American Council for an Energy-Efficient Economy
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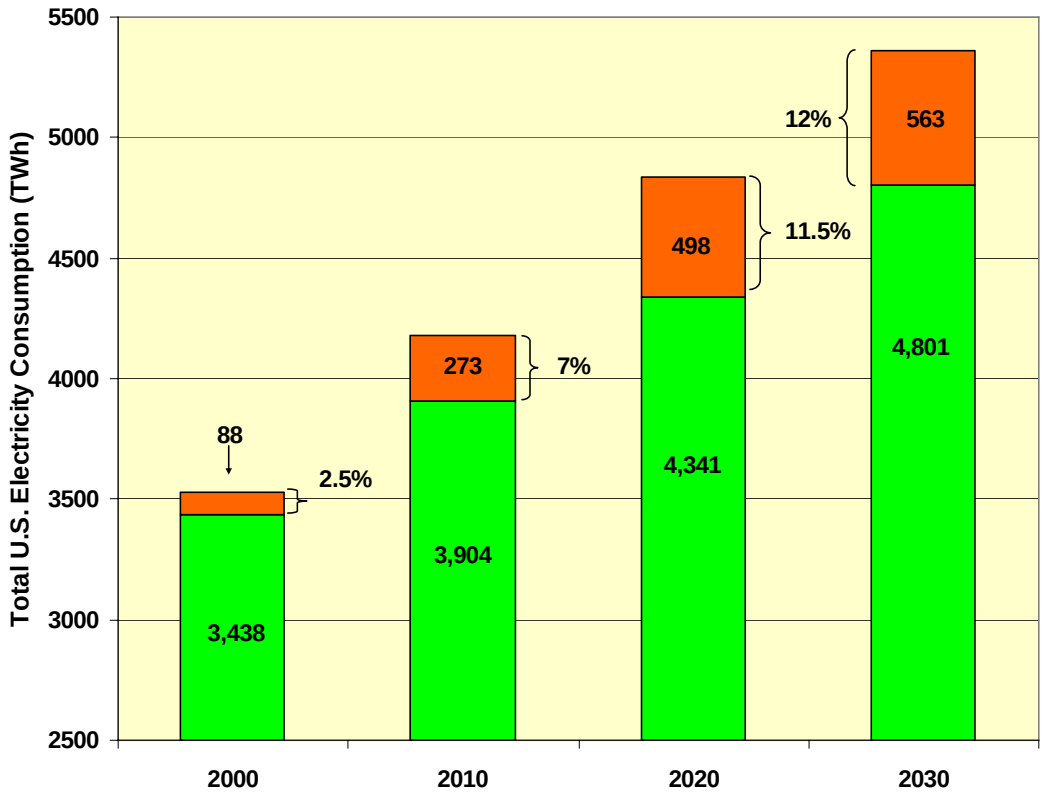
Ka-BOOM! The Power of Appliance Standards:
Opportunities for New Federal Appliance and Equipment Standards

Executive Summary[1]

July 2009

Appliance and equipment standards have proven to be one of the most reliable cornerstones of U.S. energy policy for more than two decades in helping to limit the growth of national energy consumption. After a period of stagnation at the Department of Energy (DOE), when obligations to improve federal standards were missed, both the Obama Administration and the U.S. Congress have recently begun emphasizing the need for improved and expanded national appliance standards as a key strategy for U.S. energy policy. This renewed attention is well-justified: to date national standards have already had an enormous impact. For example, U.S. electricity use in 2000 was 88 terawatt-hours (TWh) lower than it would have been absent existing standards (a 2.5% reduction). In 2010, the savings will have grown to about 273 TWh, or a 7% reduction in projected U.S. electricity consumption, while in 2030 savings increase to 563 TWh, or 12% of projected consumption. Even greater gains could have been achieved if the DOE had met the nearly two dozen legal deadlines for updated standards that passed without action between 1994 and 2004. Nevertheless, the substantial savings achieved to date are a testament to appliance standards' far-reaching impacts.

