701 Pennsylvania Avenue, N.W. | Washington, D.C. 20004-2696 | 202.508.5000 | www.eei.org

Edison Electric Institute

July 10, 2015

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Office
Mailstop EE-5B
Energy Conservation Standards for Residential Furnaces
EERE–2014–BT–STD–0031
1000 Independence Avenue SW
Washington, DC 20585-0121

Re: Notice of Proposed Rulemaking for Energy Conservation Standards for Residential Furnaces, Docket # EERE-2014-BT-STD-0031

Dear Ms. Edwards,

The Edison Electric Institute (EEI) appreciates the opportunity to submit comments on the amended energy conservation standards for residential furnaces, which were proposed by the Department of Energy (DOE or Department). *See Energy Conservation Program: Energy Conservation Standards for Residential Furnaces,* 80 *Fed. Reg.* 13,120 (Mar. 12, 2015). DOE subsequently extended the comment deadline from June 10 to July 10. *See* 80 *Fed. Reg.* 28,851 (May 20, 2015).

EEI is the association that represents all U.S. investor-owned electric companies. Our members provide electricity for 220 million Americans, operate in all 50 states and the District of Columbia, and directly employ more than 500,000 workers. With more than $85 billion in annual capital expenditures, the electric power industry is responsible for millions of additional jobs. Reliable, affordable, and sustainable electricity powers the economy and enhances the lives of all Americans. Many of our members are combination gas and electric companies, and provide services for both energy types.

EEI strongly supports the Department's energy conservation standards program for consumer products and certain commercial and industrial equipment. We believe that the program has been one of the most successful energy efficiency efforts ever created because of its focus on setting standards that are technically feasible and economically justified for a majority of consumers. The program's success can be largely attributed to its historical reliance on setting standard levels that ensure that customers who purchase the product save money.

EEI's comments on this Notice of Proposed Rulemaking (NOPR) focus on technical and analytical aspects of this rulemaking.

EEI Would like DOE to Address Market Neutrality

For the record, EEI would like to note that the minimum efficiency standards for non-weatherized gas furnaces in July, 2015, are the same as they were in January, 1992.

Under NAECA 1987, DOE was required to take the following actions:

> (B) The Secretary shall publish a final rule no later than January 1, 1994, to determine whether the standards established by this subsection for furnaces (including mobile home furnaces) should be amended. Such rule shall provide that any amendment shall apply to products manufactured on or after January 1, 2002.
>
> (C) After January 1, 1997, and before January 1, 2007, the Secretary shall publish a final rule to determine whether standards in effect for such products should be amended. Such rule shall contain such amendment, if any, and provide that any amendment shall apply to products manufactured on or after January 1, 2012.

During this time period, the efficiency of competitive electric products (air source heat pumps) increased dramatically. In January 2006, the minimum efficiency of heat pumps increased significantly from 10 SEER / 6.8 HSPF to 13 SEER / 7.7 HSPF. In January, 2015, the efficiency standards of heat pumps increased significantly again to 14 SEER / 8.2 HSPF.

Under the November 2007 Final Rule, the minimum efficiency of gas furnaces will increase slightly from 78 to 80 AFUE in November 2015. However, for the next few years, due to the regional efficiency standards, home builders and home buyers in the "North" will be able to choose products with no cost increases (13 SEER central air conditioner and/or 78 AFUE gas furnace), or a more efficient but higher cost 14 SEER / 8.2 HSPF heat pump.

Under the June 2011 Direct Final Rule, the efficiency of non-weatherized gas furnaces was supposed to increase in May 2013, while the efficiency of heat pumps was scheduled to increase in January, 2015. EEI supported this rule, as it was fuel and market neutral, with a specific timeline for all residential heating products (except for residential boilers, where standards were increased in September 2012 as a result of the Energy Independence and Security Act of 2007).

However, due to the lawsuits by the gas industry and distributors, the furnace rule was sent back to DOE, effectively staying any increase in furnace efficiency (and cost), but the increase in heat pump efficiency took effect. The result of the settlement was to create a non-market neutral, non-fuel neutral result.

In addition, based on DOE announcements and its publication of the Spring 2015 regulatory agenda, there will be another NOPR for heat pumps published very soon, with a final rule published in December 2015, resulting in the possibility of yet another significant efficiency and cost increase for heat pumps before any significant increase in non-weatherized gas furnace efficiency. **This would be the <u>3rd</u> time in recent history that the efficiency of heat pumps will increase significantly before the first significant increase in gas furnace efficiency.**

For the record, EEI notes that none of this information is accounted for in the fuel and product switching analysis detailed in Appendix 8J of the Technical Support Document (TSD).

