March 24, 2011

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
Mailstop EE-2J
1000 Independence Avenue, SW
Washington, DC 20585-0121

RE: Docket Number EE-2008-BT-STD-0012: Equipment Price Forecasting in Energy Conservation Standards Analysis

Dear Ms. Edwards:

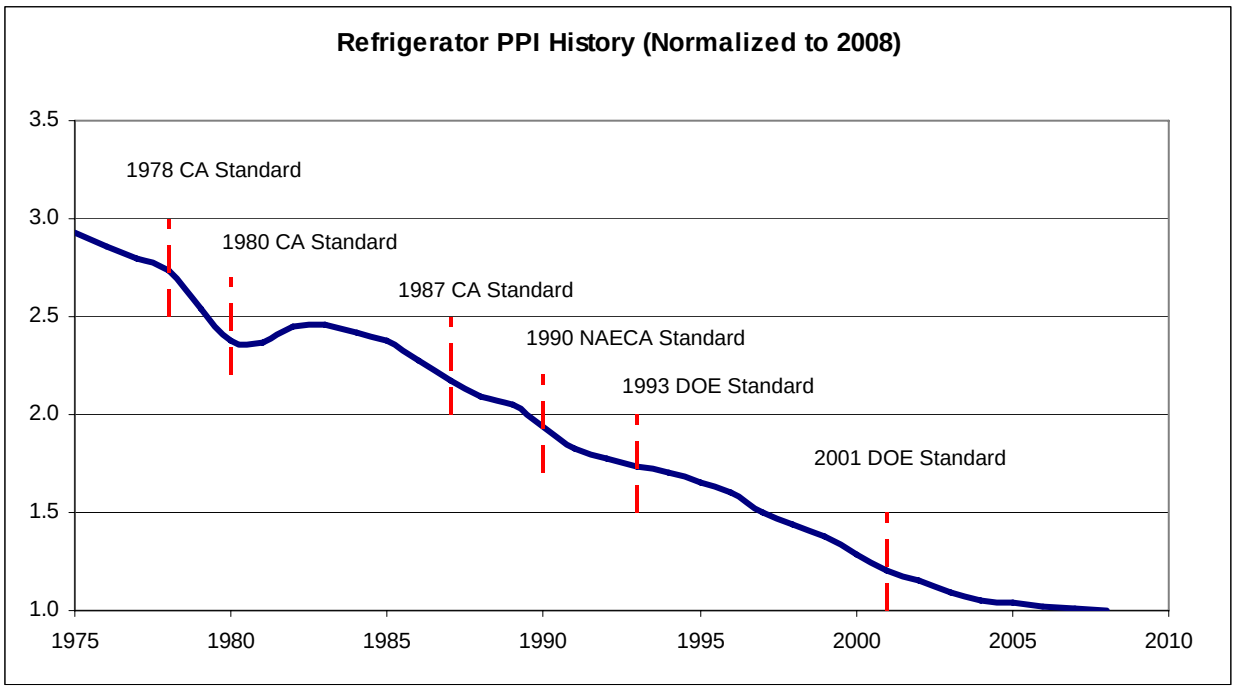
This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP) in response to the Department of Energy (DOE) request for comments on the notice of data availability (NODA) regarding equipment price forecasting in energy conservation standards analysis. 76 Fed. Reg. 9696 (February 22, 2011). ASAP is a coalition group dedicated to advancing cost-effective energy efficiency standards for appliances and equipment. ASAP works at both the state and federal levels and is led by a Steering Committee with representatives from consumer groups, utilities, state government, environmental groups, and energy-efficiency groups. We appreciate the opportunity to provide input to the Department. We believe that the incorporation of "learning" or "experience" curves in the energy conservation standards rulemakings will help the DOE analyses better reflect real-world market dynamics and could lead to better decision-making and greater benefits to consumers and the nation.

Supplementing our comments is a report from Synapse Energy Economics, attached as Appendix A, which ASAP and the Natural Resources Defense Council (NRDC) engaged to assist in assessing DOE's data and methodology on incorporating learning and experience in product cost forecasts.