Figure ES-1. Total U.S. Electricity Consumption with Savings from Existing Standards (TWh)



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Improved efficiency achieved through standards and other approaches helps meet energy policy objectives while lowering energy bills for consumers and reducing emissions of greenhouse gases and other criteria pollutants. Other benefits include lower peak electric demand levels, which reduce strain on the electric grid and the need to build costly new power plants. Reduced energy consumption also puts downward pressure on overall energy prices, saving money for all energy consumers. In addition, as the U.S. Congress contemplates a cap-and-trade system for greenhouse gases, improved efficiency standards are critical for meeting national greenhouse gas reductions goals at the lowest possible overall cost (ACEEE 2009).

The importance of and the need for appliance efficiency standards have been heralded by both President Barack Obama and DOE Secretary Steven Chu. In a speech at the DOE on February 5, 2009, President Obama put appliance efficiency standards front and center as a key element of his energy plan. He signed a Presidential Memorandum ordering the Department to complete five new standards subject to legal deadlines by August 8, 2009 and to work toward completing standards due after August 8th ahead of schedule, especially those with the largest potential savings. DOE's FY 2010 budget request includes funding to review and implement standards for up to an additional three products ahead of schedule, targeting those products that will generate the most savings (DOE 2009g). In all, as required by a combination of court orders, Congressional deadlines, and the President's memorandum, over the next four years DOE is scheduled to complete new standards for twenty-six products. This pace of work far exceeds what DOE has done at any other time in its history.

Table ES-1. DOE Final Rulemaking Schedule Through January 2013

Product	Final Rule Due Date	Effective Date
Incandescent Reflector Lamps***	June 2009	2012
Linear Fluorescent Lamps***	June 2009	2012
Commercial Boilers	July 2009	2012
Refrigerated Vending Machines	August 2009	2012
Commercial Clothes Washers	January 2010	2013
BR \ Exempted Reflector Lamps***	January 2010	2013
Small Electric Motors	February 2010	2013
Direct Heating Equipment	March 2010	2013
Pool Heaters	March 2010	2013
Residential Water Heaters	March 2010	2013
High-Intensity Discharge Lamps**	June 2010	NA
Residential Refrigerators and Freezers	December 2010	2013
Microwave Ovens — Standby Power	March 2011	2014
Residential Furnaces	May 2011	2015
Fluorescent Lamp Ballasts	June 2011	2014
Residential Clothes Dryers	June 2011	2014
Room A/C	June 2011	2014
Residential Central A/C and Heat Pumps	June 2011	2014
Battery Chargers	July 2011	2014
External Power Supplies	July 2011	2014
Residential Clothes Washers	December 2011	2015
Metal Halide Lamp Fixtures	January 2012	2015
Walk-In Coolers and Freezers	January 2012	2015
Commercial Reach-In Refrigerators and Freezers	January 2013	2016
Liquid Immersed Transformers	January 2013*	2016
Low-Voltage Dry-Type Distribution Transformers	January 2013*	2016
Residential Furnace Fans	January 2013*	2016

* We include these products because their large potential savings make them excellent candidates for completion earlier than is legislatively required.

** DOE must first determine by June 2010 whether standards are needed. If the determination is positive, standards could be issued by 2012 and effective some time later. We did not analyze this technology for this report.

*** DOE issued standards for general service fluorescent lamps and incandescent reflector lamps on June 26, 2009, when this report was nearing completion. DOE announced in early 2009 that it will start a new rulemaking for BR and other exempted reflector lamps. Although a due date for the final rule has not yet been set, bills in the House and Senate have targeted January 1, 2013 as the effective date.

