile (e.g. previous DOE rulemakings, industry reports, trade journals, and U.S. Securities and Exchange Commission form 10-K filings), and the information is refined by information gathered during detailed manufacturer interviews. For example, for the analysis for the 2024 direct final rule for dishwashers, DOE interviewed manufacturers that accounted for 90% of product shipments;[58] for the analysis for the 2024 direct final rule for clothes washers, DOE interviewed manufacturers that accounted for 82% of product shipments.[59] These interviews provide an opportunity for manufacturers to provide detailed feedback to the Department on items such as broad concerns related to the rulemaking; product classes; efficiency levels; technology options; cost-efficiency curves; company organization and market share; conversion costs (capital conversion, product conversion, stranded assets); key financial parameters (e.g. tax rate, working capital, research and development, discount rate, depreciation, capital expenditures); markups, distribution channels, and profitability; cumulative regulatory burden; manufacturing capacity, foreign competition, and outsourcing; industry consolidation; impacts on small manufacturers; repair and maintenance costs; and any proposed test procedure changes.[60]

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[55] See 42 U.S.C. §§ 6295(o)(2)(B)(i)(V) & (o)(2)(B)(ii).

[56] 91 Fed. Reg. at 41585.

[57] Dep't of Energy, Energy Conservation Standards Rulemaking Peer Review Report (Feb. 2007), at 42, available at https://www.energy.gov/sites/prod/files/2013/12/f5/peer_review_report021507.pdf.

[58] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Dishwashers (Apr. 2024), at 12-3, available at https://www.regulations.gov/document/EERE-2019-BT-STD-0039-0061.

[59] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Clothes Washers (Mar. 2024), at 12-3, available at https://www.regulations.gov/document/EERE-2017-BT-STD-0014-0510.

[60] Dep't of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Dishwashers (Apr. 2024), at 12-3 and Appendix 12A, available at https://www.regulations.gov/document/EERE-2019-BT-STD-0039-0061.

We encourage DOE to continue to engage industry through these interviews to refine the model; however, we do not believe that substantial changes to the GRIM or overall MIA are necessary.

DOE's analysis appropriately focuses on maximizing energy efficiency improvements through energy conservation standards rulemakings. DOE has requested comment on how best to reflect ongoing changes in the electricity generation system.[61] The NASEM report suggests that DOE should include demand response readiness as a factor in cost-efficiency calculations and that DOE should economically value features that save consumers money and enable appliances to contribute to grid reliability.[62]

While the beneficial impact of demand-flexible appliances and equipment on the electrical grid is potentially significant, we have two major interrelated areas of concern regarding the incorporation of demand response readiness as a factor in energy conservation standards rulemakings. First, EPCA directs DOE to maximize energy efficiency improvement to the extent technologically feasible and economically justified;[63] it is not clear that DOE has the authority to incorporate the impacts of demand response into its assessment of these criteria. But even if EPCA does not clearly foreclose the integration of demand response readiness and energy conservation standards, awaiting guidance from Congress would be the prudent course given that DOE's evaluation of the costs and benefits of demand response would represent a significant analytical departure from the typical energy conservation standard rulemaking. We note that in 2022, bipartisan legislation H.R. 7962 was introduced to grant DOE the authority to consider "demand response capabilities" for residential electric storage water heaters,[64] but that bill did not progress beyond initial introduction.

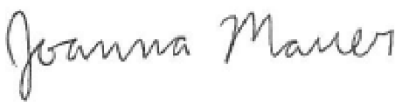
Second, we view including demand response readiness in DOE test procedures as impractical. Demand response readiness allows for shifting electric loads from peak periods to off-peak periods, for example. However, that load shifting does not necessarily reduce the total energy use of a product (and, in some cases, can modestly increase energy use). EPCA requires that DOE test procedures "shall be reasonably designed to produce test results which measure energy efficiency, energy use . . . during a representative average use cycle or period of use."[65] Since incorporating demand response readiness in a test procedure could *decrease* measured efficiency (or increase measured energy use), such an approach would seem to conflict with the goal of capturing the value of the technology.

Instead, we believe that any efforts to encourage wider adoption of demand response readiness should consider potential separate requirements for demand response capabilities, similar to the approach outlined in H.R. 7962, which would authorize DOE "to require that electric storage water heaters possess demand response capabilities" (i.e., as a separate requirement).

Thank you for considering these comments.

Sincerely,

[61] 91 Fed. Reg. at 41587
[62] *Id.*
[63] 42 U.S.C. § 6295(p)(1).
[64] H.R. 7962 (2022), A Bill To Amend the Energy Policy and Conservation Act to Modify the Definition of Water Heater under Energy Conservation Standards, and for Other Purposes, available at https://www.congress.gov/117/meeting/house/114932/documents/BILLS-117HR7962ih.pdf.
[65] 42 U.S.C. § 6293(b)(3).



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