Submitted via regulations.gov

September 26, 2023

Ms. Julia Hegarty
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Building Technologies Office, EE-5B
1000 Independence Avenue SW
Washington, DC 20585-0121

Re: Notice of Proposed Rulemaking and Request for Comment: *Energy Conservation Program: Energy Conservation Standards for Consumer Water Heaters*, EERE-2017-BT-STD-0019, RIN 1904-AD91, 88 Fed. Reg. 49058 (July 28, 2023)

Dear Ms. Hegarty:

The American Gas Association ("AGA"), American Public Gas Association ("APGA"), National Propane Gas Association ("NPGA"), Spire Inc., Spire Missouri Inc., and Spire Alabama Inc. (collectively, "Joint Commenters") respectfully submit these comments in response to the above-referenced proceeding regarding the notice of proposed rulemaking and request for comment ("NOPR") pertaining to energy conservation standards for consumer water heaters issued by the U.S. Department of Energy ("DOE" or "Agency").[1]

I. Identity and Interest

AGA, founded in 1918, represents more than 200 local energy companies that deliver clean natural gas throughout the United States. There are more than 77 million residential, commercial, and industrial natural gas customers in the U.S., of which 96 percent — more than 74 million customers — receive their gas from AGA members. AGA is an advocate for natural gas utility companies and their customers and provides a broad range of programs and services for member natural gas pipelines, marketers, gatherers, international natural gas companies, and industry associates. Today, natural gas meets more than one-third of the United States' energy needs.[2]

[1] *Energy Conservation Program: Energy Conservation Standards for Consumer Water Heaters*, EERE-2017-BT-STD-0019, RIN 1904-AD91, 88 Fed. Reg. 49058 (July 28, 2023).
[2] For more information, please visit www.aga.org.

APGA is the trade association for more than 730 communities across the U.S. that own and operate their retail natural gas distribution entities. They include not-for-profit gas distribution systems owned by municipalities and other local government entities, all locally accountable to the citizens they serve. Public gas systems focus on providing safe, reliable, and affordable energy to their customers and support their communities by delivering fuel to be used for cooking, clothes drying, and space and water heating, as well as for various commercial and industrial applications.[3]

NPGA is the national trade association of the propane industry with a membership of about 2,400 companies, and 36 state and regional associations that represent members in all 50 states. Membership in NPGA includes retail marketers of propane gas who deliver the fuel to the end user, propane producers, transporters and wholesalers, and manufacturers and distributors of equipment, containers, and appliances. Propane gas fuels millions of installations nationwide for home and commercial heating and cooking, in agriculture, industrial processing, and as a clean air alternative engine fuel for both over-the-road vehicles and industrial lift trucks. Roughly 75% of NPGA's members have fewer than 100 employees, and are considered small businesses. The proposal directly addresses products which currently, and in the future, may rely on propane for fuel, and as such, the proposal has the potential to have a direct and significant impact on NPGA's members.

Spire Inc., Spire Missouri Inc., and Spire Alabama Inc. (collectively, "Spire") are in the natural gas utility business. Spire Inc. owns and operates natural gas utilities that distribute natural gas to over 1.7 million residential, commercial, and institutional customers across Missouri and Alabama, and Spire Missouri Inc. and Spire Alabama Inc. are the largest natural gas utilities serving residential, commercial, and institutional customers in Missouri and Alabama, respectively.

Joint Commenters provide the energy needed to fuel consumer water heaters, thus making them critical stakeholders. Joint Commenters support and actively invest in energy efficiency.

II. Overview of the NOPR

The Energy Policy and Conservation Act, as amended ("EPCA"), prescribes energy conservation standards for various consumer products and certain commercial and industrial equipment, including consumer water heaters. EPCA also requires DOE to periodically determine whether more-stringent standards would be technologically feasible and economically justified and would result in significant energy savings. In this NOPR, DOE proposes amended energy conservation standards for consumer water heaters. While the NOPR proposes new energy conservation standards for a number of different consumer water heaters, these comments focus on only those consumer water heaters that are gas-fired.

Of note, the NOPR proposes a uniform energy factor ("UEF") in the non-condensing range for all gas-fired storage water heaters ("GSWH") with effective storage volume less than or equal to 55 gallons or greater than 100 gallons. For gas-fired instantaneous water heaters ("GIWH"), the NOPR proposes a condensing level for those with less than 2 gallons of effective storage volume

[3] For more information, please visit www.apga.org.

and an input rating greater than 50,000 British thermal units per hour ("Btu/hr") (often referred to as "tankless water heaters"), but non-condensing for most other GIWHs.

III. Procedural History

According to the NOPR, DOE initiated the current rulemaking by publishing a Request for Information on May 21, 2020.[4] DOE published its preliminary analysis and technical support document ("preliminary TSD") on March 1, 2022.[5] DOE also notes it deviated from its own procedural rules (Appendix A) by publishing a preliminary analysis without a framework document.[6] DOE held a public meeting on April 12, 2022 on the preliminary TSD.[7] Joint Commenters submitted materials in response to the preliminary TSD.[8] After the close of the comment period for the preliminary TSD, DOE also received recommendations on amended energy conservation standards from what it terms "Joint Stakeholders," which included, among other entities, a limited number of water heater manufactures, but not all.[9] Joint Commenters responded to the recommendations by requesting that DOE proceed through the normal rulemaking process and not issue a direct final rule.

On July 21, 2023, DOE made available a prepublication version of the NOPR, along with associated data, including the Technical Support Document ("TSD"). DOE formally published the NOPR in the Federal Register on July 28, 2023. On September 13, 2023, DOE held a virtual public meeting to discuss the proposed rule. If finalized, the proposed standards in the NOPR are anticipated to become effective in 2030.

IV. Comments

A. Comments Pertaining to Gas-Fired Storage Water Heaters ("GSWHs")

i. Maintaining a Non-Condensing Standard for GSWHs is Appropriate

Joint Commenters are encouraged by DOE's proposed standards for 55 gallons or less storage volume for GSWHs maintains the availability of a non-condensing level standard. Non-condensing technology differs from condensing technology not only in how the appliance itself is manufactured and operates, but also in how the appliance must be installed (e.g., location, venting configuration, venting materials, condensate drainage, etc.) and whether it is compatible with a consumer's home configuration. Maintaining a non-condensing standard for GSWH is especially important, as any energy conservation standard that effectively limits the market for GSWH (or any other gas-fired appliance) to products using only condensing combustion technology would

[4] NOPR at 49067. *See also* 85 Fed. Reg. 35083 (May 21, 2020).
[5] NOPR at 49067. *See also* 87 Fed. Reg. 11327 (Mar. 22, 2022).
[6] *Id*. DOE's procedural rules are codified in Appendix A to 10 C.F.R. Part 430, Subpart C.
[7] *Id*. at 49068.
[8] *See* Joint Commenter's May 16, 2022, comments in this proceeding, identified in the docket as document No. EERE-2017-BT-STD-0019-0041.
[9] *Id*.

result in the unavailability of "performance characteristics" within the meaning of the EPCA,[10] and thus – as discussed in Section B.i. of these Comments – be precluded by statute.

Joint Commenters were also pleased to see DOE identify GSWHs that are both able to meet the proposed standards, as well as operate without any need for electricity or any electric connection, electric gauges, electric pumps, electric wires, or electric devices. The ability for a GSWH to operate with only a gas hook-up is a critical feature valued by many consumers, especially those communities that require hot water but do not utilize electricity some or all of the time.[11] However, based on the information presented in the TSD, it appears that only one, at most two, manufacturers currently utilize this technology. Before finalizing any new efficiency standards for gas-fired storage water heaters, DOE should ensure that there are no constraints surrounding the gas-actuated flue damper (referred to in the TSD as an inlet damper) that makes these efficiency gains possible, dependable, and safe over the lifetime of the product.

Before finalizing efficiency standards for GSWHs, DOE should also address some additional concerns to ensure minimal impact to homeowners who purchase a new GSWH in the future. For instance, the TSD suggests that the proposed standards can only be met with 2-2.5 inches of insulation for GSWHs, which may pose problems for the many consumers with GSWHs in tight closets and utility spaces,[12] which are especially typical in apartment homes,[13] or for those in jurisdictions where the local building code requires a certain amount of space to be kept free surrounding a water heater to facilitate service, repairs, and replacements without the removal of permanent construction. DOE's analysis also does not account for the breadth of existing multifamily building configurations. While DOE makes some reference to the differing installation and cost conditions (among other elements) between various housing types in the preliminary TSD and TSD, the analysis does not well-address distinctions within the multifamily landscape including high-rise versus low-rise buildings, historic structures and adaptive reuse projects (*i.e.*, commercial to residential conversions). Such features can significantly influence water heater installation, operations and consumer satisfaction, and DOE's impact analysis would benefit from a broader consideration of the multifamily marketplace. This is simply just one reason why we are concerned that DOE underestimates the installation costs, and significant questions still remain regarding the quality of DOE's data on installation costs.[14]

The proposed standards, if adopted, would result in GSWHs operating very close to the condensing/non-condensing efficiency line. Simply, this means that, in certain situations, condensate may unintentionally be created, which has the potential to cause both maintenance and safety issues. Before finalizing these standards, DOE should also confirm that the technology

[10] Energy Policy and Conservation Act of 1975, as amended ("EPCA"), 42 U.S.C. § 6291, *et seq*.
[11] *See, e.g.,* "Amish exemption" in DOE's consumer boiler energy conservation starts. 10 CFR 430.32(e)(2)(v).
[12] DOE Public Meeting, Sept. 13, 2023, at 2:44 PM. *See also* NOPR at 49094.
[13] The supporting analysis fails to understand that resizing a utility closet in an apartment home will typically involve substantial construction and quality of life impacts for apartment residents. DOE should also consider the consequences of utility closet changes given the common co-location of water heaters with laundry appliances in apartments.
[14] DOE Public Meeting, Sept. 13, 2023, at 2:37 PM-2:47 PM. *See also* Comments of National Multifamily Housing Council and National Apartment Association in EERE-2017-BT-STD-0019 (hereinafter "NMHC/NAA Comments").

available to meet these standards (especially those that do not require an electric connection) are able to do so safely in all anticipated conditions.

Finally, the consumer benefits claimed to justify the proposed standards for GSWHs are remarkably small.[15] Those benefits amount to an average life-cycle cost savings of only $52 over an average product life of 14.5 years, based on operating cost savings of less than $2.00 per month in the first year.[16] According to DOE's analysis, purchasers affected by this proposed standard would face average payback periods of more than ten years[17] and would experience net costs over 46% of the time.[18] These are concerning figures for all impacted Americans needing to replace their appliance in the future.

ii. The NOPR Fails to Address Significant Regional Differences in Costs and Benefits

The NOPR fails to address significant regional differences in costs and benefits that will disproportionately impact millions of Americans. The modeling done by DOE relies on national sales data only and results in impacts that do not capture the regional differences that could play a role in the installation or replacement of a water heater. Based on data taken from the proposed furnace and consumer boiler rule, the sale of higher efficiency condensing products tends to happen more in the north. In addition, regardless of venting type, the structure of a building and where the water heater may be placed will differ from region to region because of the ability to store it in the basement, ground level or attic.

While DOE's model does take into account some of these factors by utilizing the EIA Residential Energy Consumption Survey 2015 dataset, the use of national market shares treats every state the same and cannot pre-determine in the baseline where higher efficiency water heaters are more popular already. States with few sales would impact the Life Cycle Cost ("LCC") outcome more than others. In addition, the net higher installed costs for rule affected trials share the same average net cost of between $122 and $135 across the entire country.

---

[15] NOPR at 49160.

[16] 88 Fed. Reg. at 49137 at Tables V.1 and V.2.

[17] The payback period reported at 88 Fed. Reg. 49137 Table V.1 is misleading. The payback period reported (7.9 years) is the product of abstract calculations based on average input parameters that only reflect the maximum potential efficiency improvement resulting from the standard (*i.e.*, an improvement from lowest efficiency product available to a standards-compliant product). As DOE's own figures show, the average of the payback periods for consumers affected by the proposed standards is 10.1 years. EERE-2017-BT-STD-0019-0060_content.xlsm, sheet: Summary, cell U9.

[18] The percentage of consumers experiencing net costs as a result of the proposed standard – as reported at 88 Fed. Reg. 49137 Table V.2 – is also misleading. That figure (36%) presents the number of rule outcome trial cases with net cost outcomes as a percentage of all 10,000 of DOE's trial cases (including the cases representing consumers not affected by the standard). According to DOE's figures, 46.6% of the consumers affected by the standard would experience net costs. *See* Summary of Analysis of DOE's LCC Model, provided as Attachment A to these comments, at Table 2.

Based on the results of DOE's current model, most regions resemble one another with similar LCC savings, for low income and senior subgroups, there are a few regions with low or negatives LCC savings that could have played a different role in the modeled outcome if better market share data was incorporated in the results. The following tables summarize the national and subgroups for all households because DOE has elected to analyze only a subset of low-income households who are most likely to directly pay utility bills.[19] This is an incomplete conclusion since utilities can also be a function of rent where higher utilities costs can still be passed on to the end user.

Table: Regional Impact of GSWH Rule

	Total Simulated Trial Count	Affected	Total Negatively Affected	Average LCC Savings	Average First Year Savings	Higher Install Costs	Total Payback
New England	334	80%	17%	$ 193	$ 29	$ 128	5.2
Middle Atlantic	1466	80%	50%	$ 42	$ 17	$ 134	10.2
East North Central	1932	77%	59%	$ 10	$ 13	$ 133	12.4
West North Central	798	76%	52%	$ 34	$ 15	$ 128	10.5
South Atlantic	1030	77%	33%	$ 81	$ 20	$ 131	7.8
East South Central	350	77%	52%	$ 43	$ 17	$ 132	9.9
West South Central	1164	74%	57%	$ 26	$ 14	$ 133	12.8
Mountain	980	79%	45%	$ 52	$ 16	$ 127	10.1
Pacific	1946	78%	36%	$ 85	$ 19	$ 139	8.3
	10000	78%	47%	$ 52	$ 17	$ 133	10.1

Table: Regional Impact of GSWH Rule on Low-Income Households

	Total Simulated Trial Count	Low Income Weighted Trial Count	Percent Affected	Percent of Low Income Affected that are Negatively Impacted	Average LCC Savings for Low Income	Average First Year Savings for Low Income	Low Income Higher Install Costs	Low Income Payback
New England	334	84	79%	17%	$ 154	$ 29	$ 127	5.4
Middle Atlantic	1466	224	85%	52%	$ 40	$ 17	$ 135	9.9
East North Central	1932	207	84%	61%	$ 2	$ 13	$ 134	12.2
West North Central	798	70	82%	55%	$ 9	$ 13	$ 132	11.5
South Atlantic	1030	138	78%	38%	$ 66	$ 19	$ 133	8.2
East South Central	350	71	83%	39%	$ 92	$ 19	$ 127	8.0
West South Central	1164	140	81%	58%	$ 33	$ 14	$ 130	12.2
Mountain	980	116	80%	44%	$ 84	$ 19	$ 122	9.9
Pacific	1946	272	83%	38%	$ 67	$ 17	$ 133	8.9
	10000	1322	82%	46%	$ 53	$ 17	$ 132	9.9

[19] Tables showing the regional impacts of the GSWH rule generally, on low-income households, and on senior households are provided in Attachment B to these comments.

Table: Regional Impact of GSWH Rule on Senior Households

	Total Simulated Trial Count	Senior Weighted Trial Count	Percent Affected	Percent Senior Affected that are Negatively Impacted	Average LCC Savings for Seniors	Average First Year Savings for Seniors	Higher Install Cost for Seniors	Payback for Seniors
New England	334	60	79%	14%	$ 387	$ 40	$ 130	3.8
Middle Atlantic	1466	243	80%	43%	$ 73	$ 19	$ 131	9.2
East North Central	1932	298	75%	61%	$ (2)	$ 12	$ 137	13.0
West North Central	798	171	67%	58%	$ 27	$ 16	$ 133	10.5
South Atlantic	1030	153	78%	33%	$ 71	$ 19	$ 133	8.1
East South Central	350	64	80%	56%	$ 47	$ 17	$ 128	10.0
West South Central	1164	245	71%	53%	$ 59	$ 16	$ 134	12.3
Mountain	980	235	78%	46%	$ 53	$ 17	$ 126	9.8
Pacific	1946	297	79%	36%	$ 104	$ 21	$ 139	8.1
	10000	1767	76%	46%	$ 67	$ 18	$ 133	10.0

While DOE's proposal for GSWHs appears to be a step in the right direction, the Agency should be diligent in addressing our concerns to ensure that its final standard is not only safe, but appropriately economically and technologically justified, while also ensuring consumers will continue to have access to the appliances that best fit their homes and budgets.