We estimate that this unprecedented rate of rulemaking for new and updated standards could generate colossal energy and economic savings. Our key findings regarding the estimated energy and economic savings are as follows:

- New and updated federal standards could yield 24 quads of primary energy savings and over 1,900 TWh of electricity savings between now and 2030, or roughly enough power to meet the total electricity needs of every American household for 18 months.
- Annual electricity savings in 2030 alone could equal about 180 TWh, or about 4% of total projected U.S. electricity consumption in that year (EIA 2009c).
- Annual savings from standards for natural gas appliances could reach about 290 trillion Btus by 2030, or enough to heat one out of every ten natural-gas heated U.S. homes for one year.
- Peak demand savings could reach about 65,000 MW in 2030, or about 6% of total U.S. generating capacity projected for that year (EIA 2009c).
- The net present value benefits of standards amount to over $123 billion.

For individual consumers:

- The average simple payback of the twenty-six evaluated standards is 3.1 years. Simple paybacks range from less than one year to around ten years for some very long-lived products.
- The average benefit-cost ratio for the twenty-six evaluated standards is 4:1. That is, the product lifetime savings are, on average, four times larger than the upfront incremental costs for efficiency improvements.

Figure ES-2. Projected U.S. Electricity Consumption in 2020 and 2030 less Savings from New Standards (TWh)