In general, a regulatory process that evaluates all competitive products at the same time and establishes requirements that take effect on the same date provides a more level regulatory playing field. This is because it helps eliminate competitive advantages that could result when one product class is subject to newer, more rigorous standards before other product classes.

Therefore, to act in a more fuel and market neutral manner, DOE should not allow the effective date of new efficiency standards for gas furnaces to be any later than the effective date of new heat pump efficiency standards. In other words, the standards for furnaces should either increase before or on the exact same date as any increased standards for heat pumps. If there are lawsuits on one product (or class of products), then the effective date for the competitive product (or class of products) should be delayed as well, to prevent any market imbalances.

.

DOE Needs to Correct Significant Flaws in Fuel Switching Analysis that is Detailed in Appendix 8J of the Technical Support Document

Appendix 8J of the TSD describes the product switching methodology used by DOE for the analysis. The TSD states:

> "As described in chapter 8, DOE considered the possibility that some households would switch from a non-weatherized gas furnace (NWGF) to an electric furnace (EF) or electric heat pump (HP) due to more stringent NWGF standards. In addition, DOE also considered the possibility of switching from a gas storage water heater (GSWH) to electric storage water heater (ESWH)."

This analysis is a significant departure from past rulemakings.

EEI notes that DOE has not performed any such fuel switching analysis for heat pump efficiency standards. In the January 22, 2001 Final Rule (66 *Fed. Reg.* 7180-7181), DOE <u>only</u> analyzed the impacts of switching from heat pumps to electric furnaces:

> "From the perspective of saving the maximum amount of energy that is economically justifiable, the biggest ''fuel'' switching concern is from heat

pumps to a combination of central air conditioners and electric resistance heating. This may occur in households that have only electric service and where the incremental purchase price of heat pumps is too great. Such a price increase might occur if the standard on heat pumps is significantly higher than the standard for central air conditioners.

Based on data from the 1997 RECS, a little over 14 percent of households have either baseboard or forced air electric resistance heating with room or central air conditioning compared to almost 10 percent of households which have heat pumps. Because there are already such a large percentage of households that utilize a combination of central or room air-conditioning with resistance heat to meet their space conditioning needs, this supports the possibility that some purchasers would choose to switch to resistance heat from heat pumps.

Compared to heat pumps meeting the standards issued in the proposed rule (*i.e.*,13 SEER and 7.7 HSPF), electric resistance heating uses over 225 percent of the energy for the same amount of heating.[1] Therefore, if a standard of 13 SEER and 7.7 HSPF is issued for heat pumps while a 12 SEER standard is set for central air conditioners, a mere 4 percent of heat pump households would need to switch to central air conditioners and electric resistance heating to negate the energy savings achieved from increasing the heat pump standard from 12 SEER/7.4 HSPF to 13 SEER/7.7 HSPF.

If heat pump and air conditioner standards were set at different levels, the price differential between the two would increase on the order of $200. Under those conditions, we consider it likely that at least 4 percent of prospective heat pump owners would switch to lower-priced resistance heat. Therefore, we have weighed this concern in adopting today's standard levels, which require air conditioners and heat pumps to meet the same minimum efficiency standard so as to reduce the likelihood of switching to resistance heating.

A larger price differential between heat pumps and air conditioners will also tend to encourage switching to gas or oil fired furnaces. It is not our objective to encourage or discourage that type of fuel switching. Therefore, we also considered this potential effect in our decision to establish air conditioner and heat pump efficiency standards at the same SEER level."

In other words, DOE only "<u>considered</u>" the possibility of fuel switching from heat pumps to fossil fuel heating systems (to help justify the same SEER standard for heat pumps and

[1] EEI notes that electric baseboard heating may enjoy certain other efficiencies not captured in most energy modeling programs like individual room zoning, variable temperature settings, no fan energy consumption, and no distribution system losses that reduce energy usage significantly below DOE's estimates. This footnote was not in original language.

central air conditioners), but did not perform an in-depth analysis as it is doing for this rulemaking.

In addition, for the June 27, 2011 Direct Final Rule (which covered residential electric and fossil fueled heating systems, along with electric cooling systems), DOE did not perform any fuel switching analysis, and did not need to in EEI's opinion, since the proposed rule was fuel and market neutral (76 *Fed. Reg.* 37408-37548).

Moreover, by including a fuel switching analysis for water heaters, which are separate appliances regulated by DOE at different time intervals, DOE also sets a precedent for extraneous modeling that has nothing to do with the choice for space heating equipment.