B. Comments Pertaining to Gas-Fired Instantaneous Water Heaters

i. If Finalized, the NOPR Would Result in the Unavailability of an Important Feature

As explained in detail in previous comment submissions and above, minimum efficiency standards that can only be achieved by condensing products would result in the unavailability of products with "performance characteristics" and "features" provided by non-condensing products and are thus precluded by 42 U.S.C. § 6295(o)(4) (the "unavailability" provision of the statute).[20] Previous comments indicated that this would unquestionably be true in the case of gas storage water heaters, but indicated that further evaluation would be necessary to determine whether the same is true with respect to gas instantaneous water heaters.[21] Further evaluation indicates that it is true of gas instantaneous water heaters, as discussed in comments being submitted today by Rinnai America Corporation. In particular, non-condensing gas instantaneous water heaters can be installed (and thus used) in cases in which condensing gas instantaneous water heaters cannot, such as installations in high-rise buildings in which the venting required for condensing products would be precluded by any of a variety of factors including practical constraints, code restrictions, restrictive covenants, or historic preservation requirements. As explained in prior comments,[22] DOE's insistence that such performance characteristics and features are not protected under 42 U.S.C. § 6295(o)(4) because they do not "provide any utility to the consumer that is accessible to

[20] *See, e.g.*, Attachment C at 6-15, 17-23; Joint Commenter's May 16, 2022, comments in this proceeding, identified in the docket as document No. EERE-2017-BT-STD-0019-0041, at Attachment A pp. 7-11 and Attachment D pp. 3-10.

[21] Joint Commenter's May 16, 2022, comments in this proceeding, identified in the docket as document No. EERE-2017-BT-STD-0019-0041, at 4.

[22] *See, e.g.*, Attachment C at 8-13; Joint Commenter's May 16, 2022, comments in this proceeding, identified in the docket as document No. EERE-2017-BT-STD-0019-0041, at Attachment A pp. 10-11.

the layperson"[23] is an *ipse dixit* that lacks any statutory basis and serves only to impermissibly nullify an express statutory constraint on DOE's rulemaking authority.[24]

Accordingly – pursuant to 42 U.S.C. § 6295(o)(4) – DOE should decline to adopt the proposed standard for gas instantaneous water heaters on the grounds that it would result in the unavailability of products with "performance characteristics" and "features" currently available to consumers in the United States.

ii. DOE has Not Justified the Proposed Standards for Instantaneous Gas Water Heaters.

EPCA requires that "[a]ny new or amended energy conservation standard" must be "technologically feasible and economically justified."[25] Both the structure of the statute and its text make it clear that every individual standard must be economically justified and that benefits attributable to one standard cannot be used as a basis to justify a *different standard*.[26] DOE has not provided an economic justification for any of its proposed standards for GIWHs.

DOE has proposed new minimum efficiency standards for three separate categories of gas instantaneous water heaters.[27] However, DOE has provided only one life-cycle cost analysis to justify these three different standards.[28] At most, these results show that – if the economic impacts of this group of standards are combined – the net effect is positive. However, GIWHs with a rated storage volume under 2 gallons and an input capacity of up to 50,000 Btu/h are different than GIWHs with a rated storage volume of less than 2 gallons and an input capacity of over 50,000 Btu/h; these products presumably have different initial costs and different operating costs, and DOE concluded that they are *different enough* that they should be subject to two materially different minimum efficiency standards. However – as already indicated – DOE has not provided payback or life-cycle cost outcomes for either of these proposed standards. Would those results suggest that both standards are economically justified, that one is justified and the other is not, or that neither is economically justified? Having failed to address these questions, DOE has failed to justify any of its proposed standards for GIWHs. To the extent DOE believes that it does not need to justify these standards individually – an approach that presumes that benefits attributable to one standard can be used to justify a different standard – DOE is mistaken as a matter of law and should modify its regulatory approach. In any event, DOE has failed to justify its proposed standards for GIWHs as EPCA requires.

---

[23] 88 Fed. Reg. at 49079.
[24] *See Hearth Patio & Barbecue Association v. DOE*, 706 F.3d 499, 506 (D.C. Cir. 2013); *NRDC v. EPA*, 489 F.3d 1364, 1373 (D. C. Cir. 2007).
[25] 42 U.S.C. § 6295(o)(2)(A).
[26] *See* 42 U.S.C. § 6295(o)(2)(B).
[27] 88 Fed. Reg. at 49177.
[28] *See* 88 Fed. Reg. at 49139 Tables V.11 and V.12; 88 Fed. Reg. at 49149-51 (cumulative energy savings and net present value of consumer savings). It should be noted that DOE's analysis of emissions reductions and claimed climate and health benefits does not even provide results specific to the groups of standards for gas instantaneous water heaters: instead, it provides a single set of results for the claimed combined impact of all of all of DOE's proposed standards. 88 Fed. Reg. 49151-56.

iii. The Proposed Standards for Instantaneous Gas-Fired Water Heaters Are Not Economically Justified

The economic justification for the proposed standards for GIWHs is remarkably weak and based on an analysis that significantly overstates the potential for standards to provide economic benefits for consumers.

The consumer benefits claimed to justify the proposed standards amount to average life-cycle cost savings of $135 over an average product life of 20 years, again based on operating cost savings of less than $2.00 per month in the first year.[29] According to DOE's analysis, purchasers affected by this proposed standard would face average payback periods of more than *twelve years* and would experience net costs over 35% of the time.[30]

These claimed economic benefits are not credible for a number of reasons. They appear to be based on overstated gas prices, understated product, installation, and maintenance costs, and – as explained below – an analytical approach that systematically overstates the potential for standards to provide economic benefits for consumers while understating their potential to impose net costs. For all of these reasons, the fact that DOE's analysis produced extremely modest claimed benefits is a strong indication that the proposed standards would actually do consumers more economic harm than good.

However, there is an additional and even more fundamental problem that undermines the credibility of the benefits claimed to justify the proposed standards: despite the artificial precision of DOE's analytical results, its analysis has neither the accuracy nor the precision required to produce meaningful results on the scale of the benefits DOE claims. This should be obvious, because DOE's entire analysis is based on precise data inputs that are developed on the basis of decidedly imprecise information and assumptions. For example – instead of gathering actual data on the prices consumers pay for products such as GIWHs – DOE employs an elaborate analysis to "build up" product price and installation cost estimates based on numerous parameter inputs for which credible information is frequently lacking.[31] The results of this analytical approach have long been criticized for their lack of accuracy and precision, yet DOE's analysis is based on price inputs that are precise to the penny. In this case, DOE's analysis shows that the average difference in total installed cost between a non-condensing gas instantaneous water heater and an instantaneous water heater efficient enough to satisfy its proposed standard is only $127. Direct pricing information submitted in the record suggests that the difference in average *product price alone* is on the order of $450, suggesting that DOE's installed cost estimate is low by more than

[29] 88 Fed. Reg. at 49139 Tables V.11 and V.12.

[30] Again, the payback and net cost figures presented at 88 Fed. Reg. 49139 Tables V.11 and V.12 are misleading for the reasons already explained in footnote 17 and 18. As DOE's own figures show, the average of the payback periods for consumers affected by the proposed standards is 12.1 years (EERE-2017-BT-STD-0019-0060_content.xlsm, sheet: Summary, cell U28) and the percentage of consumers affected by the rule that would experience net costs is 35.3% (Attachment A at Table 3).

[31] *See* Joint Commenter's May 16, 2022, comments in this proceeding, identified in the docket as document No. EERE-2017-BT-STD-0019-0041, at Attachment B pp. 71-73.

350%.[32] The problem is not just that DOE's critical installed cost numbers appear to be grossly underestimated. It is that the uncertainties in DOE's numbers are far too great to support the claim that the small benefits it claims to justify its proposed standards can be reliably distinguished from net costs of a similar magnitude. To illustrate this point, Joint Commenters prepared a sensitivity analysis to determine the impact of incremental increases in DOE's installed cost estimates. If DOE's installed cost estimates for gas water heaters are low by even 3%, over half the consumers affected by the rule would experience net costs; if DOE's estimates are low by 6%, the average life-cycle cost savings would be negative.[33] And this is just the impact that an error in one key parameter would have. A sensitivity analysis combining errors in installed product and maintenance costs shows that – if DOE underestimated installed costs by just 2% and maintenance costs by 5% – over half the consumers affected by its proposed gas water heater standards would experience net cost results.[34]

DOE would need far better data to achieve anything like the level of precision and accuracy required to make credible claims that its standards would produce consumer benefits on the scale of the benefits it claims for gas water heaters.

iv. DOE's "Random Assignment" Methodology is Unreasonable

Gas water heaters efficient enough to satisfy the proposed standards (*i.e.*, "Standards-Compliant" water heaters) are already well-established in the market and have captured a significant and ever-increasing share of the gas water heater market. DOE's own numbers demonstrate that the economic consequences of investments in such products vary considerably based on individual circumstances, producing significant economic benefits in some cases and imposing significant costs in others. In these circumstances, a perfectly-functioning market would not result in a 100% market share for Standards-Compliant products and a standard designed to achieve a 100% market share for such products would, at best, be an over-correction for any "market failures" alleged to exist. Moreover – where some investments in Standards-Compliant products would be economically beneficial and others would impose net costs – the economic impact of a standard necessarily depends on the extent to which purchasers acting in the absence of the standard have any significant tendency to make investments in Standards-Compliant products when it would be economically beneficial to do so or to decline such investments when they are economically unattractive. To the extent purchasers have such tendencies, the distribution of economic outcomes for investments in Standards-Compliant products would be different for the investments purchasers would choose to make on their own (*i.e.*, "base case" investments) than for those they would make only if a new standard left them no choice (*i.e.*, "rule outcome" investments). Specifically:

- The base case investments in Standards-Compliant products would disproportionately include investments with *attractive* economic outcomes;

[32] August 28, 2023, Letter from Rinnai America Corp. to the U.S. Department of Justice, identified in the docket as document No. EERE-2017-BT-STD-0019-0612, at Table 1.
[33] Attachment A at 5-7 & Figure 1.
[34] Attachment A at 8, 10 & Figure 4.

- The rule outcome investments in Standards-Compliant products would disproportionately include investments with *unattractive* economic outcomes; and

- The average economic outcome for base case investments in Standards-Compliant products would be better – and *that for rule outcome investments would be worse* – than the average economic outcome for all potential investments in Standards-Compliant products.

It is absurd to suggest that the purchases of gas water heaters consumers are making in the absence of standards do not reflect *any* significant consumer preference for economically beneficial investments in Standards-Compliant water heaters or aversion to economically unattractive investments in such products. Nevertheless, DOE employs a "random assignment" methodology that assumes that such purchasing decisions are *never* influenced by the economic consequences of potential investments in Standards-Compliant water heaters *regardless of the economic stakes involved*. DOE has never even claimed that assumption is factually valid. As discussed in numerous previous comment submissions, that assumption provides a basis for analysis that significantly overstates the potential for standards to produce good economic outcomes, significantly understates their potential to impose bad economic outcomes, and thus systematically skews the results of the economic analyses DOE relies upon to justify new standards.[35]

a. The Mechanics of Random Assignment

DOE's analysis is based on 10,000 "trial cases" that ostensibly represent the full range of scenarios in which Standards-Compliant products may be installed. The economic consequences of potential investments in Standards-Compliant products – as compared to investments in lower efficiency products – can be determined for each of these 10,000 trial cases. These consequences vary depending on the case-specific circumstances represented by each individual trial case and – as already indicated – typically include some cases with very favorable economic outcomes and others with very unfavorable outcomes. For example, DOE's analysis indicates that individual investments in Standards-Compliant GIWHs can provide economic benefits of up to $5,078 or impose net costs of up to $1,886.[36]

DOE accounts for the fact that a significant percentage of consumers already choose Standards-Compliant products by creating a base case in which that same percentage of trial cases are "assigned" Standards-Compliant products to start with. Having accounted for these "base case" investments in Standards-Compliant products, the remaining trial cases are "assigned" lower efficiency products and used to simulate the investments in Standards-Compliant products that would occur only if a new standard is imposed. DOE's analysis of the economic impact of a standard is based on the economic consequences of replacing lower-efficiency products with Standards-Compliant products in the latter cases.

[35] *See e.g.*, Joint Commenter's May 16, 2022, comments in this proceeding, identified in the docket as document No. EERE-2017-BT-STD-0019-0041, at Attachment A at 13-14 and Attachment B at 58-62; *see also* Attachment C to these comments, at 15-17.

[36] These are DOE's outcomes for trial cases 7633 and 1685, respectively.

For purposes of this analysis, the percentage of trial cases "assigned" to represent base case investments in Standards-Compliant products (*i.e.*, those investments that consumers are already making on their own) is based on the market share DOE expects Standards-Compliant products to capture if no new standard is imposed. However – whatever that percentage is – the *individual trial cases* assigned to the base case are selected randomly (*i.e*., without regard to their economic outcomes), as though base case purchasers have no statistically significant preference for economically beneficial investments in Standards-Compliant products or aversion to economically unfavorable investments in such products regardless of the economic stakes involved.

b. Random Assignment Simulates Extreme and Unreasonable Purchasing Behavior.

DOE offers a tepid acknowledgement that "economic factors may play a role" in purchasing decisions but claims that random assignment reasonably "simulates behavior in the water heater market, where market failures and other consumer preferences result in purchasing decisions not being *perfectly aligned* with economic interests.[37] DOE then "emphasizes that its approach does not assume that all purchasers of water heater make economically irrational decisions," pointing out that "[a]s part of the random assignment, some homes or buildings with large hot water use will be assigned higher efficiency water heaters, and some homes or buildings with particularly low hot water use will be assigned baseline water heaters."[38] However, as DOE is well aware:

- Economic considerations play a significant role in consumer purchasing decisions; and

- The fact that random assignment produces some apparently reasonable assignments by chance does not provide a basis to assert that it simulates a market in which *any* purchasing decisions are influenced by economic considerations.

1. Economic Considerations Do Influence Purchasing Behavior

DOE knows that economic considerations have a significant influence on consumer purchasing decisions. In the NOPR, it identifies "significant additional installation costs" as a basis to conclude that "very few consumers" would make a particular kind of purchasing decision, a conclusion that follows only if economic considerations influence purchasing behavior.[39] Similarly, DOE's analysis supporting its proposed standards for non-weatherized gas furnaces included a "consumer choice" model that used economic criteria such as initial costs and payback periods to simulate purchasing behavior. While DOE used that model to address fuel switching decisions rather than to replace its random assignment methodology for base case efficiency assignment, its model was based on survey-based data that "identified consumers' willingness to purchase more-efficient space-conditioning systems."[40] DOE acknowledged that this data addressed decisions to pay more up-front for more efficient products – not decisions to engage in fuel switching – but argued that "because the data reflect a trade-off between first cost and ongoing savings, it is reasonable to expect that the payback criterion is broadly reflective of the potential

[37] 88 Fed. Reg. at 49115 (emphasis added).
[38] *Id*.
[39] 88 Fed. Reg. at 49119.
[40] 87 Fed. Reg. 40590 at 40647 (July 7, 2022).

consumer behavior regarding switching."[41] In short, DOE indicated that it was employing data demonstrating that economic considerations have a significant impact on purchasing behavior and – specifically – *on decisions to make or decline investments in more efficient products*. The source of that data was an earlier vintage of the same data source DOE is relying on for other purposes in this rulemaking: the American Home Comfort Studies.[42] DOE's insistence that it can reasonably ignore the impact that economic considerations have on consumer purchasing decisions flies in the face of such evidence.

Moreover, the fact that economic considerations have an impact on consumer purchasing decisions has been confirmed by analysis of DOE's own numbers in its rulemaking concerning standards for non-weatherized gas furnaces. As documented in comments submitted in that proceeding, DOE's numbers show that there is a significant correlation between the regional market shares for condensing furnaces and regional differences in the economic outcomes of investments in such products. In particular:

- There was a correlation showing that the market share for condensing furnaces increased as the life-cycle cost savings for investments in such products increased;[43] and

- There was correlation showing the market share for condensing furnaces decreased as the percentage of investments with net cost outcomes increased.[44]

While DOE has not provided the regional data needed to show similar correlations in DOE's results for consumer water heaters, there is no basis to suggest that economic considerations have a significant impact on decisions to invest in more efficient furnaces but not on similar decisions to invest in more efficient water heaters.

2. Random Assignment Assumes that Economic Considerations Never Matter

Random assignment simulates a market in which some base case purchasers make economically advantageous efficiency investments purely by chance, not a market in which some purchasing decisions are made *on the basis of economic considerations*. This is obvious, because – if DOE assumed that *any* percentage of purchasing decisions are made on the basis of economic considerations – that percentage of trial cases would be assigned accordingly: *i.e.*, in those cases, the trial cases in which investments in Standards-Compliant products would be economically *favorable* would at least generally be assigned to represent base case investments in such products and those in which investments in Standards-Compliant products would be economically *unfavorable* would at least generally be assigned to represent rule outcome investments in such products. **DOE does not assign *any* trial cases in that way.**

[41] 87 Fed. Reg. at 40647 (July 7, 2022).
[42] *See* 87 Fed. Reg. 40590 at 40647 (July 7, 2022); 88 Fed. Reg. at 49114 n. 84.
[43] *See* Comments of the American Gas Association for Docket No. EERE-2014-BT-STD-0031, (Oct. 6, 2022) 60-64, provided as Attachment D to these comments.
[44] *Id.* at 64-67.

The difference between random assignment and an approach that simulates *any* economic decision-making is substantial. For purposes of illustration, consider a very simplified example in which half of all potential investments in Standards-Compliant products – represented by 10,000 individual trial cases – would have "good" economic outcomes and the other half would have "bad" outcomes. Further assume that 50% of purchasers are already choosing Standards-Compliant boilers, in which case 5,000 trial cases would be assigned to represent base-case investments in Standards-Compliant products and the other 5,000 would represent rule-outcome investments in such products. The question is how the individual trial cases should be "assigned" to these two categories.