The incorporation of learning rates in the current refrigerator/freezer rulemaking and in future rulemakings for other products could lead to better decision-making. As DOE notes in the NODA, historical data show that the real cost of appliances and equipment tends to decrease over time. 76 Fed. Reg. at 9697. This observation suggests that the assumption in past DOE analyses that incremental costs of more efficient products remain constant in real terms may result in estimated incremental costs over time that are significantly higher than what would be seen in the real world. DOE is required to set standards at levels that achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. 42 U.S.C.§ 6295(o)(2)(A). If the analyses conducted by the Department as part of the appliance standards rulemakings consistently over-estimate incremental costs over time, it is not possible

for DOE to accurately determine whether a particular standard level is economically justified, and the benefits of more stringent standards will not be realized by the nation.

Standards have had no discernable effect on decreasing the trend of decreasing refrigerator prices over time – i.e., on learning. The graph below shows inflation-adjusted PPI data for refrigerators. Over the past 25 years during which three rounds of federal standards for refrigerators have gone into effect, reducing average electricity usage of refrigerators by about 60%, we have seen essentially a constant decline in inflation-adjusted PPI. This is strong evidence of the persistence of learning even after several rounds of standards.



The incorporation of learning rates would improve internal consistency across different aspects of the DOE analyses. A key input to the calculation of the life-cycle cost and net present value for a given standard level is the forecasted price of energy over the analysis period. DOE forecasts energy prices based on outputs from the National Energy Modeling System (NEMS). NEMS incorporates learning rates in various parts of the model, including in the Electricity Market Module, which applies learning factors that represent reductions in capital costs due to learning-by-doing, and in the Oil and Gas Supply Module, which assumes annual decreases in costs in response to technological progress.[1] The incorporation of learning rates in the estimation of incremental costs of more-efficient products over time would be consistent with the assumption of learning-by-doing for energy supply. Consistency between supply and demand sectors has been explored in the literature.[2]

[1] U.S. Energy Information Administration. *The National Energy Modeling System: An Overview*. http://www.eia.doe.gov/oiaf/aeo/overview/.

[2] Laitner, J.A. and A.H. Sanstad. 2004. Learning-by-doing on both the demand and the supply sides: implications for electric utility investments in a Heuristic model. International Journal of Energy Technology and Policy 2, 142-152.

The incorporation of learning rates would also align the analyses for energy conservation standards with the analyses for fuel economy and greenhouse gas standards for vehicles. The basic analyses to determine the cost-effectiveness of appliance standards and vehicle standards are similar—in both cases, a net present value analysis compares the present value of the incremental costs of the more-efficient product or vehicle to the present value of the energy savings (and other benefits). The rulemakings for fuel efficiency and greenhouse gas standards for vehicles incorporate learning rates. In the final rule for Corporate Average Fuel Economy (CAFE) and greenhouse gas standards for model years 2012-2016 jointly published by the National Highway Traffic Safety Administration (NHTSA) and the Environmental Protection Agency (EPA), both agencies employed volume-based and time-based learning effects. The Joint Technical Support Document notes that "both agencies believe that there are indeed many factors that cause costs to decrease over time."[3] NHTSA and EPA also applied volume-based and time-based learning effects in the proposed rulemaking for fuel efficiency and greenhouse gas standards for medium- and heavy-duty engines and vehicles.[4]

DOE should not assume no learning in cases where data are not available. If no learning rate is applied, the implicit assumption is that there will be no decline in incremental costs in real terms over the analysis period, which would contradict the observations of historical price declines over time for a wide range of products and technologies. At a minimum, DOE should run sensitivity analyses that incorporate learning in those cases where there is no historic data available.

We encourage DOE in the future to also analyze DOE estimates of initial incremental costs in past rulemakings compared to the price impacts of standards observed in the market. The incorporation of learning rates is an important step in better reflecting real-world market dynamics in the DOE analyses, and we support the application of this approach in the current refrigerator/freezer rulemaking as well as in future rulemakings for other products. However, engineering analyses tend to over-estimate the cost to improve efficiency,[5] which suggests that the DOE analyses may be over-estimating initial incremental costs as well as incremental costs over time. If the estimates of incremental costs in the year a standard goes into effect are higher than what is ultimately seen in the market, the life-cycle cost (LCC) analyses will underestimate the LCC savings from more-efficient products since the LCC is calculated as if each new purchase occurs in the year the standard takes effect.

DOE should weigh all seven factors as required by EPCA when determining whether the benefits of a proposed standard exceed its burdens. In addition to evaluating economic impacts on consumers and manufacturers, EPCA requires that DOE consider factors including total projected energy savings, the need for national energy conservation, and other factors the Secretary considers relevant in deciding whether a proposed standard is economically justified.