Flaws in the Fuel Switching Analysis

There are many analytical flaws in the fuel switching analysis that need to be addressed.

Flaw #1: The analysis ignores other space heating options.

Section 8J of the TSD only shows gas-fired and electric heating options. However, there are many other heating options in the marketplace for both new construction and existing homes that are not considered. Data from the US Census Bureau show that for new homes, heating products that use heating oil, kerosene, wood, coal, and solar energy are installed. The data does not break out whether these are air-source, water-source (hydronic), or geothermal (in the case of electricity).

In the case of heating oil, the US Census Bureau data shows that from 1971 to 2009, for new single-family homes completed in the Northeast, oil-fired heating systems were anywhere from 11% to 51% of the main heating system installations. As recently as 2005, oil-fired heating systems were installed in 22% of new single-family homes in the Northeast.

Therefore, the DOE analysis is incomplete, as it does not consider other technical options that are available in the marketplace.

Flaw #2: The analysis ignores the fuel switching that has occurred or will occur as a result of increasing electric air-source heat pump standards.

The DOE analysis ignores the increases in heat pump efficiency standards in 2006 and January 2015, and the impact of fuel switching from high efficiency and zero emission heat pumps to lower efficiency and high emission fossil fuel heating systems.

Based on AHRI data, air-source heat pump shipments hit a peak of 2.136 Million units in 2005 (the year before the new standards took effect), and then declined every year through 2009 (down to 1.642 Million units). Shipments increased slightly in 2010 and

2011, then declined again in 2012 (to 1.698 Million units). Shipments increased in 2013 and 2014, but the increase in efficiency standards and resulting fuel switching definitely had an impact on heat pump sales – an impact that is not accounted for in the TSD.

In addition, the impact of heat pump efficiency standards being higher than central air conditioner standards in the "North" region of the United States (along with no increase in central air conditioner costs and only a slight increase in non-weatherized gas furnace efficiency requirements) is not taken into account in the DOE analysis in Section 8J. Also, heat pump efficiency standards may again be increased before any new standard for non-weatherized gas furnaces takes effect, which will again have a significant impact on the choices made by consumers and home builders.

Flaw #3: The analysis ignores the impact of the residential storage water heater efficiency standards that took effect in April, 2015, especially for larger units.

The new efficiency standards require electric storage water heaters above 55 gallons to be heat pump water heaters, and it requires gas-fired water heaters above 55 gallons to be condensing-type units. There are significant issues with these technologies in existing homes, and the cost increases were not accounted for in the analysis.

In addition, there are other types of water heaters (such as instantaneous gas, instantaneous electric, oil-fired storage, solar-thermal water heaters, solar PV water heaters, combination space/water heating systems, etc.) that can also be chosen by consumers that are not included in the analysis. These products are in the marketplace and can be chosen by any consumer or home builder in the United States. Their exclusion creates more of an incomplete analysis.

Therefore, since the fuel switching analysis does not account for other fuel types, other space heating technologies, and other water heating technologies, the current estimates of energy and emissions impacts from this limited fuel switching analysis should not be used for the DOE decision making process, and should not be used in the energy, economic or emissions impact analysis in the Final Rule.

Long-term Assessments About Electricity Usage and Upstream Emissions Related to Electricity Production Should Reflect the Changing Generating Fleet and Changes in Demand for Electricity

As required by statute, the process for amending energy conservation standards for a product requires DOE to determine that proposed new standards are economically justified and the that benefits exceed the burdens. *See* 42 U.S.C. 6295(o)(2)(B)(i) and 6295(o)(3). In making these determinations, DOE further is required to consider seven statutory factors, including the total projected energy savings likely to result directly from the standards and the need for energy conservation. *See id*. at 6295(o)(2)(B)(i)(I)-(VII).

To satisfy these requirements, DOE performs several analyses, including assessments of national energy savings (NES) and environmental benefits, in the form of reduced emissions of air pollutants and greenhouse gas (GHG) emissions. These analyses look at the impact of the proposed standards over the lifetime of the product. In the case of residential furnaces, this lifetime is 30 years or more.

EEI regularly comments on the NES and emissions analysis associated with proposed new and amended standards for products that use electricity. Before addressing specific concerns with the analyses used in this residential furnace NOPR, it is important to note that DOE's general approach to the long-term assessment of the impacts of energy conservation standards on electricity usage and the related emissions from the power sector is fundamentally flawed.