With random assignment, the 5,000 trial cases representing base case investments in Standards-Compliant products are selected randomly, with the result that – statistically – they should include about 2,500 trial cases with "good" outcomes and 2,500 cases with "bad" outcomes. This would leave about 2,500 trial cases in which investments in Standards-Compliant products would have "good" outcomes and 2,500 cases in which such investments would have "bad" outcomes to represent the investments in Standards-Compliant products that would occur as a result of the standard.

If it is assumed that *half* of all purchasing decisions are the product of sound economic decision-making, 5,000 trial cases should be "assigned" accordingly: those in which investments in Standards-Compliant products would have "good" economic outcomes (about 2,500 cases) should be assigned to represent base case investments in such products, and those with "bad" outcomes (again, about 2,500 cases) should be assigned to represent investments that would occur as a result of the standard. The remaining 5,000 trial cases would then be assigned randomly (to simulate the 50% of cases in which economic considerations are completely ignored) with the result that the additional 2,500 trial cases representing base case investments in Standards-Compliant products should include about 1,250 cases with "good" outcomes and 1,250 cases with "bad" outcomes (leaving about 1,250 case with "good" outcomes and 1,250 cases with "bad" outcomes to represent the investments that would occur as result of the standard).

The resulting difference in the distribution of economic outcomes is striking:

- Random assignment simulates a market in which economic considerations *never* matter, with the result that about half of the 5,000 trial cases representing rule-outcome investments in Standards-Compliant products would have "good" economic outcomes and the other half would have "bad" outcomes. As a result, the average LCC result for the standard would be squarely between "good" and "bad."

- By contrast, simulation of a market in which half of all purchasing decisions are based on sound economic decision-making produces a result in which about 1,250 (25%) of the 5,000 trial cases representing rule outcome investments in standards-compliant products would have "good" economic outcomes and the other 3,750 (75%) would have "bad" economic outcomes. As a result, the average LCC result for the standard would be "bad."

This difference in outcome is not attributable any difference in the base case market share for standards-compliant boilers or in the range or distribution of economic outcomes for potential investments in standards-compliant products: it is solely a product of the difference between random assignment and a methodology that really does assume that some purchasing decisions are made on the basis of sound economic decision making and others are not.

c. Random Assignment Unreasonably Skews the Results of DOE's Analysis.

Because it simulates a world in which decisions to make (or decline) efficiency investments are *never* influenced by the economic consequences of such investments, random assignment treats too many good investments in Standards-Compliant products as rule outcomes and too many bad investments in such products as the self-inflicted injuries of consumers acting on their own. As a result, DOE's analysis significantly understates the percentage of consumers that would experience net costs as a result of the standard and overstates the economic benefits the standard would provide. The practical impact of the latter problem is significantly exacerbated by the fact that the average LCC outcome for DOE's purported rule outcome investments (a figure on which DOE principally relies to justify standards) tends to be disproportionately influenced by a small percentage of trial cases with relatively extreme economic outcomes: precisely the kinds of cases in which economic considerations are *most likely* to drive purchasing decisions. Accordingly – while random assignment is unreasonable – it is *most unreasonable* as applied to the individual trial cases that matter most: those that have the most substantial economic consequences (good or bad) and thus the greatest impact on the results of DOE's analysis.

To illustrate, DOE's analysis for GIWHs claims regulatory benefits in the form of life-cycle cost savings that barely exceed zero. These claimed benefits are the product of analysis based on 3,751 randomly selected trial cases, of which over 35% (1,324 cases) have net cost economic outcomes: *i.e.*, outcomes *so bad* that consumers would still be left in the red even after the average 20-year life of the product. Statistically, DOE's 3,751 randomly selected trial cases should be representative of all 10,000 trial cases, and analysis of DOE's numbers confirms that they are.[45] Consequently, roughly one third of *all potential investments* in Standards-Compliant products (represented by over 3,300 of DOE's 10,000 trial cases) can be expected to have net cost outcomes. DOE's analysis assigned only 1,324 of those cases to represent rule outcomes because it absurdly assumed that – because over 62% of purchasers are already choosing standards-compliant products – over 62% of the purchasers *facing investments with these conspicuously bad outcomes* would choose to snap them up. In short, random assignment assumed that the probability that consumers would be deterred by *even the worst possible* economic outcomes is exactly zero.

Conversely, over 34% of DOE's total claimed benefits are provided by 575 individual trial cases in which the Standards-Compliant product is the option *with the lowest installed cost*. There is no basis to suggest that standards are necessary to induce purchasers to choose more efficient products when they cost less to start with, yet these 575 cases were assigned to represent rule outcomes

[45] To confirm that DOE's randomly selected rule outcomes are representative of all 10,000 trial cases, Joint Commenters assigned lower efficiency products to all of the trial cases that had been randomly assigned standards-compliant products in DOE's analysis. As expected, the results showed no significant difference in the distribution of economic outcomes. *See* Attachment A at 1-5.

because random assignment absurdly assumed that – because over 35% of consumers choose not to invest in standards-compliant GIWHs – over 35% of the purchasers presented with *these obvious opportunities to save money* would choose to pay more for less efficient products instead. In short, random assignment assumed that the probability that consumers would be attracted to investments that would provide windfall economic benefits is exactly zero.

These are two specific examples of objectively absurd and disproportionately consequential "assignment errors" attributable to the assumption that purchasing decisions are *never* influenced by economic considerations *regardless of the economic stakes involved*. In this case, it is not reasonable to conclude that purchasers acting on their own would make so many investments with conspicuously bad economics or turn down so many opportunities for windfall economic benefits. As these examples show, random assignment produces an analysis of rule impacts that is based on *the wrong set of trial cases*: one that is representative of all potential investments in standards-compliant products rather than of the investments that could reasonably be expected to occur as the result of a standard.

DOE's failure to take any reasonable account of the impact that economic considerations are likely to have on purchasing decisions is unreasonable but is particularly egregious in the case of the high-consequence trial cases – good and bad – that disproportionately influence the results of its economic analysis.

d. DOE's Failure to Address the Errors Created by Random Assignment is Unreasonable.

Interested parties have been pointedly challenging DOE's random assignment methodology for a number of years, as demonstrated by numerous comments submitted in this and a variety of other DOE rulemaking proceedings.[46] The issue was raised in *American Public Gas Ass'n v. DOE*,[47] – a challenge to DOE's commercial packaged boiler standards – and the Court found that DOE had failed to respond to the "substantial concerns" about this "crucial part of its analysis" and that its "failure to engage the arguments raised before it . . . bespeaks a failure to consider an important aspect of the problem."[48] The NOPR exhibits the same failing.

The NOPR acknowledges previous comments expressing the concern that random assignment "completely ignores the fact that—in the absence of new standards—purchasers tend to make the most economically attractive efficiency investments and decline those with the most substantial net costs" and assigns "even the most economically attractive and highest net-cost efficiency investment outcomes to the base case for analysis randomly, as though purchasers never consider the economics of potential efficiency investments regardless of the economic stakes involved."[49] The NOPR also acknowledges concerns about the absurd impacts of random assignment, including

[46] *See e.g.*, Attachment C at 15-17; Attachment D at 54-67; Joint Commenter's May 16, 2022, comments in this proceeding, identified in the docket as document No. EERE-2017-BT-STD-0019-0041, at Attachment A pp. 13-14 and Attachment B pp. 58-62.
[47] 22 F.4th 1018 (D.C. Cir. 2022) ("*APGA v. DOE*").
[48] *Id.*, 22 F.4th at 1027-28.
[49] 88 Fed. Reg. at 49115.

the specific concern that "because there is no basis to suggest that standards are needed to ensure that consumers will choose more efficient products when those products have lower initial costs, DOE should assign such cases to the base case for analysis rather than assigning them to the base or standard cases randomly."[50] Nevertheless, DOE has provided no meaningful response to these concerns and has done nothing to address the unreasonable impacts that random assignment has on the results of its analysis.

Instead, DOE responds to criticisms of random assignment with claims that assignment "based solely on economic measures . . . most likely would not fully and accurately reflect actual real-world installations" because alleged market failures suggest that decisions to make efficiency investments "are unlikely to be *perfectly correlated* with energy use."[51] DOE then claims that random assignment reasonably "simulates behavior in the water heater market, where market failures and other consumer preferences result in purchasing decisions not being *perfectly aligned* with economic interests more reliably than relying *only on apparent cost effectiveness criteria derived from the limited information in CBECS or RECS*."[52]

As already discussed, economic considerations often have a significant influence on consumer purchasing decisions and there is no remotely credible basis to assume that they do not. This does not mean that such decisions are *always* "based solely on economic measures" or are "*perfectly correlated with energy use*," but it does mean that the core assumption embodied by random assignment – that base case purchasing decisions are *never* influenced by the economics of potential investments in Standards-Compliant products *regardless of the economic stakes involved* – is indefensible.

Again, random assignment is not a "reasonable approach" that "simulates behavior" in a market in which "purchasing decisions" are not "perfectly aligned" with economic interests; it is an approach that unreasonably assumes that economic considerations *never influence purchasing decisions at all*. DOE's claim that random assignment simulates purchasing behavior in the market for water heaters "more reliably than relying *only on apparent cost effectiveness criteria derived from the limited information in CBECS or RECS*" is not even relevant, because the alternative to random assignment is not to rely on "apparent cost effectiveness criteria derived from the limited information in CBECS or RECS" as DOE seems to suggest.[53] The fundamental problem with random assignment is that it fails to address the impact that economic considerations have on consumer purchasing behavior (and hence the economic impact of new efficiency standards). By themselves, building characteristics do not provide a basis to determine case-specific economic outcomes, and it is those outcomes – which DOE's individual trial case results already provide – that must be considered in determining the impact that economic considerations are likely to have on purchasing behavior. Moreover, it is the way that *individual trial cases* are assigned – not the *number of trial cases assigned* (as determined market share) – that DOE must correct. It is therefore no surprise that DOE's 5% market share adjustments based on building characteristics[54]

[50] *Id*.
[51] 88 Fed. Reg. at 49115 (emphasis added).
[52] *Id.* (emphasis added).
[53] *Id.*
[54] 88 Fed. Reg. at 49114.

did nothing to address the problems created by random assignment; in fact, these adjustments appear to have no material impact on the results of DOE's analysis.[55]

Similarly, DOE's claim that random assignment would not skew its analysis where "most consumers will continue to be assigned the same efficiency regardless of the details of the methodology"[56] is in error, because the problem with random assignment is not *how many* trial cases are "assigned" products of particular efficiencies: it is the fact that the *individual trial cases* assigned to represent base case investments in Standards-Compliant products are selected without consideration of their economic consequences, as though base case purchasers never consider economic consequences of potential efficiency investments regardless of the stakes involved.

DOE's extended discussion of theoretical market failures[57] is also misdirected, for the simple reason that claims that consumers do not always make perfect economic decisions are facially insufficient to justify the assumption that purchasers are never influenced by economic considerations at all. For example, the NOPR cites one study for the proposition that a "significant subset of consumers appear to purchase appliances without taking into account their energy efficiency and operating costs at all,"[58] ignoring the fact that this proposition does not justify the assumption that *no* consumers consider such factors and the fact that the study it relies on concluded that – on average – consumers do consider such factors.[59] Indeed, the entire body of literature on market failures consists of efforts to identify and (in some cases) assess the impact of potential *exceptions to* (or *limitations on*) the general proposition that purchasers tend to act in their own economic interest.

DOE should also recognize that not all purported "market failures" represent "problems" that should – or in some cases can – be "corrected" by efficiency standards. As the study cited above found, the consumers most likely to prioritize initial costs over efficiency benefits are low-income consumers, and – as detailed in previous comment – it would be more cruel than wise to adopt standards designed to force such consumers to make efficiency investments they cannot afford.[60] Similarly, DOE should recognize that (at least in the case of appliances such as heating and water heating equipment) a tendency toward like-for-like replacements in "emergency replacements of essential equipment such as water heaters"[61] is not a "market failure" at all, except in the sense that it does not prioritize energy efficiency over the consumer's need to restore service as quickly and easily as possible.

---

[55] Indeed, these adjustments had less impact on the results of DOE's analysis than a simple change in the random seed number used in DOE's analysis, which should not have a material impact on the results of the analysis. *See* Attachment A at 1-4 & Tables 2 and 3.

[56] 88 Fed. Reg. at 49118.

[57] 88 Fed. Reg. at 49115-18.

[58] 88 Fed. Reg. at 49116.

[59] Houde, S. "*How Consumers Respond to Environmental Certification and the Value of Energy Information*," cited at 49116 n. 91.

[60] *See* Joint Commenter's May 16, 2022, comments in this proceeding, identified in the docket as document No. EERE-2017-BT-STD-0019-0041, at Attachment B, pp. 38-41 (detailing the adverse health and safety impact of such standards in the context of furnaces).

[61] 88 Fed. Reg. at 49116.

Alleged market failures must also be viewed in context. The potential that market failures might cause consumers to choose the low-cost option when they might be better off investing in a more efficient product cannot justify the random assignment of cases in which the more efficient product *is the low-cost option*. Concerns that consumers might have trouble making perfect economic decisions in close or complicated cases provides no basis for random assignment of cases that are obvious "no brainers" from an economic standpoint. The fact that "[t]here are consumers who are willing to pay a premium for more energy-efficient products"[62] provides no basis to conclude that consumers have no statistically significant aversion to bad investments *regardless of the stakes involved* and certainly does not justify the random assignment of trial cases representing investments that, for example, have initial costs with an obvious potential to induce "sticker shock." Even demonstrated market failures in the market at issue would – at most – have incremental impacts insufficient to justify random assignment.

Although DOE claims that it "minimizes any bias in the analysis by using random assignment, as opposed to assuming certain market conditions that are unsupported given the available evidence"[63], the opposite is true: random assignment creates a massive bias in DOE's analysis by "assuming certain market conditions" that are unsupported by the available evidence. As a result, DOE's analysis is arbitrary and insufficient to support the adoption of any standard.

e. Alternatives to Random Assignment

The obvious alternative to random assignment is to prepare a base case for analysis that reasonably represents actual market conditions and purchasing behavior. For purposes of the following discussion, Joint Commenters will assume that DOE:

- Retains an LCC analysis based on 10,000 trial cases representing the range and distribution of scenarios in which standards-compliant products can be expected to be installed; and

- Continues to determine the percentage of these trial cases that should represent base-case investments in standards-compliant products.

The sole issue is how the individual trial cases representing base-case investments in standards-compliant products should be selected.

As a preliminary step, DOE should assign lower-efficiency products to all 10,000 trial cases for purposes of determining the economic outcome of investments in standards-compliant products in each of its 10,000 trial cases. This step is necessary to enable DOE to consider the impact that those economic outcomes are likely to have on base case purchasing decisions.

While the specific methodology for the assignment of individual trial cases should vary depending on the nature of the product, the range and distribution of economic outcomes for potential investments in standards-compliant products, and evidence of specific market failures and other

[62] *Id.*
[63] *Id.*

relevant market conditions. However, there are at least two core principles that should govern DOE's approach.

First, market failures, by definition, are limited exceptions to the principle that consumers can generally be expected to act in their own economic interest. Accordingly – to the extent there are demonstrated market failures – their impact should be simulated in a way that accounts for the circumstances in which each such failure is likely occur and the way in which each failure can be expected to influence purchasing decisions.

Second – while purchasing decisions are not always based on *perfect* economic decisions – DOE should recognize that the probability that a purchasing decision will be made on the basis of economic considerations increases as the economic consequences of that decision (good or bad) increases.

The approach described below provides a general (and admittedly abstract) illustration of how issues might be addressed in a manner consistent with the above principles.

1. Accounting for Consumers Willing to Pay a Premium for Energy Efficient Products

If there is sound basis to conclude that some percentage of purchasers are so willing to pay a premium for more energy-efficient products (and so insensitive to costs) that they would generally purchase standards-compliant products regardless of the economic consequences, DOE could:

- Select that percentage of the 10,000 trial cases – without considering their economic outcomes – by choosing individual trial cases that appropriately represent cases involving such purchasers (*i.e.*, cases involving installations in buildings likely to be owned by higher-income consumers and governmental or institutional purchasers with policies requiring investment in high-efficiency products); and

- Assign those trial cases to represent base case investments in standards-compliant products, subject to appropriate exceptions to address individual cases in which problematic outcomes are likely to cause even those prepared to pay a premium for higher efficiency to decline investments in Standards-Compliant products.

This approach would account for relatively extreme cases in which consumers value efficiency over economic considerations: *i.e.,* cases in which purchasers can be expected to be particularly insensitive to negative economic outcomes. At the same time, it would recognize that there are factors (such as a level of "sticker shock") that would cause many such purchasers to decline unreasonably costly efficiency investments (DOE should note that many institutional policies favoring higher-efficiency products provide exceptions for such cases). Such cases would represent limited exceptions to the expected behavior of purchasers who are generally prepared to pay a premium for higher efficiency products. The result would be that a randomly-selected percentage of trial cases would assigned to represent base case investments in standards-compliant products, with the exception of cases with particularly negative outcomes (which would be

assigned lower efficiency products to represent cases in which even purchasers prepared to pay a premium for more efficient products would be expected to balk).