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[3] EPA and NHTSA. 2010. Joint Technical Support Document: Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. p. 3-17, 3-18. http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/Final_Joint_TSD.pdf.

[4] EPA and NHTSA. 2010. Draft Regulatory Impact Analysis: Proposed Rulemaking to Establish Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles. p. 2-8. http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/HD_FE_GHG_DRIA_101025.pdf.

[5] See, for example: Dale, L., C. Antinori, M. McNeil, J.E. McMahon and K.S. Fujita. 2009. Retrospective evaluation of appliance price trends. Energy Policy 37, 597-605.

42 U.S.C. 6295(o)(2)(B)(i). Additional benefits of appliance standards beyond energy savings and consumer savings include reductions in peak electricity demand, greenhouse gas emissions, and other air pollutants; job creation; and marginal reductions in energy prices. These additional benefits accrue not only to the users of the particular product subject to regulation but to the entire nation and should be seriously weighed in standards decision-making.

DOE should act expeditiously to publish a final rule for refrigerator/freezer standards. DOE was required by statute to publish a final rule for amended refrigerator/freezer standards by December 31, 2010. 42 U.S.C. 6295(b)(4). As of March 24, 2011 a final rule had yet to be published.[6] The standards proposed by DOE in the notice of proposed rulemaking (NOPR) published in September 2010 reflect a consensus agreement between manufacturers and efficiency, environmental, and consumer advocates. 75 Fed. Reg. 59470 (September 27, 2010). The refrigerator/freezer standards in the consensus agreement carefully balance considerations including energy savings, consumer benefits, and manufacturer impacts. The application of learning rates to the refrigerator/freezer analysis, which we believe is appropriate, should only reinforce that the standards in the consensus agreement meet the statutory criteria for amended energy conservation standards.

Standards can stimulate innovation and investment in U.S. appliance and equipment industries. The regulatory certainty of national appliance standards allows manufacturers to make strategic investment decisions. In contrast, a patchwork of state standards creates complexity for industry and hinders the ability of manufacturers to invest in innovation. We have seen many examples of innovation to meet new standards and to develop new premium products that exceed the minimum standards including the following:

- Lighting manufacturers have recently introduced high-efficiency halogen incandescent lamps to offer consumers the option of an incandescent light bulb that complies with the EISA standards for general service incandescent lamps.
- New technologies have been introduced and/or brought to scale to help meet and exceed new standards such as high-efficiency compressors and vacuum insulation panels for refrigerators.
- In 2006, the efficiency standard for central air conditioners and heat pumps was raised from 10 SEER to 13 SEER. Manufacturers have since introduced new premium products with efficiency ratings as high as 21 SEER.[7]
- Manufacturers are offering products that exceed the 2010 efficiency levels for commercial package air-cooled air conditioners. For example, the current federal standard for units ≥135,000 Btu/h and <240,000 Btu/h is 11.0 EER. Single-package units are available for sale with efficiency levels as high as 12.7 EER.[8]

[6] According to OMB's website, the refrigerator/freezer rule has been pending OMB review since December 8. http://www.reginfo.gov/public/jsp/EO/eoDashboard.jsp.
[7] See, for example, http://www.residential.carrier.com/products/acheatpumps/ac/index.shtml.
[8] AHRI Directory of Certified Product Performance. Unitary Large Equipment. http://www.ahridirectory.org/ahridirectory/pages/home.aspx.

- Manufacturers of fluorescent lamp ballasts, electric motors, and low-voltage dry-type distribution transformers offer "NEMA Premium" products that allow purchasers to easily identify high-performing products that exceed the minimum efficiency standards.[9]
- Manufacturers of residential clothes washers have innovated to dramatically reduce energy and water consumption while maintaining and even improving washing performance. All major manufacturers have introduced both top-loading and front-loading models that far exceed the minimum standards (1.26 MEF and 9.5 WF)—clothes washers are currently available with MEFs as high as 3.35 and WFs as low as 2.7,[10] and many of these high-efficiency models are offered at very competitive price points.[11]

Innovation by manufacturers to meet and exceed minimum efficiency standards provides a foundation for future standards by demonstrating the feasibility of more stringent standards, which ultimately yields additional benefits for consumers and the nation.