The flaws in DOE's analysis stem from its refusal to address significant and expected changes in the power sector that will change demand for electricity and the composition of the generating fleet through the 30-year period that is covered by the life of a new residential furnace. DOE's analysis assumes only current law and current demand patterns. Reasoned decision making cannot exclude an assessment of the expected changes in electricity demand and generation.

DOE relies on the Energy Information Agency's (EIA's) Annual Energy Outlook (AEO) when assessing the impact of proposed standards on emissions. *See, e.g.*, 80 *Fed. Reg*. at 17,263.[2] By definition, AEOs only address final environmental standards and do not include expected, but not yet final, new or amended environmental standards. *See AEO 2014, Legislation and Regulations: Recent Environmental Regulations in the Electric Power Sector* (Apr. 30, 2014). As a result of the focus on only existing regulations, AEO often makes predictions about the future composition of the electric generating fleet and the related emissions from that fleet that are unlikely to be borne out by actual experience.

It is particularly unreasonable to refuse to assess future, expected changes in regulations when these are expected to have a significant impact on the electric sector. In June 2014, EPA proposed the Clean Power Plan, which is aimed at reducing GHG emissions from existing electric generating units by 30 percent (from 2005 levels) by 2030. *See Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units*, 79 *Fed. Reg*. 34,830 (June 18, 2014); *See also* EPA, Clean Power Plan by the Numbers: Cutting Carbon Pollution from Power Plants, Fact Sheet (June 2, 2014). The Clean Power Plan is expected to be finalized by the end of this year and compliance will be required beginning in 2020. This means that these new environmental standards for the power sector will be in effect before or as the proposed amended standards for furnaces go into effect. DOE's analyses in support of the furnace standards are flawed

---

[2] EEI notes that the NOPR indicates that DOE relied on AEO 2013, but that the Technical Support Document (TSD) states that DOE relied on AEO 2014. If DOE is going to rely on AEO data when assessing impacts on and emissions from electricity generation, the Department should, at minimum, use the most recent AEO available.

and inaccurate because they do not consider the impact EPA's Clean Power Plan will have on the future composition of electric generation fleets.

For example, the Environmental Protection Agency estimates that coal-based generation will decline by 20-22% in 2020 and by 25-27% in 2030. *See* EPA, Regulatory Impacts Analysis at 3-26. EPA also projects that nearly 50 GigaWatts (GW) of installed coal capacity will retire by 2020, in addition to the nearly 50 GWs that EPA expects to retire in its base case. *See* EPA, Technical Support Document: Resource Adequacy and Reliability Analysis at 2-3. Moreover, the Clean Power Plan is designed to reduce demand for electricity through aggressive demand side energy efficiency improvements. *See* Clean Power Plan, 79 *Fed. Reg*. at 34,836. These changes (reductions) in coal generating capacity will reduce emissions from the power sector after 2020, even if new appliance conservation standards somehow incrementally increase electricity usage. Changes in demand for electricity overall will reduce the impact of increased usage of electricity by certain appliances, relative to a 2014 baseline.

DOE should consider the impacts of the Clean Power Plan when assessing impacts on the utility sector and emissions related to proposed or amended conservation standards for appliances. *At minimum, DOE should acknowledge that its analysis is excluding Clean Power Plan impacts and therefore likely overstates increases in emissions or the impacts of increased usage of electricity from fuel switching to electric heating.*

DOE Needs to Update the Energy Savings Analysis in the Technical Support Document, and Update the Emissions and Utility Impact Analysis

In the Technical Support Document ("TSD") for this rulemaking, DOE provides information on fossil fuel savings from increased AFUE ratings, the impacts on furnace system electric usage from increases in gas furnace AFUE ratings, and the impacts on electricity usage from reductions in "Standby" and "Off" modes.

At TSL 3 (DOE's proposed standard level) found in Chapter 7 of the TSD, the estimated annual electricity impacts from both AFUE and "Standby" changes are as follows, based on the information shown in Tables 7.4.1 and 7.4.2:

Furnace Type	**AFUE Impacts**	**Standby Impact**	**Net Impact**
Non-Weatherized Gas Furnace	- 12.0 kWh	- 19.3 kWh	- 31.3 kWh / year
Mobile Home Gas Furnace	- 1.1 kWh	- 20.3 kWh	- 21.4 kWh / year

As the above table clearly shows, there will be reductions in electric usage as a result of increasing the standards for gas furnaces.

In Chapter 10, which provides details of the National Impact Analysis, there are tables that show overall impacts based on all uses of residential furnaces (in residential and commercial buildings).