Cases in which decisions are less dramatically influenced by a willingness to pay a premium for higher-efficiency products could be addressed through criteria reflecting imperfect economic decision-making (described below).

2. "Split Incentives"/Extreme Sensitivity to Initial Costs

If there is a sound basis to conclude that some percentage of purchasers would generally choose the product with the lowest installed cost regardless of any other considerations:

- DOE should select that percentage of trial cases – without considering their economic outcomes – by choosing individual trial cases that appropriately represent cases involving such purchasers (*i.e.*, cases involving installations in buildings likely to be owned by low-income consumers and owners of low-income housing); and

- For the base case, DOE should assign each of these trial cases the product with the lowest installed cost, subject to appropriate exceptions for cases in which small differences in initial costs or high operating costs would likely cause purchasers otherwise inclined to choose the low-cost option to invest in Standards-Compliant products instead (*e.g.*, cases in which a landlord could expect a relatively modest investment to pay off through improved tenant retention).

This approach is designed to appropriately account for the circumstances in which extreme sensitivity to initial costs is likely to occur and simulates the impact such sensitivity would be likely to have on purchasing behavior.

Again, cases in which purchasing decisions are less dramatically influenced by sensitivity to initial costs can be addressed through criteria reflecting imperfect economic decision-making (described below).

3. Informational Market Failures

In the case of professionally-installed appliances for which certified efficiency ratings are required and products are differentiated largely on the basis of their cost and efficiency, concerns about the ability of consumers to make sound economic decisions should be limited to cases in which the economic stakes are relatively small and difficult to assess. As a result, these concerns can be appropriately addressed through criteria reflecting imperfect economic decision-making (described below).

4. Imperfect Economic Decision-Making

To simulate imperfect economic decision-making, DOE should – after accounting for significant demonstrated market failures as appropriate – attempt to identify (1) categories of trial cases in

which sound economic decision-making can be expected drive decisions, (2) categories of trial cases in which economic decision-making can be expected to drive decisions in a relatively large percentage of cases, and (3) categories of trial cases in which economic decision-making is significantly less likely to drive purchasing decisions.

The line drawing required for this purpose should be informed by the range and distribution of economic outcomes in DOE's 10,000 trial cases, the percentage of consumers expected to purchase standards-compliant products in the absence of a new standard, and relevant data concerning consumer purchasing behavior. However, DOE should start with the assignment of the trial cases in which purchasing decisions are most likely to be made on the basis of economic considerations (generally those in which the economic stakes are highest) and progress to the cases in which economic considerations are least likely to be decisive (generally those in which the economic stakes are lowest). This approach appropriately prioritizes the reasonable assignment of the trial cases with the greatest impact on the results of DOE's analysis, thereby reducing the potential impact of assignment errors. It should be noted that the approach described below assumes significant market failures as well as a significant disconnect between the kinds of outcomes DOE considers to be "economically beneficial" (*i.e.*, any investment that would provide non-zero life-cycle cost savings) and those consumers are likely to consider to be economically reasonable.

a. Cases in Which No "Investment" in Efficiency is Required

DOE should identify all trial cases in which the total installed cost of a Standards-Compliant product is lower than the total installed cost of a baseline efficiency product and would not impose higher operating costs. DOE should assign all of these cases to represent base case investments in standards-compliant products, because – in a context in which cost and efficiency are the principal significant variables – there is no basis to believe that consumers acting on their own would choose to pay more up-front for a less-efficient version of a Standards-Compliant product.

b. Investments with Very Obvious Economic Outcomes

DOE should identify and appropriately assign trial cases in which the economic consequences of investments in Standards-Compliant products are so obviously favorable or unfavorable that – in the absence of severe market failures of the kind already accounted for as described above – the economic consequences could not reasonably be expected to be overlooked or ignored.

For example, DOE could identify cases with very short payback periods (*e.g.*, simple payback periods that do not exceed one year) and assign all of those cases to represent base case investments in standards-compliant products.

Similarly, DOE could identify cases with very long simple payback periods (*e.g.*, simple payback periods exceeding the expected life of the product) and assign all of those cases to represent investments in standards-compliant products that would occur as a result of the standard.

The criteria used as examples above should be designed to identify trial cases in which economic outcomes are too obvious to be obscured by realistic informational market failures, and the

economic stakes are high enough to ensure that purchasing decisions are unlikely to be swayed by preferences for more efficient products or sensitivity to initial costs less pronounced than that already accounted for as described above.

c. Investments with Less Obvious Economic Outcomes

Purchasing decisions with less obvious economic outcomes can be expected to be driven by economic decision-making in some cases but not in others. As a result, such cases could appropriately be addressed through a combination of random and non-random assignment that accounts for the probability that particular categories of purchasing decisions would be based on economic decision-making.

Such an approach should start by identifying trial cases in which economic considerations are *likely* to be decisive in a large percentage of cases. For example, it would probably be reasonable to assume that a relatively large percentage of purchasers facing efficiency investments with simple payback periods of between one and three years would choose to make those investments on the basis of economic considerations.[64] Conversely, it may make sense to assume that a large percentage of purchasers facing efficiency investments with simple payback periods of between ten years and the expected life of the product would decline to make such investments on the basis of economic considerations. For the trial cases defined by such criteria, the percentage of cases in which economic decision-making can be assumed should be selected randomly and assigned on the basis of their economic outcomes (*i.e.*, with the cases with favorable economic outcomes being assigned to represent base case investments in standards-compliant products and those with unfavorable outcomes being assigned to represent investments that would occur as a result of the standard). The remaining percentage of the cases defined by such criteria should then be *assigned randomly*, simulating the result that – for reasons not already accounted for – it is assumed that purchasing decisions would not be based on economic outcomes.

Additional criteria could then be developed to define categories of trial cases in which economic considerations are likely to drive decisions in a lower percentage of cases. For each such category, the individual trial cases could again be assigned through a combination of random and non-random assignment that reflects the probability that purchasing decision will be made on the basis of economic decision-making. A purely random approach to assignment would only be appropriate for cases in which the economic stakes of potential efficiency investments are so modest and difficult to assess that they are unlikely to have *any influence* on purchasing decisions.

v. The NOPR Fails to Address Significant Regional Differences in Costs and Benefits

The NOPR fails to address significant regional differences for all water heaters modeled, with GIWHs showing a greater need for more detailed data than GSWHs. Based on the results of DOE's current model, most regions resemble one another with similar LCC savings, for low

[64] Again, the sequence in which different considerations are addressed is important. Here the impacts of cases involving significant market failures have already been addressed (*see* Section C.2.b above), as have cases with simple payback periods *not exceeding one year* (*see* Section C.1).

income and senior subgroups, there are several regions with low or negative LCC savings that could have played a different role in the modeled outcome if better market share data had been incorporated in the final results. At the state level 12 out of 51 states saw negative impacts from the rule. For low-income and senior households, this total grew to 12 and 18 of all 51 states.[65]

Table: Regional Impact of GIWH Rule

	Total Simulated Trial Count	Affected	Total Negatively Affected	Average LCC Savings	Average First Year Savings	Higher Install Costs	Total Payback
New England	484	40%	23%	$ 294	$ 22	$ 71	7.9
Middle Atlantic	719	36%	37%	$ 46	$ 13	$ 212	14.4
East North Central	1976	40%	37%	$ 143	$ 11	$ 91	13.6
West North Central	699	40%	36%	$ 22	$ 16	$ 33	12.5
South Atlantic	1661	34%	33%	$ 154	$ 8	$ 47	8.0
East South Central	488	37%	32%	$ 234	$ 7	$ 40	11.5
West South Central	1479	35%	44%	$ 88	$ 23	$ 52	13.5
Mountain	522	39%	32%	$ 78	$ 20	$ 37	10.1
Pacific	1972	38%	32%	$ 169	$ 21	$ 232	9.6
	10000	38%	35%	$ 135	$ 16	$ 105	11.3

Low-income and senior households installing or replacing GIWHs saw more than half the savings as the national average LCC with only $67 and $53 in savings with payback periods between 14 and 16 years. The equipment has an average lifespan of 20 years. At the regional level, five out of nine census regions saw low to negative LCC savings for low-income households with payback periods ranging from 12 to 31 years.

Low-income households in New England saw the best LCC savings but the worst net first year cost to operate the more efficient GIWH of negative $10. The average installation cost for low-income households in New England was also $81 higher because of the rule, yet the LCC suggests that a home can save $259 with a short payback of just 7 years. Outcomes like these may not match consumer expectations and be heavily reliant on the price forecast provided by EIA to justify the savings. It is also possible that New England has a higher share of condensing products and would never have had so many rule affected trials run in the first place, resulting in a different outcome that has less influence on the final results.

[65] Tables showing the regional impacts of the GIWH rule generally, on low-income households, and on senior households are provided in Attachment E to these comments.

Table: Regional Impact of GIWH Rule on Low-Income Households

	Total Simulated Trial Count	Low Income Weighted Trial Count	Percent Affected	Percent of Low Income Affected that are Negatively Impacted	Average LCC Savings for Low Income	Average First Year Savings for Low Income	Low Income Higher Install Costs	Low Income Payback
New England	484	39	8%	19%	$ 259	$ (10)	$ 81	7.0
Middle Atlantic	719	47	7%	37%	$ 0	$ 5	$ 173	20.4
East North Central	1976	105	5%	50%	$ 6	$ 15	$ 93	30.9
West North Central	699	16	2%	39%	$ (35)	$ 51	$ 200	30.5
South Atlantic	1661	69	4%	44%	$ 62	$ 27	$ 144	9.7
East South Central	488	22	5%	57%	$ (1)	$ 18	$ 125	12.1
West South Central	1479	52	3%	34%	$ 107	$ 24	$ 124	11.9
Mountain	522	68	13%	11%	$ 212	$ 6	$ 50	8.9
Pacific	1972	192	10%	40%	$ 23	$ 2	$ 203	12.5
	10000	609	6%	37%	$ 67	$ 11	$ 138	15.8

Senior households saw more negative impacts than low-income households with the same five poor outcome census regions all showing negative LLC savings and long payback averages. East North Central, another cold climate with a high market share for condensing furnaces and boilers, had the lowest LCC savings and longest average payback of over 35 years. Both low-income and senior subgroups are of particular modeling importance because of the potential financial burden that this rule could impose. Unlike storage water heaters which are equally common amongst both subgroups, tankless gas-fired water heaters were modeled 3 times as frequently in senior households than in low-income households, with the worst results out of all gas-fired products subgroups analyzed.

Table: Regional Impact of GIWH Rule on Senior Households

	Total Simulated Trial Count	Senior Weighted Trial Count	Percent Affected	Percent Senior Affected that are Negatively Impacted	Average LCC Savings for Seniors	Average First Year Savings for Seniors	Higher Install Cost for Seniors	Payback for Seniors
New England	484	14	3%	0%	$ 326	$ 1	$ 151	4.3
Middle Atlantic	719	182	25%	47%	$ (46)	$ 27	$ 288	24.5
East North Central	1976	218	11%	58%	$ (15)	$ 9	$ 91	17.6
West North Central	699	57	8%	64%	$ (116)	$ 10	$ 102	35.1
South Atlantic	1661	364	22%	36%	$ 95	$ 37	$ 29	8.0
East South Central	488	171	35%	29%	$ 111	$ 20	$ (15)	6.4
West South Central	1479	560	38%	29%	$ 139	$ 26	$ 57	9.6
Mountain	522	137	26%	39%	$ (15)	$ 14	$ 109	16.5
Pacific	1972	228	12%	52%	$ (2)	$ 25	$ 197	18.7
	10000	1931	19%	40%	$ 53	$ 23	$ 95	14.1

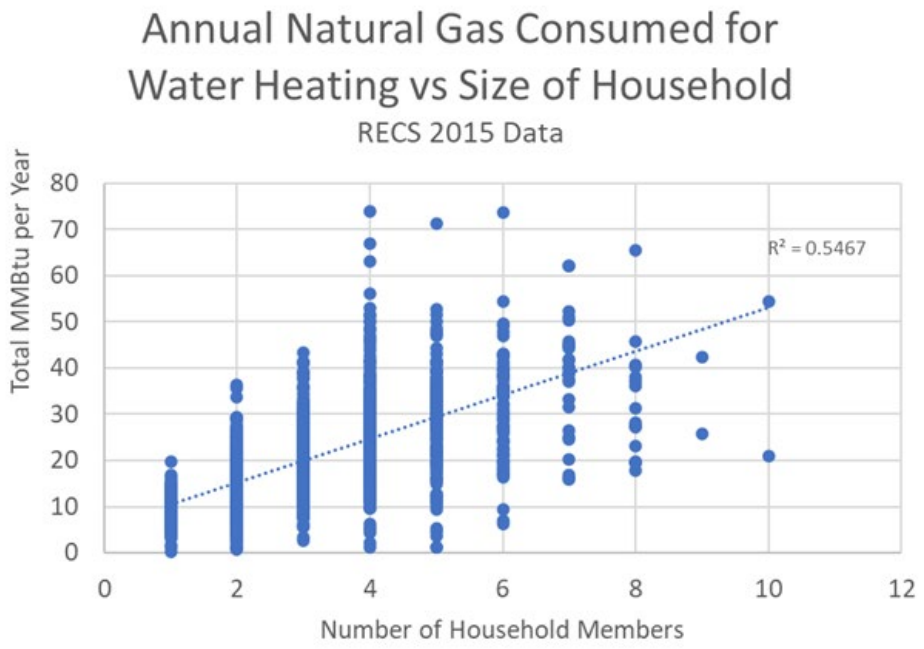
vi. DOE Incorrectly Modeled Home Water and Energy Usage Based on Household Characteristics

The EIA 2015 Residential Energy Consumption Survey ("RECS") used to generate the sample buildings in the model shows a clear relationship between the energy used to heat water and the size of the household (not the size of the home). With more members in the household the average usage increases. During the DOE Webinar for the consumer water heating rule, held on 9/13/2023, Victor Franco of LBNL confirmed that this relationship is not considered within the model but should nonetheless show up in the results because of how the Energy Information Administration generated the average usage data for RECS. Additionally, DOE has referenced in the model the

importance of the square footage of the home to the efficiency of the water heaters, but the evidence doesn't support that in the original survey.

Average Usage Based on Household Size

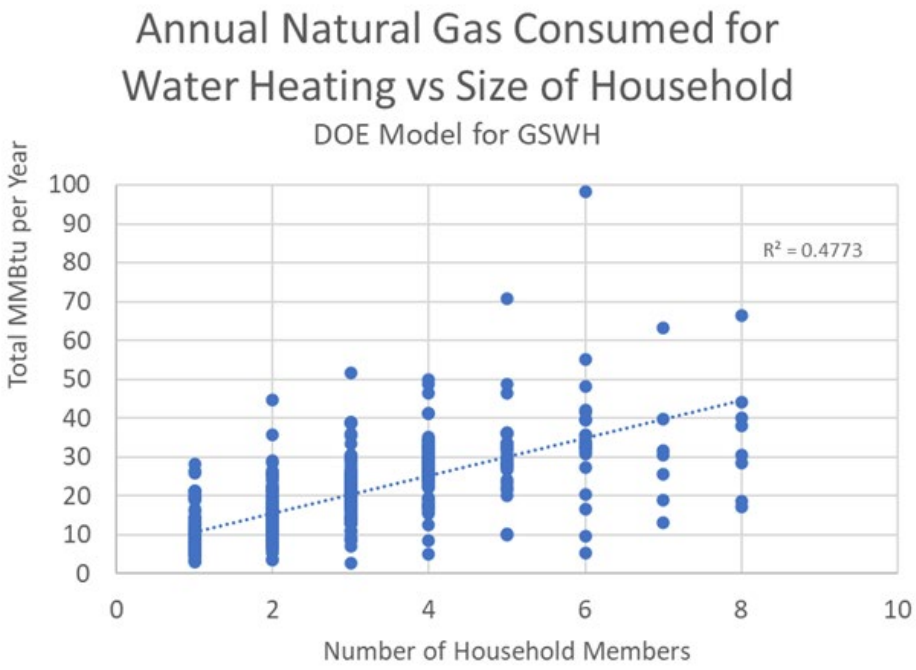
Size	1	2	3	4	5	6	7	8	9	10	Average
MMBtu/Year	9	15	21	26	29	32	38	32	34	38	18



Looking at DOE's Consumer Water Heater model's results, the GSWH resembles the same pattern found in the RECS 2015 Data. With more household members the average usage decreases. For the baseline EL0 water heater, the average usage matches the average usage in the 2015 survey. This is consistent with what DOE has said during publicly held meetings.