Standards can improve the competitiveness of U.S. products and companies in the global marketplace. If standards in the U.S. do not keep pace with standards in other countries, foreign manufacturers can gain market share in the U.S. by introducing innovative products spurred by standards in other countries. In contrast, U.S. standards can help maintain the competitiveness of U.S. manufacturers overseas by stimulating the production of new products that meet efficiency standards in other countries. In cases where domestic manufacturers already offer products that would meet higher standards while foreign manufacturers may not be capable of producing the higher-efficiency products, more stringent standards can give U.S. manufacturers a competitive advantage.

U.S. standards that exceed efficiency levels in other countries can yield additional global benefits. Other countries, especially in the developing world, often consider U.S. appliance standards when establishing their own standards. Initial U.S. standards that exceed efficiency levels in other countries can therefore yield additional global energy savings if the U.S. standards are subsequently adopted by other countries. U.S. standards that drive innovative products to the market can lead to the adoption of these products in other countries regardless of the minimum standards in these countries yielding additional global energy savings. Finally, U.S. energy-related CO_2 emissions represent about 20 percent of the world total,[12] and reductions in greenhouse gas emissions in the U.S. provide global benefits.

It is not clear that the theoretical framework presented in DOE's paper titled "Notes on the Economics of Household Energy Consumption and Technology Choice" is appropriate for appliance standards analyses or will support better decision-making. Appliance standards have generated large energy bill savings for consumers and significant national benefits by helping to overcome market barriers that hinder the sale of cost-effective and more energy-efficient products. DOE notes many of these market barriers in the NODA. 76 Fed. Reg. at 9699.

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[9] National Electrical Manufacturers Association. Energy Efficiency. http://www.nema.org/gov/energy/efficiency/.
[10] ENERGY STAR Residential Clothes Washers Qualified Product List. March 15, 2011. http://downloads.energystar.gov/bi/qplist/res_clothes_washers.pdf.
[11] For example, the Whirlpool Cabrio WTW5500X[W] has a 2.47 MEF and a 3.9 WF. The retail price is about $550.
[12] U.S. Energy Information Administration. Emissions of Greenhouse Gases Report. http://www.eia.doe.gov/oiaf/1605/ggrpt/index.html.

A recent survey conducted by the Consumer Federation of America (CFA) found that substantial majorities of Americans favor improved energy efficiency of appliances even when the payback period is as long as 10 years.[13] It is also important to recognize that while the direct economic impacts on consumers are an important factor in determining appropriate standard levels, it is not the goal of the appliance standards program to maximize "consumer welfare." As noted above, DOE is required to set standards at a level that achieves the "maximum improvement in energy efficiency . . . which the Secretary determines is technologically feasible and economically justified," and DOE must consider seven factors in determining whether a proposed standard is economically justified. 42 U.S.C. 6295(o)(2).

We have concerns with the theoretical framework presented, including that it appears to rely on a set of assumptions that do not reflect the real world such as the assumptions of a continuous curve of technology options and consumer possession of perfect information. In addition, data do not currently exist to develop this framework, and it is unclear that the substantial effort that would be required to gather this type of data would yield any benefits to consumers and the nation. EPCA specifically directs DOE to consider "the savings in operating costs . . . compared to any increase in the price, initial charges, or maintenance expenses for the covered products that are likely to result from the imposition of the standard." 42 U.S.C. 6295(o)(2)(B)(i). DOE's current analyses thoroughly evaluate the trade-off between operating cost savings and incremental costs of more-efficient products. The life-cycle cost analyses incorporate uncertainty and variability in inputs using Monte Carlo simulation and probability distributions and allow for estimating the percentage of consumers that will experience a net benefit due to a potential standard.

In summary, we believe that the application of learning curves in the current refrigerator/freezer rulemaking and in future rulemakings is a good step in incorporating real-world market dynamics in the DOE analyses. We urge DOE to quickly publish a final rule for amended refrigerator/freezer standards. We also urge DOE in all rulemakings to seriously weigh the numerous benefits that appliance standards provide to the nation.

Thank you very much for considering these comments.

Sincerely,

Andrew deLaski
Executive Director

[13] Cooper, M. 2011. *Public Attitudes Toward Energy Efficiency and Appliance Energy Efficiency Standards: Consumers See the Benefits and Support the Standards*. Consumer Federation of America. http://www.consumerfed.org/pdfs/CFA-Appliance-Efficiency-Report-3-11.pdf.