Table 10.5.1 Average Annual Furnace Energy Use for the Base and Standards Cases in 2021 for AFUE Standard

Product Class	Base Case	TSLs				
		1	2	3	4	5
Non-Weatherized Gas Furnaces						
Average Annual Fuel Use (MMBtu/yr)	38.8	37.6	37.0	36.9	36.3	35.3
Average Annual Elec Use (kWh/yr)	319.8	317.3	311.7	317.0	306.4	335.3
Mobile Home Gas Furnace						
Average Annual Fuel Use (MMBtu/yr)	29.4	27.9	27.5	26.5	25.9	25.4
Average Annual Elec Use (kWh/yr)	233.6	233.9	227.3	229.5	223.9	245.5

Table 10.5.2 Average Annual Electricity Use for the Base and Standards Cases in 2021 for Standby and Off-Mode Standard

Product Class	Base Case	Trial Standard Levels		
		1	2	3
	kWh/year			
Non-Weatherized Gas Furnaces	75.0	68.3	66.9	62.9
Mobile Home Gas Furnaces	67.1	66.7	66.6	66.4

Again, the analysis shows reductions in electric usage as a result of the increased standards at TSL 3 for gas furnaces.

Based on the Chapter 10 analysis, there is a reduction in annual electricity usage for all furnaces in all cases.

In Table 10.5.3, which provides estimated increases in per home electricity usage, many of the values in the table may be overstated, especially in light of the new Uniform Energy Factors for storage water heaters that show the differences in efficiency based on water draw patterns.

In addition, while purporting to be a national impact analysis, Chapter 10 ignores the fact that all of the other DOE final rules (and the EPA Energy Star program) will significantly reduce end-use residential electricity usage well before 2020. Over the past 5 years, DOE final rules and the EPA Energy Star program updates have significantly reduced electricity usage of new central air conditioners, central heat pumps, packaged air conditioners and heat pumps, room air conditioners, clothes washers, clothes dryers, incandescent lighting (general service and reflector lamps), fluorescent lamp ballasts, fluorescent lamps, microwave ovens, refrigerators, freezers, dishwashers, electric storage water heaters, set-top boxes, computers, computer monitors, and televisions. Recent DOE proposed rules on residential dehumidifiers and conventional ovens will also reduce residential electricity usage starting in 2019.

Therefore, any increase in electric usage due to limited fuel switching will be more than offset by the very large reductions in electricity usage by all major home appliances between now and 2050. DOE cannot ignore the impacts of its own efficiency standards when undertaking these sorts of analyses.

Specific Concerns with the Utility Impacts and Emissions Analyses

EEI is concerned with certain aspects of the emissions and "Utility" analyses included in the TSD and discussed in the proposed rulemaking.

In the "Utility" analysis (Chapter 15 of the TSD), DOE only looked at estimated "upstream" impacts of the standard on electric generation, ignoring any "upstream" impacts on the production of natural gas or propane or fuel oil (propane is a by-product of fuel oil refining). While the TSD attempts to estimate the increase in upstream electricity production based on changes to electricity usage associated with fuel switching, the TSD does not try to estimate any decrease in production of natural gas or fuel oil or propane as a result of the standard. As shown in Chapters 7 and 10 of the TSD, the reductions in end-use gas and oil usage are far greater than the increases in end-use electricity usage (from fuel switching). By not including any estimated impacts on gas or fuel oil or propane production or transportation, this "Utility" analysis (which should be an "energy supply analysis") is incomplete and inaccurate.

In addition, while purporting to be a national analysis, Chapter 15 ignores the fact that all of the other DOE final rules (and the EPA Energy Star program) will significantly reduce end-use residential electricity usage well before 2020. Over the past 5 years, DOE final rules and the EPA Energy Star program updates have significantly reduced electricity usage of new central air conditioners, central heat pumps, packaged air conditioners and heat pumps, room air conditioners, clothes washers, clothes dryers, incandescent lighting (general service and reflector lamps), fluorescent lamp ballasts, fluorescent lamps, microwave ovens, refrigerators, freezers, dishwashers, electric storage water heaters, set-top boxes, computers, computer monitors, and televisions. Recent DOE proposed rules on residential dehumidifiers and conventional ovens will also reduce residential electricity usage starting in 2019 (assuming that the final rules are published in 2016).

Therefore, any increase in electric usage due to limited fuel switching will be more than offset by the very large reductions in electricity usage by all major home appliances between now and 2050. DOE cannot ignore the impacts of its own efficiency standards when undertaking these sorts of analyses.

In addition, for many of these furnaces, any electric usage increase will most likely occur during the winter months, not during the peak season (or times) for electric generation, which occurs in the summer for nearly all of the United States. Any increase in the winter usage of electricity that results from fuel switching will not require new generation capacity, especially when considering all of the other appliance energy efficiency standards.