Average GSWH EL0 Usage Based on Household Size

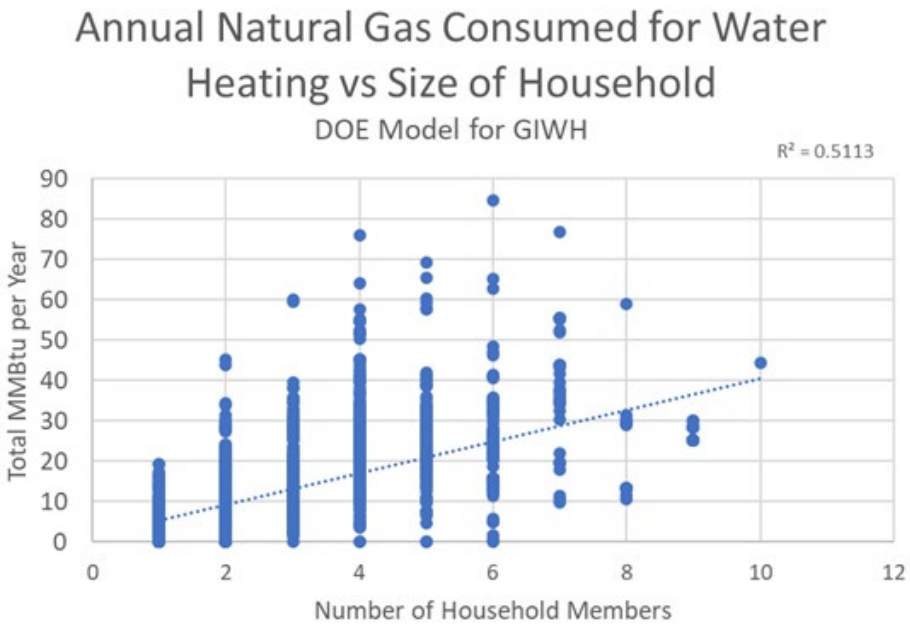
Size	1	2	3	4	5	6	7	8	9	10	Average
MMBtu/Year	9	15	21	28	30	34	42	30	43	37	19
Gal/Day	19	43	67	92	103	121	140	109	159	110	57



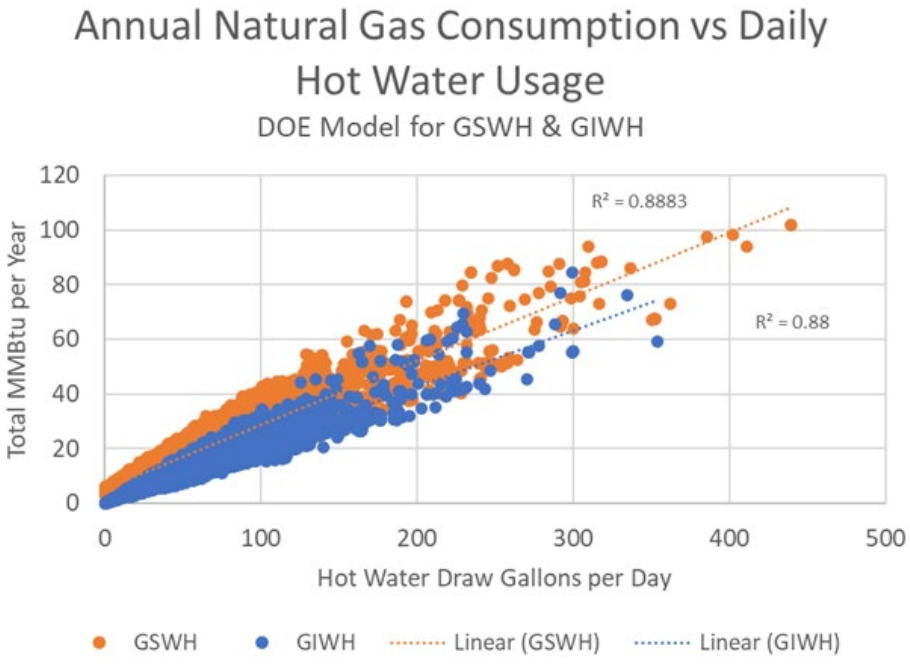
GIWHs, however, do follow the same pattern but have many cases that may go against conventional logic. For each size of household within the model, tankless water heaters result in greater outliers for usage than their storage unit equivalent. The model also results in unrealistic outliers with gas and water usage for smaller households reaching consumption levels equal to space heating.

Average GIWH EL0 Usage Based on Household Size

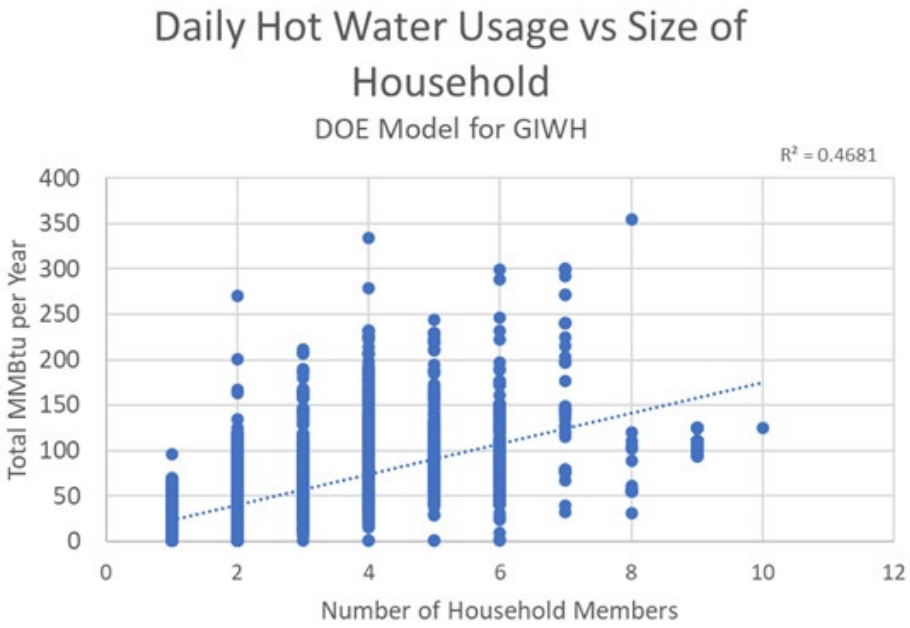
Size	1	2	3	4	5	6	7	8	9	10	Average
MMBtu/Year	5	9	14	18	22	22	38	22	27	44	12
Gal/Day	20	39	58	83	86	97	168	91	108	125	51



A potential reason for this failure to model energy usage and household size is how the model calculates daily water usage which influences energy usage. For both GSWHs and GIWHs, usage and daily water consumption follow a logical pattern. A linear relationship exists between using more hot water and using more energy. If smaller households are using more energy than larger households, then it is likely that DOE has incorrectly determined the water use for GIWH.



As expected, comparing water consumption with household size fits the same pattern found when comparing household size and energy usage. This means that reviewing how water consumption is calculated may show a better solution to the model so that usage fits the size of the household better. It is also important to note that for smaller households not only is the water usage higher, but the outliers result in more than just high energy usage but also extreme water use. At 200 to 350 gallons a day, an individual would need to fill a bathtub four to seven times daily to use that much hot water 365 times a year. Even a rental unit or single-member housing unit sharing resources amongst more individuals than listed would likely not use this much water at the same consistency shown by DOE's model. This issue decreases with one or two occupant, with the largest households using enough water on average to supply only two or three baths total, ignoring everyone's needs and other end uses entirely.



Draw Pattern ID, which determines how much water is being consumed, is based on a randomly assigned distribution. DOE has pre-determined that households will always use more water if they use an instantaneous unit. For the smallest storage units, most likely to fit a household of one or two members, there is a 5 percent chance of a large draw pattern but a 75 percent chance for instantaneous.

Screen Capture of DOE Model – Tab "Building Sample"

GSWHs

RECS ID	RECS Size Bin	Low Draw	Medium Draw	Large Draw	Draw Pattern ID
1	*Small storage tank (30 gallons or less)*	15%	80%	5%	2
2	*Medium storage tank (31 to 49 gallons)*		70%	30%	2
3	*Large storage tank (50 gallons or more)*		10%	90%	3

OSWHs

RECS ID	RECS Size Bin	Low Draw	Medium Draw	Large Draw	Draw Pattern ID
1	*Small storage tank (30 gallons or less)*	0%	0%	100%	3
2	*Medium storage tank (31 to 49 gallons)*	0%	0%	100%	3
3	*Large storage tank (50 gallons or more)*	0%	0%	100%	3

ESWHs <=55 gallons

RECS ID	RECS Size Bin	Low Draw	Medium Draw	Large Draw	Draw Pattern ID
1	*Small storage tank (30 gallons or less)*	0%	100%	0%	2
2	*Medium storage tank (31 to 49 gallons)*	15%	85%	0%	2
3	*Large storage tank (50 gallons or more)*	5%	85%	10%	1

ESWHs >55 gallons

RECS ID	RECS Size Bin	Low Draw	Medium Draw	Large Draw	Draw Pattern ID
3	*Large storage tank (50 gallons or more)*	0%	20%	80%	3

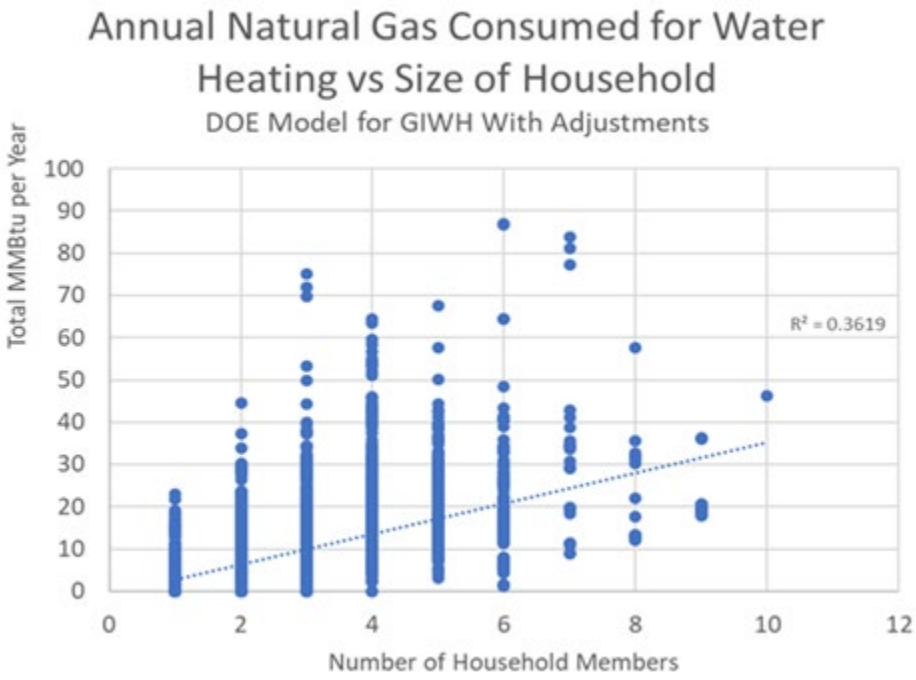
GIWH

RECS ID	RECS Size Bin	Low Draw	Medium Draw	Large Draw	Draw Pattern ID
1	*Small storage tank (30 gallons or less)*		25%	75%	2
2	*Medium storage tank (31 to 49 gallons)*		15%	85%	3
3	*Large storage tank (50 gallons or more)*		10%	90%	3
4	*Tankless or on-demand*		15%	85%	3

Copying the draw pattern statistics and the logical code used to determine the water heater size bin ID from the gas storage unit and using it for the instantaneous unit has the following impact. While consumer preferences for usage may change with an instantaneous unit according to DOE's modeling, this would go in contradiction to conventional knowledge about how much water a single person may use in a home. Outliers still exist with high gas usage and water usage, however assuming consumption behavior consistent with a gas-fired storage water heater results in much lower LCC savings compared to the default assumptions used by DOE.

Average Adjusted GIWH EL0 Usage Based on Household Size

Size	1	2	3	4	5	6	7	8	9	10	Average
MMBtu/Year	2	6	12	15	17	17	33	22	21	46	9
Gal/Day	8	25	50	70	67	76	136	92	85	163	38



Original Summary Output for GIWH

LCC Savings $135

Simulation Results NATIONAL - 10000 samples												AEO 2023 - Reference Case		
			Average LCC Results									Payback Results		
	Level	Description	Installed Price	First Year Oper. Cost	Lifetime Oper. Cost	LCC	LCC Savings	Simple LCC Savings	Net Cost	No Impact	Net Benefit	Simple PBP	Average	Median
GIWH	0	GIWH Non-Condensing	$2,320	$262	$3,846	$6,166	NA	NA	NA	100%	NA			
GIWH	1	GIWH Condensing	$2,424	$248	$3,665	$6,089	$66	$78	13%	70%	17%	7.3	16.0	7.7
GIWH	2	GIWH Condensing	$2,447	$240	$3,509	$6,004	$135	$163	13%	62%	24%	5.9	12.1	5.8
GIWH	3	GIWH Condensing	$2,465	$237	$3,509	$5,975	$89	$192	29%	16%	55%	5.9	10.7	6.9
GIWH	4	GIWH Condensing	$2,493	$254	$3,468	$5,962	$95	$205	36%	9%	55%	6.3	13.6	9.5

Adjusted Draw Rates Summary for GIWH

LCC Savings $36 (Negative $17 with EL1)

Simulation Results NATIONAL - 10000 samples												AEO 2023 - Reference Case		
			Average LCC Results									Payback Results		
	Level	Description	Installed Price	First Year Oper. Cost	Lifetime Oper. Cost	LCC	LCC Savings	Simple LCC Savings	Net Cost	No Impact	Net Benefit	Simple PBP	Average	Median
GIWH	0	GIWH Non-Condensing	$2,321	$263	$2,962	$5,283	NA	NA	NA	100%	NA			
GIWH	1	GIWH Condensing	$2,424	$164	$2,850	$5,274	-$17	$9	17%	70%	13%	10.8	27.0	9.9
GIWH	2	GIWH Condensing	$2,448	$168	$2,772	$5,220	$36	$63	19%	63%	19%	8.5	21.8	8.0
GIWH	3	GIWH Condensing	$2,466	$166	$2,738	$5,264	$31	$79	42%	16%	42%	8.4	16.3	8.6
GIWH	4	GIWH Condensing	$2,494	$163	$2,705	$5,199	$34	$84	48%	9%	43%	8.8	23.3	12.4

A better solution would be to use the test procedure for water heaters as a basis for modeling energy usage rather than assuming draw rates based on the size of the original equipment in the RECS survey. By utilizing the size of the tank and determining draw rates, DOE's modeled results contradict the actual collected water heating data found in the Residential Energy Consumption Statistics ("RECS") survey. Another solution is to model GIWHs the same as gas-fired storage units with the assumption that households will consume hot water in the same way.

C. DOE Incorrectly Relies on Outdated Data in Its Analysis

Throughout the NOPR, DOE states that it relies upon data from the 2015 RECS to establish samples and calculate data.[66] DOE claims that the 2015 RECS is the most recent such survey that is currently available. However, DOE last accessed the data on May 1, 2023,[67] while the NOPR was published on July 28, 2023. According to the Energy Information Administration, the final set of data for the 2020 RECS was released on June 15, 2023, almost six weeks prior to publication.[68] Rather than use the most recent and reliable data available, DOE chose to use outdated, inapplicable data for a preponderance of its calculations. DOE cherry-picked data from the 2020 data[69] and chose to use current and outdated data at its convenience. DOE's use of outdated data for lifecycle costs, payback period, installation costs, product literature and other analyses questions the validity and quality of their analysis. Rather than rely on questionable data, DOE should recalculate and reexamine its conclusions based on the best available, most current data.

D. DOE Failed to Appropriately Consider Manufacturer Burden in Its Analysis

DOE's proposed regulation would be an enormous burden on manufacturing and on competition. A rule with, by its own estimates, $2,235,000 in costs[70] fails to meet EPCA's three-year rebuttable presumption of economic justification under pure economic terms.[71] DOE concedes that it is creating an enhanced market for heat pumps, noting that heat pump production for electric storage water heaters will go from 5% of electric storage water heaters to 63% in 2030.[72] The consequences of DOE's proposed rule are an impermissible burden on the water heater market and diminishes competition between gas and electric water heaters.

For example, Rinnai America, Inc ("Rinnai"). commented that they opened a facility in Griffin, Georgia in 2022 at a cost of $70 million, which exclusively makes non-condensing tankless water heaters.[73] The facility employs approximately 122 employees and makes a product more efficient than 75% of the market.[74] According to Rinnai, the facility's products would not meet the proposed standard, would be rendered a stranded asset, and the proposed standard for GIWHs would eliminate almost 20 years of improvements in the non-condensing tankless water heater market.[75] Rinnai stated that it would not make economic sense to update the plant, as Rinnai's

---

[66] NOPR at 49101 (*generally*); NOPR at 49107 (Life Cycle Costs); NOPR at 49107 (Payback Period); NOPR at 49107 (Installation Costs); NOPR at 49112 (Energy Prices); NOPR at 49112 (Product Literature); NOPR at 49125 (Consumer Subgroup Analysis).

[67] NOPR at 49101-102, fn. 46.

[68] Residential Energy Consumption Survey (RECS) - Energy Information Administration (eia.gov) (last accessed Sept. 11, 2023).

[69] NOPR at 49119 (looking at homes capacity to install a natural gas water heater from 2020 data).

[70] NOPR at 49162.

[71] NOPR at 49073 (noting the payback period) and 49153 (claiming that the rule would be justified without monetizing the reduction in greenhouse gas emissions).

[72] NOPR at 49160.

[73] DOE Public Meeting, Sept. 13, 2023, at 1:12 PM.

[74] *Id*.