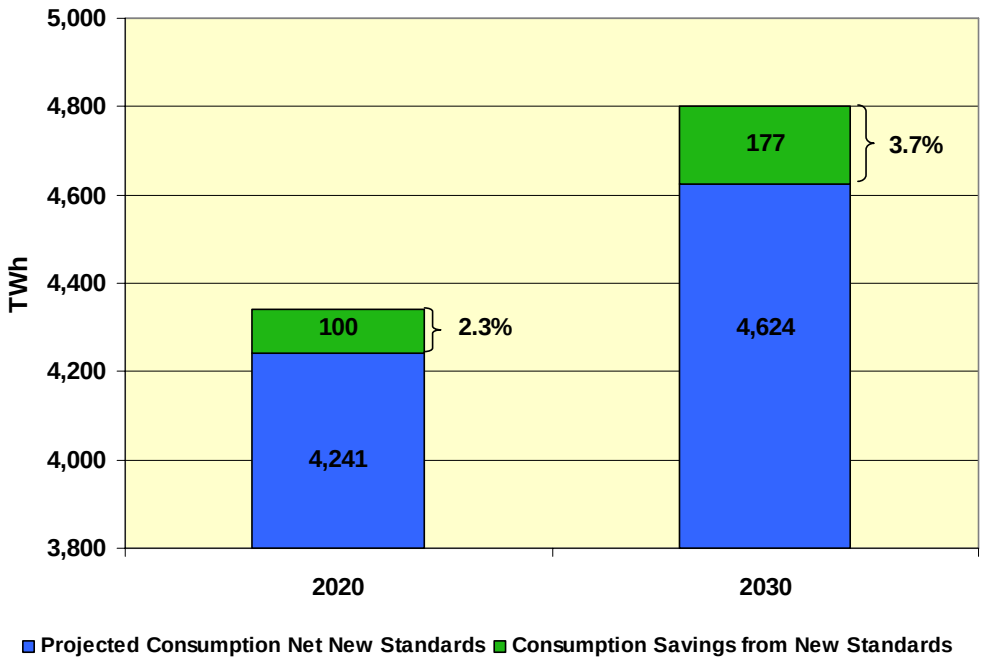


Table ES-2. Savings Summary from 2009-2013 DOE Rulemakings

Product	Energy Savings in 2020		Energy Savings in 2030		Cumulative (quads)[b]	Net Present Value for Purchases through 2030 ($ Million)
	TWh	TBtu[a]	TWh	TBtu[a]		
Residential:						
Battery chargers	9.1	94.9	9.1	91.5	1.3	$5,811
Central AC & HP	5.3	55.6	17.2	172.7	1.4	$7,331
Clothes dryers	3.6	41.1	9.2	101.1	0.9	$4,133
Clothes washers	3.8	59.4	7.6	116.0	1.2	$15,627
Direct heaters	*NA*	7.5	*NA*	15.2	0.2	$652
External power supplies	2.1	21.6	2.1	20.8	0.3	$544
Furnaces *(gas)*	*NA*	*80.1*	*NA*	*186.9*	1.7	$7,058
Furnaces *(oil)*	*NA*	*2.3*	*NA*	*5.4*	0.05	$843
Furnace fans	6.5	68.1	21.0	211.6	1.7	$11,735
Microwave ovens	1.8	18.4	1.9	18.8	0.3	$1,453
Pool heaters	*NA*	*2.9*	*NA*	*2.9*	0.0	$226
Refrigerators	6.6	69.0	16.8	169.1	1.5	$8,640
Room AC	1.7	17.7	3.3	32.8	0.4	$1,467
Water heaters	7.7	127.8	14.4	220.7	2.6	$14,396
Commercial:						
Beverage vending machines	0.3	3.1	0.5	4.8	0.1	$286
Boilers	*NA*	4.8	*NA*	11.1	0.1	$771
Clothes washers	0.4	8.2	0.4	10.1	0.1	$239
Fluorescent ballasts	2.1	21.5	5.1	51.1	0.5	$2,815
Fluorescent lamps[c]	25.3	264.2	25.3	254.9	4.3	$12,853
Incandescent reflector lamps[c]	7.5	78.1	7.5	75.3	1.4	$5,061
BR \ exempted reflector lamps[d]	3.4	35.4	3.4	34.2	0.7	$2,777
Liquid-immersed transformers	0.9	9.5	2.9	29.6	0.2	$928
Low volt. dry-type transformers	2.5	26.5	8.2	82.3	0.7	$5,643
Metal halide fixtures	4.6	47.5	12.8	129.0	1.1	$7,836
Reach-in refrigerators & freezers	0.8	8.2	2.1	21.1	0.2	$1,019
Small electric motors	3.7	38.7	4.7	47.5	0.6	$2,429
Walk-in coolers & freezers	0.6	6.1	1.3	12.8	0.1	$676
TOTAL	**100**	**1,218**	**177**	**2,129**	**24**	**$123,249**

Notes: [a] These savings represent primary energy savings for standards on products that consume electricity or natural gas/oil savings for standards on products that consume natural gas/oil.

[b] The quad estimates in this report are calculated differently than estimates developed by DOE in their rulemakings. For this report, we account for savings from products sold through 2030, i.e., we account for between 15 and 18 years of sales for most products. DOE, on the other hand, typically accounts for 30 years worth of sales in its analyses.

[c] Savings estimated for fluorescent lamps and incandescent reflector lamps are based on the standards set by DOE's final rule issued June 26, 2009.

[d] These savings are attributable to BR and other reflector lamps that were exempted from EPAct 1992 and EISA 2007 and remain exempt in the fluorescent and incandescent reflector lamp final rule issued June 26, 2009.