To conclude that more electric generation will be required due to the currently estimated slight increase in end-use electricity usage from this standard is not technically or analytically correct. DOE should revise this analysis before the publication of a final rule.

In terms of the "Emissions" impact analysis, DOE must address several flaws in Chapter 13 of the TSD. First, and most importantly, DOE only looks at estimated "upstream" emissions impacts of the standard due to electric generation, ignoring the "upstream" emissions impacts due to the production of natural gas, propane, or fuel oil. While the TSD attempts to estimate the increase in emissions based on changes to electricity production, the TSD does not even try to estimate any decrease in emissions due to the decreased production or transportation of natural gas or fuel oil or propane as a result of the standard.

The analysis also ignores the fact that even as the amount of electricity being used has increased over the years, emissions have declined significantly for all major emissions that are regulated at the federal level. For example, between 1990 and 2013, while electricity use has increase by about 35%, the annual emissions of NO_x have declined by 74% and the annual emissions of SO_2 have declined by 80%. Preliminary data published by EPA have shown that in 2014, even with the impact of the polar vortex requiring more use of fuel-oil and coal-fired power plants, U.S. power plant emissions declined by 2.7% for SO_2 and 3.4% for NO_x compared to 2013. In addition, according to other published reports, mercury emissions decreased by 51% between 2000 and 2012 (and by 60% between 1990 and 2012).

Under more recent rules, such as the EPA MATS rule, which went into effect in April of this year, there is going to be a significant reduction in all coal-fired power plant emissions between now and 2020 or 2030. EPA itself projects that these standards will prevent 90 percent of the mercury in coal burned in power plants from being emitted to the air; reduce 88 percent of acid gas emissions from power plants; and cut 41 percent of sulfur dioxide emissions from power plants beyond the reductions expected from other EPA rules. *See* EPA, Mercury and Air Toxics Standards – Benefits and Costs of Cleaning Up Toxic Air Pollution from Power Plants, Fact Sheet (Dec. 16, 2011).

In the EIA *Annual Energy Outlook 2015*, Table A-8 provides the EIA estimates of electric power sector emissions as a result of federal environmental regulations. For sulfur dioxide, EIA shows emissions of 3.27 million short tons in 2013 dropping to 1.42 million short tons by 2020 – a further 56.7% decrease (most of which will likely occur by 2016 or 2017). For nitrogen oxide, the document shows a decline from 1.69 million short tons in 2013 to 1.57 million short tons by 2020 – a further 7.1% decline. For mercury, as a result of the MATS rule, the EIA analysis shows a dramatic drop from 27.94 short tons in 2013 to 6.58 short tons by 2020 – a further 76.4% decline (again, most of which will likely occur by 2016 or 2017).

In addition, the Energy Information Administration, in its March 10, 2015 publication of "*Today in Energy*," predicted that, while 12,922 MW of coal-fired power plants and 800 MW of petroleum and "other" power plants will retire by the end of 2015, there will be the addition of 13,168 MW of zero-emission wind, solar, and nuclear power plants by the end of this year. As noted, this analysis does not include the projected impacts of EPA's proposed Clean Power Plan. EPA projects that Clean Power Plan compliance will result in the retirement of an additional 49 GW of coal-based electric generating units by 2020. *See* Technical Support Document, Resource Adequacy and Reliability Analysis.

In the June 5, 2015, EIA publication of "*Today in Energy*," entitled "Proposed Clean Power Plan would accelerate renewable additions and coal plant retirements," EIA provides a summary of its analysis of the impact of the EPA Clean Power Plan proposed rule. EIA performed 5 different analyses with different Clean Power Plan scenarios compared to 3 baselines (reference, high economic growth, and high oil and gas resource). In every scenario that runs through 2040, the Clean Power Plan results in at least 138 GW of coal and gas power plant retirements and a significant increase (over 72 GW) in the addition of wind and solar electric generation.

For example, according to the June 5, 2015 EIA publication cited above, "In the Base Policy case with the proposed rule, 283 gigawatts (GW) of cumulative additions of renewable electricity generation capacity are added through 2040, compared to only 109 GW of renewable generating capacity additions projected in the baseline, the *Annual Energy Outlook 2015* (AEO2015) Reference case."