[75] *Id*; *see also id*. at 3:11 PM and 3:27 PM.

parent company makes condensing tankless water heaters in Japan, and Rinnai would find it more cost-effective to import the products than manufacture them domestically.[76] Consequently, the proposed regulation for instantaneous water heaters would result in the offshoring of manufacturing capacity and manufacturing jobs currently in Georgia.[77]

Another concern is DOE's expectation of manufacturers meeting the anticipated demand from the proposed rule. DOE anticipates that manufacturers will need to produce an additional 3-4 million electric heat pumps per year,[78] with no corresponding increase in gas-fired heat pumps because it claims they cannot be produced at scale.[79] DOE provides no analysis supporting how either claim is true or realistic. Public comment showed no capacity to produce or install electric heat pumps at the level anticipated.[80] DOE's manufacturing burden shows a clear fuel preference and a goal of eliminating consumer choice with respect to energy source.

E. DOE Failed to Consider the Counterproductive Impacts of its Proposed Standards

DOE has failed to consider the potentially counterproductive impacts of its proposed standard for GIWHs. DOE claims that consumers will not switch products due to the cost but has failed to consider the real-world impacts that a condensing standard would have in the context of product replacements.[81] Conceivably, in order to avoid excessive installation burdens (or make replacement of an existing non-condensing GIWH feasible), an apartment owner may choose a non-condensing GSWH as a replacement. Therefore, the efficiency of their water heater will go from 0.81, the current standard for non-condensing GIWHs, to 0.59. The potential for this 25% drop in efficiency is ignored by DOE but is a likely consequence of a standard that would make non-condensing GIWHs unavailable.[82] The same net reduction in efficiency (and thus energy savings) would occur to the extent that the higher costs imposed by the proposed condensing standard for GIWHs makes instantaneous water heaters generally less competitive with GSWHs.

---

[76] *Id*. at 3:27 PM.
[77] *Id*; *see also id*. at 1:25 PM.
[78] NOPR at 49147.
[79] NOPR at 49084.
[80] DOE Public Meeting, Sept. 13, 2023, at 1:23 PM and 2:54 PM (NW Energy Alliance stating they were installing 20,000 electric heat pumps per year).
[81] DOE Public Meeting, Sept. 13, 2023, at 3:11 PM.
[82] DOE should fully examine any unintended consequences of its proposal, including those impacting safety and jurisdictional building codes. For instance, in multifamily properties, furnaces and gas water heaters from several units commonly share a chimney vent, or a gas furnace and a water heater within one apartment will share a venting system. If a new condensing gas water heater cannot be accommodated in an apartment due to building construction limitations, then it is likely the unit will be replaced with an electric unit. Venting systems are designed to work with a certain volume of gases; changes in the volume of gas being vented will affect the draw of the venting system and could result in combustion gases being drawn back into the building. In short, eliminating a non-condensing water heater from a venting stack may initiate a cascade of equipment replacements due to venting requirements or force additional venting changes. It is foreseeable that local building inspectors will have concerns about the adequacies of the draw of a vent when it is carrying a reduced volume of gases. *See* NMHC/NAA Comments.

F. DOE Relied on Flawed Energy Price Assumptions in Its Analysis

In the NOPR, DOE is using an energy price forecast based on the AEO which has consistently overestimated future natural gas energy costs. AGA conducted a review of forecasted prices versus actual prices using historical AEOs back to 2010. The AEO reported higher prices 70% of the time for residential consumers and 86% of the time for commercial consumers nationally. The only years with higher actual versus forecasted prices are the most recent two years or 2021 and 2022 ("2022 and 2023 AEO") which is heavily impacted by the COVID-19 economy. The consumer water heater rule uses the 2023 release year AEO.

While uncertainty is a major factor in any forecast, the statistically bias outcome towards higher prices in the AEO compared to what is actual reported historically presents a need for energy prices to be modeled based on a distribution of prices and not a forecasted mean. The figures below include a comparison between what EIA reports as actual prices versus what was forecasted in each AEO.

Actual Residential Historical Prices vs Annual Energy Outlook Forecast

Forecast Release Year Data	Historical Data	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
		$ 13.08	$ 13.89	$ 12.14	$ 11.39	$ 11.03	$ 10.65	$ 10.32	$ 10.97	$ 10.38	$ 10.05	$ 10.91	$ 10.50	$ 10.51	$ 10.78	$ 12.18	$ 14.80
	2010	$ 13.32	$ 13.87	$ 11.72	$ 11.21	$ 12.12	$ 12.21	$ 11.81	$ 11.74	$ 11.89	$ 11.99	$ 12.03	$ 12.10	$ 12.18	$ 12.30	$ 12.42	$ 12.62
	2011		$ 13.99	$ 12.20	$ 11.31	$ 10.56	$ 10.44	$ 10.39	$ 10.28	$ 10.39	$ 10.50	$ 10.61	$ 10.74	$ 10.90	$ 11.16	$ 11.38	$ 11.55
	2012			$ 12.25	$ 11.36	$ 10.65	$ 10.78	$ 10.69	$ 10.38	$ 10.56	$ 10.61	$ 10.67	$ 10.80	$ 10.94	$ 11.11	$ 11.42	$ 11.76
	2013				$ 11.62	$ 11.05	$ 10.71	$ 10.72	$ 10.49	$ 10.39	$ 10.91	$ 11.24	$ 11.66	$ 11.89	$ 12.05	$ 12.24	$ 12.48
	2014					$ 11.22	$ 10.69	$ 10.62	$ 11.44	$ 11.24	$ 10.92	$ 11.25	$ 11.71	$ 11.88	$ 11.85	$ 12.06	$ 12.16
	2015						$ 10.86	$ 10.29	$ 10.80	$ 10.62	$ 10.48	$ 10.65	$ 10.84	$ 11.38	$ 11.92	$ 12.29	$ 12.50
	2016								$ 11.08	$ 10.40	$ 9.70	$ 9.87	$ 10.28	$ 10.67	$ 11.08	$ 11.19	$ 11.30
	2017									$ 10.58	$ 10.22	$ 10.91	$ 10.92	$ 11.06	$ 11.20	$ 11.31	$ 11.39
	2018										$ 10.30	$ 11.17	$ 10.77	$ 11.19	$ 11.47	$ 11.59	$ 11.69
	2019											$ 11.18	$ 10.75	$ 10.71	$ 11.00	$ 11.08	$ 11.24
	2020													$ 10.80	$ 10.39	$ 10.53	$ 10.45
	2021														$ 10.54	$ 10.81	$ 10.74
	2022															$ 12.15	$ 12.60
	2023																$ 14.29

*Red highlighted cells note forecasted prices that were higher than what was reported historically by EIA.

Actual Commerical Historical Prices vs Annual Energy Outlook Forecast

Forecast Release Year Data	Historical Data	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
		$ 11.34	$ 12.23	$ 10.06	$ 9.47	$ 8.91	$ 8.10	$ 8.08	$ 8.90	$ 7.91	$ 7.28	$ 7.88	$ 7.79	$ 7.61	$ 7.49	$ 8.79	$ 11.34
	2010	$ 11.53	$ 12.29	$ 9.31	$ 8.92	$ 10.01	$ 10.36	$ 10.20	$ 10.14	$ 10.28	$ 10.38	$ 10.40	$ 10.46	$ 10.53	$ 10.65	$ 10.76	$ 10.96
	2011		$ 12.32	$ 9.94	$ 9.15	$ 9.30	$ 9.03	$ 8.80	$ 8.52	$ 8.60	$ 8.68	$ 8.74	$ 8.84	$ 8.96	$ 9.19	$ 9.37	$ 9.51
	2012			$ 10.06	$ 9.32	$ 8.82	$ 8.90	$ 8.86	$ 8.67	$ 8.82	$ 8.82	$ 8.85	$ 8.94	$ 9.06	$ 9.21	$ 9.49	$ 9.79
	2013				$ 9.61	$ 9.04	$ 8.26	$ 8.66	$ 8.42	$ 8.29	$ 8.76	$ 9.03	$ 9.38	$ 9.57	$ 9.69	$ 9.83	$ 10.05
	2014					$ 9.16	$ 8.29	$ 8.49	$ 9.29	$ 9.11	$ 8.91	$ 9.21	$ 9.62	$ 9.76	$ 9.70	$ 9.90	$ 9.97
	2015						$ 8.36	$ 8.35	$ 8.82	$ 8.73	$ 8.76	$ 8.77	$ 8.81	$ 9.32	$ 9.82	$ 10.15	$ 10.34
	2016								$ 9.24	$ 7.92	$ 7.46	$ 7.93	$ 8.54	$ 9.19	$ 9.58	$ 9.67	$ 9.76
	2017									$ 8.28	$ 7.42	$ 8.14	$ 8.69	$ 9.33	$ 9.96	$ 10.07	$ 10.14
	2018										$ 7.50	$ 8.11	$ 7.96	$ 8.33	$ 8.69	$ 8.88	$ 9.08
	2019											$ 8.12	$ 8.01	$ 7.94	$ 8.14	$ 8.26	$ 8.44
	2020													$ 7.80	$ 7.43	$ 7.58	$ 7.60
	2021														$ 7.51	$ 7.95	$ 8.20
	2022															$ 8.76	$ 9.13
	2023																$ 10.99

*Red highlighted cells note forecasted prices that were higher than what was reported historically by EIA.

G. Errors Found in the Model

In addition to the above analysis concerns, Joint Commenters also found a number of errors in the model DOE uses to justify the proposed rulemaking:

- DOE has utilized single-year weather data despite the availability of 10-year average data. This has a small but real impact on instantaneous gas water heaters.

- DOE references on the tab "No-New Standards Case UEF" an equation that adjusts the likelihood of more efficient appliances based on square footage. The model in writing has one equation but DOE has coded a different version that relies on larger square footage residences. This equation ultimately changes the randomly assigned baseline efficiency levels. Larger homes that use more energy might on average install more efficient appliances based on this equation.

Adjustment Range Used in TSD

Square Footage	Fraction
>= 1500	-5%
1500 to 2500	0%
2500+	5%

Adjustment Range Used in Model

Square Footage	Fraction
>= 2000	-5%
2000 to 3000	0%
3000+	5%

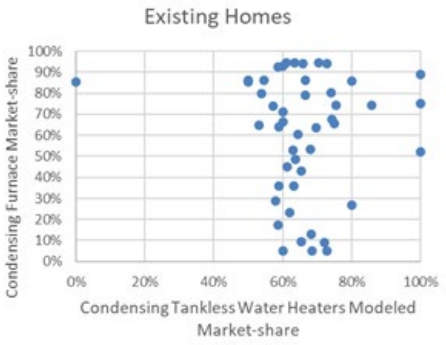
The use of the adjustment factor also does not make any sense for this analysis. Water use is typically not dependent on the size of a home. The use of total household members would be a better statistic to use for any adjustment to consumer preference for more efficient water heating.

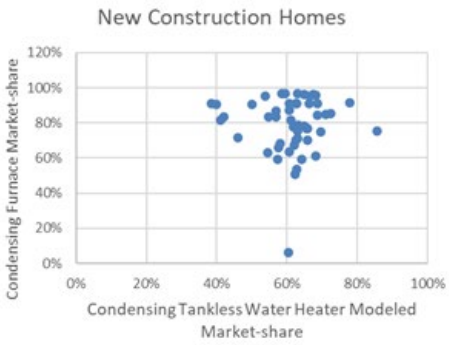
- Based on the TSD, Table 6A.8.5 "Estimated Fraction of Shipments by Market Segment", DOE uses slightly different values to determine the share of new construction vs. replacement as well as residential vs. commercial. In the TSD 13% of gas-fired storage units are new builds while the model reports 10% of all trials. For tankless units, the TSD uses 35% while the model reports 32% for all trials. Based on Table 6A.8.6 "Estimated Fraction of Shipments by Residential/Commercial Applications" DOE references 7% and 20% for the share of commercial units of storage and instantaneous gas-fired water heaters. Within the model, DOE reports 2% and 9% of all trials for storage and instantaneous gas-fired water heaters.

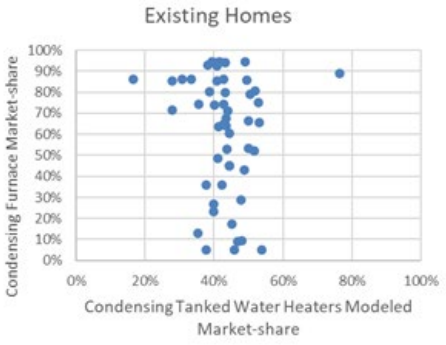
Insufficient market data for this analysis:

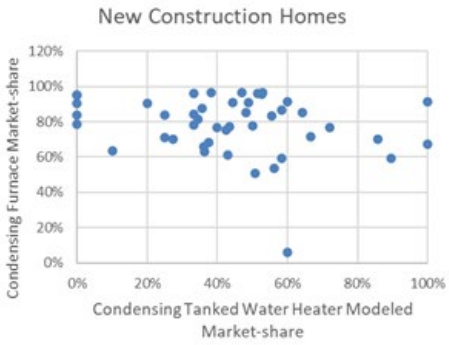
This rulemaking relies on data that is inconsistent with other current rulemaking. DOE uses national-level statistics and not state-level without differentiation for new vs. replacements for market shares of each efficiency level. This data is necessary for determining the baseline for potential savings from the rule and the geographical location of products. Having more or fewer rule-impacted trial runs within a given state can have a different impact on overall LCC savings by using different energy or installation cost data more frequently. It is more likely that homes will share venting methods and install more condensing products in states with more condensing furnaces or boilers. Comparing the results of the model with the shipment data from the pending DOE furnace rule, there is a notable disconnect between the existing buildings modeled and the market share for other condensing products like gas furnaces.

PC	EL	Design Options	Distributions	Percentiles	EL
GSWH	0	GSWH SP, Atm. Vent	62%	0%	0
GSWH	1	GSWH SP, Atm. Vent	15%	62%	1
GSWH	2	GSWH Multiple Designs	7%	77%	2
GSWH	3	GSWH Elec. Ignition, Power Vent	15%	84%	3
GSWH	4	GSWH Elec. Ignition, Condensing	1%	99%	4
GSWH	5	GSWH Elec. Ignition, Condensing	0%	100%	5
OSWH	0	OSWH 1" Insulation	50%	0%	0
OSWH	1	OSWH 2" Insulation	25%	50%	1
OSWH	2	OSWH 2" Insulation	25%	75%	2
E SWH	0	ESWH Elec. Resistance	90%	0%	0
E SWH	1	ESWH Elec. Resistance	2%	90%	1
E SWH	2	ESWH Heat Pump	4%	92%	2
E SWH	3	ESWH Heat Pump	4%	96%	3
E SWH>55	0	ESWH>55 Heat Pump	10%	0%	0
E SWH>55	1	ESWH>55 Heat Pump	65%	10%	1
E SWH>55	2	ESWH>55 Heat Pump	25%	75%	2
GIWH	0	GIWH Non-Condensing	37%	0%	0
GIWH	1	GIWH Condensing	13%	37%	1
GIWH	2	GIWH Condensing	42%	50%	2
GIWH	3	GIWH Condensing	8%	92%	3
GEWH	0	GEWH 2" Foam Insulation	99%	0%	0
GEWH	1	GEWH 4" Foam Insulation	1%	99%	1









For new construction, the national average distribution and that of each state is a lot closer to one another. This is because condensing furnaces already have a very high market share in new construction and less variation between regions, even for states with low space heating

requirements. More than 70% of all trials are for retrofitting residential buildings and the lack of market share data would impact these trails most.

H. The NOPR Did Not Provide Adequate Opportunity to Comment

On July 28, 2023, DOE published in the Federal Register a proposed rule to revise energy conservation standards for consumer water heaters. DOE provided stakeholders only 60-days, or until September 26, 2023, to comment on the NOPR. Moreover, many stakeholders have limited staff available to review the various pending proposed rules and to provide meaningful comments during overlapping and concurrent comment periods. In this case, DOE had also issued various other proposed and final rules that warranted stakeholder attention with overlapping comment periods, including proceedings for consumer water heaters, conventional cooking products, and consumer boilers.[83]

In the NOPR, DOE deviates from its own procedures, aka the "Process Rule,"[84] in two ways that prejudice stakeholders. DOE determined not to conduct an Advanced Notice of Proposed Rulemaking.[85] Then DOE determined to shorten the comment period because "stakeholders have already been afforded multiple opportunities to provide comments on this rulemaking."[86] This is despite the fact that multiple proposals had been filed in this proceeding and this is the first time DOE has publicly responded to such proposals. Importantly, the Process Rule states that "[t]here will be not less than 75 days for public comment on the NOPR, with at least one public hearing or workshop."[87] It was unreasonable on its face for DOE to shave 15 days off of its own procedures when the statutory deadline has been exceeded not by days or months but by years. By denying our request for extension of the comment period, Joint Commenters and other stakeholders were unfairly prejudiced for DOE's own administrative deficiency. It is an important tenet of administrative law that a federal agency adhere to its own policies, rules and regulations. Ad hoc departures are not proper, for such activities disrupt orderly processes and harm predictability, which are the hallmarks of lawful administrative action.[88]

---

[83] *See e.g., Energy Conservation Program: Energy Conservation Standards for Consumer Conventional Cooking Products*, 88 Fed. Reg. 50810 (Aug. 2, 2023) (comment period ending September 1, 2023); *Energy Conservation Program: Energy Conservation Standards for Consumer Boilers*, EERE-2019-BT-STD-0036, 88 Fed. Reg. 55128 (Aug. 14, 2023) (comment period ending October 13, 2023); *Energy Conservation Program: Energy Conservation Standards for Commercial Water Heating Equipment*, EERE-2021-BT-STD-0027 (prepublication final rule posted).