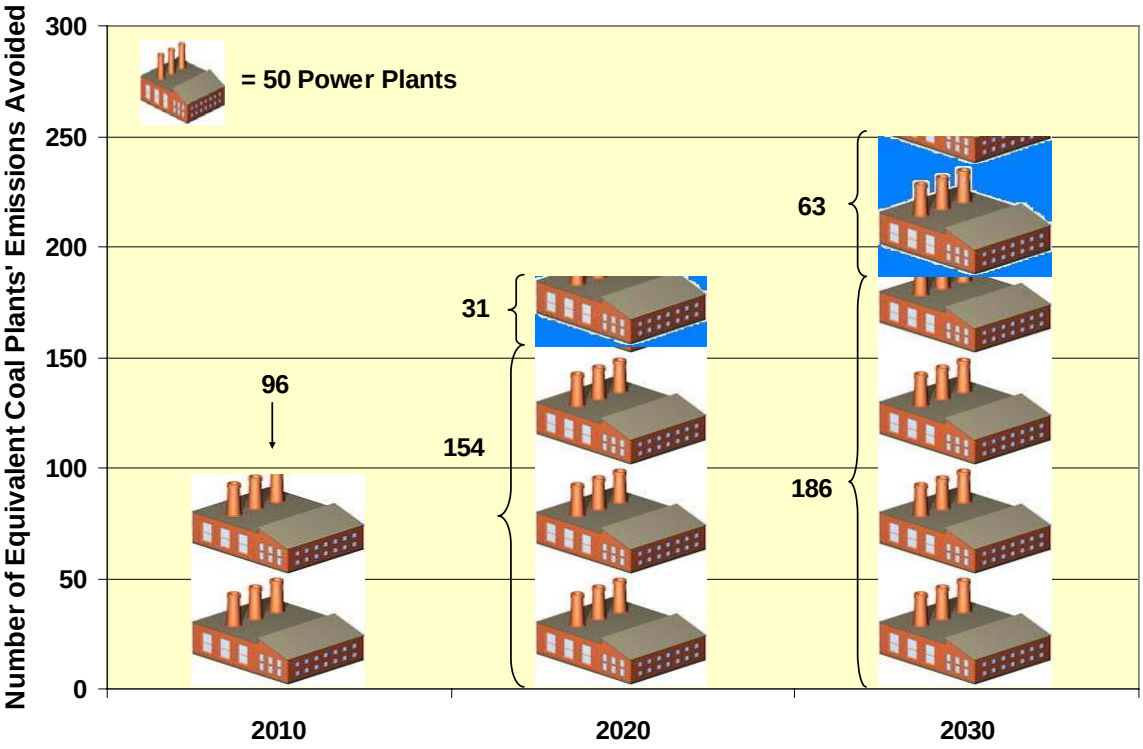
The energy savings from standards also result in fewer criteria pollutant emissions from power plants and direct combustion of fossil fuel by appliances. Reductions in nitrogen oxides (NO_x), sulfur dioxides (SO_2) and mercury help meet air quality goals designed to protect public health and the environment. Reductions in carbon dioxide (CO_2) emissions help address climate change: the savings from standards can make a significant contribution in cutting the amount of CO_2 emissions in the years ahead. For example, due to existing standards, CO_2 emissions will be about 4% lower in 2010 than they would have been otherwise, about 6.5% lower in 2020, and about 7.5%

lower in 2030. New and updated standards can add to this total. Figure ES-3 shows that the emissions savings from already existing standards are equal to the output of 96 conventional coal-fired power plants in 2010, increasing to 154 power plants in 2020 and 186 power plants in 2030.

On a national basis, we estimate that the standards proposed in this report could:

- Reduce carbon dioxide emissions by 78 million metric tons (MMT) in 2020 and 158 MMT in 2030, or another 1.3% and 2.6% of projected U.S. emissions in those years. These emissions reductions are equivalent to the output of an additional 31 new conventional coal power plants in 2020 and 63 new conventional coal power plants in 2030 (see Figure ES-3).
- Reduce nitrous oxides emissions by 66 and 118 thousand metric tons and reduce sulfur dioxide emissions by 269 and 475 thousand metric tons in 2020 and 2030, respectively.

Figure ES-3. Emissions Reductions from Existing and Potential Standards in Equivalent Number of Coal Plants



Clearly new national appliance standards have the power to cost-effectively save the nation a considerable amount of energy while saving money for the consumers and businesses that buy and use more efficient products. New standards can also make significant contributions toward environmental objectives by reducing energy-related emissions. Ultimately, standards can contribute towards bringing U.S. energy supply and demand into better balance, thereby improving the long-term reliability of our electric grid and helping to moderate long-term energy prices. These large potential benefits make a strong case for aggressive action to ensure that standards are completed on time and are set at efficiency levels that will yield the largest possible benefits.