In terms of power plant retirements, EIA wrote "Even in the absence of the proposed Clean Power Plan rule, 40 GW of existing coal-fired capacity and 46 GW of existing natural gas/oil-fired capacity are expected to retire through 2040 in the Reference case. Cases that implement the proposed Clean Power Plan rule accelerate and amplify these retirements, especially for coal. In the Base Policy case, 90 GW of coal-fired capacity and 62 GW of natural gas/oil-fired capacity retire by 2040. In the Policy Extension case, as emission rates continue declining after 2030, 101 GW of coal-fired generating capacity and 74 GW of natural gas/oil-fired generating capacity retire by 2040."

Therefore, to conclude that more emissions – of any kind, including criteria pollutants, hazardous air pollutants or greenhouse gases – will be the result from electric generation due to the TSD estimated slight increase due to fuel switching) in end-use electricity usage from this standard is technically and analytically incorrect. The resulting emissions from electric generation will go down significantly over the next 30-40 years, regardless of any minor increase in the end use of electricity resulting from the addition of more electric components to fossil-fuel fired furnaces or fuel switching

In addition, DOE uses a fairly rigid "marginal" and incorrect worst-case analysis of electric generation to conclude that there will be additional upstream emissions. Based on current trends in power plant retirements, additions of new zero-emission electric generation, and reductions in the use of electricity in nearly all end-use applications, emissions from electric generation will decrease, not increase. DOE should revise this analysis before the publication of a final rule.

EEI Favors Creating "Standby/Off Mode" Standards During the Same Rulemakings when "Active" Mode Standards are Decided

It is appropriate, as required by the Energy Policy and Conservation Act as amended by the Energy Independence and Security Act of 2007, to propose standards for furnaces that address "standby" and "off" mode energy consumption. From a process and resource point of view, it does not make sense to have separate rulemakings for "active" mode efficiency standards and "standby / off" mode efficiency standards for the same product that impacts the same set of manufacturers and the same set of consumers.

However, there are specific issues related to the proposed "standby" and "off" mode standards that are discussed below.

EEI has Concerns with the Proposed TSL for Standby and Off Mode

In the NOPR, DOE chose TSL 3 for the "Standby" mode and "Off" mode requirements, which correspond to the "max tech" level of available technologies.

Technical concerns

Based on the TSD, Chapter 7B.3.4, the baseline "standby" estimate for non-weatherized gas furnaces and mobile home gas furnaces is 11.0 Watts. The value for standby in TSL 1 is 9.5 Watts. For TSL 2, the value is 9.2 Watts, and for TSL 3, the value is 8.5 Watts.

In Section 5.10.2 of the TSD, DOE writes "DOE's testing of over 40 models of residential furnaces showed standby mode power consumption from 4 to 10 watts. However, because this represented only a fraction of the residential furnace market, DOE took a conservative approach and summed the most energy consumptive components in each individual furnace tested to create the baseline model. The baseline furnace model contains a 40VA control transformer, BPM blower motor (and associated controls), and linear power supply. DOE examined and tested the standby power consumption of a variety of products, including those with "premium" features that are related to consumer utility, but unrelated to product efficiency. In order to prevent a reduction in consumer utility, DOE did not consider any design options that would reduce the feature set of these units."

EEI appreciates the conservative nature of the analysis, but the test results would mean that a significant number of furnaces have already improved their standby / off energy usage, which would mean that in certain cases, standby / off mode electricity usage would not be decreased (or may increase from current levels).

In addition, EEI would like to reiterate its comments from the residential boiler rulemaking, as there was no technical information found in the furnace TSD on standby / off mode technologies:

The information provided in support for the proposed standards for "Standby" and "Off" modes appears to be incomplete and may contain errors. In the residential boiler NOPR TSD, figures 5.7.5 through 5.7.10 and Tables 5.4.8 through 5.4.13 present the baseline estimates for electrical standby/off mode power usage, which range from 10.5 to 13.5 Watts. However, there is no information about whether these values represent an average value or a "worst case" baseline value. In addition, no information is provided about the range of baseline standby/off mode wattages.

In terms of the ranges of energy usage at each level, the residential boiler NOPR TSD only states "Table 5.4.8 through Table 5.4.13 shows each of the product classes examined and their respective *intermediate energy efficiency levels*" (emphasis added). However, there is no information provided about whether "intermediate" represents an average or median value, and more importantly, what the range of values was for the baseline and for each TSL. Since energy usage is so low, a range of +/- 2 Watts for each efficiency level could mean that in some cases, there are no energy savings, or energy usage could actually increase.

Further, while TSL 1 (a low-loss transformer) would save 1.5 Watts and the technology for TSL 2 (switching mode power supply) would save 1.8 Watts, TSL 3, which is a combination of the TSL 1 and 2 technologies is estimated to save only 2.5 Watts instead of 3.3 Watts.