[84] *Energy Conservation Program for Appliance Standards: Procedures, Interpretations, and Policies for Consideration in New or Revised Energy Conservation Standards and Test Procedures for Consumer Products and Commercial/Industrial Equipment*, 86 Fed Reg. 70892 (Dec. 13, 2021) ("Process Rule"). See also 10 C.F.R. Part 430, Subpart C, Appendix A.

[85] NOPR at 49075.

[86] NOPR at 49068.

[87] Process Rule at 70927; *see* Section 6(f)(2) of Appendix A. The Process Rule also states that "[t]he length of the public comment period for pre-NOPR rulemaking documents will vary depending upon the circumstances of the particular rulemaking, but will not be less than 75 calendar days." Process Rule at 70926; *see* Section 6(d)(2) of Appendix A.

[88] *See, e.g., Reuters Ltd. v. FCC*, 781 F.2d 946, 950-51 (D.C. Cir. 1986) ("[I]t is elementary that an agency must adhere to its own rules and regulations. Ad hoc departures from those rules, even to achieve laudable aims, cannot be sanctioned . . . for therein lie the seeds of destruction of the orderliness and predictability which are the hallmarks of lawful administrative action. Simply stated, rules are rules, and fidelity to the rules which have been properly

While the Administrative Procedure Act ("APA") does not establish a minimum comment period for rulemakings, courts require that agencies provide a "meaningful" opportunity for comment.[89] In short, "[t]he opportunity for comment must be a meaningful opportunity" and "in order to satisfy this requirement, an agency must also remain sufficiently open-minded."[90]

To sufficiently analyze the NOPR and the related documents, additional time was required. DOE's determinations in this proceeding will have significant implications for consumers and the energy industry. Any modifications to the efficiency standards, large or small, will have significant ramifications on suitable water heater availability for consumers and the marketplace for years to come. Despite the numerous compounding factors impacting stakeholders' ability to develop meaningful comments in the allotted time, as well as its legal responsibilities, DOE denied the request to extend the comment period, which unreasonably prejudiced Joint Commenters and all stakeholders. As a result, as these comments are being submitted, Joint Commenters are still identifying significant additional issues that they have not had sufficient time to consider or address in this submission.

I. Executive Orders 12866, 13563, and 14094

Executive Order ("EO") 12866, "Regulatory Planning and Review,"[91] as supplemented and reaffirmed by EO 13563, "Improving Regulation and Regulatory Review,"[92] and amended by EO 14094, "Modernizing Regulatory Review,"[93] requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible.[94] DOE has unequivocally failed to follow these EOs, as it has used outdated data to quantify present and future benefits and costs, when current and applicable data was available prior to publication. DOE's extraordinary reliance on the 2015 RECS is a clear violation of these EOs.

J. Regulatory Flexibility Act

The proposed rule also fails to comply with Executive Order 13272, "Proper Consideration of Small Entities in Agency Rulemaking."[95] DOE identified 22 original equipment manufacturers ,[96] of which it only found 2 that satisfied the criteria to be considered small businesses.[97] Further,

promulgated, consistent with applicable statutory requirements, is required of those to whom Congress has entrusted the regulatory missions of modern life."); *Brock v. Cathedral Bluffs Shale Oil Co*., 796 F.2d 533, 536 (D.C. Cir. 1986) ("It is axiomatic that an agency must adhere to its own regulations."); *Mine Reclamation Corp. v. FERC*, 30 F.3d 1519, 1524 (D.C. Cir. 1994) (on its way to decision an agency must follow its own regulations).

[89] *See, e.g., Rural Cellular Ass'n v. Fed. Commc'ns Comm'n*, 588 F.3d 1095, 1101 (D.C. Cir. 2009), *Gerber v. Norton*, 294 F.3d 173, 179 (D.C. Cir. 2002).

[90] *Rural Cellular Ass'n*, 588 F.3d at 1101.

[91] 58 Fed. Reg. 51735 (Oct. 4, 1993).

[92] 76 Fed. Reg. 3821 (Jan. 21, 2011).

[93] 88 Fed. Reg. 21879 (April 11, 2023).

[94] NOPR at 49168.

[95] 67 Fed. Reg. 53461 (Aug. 16, 2002).

[96] This acronym is used, but not defined in the proposed rule.

[97] NOPR at 49169.

neither of the small businesses which qualified produced gas-fired water heaters.[98] Based on its analysis and the results of its interviews, DOE does not have sufficient information pertaining to the NOPR's effect on small businesses who manufacture gas-fired water heaters. DOE has no data on their redesign costs, product availability, or whether or not the proposed efficiency levels will force these manufacturers to leave the market. DOE's failure to properly identify affected parties is a glaring informational liability in the rule and must be addressed pursuant to Executive Order 13272.

V. Conclusion

Joint Commenters thank the Department of Energy for its review and consideration of these comments. If you have any questions regarding this submission, please do not hesitate to contact the undersigned.

Respectfully submitted,

[98] *Id.*

Matthew J. Agen
Chief Regulatory Counsel, Energy
American Gas Association
400 N. Capitol Street, NW
Washington, DC 20001
magen@aga.org

Stuart Saulters
Vice President of Government Relations
American Public Gas Association
201 Massachusetts Avenue NE, Suite C-4
Washington, DC 20002
ssaulters@apga.org

Benjamin Nussdorf
Vice President, Regulatory & Industry Affairs
National Propane Gas Association
1140 Connecticut Ave., NW
Suite 1075
Washington, DC 20036
bnussdorf@npga.org

Sean P. Jamieson
Vice President, Federal Affairs
Spire Inc.
3773 Richmond Avenue, Suite 300
Houston, TX. 77046
Sean.Jamieson@spireenergy.com

Cc: Ms. Ami Grace-Tardy (U.S. DOE, Office of the General Counsel)

Attachments

Attachment A

Summary of Analysis of DOE's LCC Model

EERE-2017-BT-STD-0019

Summary of Analysis of DOE's LCC Model

Scenarios Tested

All scenarios run used the baseline life-cycle cost (LCC) model, EERE-2017-BT-STD-0019-0060_content.xlsm, as a starting point. The model as presented in the docket and this is referred to in this document as Scenario 0.

Scenario 0a is the baseline DOE model changing only the seed value for the random number generator from 1 to 27. This was only done one time and the seed number chosen was completely arbitrary. This was done to see how large a change in results can be expected in different model runs due solely to the impact of randomness in the model.

The next three scenarios, Scenarios 1, 2, and 3, were modifications of Scenario 0 that were run to determine:

- Whether the trial cases representing affected consumers in Scenario 0 are representative of all 10,000 trial cases in DOE's analysis; and
- To assess the impact of DOE's home size market share adjustments on the results of its analysis.

Scenarios 4, 5, and 6 were run to look at the sensitivity of average LCC savings and the percentage of Net Cost outcomes to increases in installed equipment cost, maintenance costs, and both installed cost and maintenance cost simultaneously.

Table 1 describes each scenario and what was changed relative to the baseline DOE model (Scenario 0). Tables 2 and 3 present the average LCC savings and Net Cost and Net Benefit results for all scenarios for the gas storage water heater (GSWH) and gas instantaneous water heater (GIWH) analyses for the proposed standard levels (EL2).

Table 1: Scenarios with descriptions

	Short Description	Detailed Changes
Scenario 0	DOE baseline model	No changes to DOE model EERE-2017-BT-STD-0019-0060_content.xlsm
Scenario 0a	DOE baseline model with a different seed random number	The random number seen was changed from 1 to 27.
Scenario 1	Market shares for EL0 and EL1 adjusted to total 100% while maintaining the ratio of EL0 to EL1.	Change the distributions in 'No-New Standards Case UEF' column N such that the the ratio of EL0 to EL1 remains unchanged but the EL0 and EL 1 market shares together total 100%. For GSWH this means that instead of EL0 and EL1 being 54.9% and 21.7% respectively they were changed to 71.6% and 28.4%. For GIWH this means that instead of 30.0% and 7.6% the EL0 and EL1 shares were changed to 79.8% and 20.2%.
Scenario 2	Eliminates the market share adjustment for building size.	No-New Standards Case UEF Column D Rows 21-23 percentages were changed to zero.
Scenario 3	Combine Scenarios 1 and 2 leaving the same market shares used in Scenario 1 and eliminate the building size adjustment.	This stops the few cases that end up being Not Impacted because the 5% adjustement for large buildings pushes them into EL2.
Scenario 4	Adjusts Retail and Installation Cost for the EL2 GSWH and the GIWH	Multiplied the Retail Price and Installation Cost in LCC&PB Calcs by a fixed percentage increase in columns R and S Rows 8 and 27
Scenario 4a	1% adustment	
Scenario 4b	2% adustment	
Scenario 4c	3% adustment	
Scenario 4d	4% adustment	
Scenario 4e	5% adustment	
Scenario 4f	6% adustment	
Scenario 5	Adjusts Maintenance Costs for the EL2 GSWH and the GIWH	Multiplied the Maintenance Cost in LCC&PB Calcs by a fixed percentage increase in column AJ Rows 8 and 27
Scenario 5a	5% adjustment	
Scenario 5b	10% adjustment	
Scenario 5c	15% adjustment	
Scenario 5d	20% adjustment	
Scenario 5e	25% adjustment	
Scenario 5f	30% adjustment	
Scenario 5g	35% adjustment	
Scenario 5h	40% adjustment	
Scenario 6	Adjusts Retail and Installation Cost as well as maintenance costs as was done in Scenarios 4 and 5 for the EL2 GSWH and GIWH.	
Scenario 6a	1% Installed cost and 5% maintenance	
Scenario 6b	1% Installed cost and 10% maintenance	
Scenario 6c	1% Installed cost and 15% maintenance	
Scenario 6d	1% Installed cost and 20% maintenance	
Scenario 6e	1% Installed cost and 25% maintenance	
Scenario 6f	1% Installed cost and 30% maintenance	
Scenario 6AA	2% Installed cost and 5% maintenance	
Scenario 6AB	2% Installed cost and 10% maintenance	
Scenario 6AC	2% Installed cost and 15% maintenance	

Table 2: Results for GSWH EL2

GSWH			
	LCC Savings	Net Cost	Net Benefit
Scenario 0	$52.18	46.6%	53.4%
Scenario 0a	$51.45	47.5%	52.5%
Scenario 1	$52.13	47.0%	53.0%
Scenario 2	$51.82	47.1%	52.9%
Scenario 3	$51.97	47.1%	52.9%
Scenario 4	N/A		
Scenario 4a	$35.55	53.6%	46.4%
Scenario 4b	$18.92	59.3%	40.7%
Scenario 4c	$2.28	64.3%	35.7%
Scenario 4d	-$14.35	68.8%	31.2%
Scenario 4e	-$30.98	72.6%	27.4%
Scenario 4f	-$47.61	75.5%	24.5%
Scenario 5	N/A		
Scenario 5a	$45.52	48.7%	51.3%
Scenario 5b	$38.86	50.0%	50.0%
Scenario 5c	$32.20	50.5%	49.5%
Scenario 5d	$25.54	50.8%	49.2%
Scenario 5e	$18.88	51.0%	49.0%
Scenario 5f	$12.22	51.1%	48.9%
Scenario 5g	$5.56	51.2%	48.8%
Scenario 5h	-$1.10	51.2%	48.8%
Scenario 6	N/A		
Scenario 6a	$28.89	55.7%	44.3%
Scenario 6b	$22.23	56.7%	43.3%
Scenario 6c	$15.57	57.1%	42.9%
Scenario 6d	$8.91	57.4%	42.6%
Scenario 6e	$2.25	57.5%	42.5%
Scenario 6f	-$4.41	57.6%	42.4%
Scenario 6AA	$12.26	61.3%	38.7%
Scenario 6AB	$5.60	62.0%	38.0%
Scenario 6AC	-$1.06	62.4%	37.6%

Table 3: Test Results for GIWH EL2

GIWH			
	LCC Savings	Net Cost	Net Benefit
Scenario 0	$135.36	35.3%	64.7%
Scenario 0a	$153.70	32.8%	67.2%
Scenario 1	$144.67	33.9%	66.1%
Scenario 2	$145.25	34.0%	66.0%
Scenario 3	$145.57	33.4%	66.6%
Scenario 4	N/A		
Scenario 4a	$110.72	42.4%	57.6%
Scenario 4b	$86.08	48.3%	51.7%
Scenario 4c	$61.44	52.6%	47.4%
Scenario 4d	$36.80	57.5%	42.5%
Scenario 4e	$12.16	60.9%	39.1%
Scenario 4f	-$12.48	64.2%	35.8%
Scenario 5	N/A		
Scenario 5a	$102.07	41.6%	58.4%
Scenario 5b	$68.78	44.7%	55.3%
Scenario 5c	$35.49	47.0%	53.0%
Scenario 5d	$2.20	48.7%	51.3%
Scenario 5e	-$31.09	49.7%	50.3%
Scenario 5f	-$64.38	50.7%	49.3%
Scenario 5g	-$97.67	51.3%	48.7%
Scenario 5h	-$130.96	51.6%	48.4%
Scenario 6	N/A		
Scenario 6a	$77.43	47.6%	52.4%
Scenario 6b	$44.14	51.1%	48.9%
Scenario 6c	$10.85	52.7%	47.3%
Scenario 6d	-$22.44	54.3%	45.7%
Scenario 6e	-$55.73	55.3%	44.7%
Scenario 6f	-$89.02	56.1%	43.9%
Scenario 6AA	$52.79	52.7%	47.3%
Scenario 6AB	$19.50	55.6%	44.4%
Scenario 6AC	-$13.79	57.0%	43.0%

Representativeness of Randomly-Selected Trial Cases

The percentage of trial cases representing investments in standards-compliant products resulting from the proposed standards is determined on the basis of the baseline market share for such products. If those trial cases are selected randomly, the distribution of economic outcomes for investments in standards-compliant products for those trial cases should be representative of the distribution of economic outcomes for potential investments in standards-compliant products in all 10,000 trial cases. In that case, the average LCC savings and percentage of cases in which consumers would experience net costs as a result of investments in standards-compliant products for all 10,000 trial cases should be approximately the same as they are for the rule outcome trial cases.

To test this hypothesis, the base case efficiencies for trial cases representing base-case efficiencies in standards-compliant products were re-set to EL0 or EL1 by setting the market shares in the model to have the same ratio of EL0 and EL1 market share but such that the sum of the two market shares is 100% (Scenario 1). For the GSWH model, this produced an LCC savings of $52.13 compared to $52.18 for the baseline DOE model (Scenario 0). The percentage of consumers affected by the standard that would experience net costs was 47.0% as compared to 46.6% in Scenario 0. For the GIWH model, the average LCC savings was $144.67 in Scenario 1 as compared to $135.36 in Scenario 0, and the percentage of affected consumers experiencing net costs was 33.9% in Scenario 1 as compared to 35.3% in Scenario 0. These results confirm that the randomly-selected rule outcome trial cases are representative of all 10,000 trial cases, as expected.

Scenario 1 simulated investments in standards-compliant products in more than 98% of DOE's 10,000 trial cases. The reason it did not provide results for all 100% of the trial cases is that – even after reassignment of base case efficiencies described in Scenario 1 – the 5% market share adjustments the model made on the basis of building sizes caused some trial cases to be assigned base case efficiencies at or above the standards level.

Looking at the effect of removing the 5% adjustment (Scenario 2) but changing nothing else shows essentially the same economic outcomes as Scenarios 0 and Scenario 1. Scenario 3 combines the removal of the 5% market share adjustments with the revised market shares as described in Scenario 1 to account for all 10,000 trial cases. This scenario produces essentially the same results as Scenarios 0, 1, and 2, again confirming that there is no material difference in the distribution of economic outcomes for potential investments in standards-compliant products between the rule outcome trial cases and all 10,000 trial cases in DOE's analysis. Scenario 0a, which changes nothing other than the random number generator's seed value, results in larger changes to average LCC savings relative to Scenario 0 than any of Scenarios 1, 2, or 3 which further confirms that the results of these scenarios cannot be distinguished from Scenario 0.

Sensitivity Analysis

The LCC savings that DOE is using as evidence of a market failure represent a very small fraction of the total life cycle cost. For the GSWH, the LCC savings for EL2 is $52/$4556 = 1.15% and for the GIWH the LCC savings is $135/$6004 = 2.25%.

Because DOE is setting a rule based on such small percentage savings, essentially every input into the model must be very accurate in order to distinguish the savings from zero. This section looks at LCC savings and net cost outcome sensitivity to the total installed cost and maintenance costs of equipment. These were chosen in particular because DOE does not use real world installation and maintenance data and instead builds up costs through a very complex procedure. It should be noted that the installed base of the gas equipment covered by this rulemaking totals millions of units. Actual, real-world, cost data exists in very large quantity; DOE simply has not collected it and relies instead on an academic analysis to generate costs.

As shown in Figure 1 and in Tables 2 and 3 under Scenarios 4a-4f, average LCC savings for the proposed GSWH standards at EL2 are negative if installed cost is underestimated by less than 4% and more than half of rule affected outcomes are net cost outcomes if installed cost is underestimated by less than 1%. For the proposed GIWH standards, average LCC savings are negative if installed cost is underestimated by less than 6% and more than half of rule affected outcomes are net cost outcomes if installed cost is underestimated by less than 3%.