In addition, there was no detailed information about switching mode power supply ("SMPS") technology and its associated energy savings in the residential boiler NOPR TSD. Also, the only reference to information about low-loss transformers in the residential boiler NOPR TSD is a paper written in 2004, shown as follows:

"N. Nielsen. "Loss Optimizing Low Power 50 Hz Transformers Intended for AC/DC Standby Power Supplies." *Applied Power Electronics Conference and Exposition, 2004.* IEEE, pp. 420–425, September 9, 2004."

EEI was able to access this paper at http://orbit.dtu.dk/fedora/objects/orbit:56806/datastreams/file_4175071/content , and would like to highlight some key quotes:

> "A typical off-the-shelf transformer which can deliver 2-3W output effect in a resistive load (e.g. one suitable for a 5V-DC@1W standby power supply) has a typical no-load loss which is in the range of 0.5W and up to around 1.5W."
>
> "A drawback for this principle of loss reduction is that it requires a larger core size, which means that the core weight and the overall cost also increases."

If DOE is assuming that all of the savings will be in the "no load" conditions, it is unclear how the "average" savings will be 1.5 Watts for TSL, since the range of no-load losses (according to the paper) is 0.5 to 1.5 Watts.

Tables 1 and 2 in the paper show information about the wattage savings, but only under no-load conditions (and not under part load or full load conditions). It should be noted that the savings shown in many of the tests reveal results that are less than the 1.5 Watts savings shown in TSL 1.

In addition, the 50 Hz transformers would not be useful in the US market, since they are not designed for the US electric frequency of 60 Hz.

As noted the proposed conservation standards for standby and off modes, which are based on TSL 3, represent the maximum improvement in energy efficiency that is technologically feasible. *See* 80 *Fed. Reg*. at 13,187. The NOPR does not contain any discussion of the possible implications of setting a "max tech" standard going forward. For example, in the future, there may be smart grid applications and other important functions (such as carbon monoxide monitoring of gas furnaces, maintenance warnings, self-diagnostic tools, methane leak detection and warnings, remote temperature settings, energy usage displays, automatic gas demand response during a "polar vortex", etc.) that necessitate an increase in "standby" electric usage. Because of EPCA's "anti-backsliding provisions, which prevent DOE from amending standards if it would increase the maximum allowable energy use or decreasing the minimum required efficiency of a covered product, the proposed conservation standards for standby electric usage could prevent such valuable features from being developed and implemented. *See* 42 U.S.C. 6295(o)(1). Before finalizing standby standards based on "max tech," DOE should consider whether this limits future product innovations that could increase furnace energy efficiency, reduce furnace emissions, increase safety, or increase value to consumers.

<u>Economic concerns</u>

At TSL 1 for standby / off electricity usage, the NOPR estimates that the median payback ranges from 1.2 to 1.3 years, based on the type of gas furnace. However, for TSL 2, due to the significant cost increase and low estimated incremental energy savings (0.3 Watts), the median paybacks range from 9.2 to 9.7 years. At TSL 3, the median paybacks range from 7.1 to 7.5 years.

In addition, for both non-weatherized and mobile home gas furnaces, the average life cycle costs are lower at TSL 1 than at TSL 2 or TSL 3. Therefore, in terms of life cycle costs, TSL 1 provides the lowest life cycle costs for owners of both types of gas furnaces.

Also, at TSL 1, 0%-2% of consumers are estimated to have higher net costs for all furnace types, compared to 1 to 15% of consumers having higher net costs at TSL 2, and

1 to 9% of consumers having higher net costs at TSL 3. In terms of percent of consumers having net benefits, TSL 1 has the highest percentage of consumer with net benefits for both furnace types.

Therefore, due to the technical issues (in terms of the actual energy savings available and potential future functionality that will improve furnace technology) and economic concerns based on the current analysis, EEI would recommend that DOE use TSL 1 for the standby / off mode energy conservation standard.

EEI has Concerns About Eliminating Entire Product Classes

As EEI has stated in other rulemakings, EEI is always concerned when a DOE energy efficiency standard eliminates an entire class of products, such as non-condensing furnaces, from the marketplace.

Thank you for your review and consideration of our comments. Please contact Steve Rosenstock (202-508-5465, srosenstock@eei.org) if you have any questions about EEI's comments.

Respectfully submitted,

Steve Rosenstock, P.E.
Senior Manager, Energy Solutions

cc: Rick Tempchin, EEI
Emily Fisher, Esq., EEI