Figure 2, and Tables 2 and 3 under Scenarios 5a-5h, show the impact of underestimating maintenance costs. For the GSWH average LCC savings become negative if maintenance costs are underestimated by more than 30%, but half of affected consumers would experience net costs if maintenance costs are underestimated by even 10%. In the GIWH analysis, less than a 25% underestimate of maintenance costs would result in negative LCC savings and more than half of affected consumers experiencing net costs.

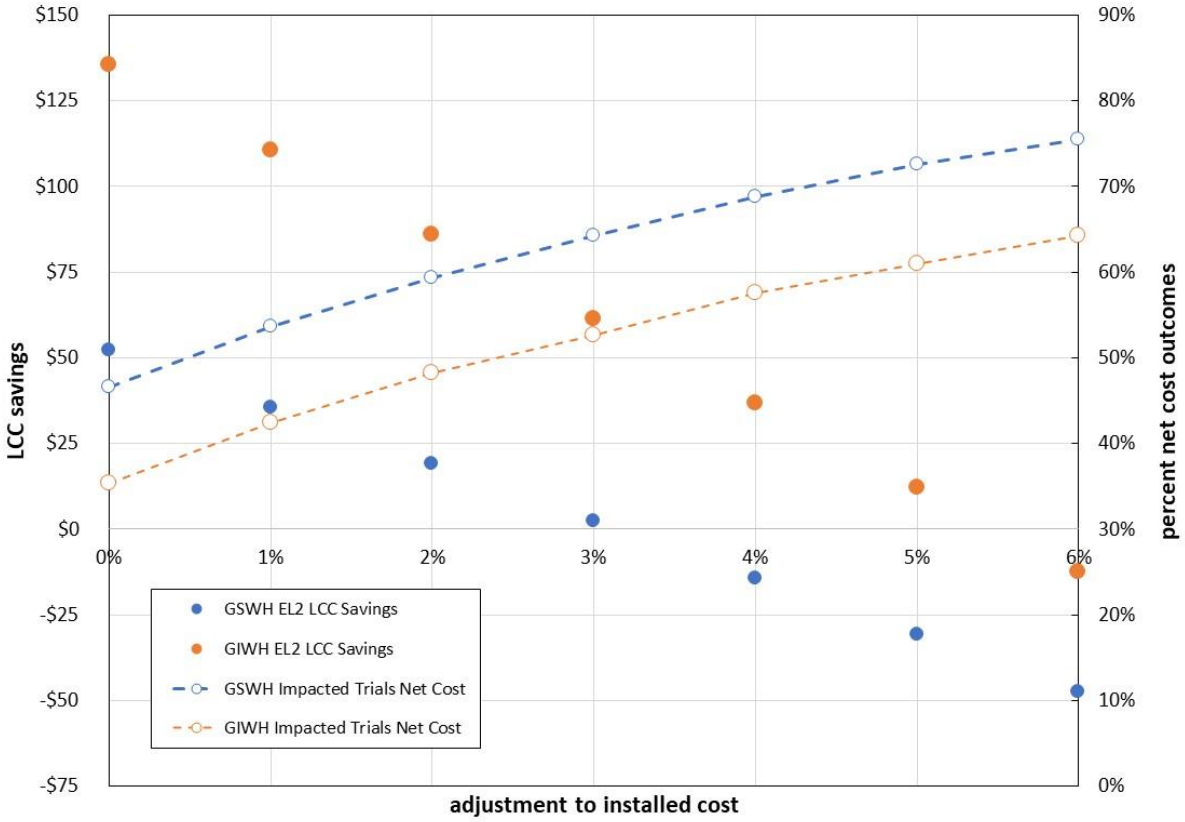


Figure 1: LCC savings and percentage of rule affected trials that result in net cost vs. adjustments to installed cost of GSWH and GIWH at EL2.

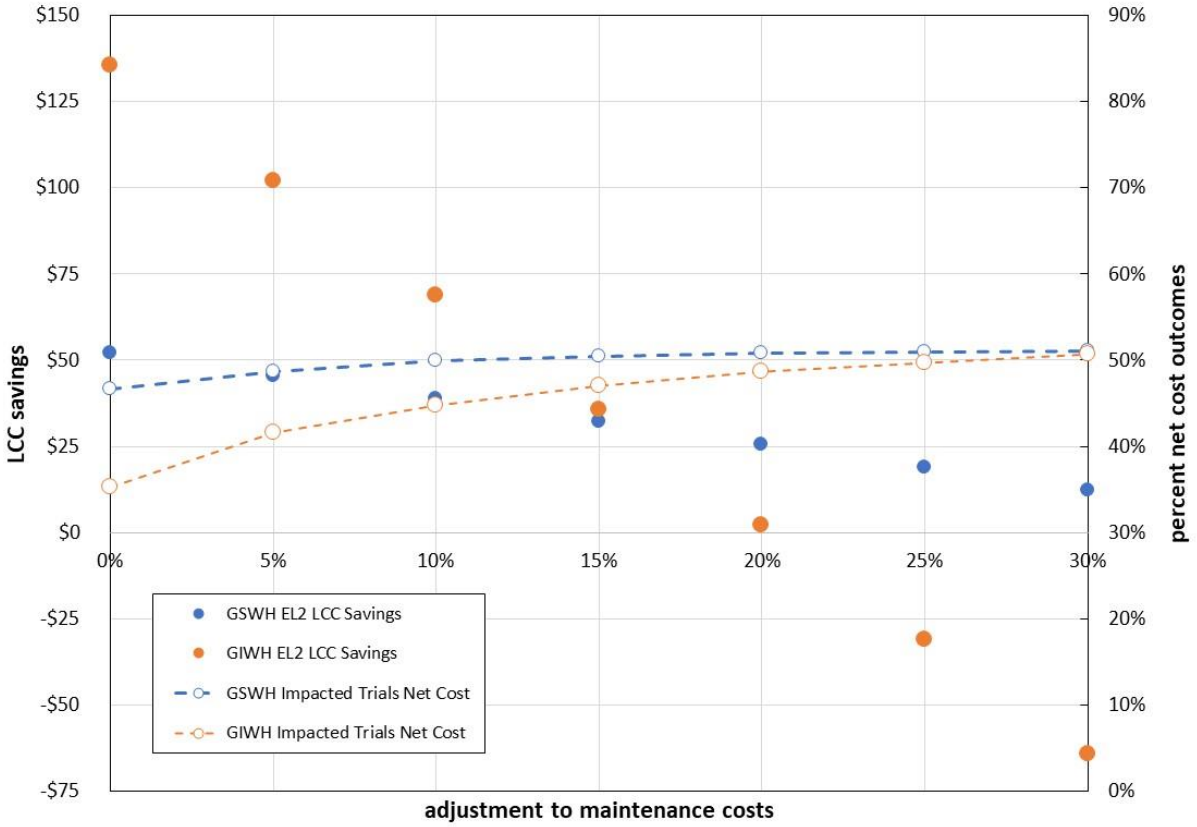


Figure 2: LCC savings and percentage of rule affected trials that result in net cost vs. adjustments to maintenance costs of GSWH and GIWH at EL2.

Combinations of underestimated costs will of course drive LCC outcomes negative at even smaller levels of underestimation. Figures 3 and 4 show the effects of maintenance cost underestimates at fixed installed costs underestimates of 1% and 2% respectively. These results are also shown in Tables 2 and 3 under Scenarios 6a-6AC. For the GSWH analysis, LCC savings are negative if installation costs are underestimated by 2% and maintenance costs are underestimated by 15%, and more than half of affected consumers would experience net cost with any combination of installed cost and maintenance cost underestimates evaluated. For the GIWH analysis, LCC savings are also negative with a 2% installed cost underestimate and 15% maintenance underestimate, and more than half affected consumers would experience net cost outcomes in all Scenarios other than Scenario 6a (1% and 5% underestimates of installed and maintenance costs, respectively).

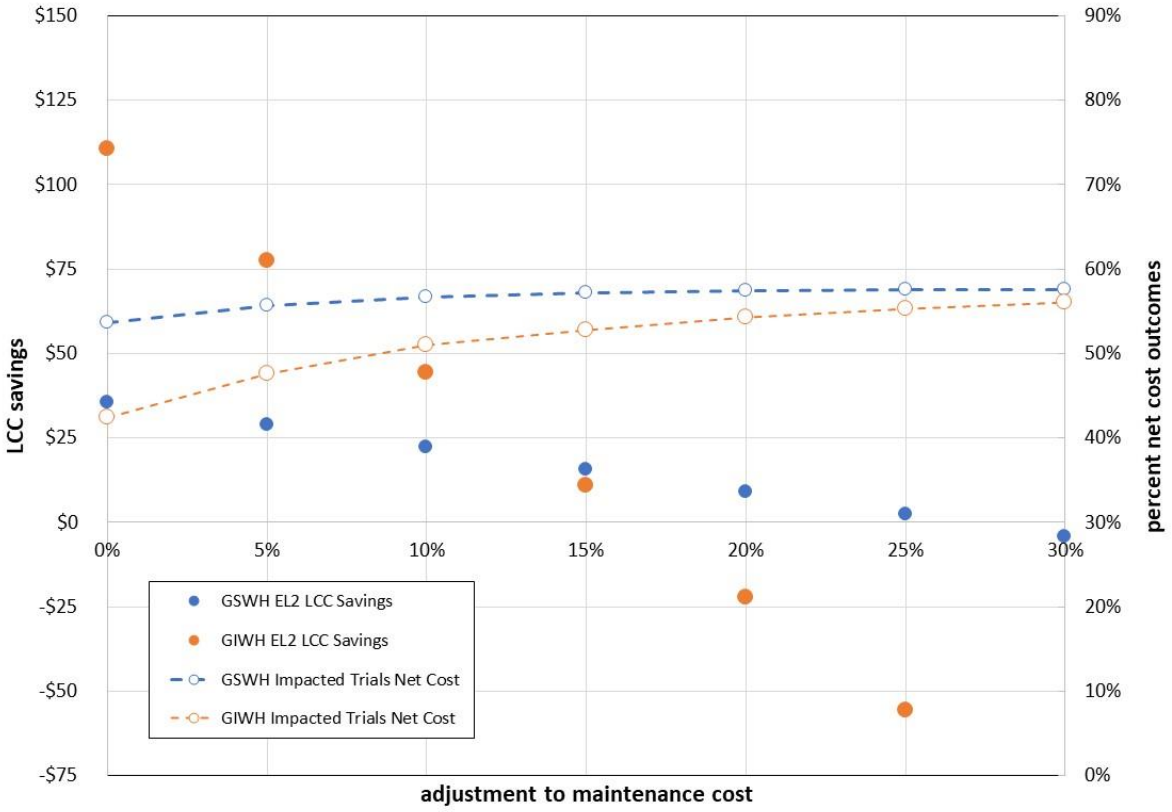


Figure 3: Maintenance cost adjustments vs. LCC savings and net cost outcome percentages at a fixed installed cost adjustment of 1%.

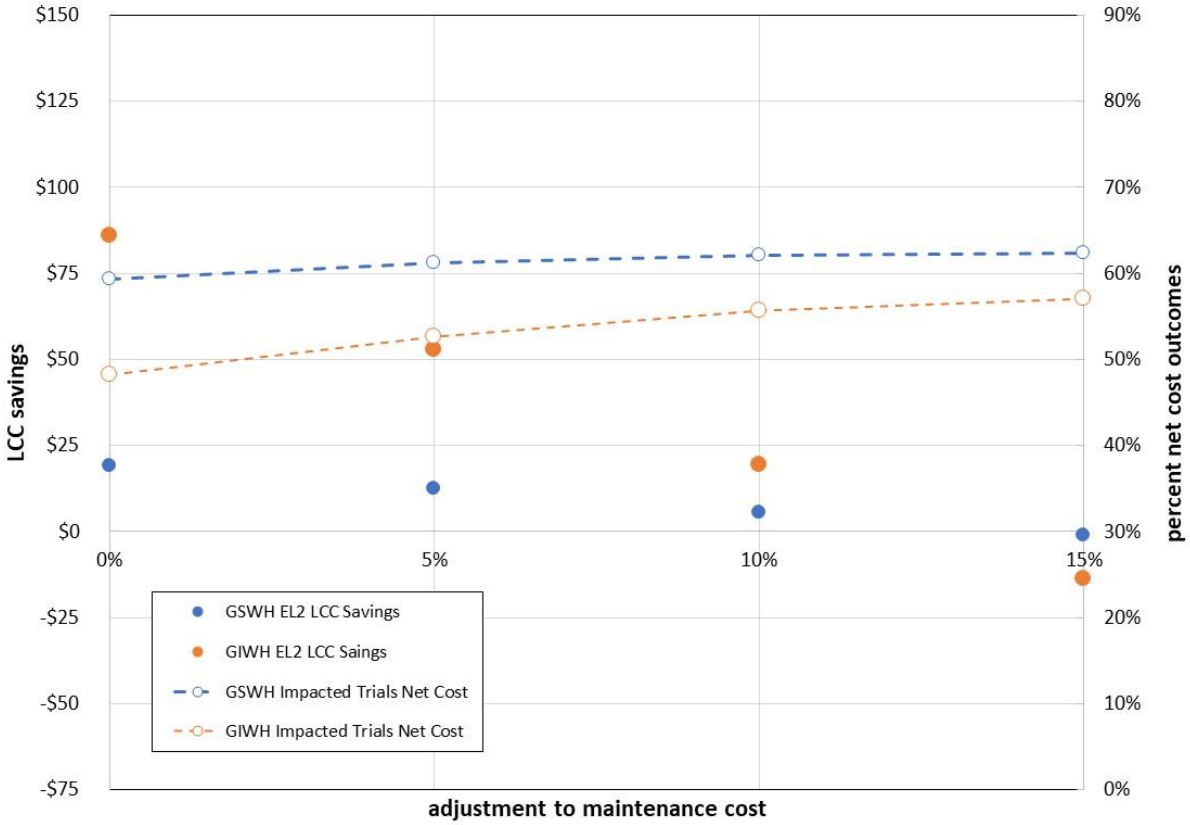


Figure 4: Maintenance cost adjustments vs. LCC savings and net cost outcome percentages at a fixed installed cost adjustment of 2%.

Attachment B

Regional Impact Tables for GSWHs

EERE-2017-BT-STD-0019

Table: Regional Impact of GSWH Rule

	Total Simulated Trial Count	Affected	Percent of Affected that are Negatively Impacted	Average LCC Savings	Average First Year Savings	Higher Install Costs	Total Payback
Alabama	64	83%	43%	$ 42	$ 16	$ 130	9.6
Alaska	18	72%	69%	$ (13)	$ 11	$ 140	12.9
Arizona	199	73%	30%	$ 162	$ 26	$ 122	7.2
Arkansas	101	75%	46%	$ 31	$ 15	$ 133	9.3
California	1,674	78%	33%	$ 94	$ 20	$ 140	7.9
Colorado	290	79%	39%	$ 53	$ 15	$ 125	9.5
Connecticut	71	86%	34%	$ 61	$ 20	$ 120	6.7
Delaware	19	68%	31%	$ 54	$ 16	$ 112	7.6
District of Columbia	27	93%	24%	$ 70	$ 19	$ 128	7.0
Florida	121	76%	30%	$ 117	$ 23	$ 127	7.5
Georgia	212	81%	42%	$ 55	$ 19	$ 137	8.1
Hawaii	9	78%		$ 444	$ 38	$ 125	3.4
Idaho	56	77%	67%	$ (21)	$ 10	$ 132	13.1
Illinois	565	78%	54%	$ 9	$ 13	$ 135	11.4
Indiana	214	77%	73%	$ (18)	$ 11	$ 133	15.1
Iowa	128	80%	52%	$ 16	$ 14	$ 127	10.2
Kansas	136	74%	53%	$ 23	$ 16	$ 134	9.4
Kentucky	108	73%	59%	$ 5	$ 15	$ 132	9.9
Louisiana	128	66%	58%	$ 35	$ 14	$ 133	12.4
Maine	14	71%		$ 466	$ 41	$ 149	3.6
Maryland	195	73%	20%	$ 137	$ 24	$ 126	6.2
Massachusetts	188	77%	10%	$ 236	$ 34	$ 132	4.5
Michigan	467	76%	57%	$ 7	$ 13	$ 135	12.2
Minnesota	205	75%	46%	$ 68	$ 16	$ 130	9.9
Mississippi	62	77%	33%	$ 124	$ 21	$ 129	8.7
Missouri	185	71%	48%	$ 36	$ 13	$ 122	11.1
Montana	44	86%	61%	$ 25	$ 15	$ 137	10.4
Nebraska	95	82%	62%	$ 24	$ 15	$ 129	11.2
Nevada	115	86%	73%	$ (17)	$ 12	$ 133	14.7
New Hampshire	23	87%	20%	$ 145	$ 29	$ 128	5.9
New Jersey	361	80%	64%	$ (5)	$ 13	$ 138	12.0
New Mexico	116	78%	40%	$ 22	$ 14	$ 129	9.8
New York	741	81%	44%	$ 78	$ 19	$ 132	9.5
North Carolina	152	72%	27%	$ 88	$ 20	$ 132	7.6
North Dakota	23	78%	61%	$ 10	$ 13	$ 141	11.5
Ohio	471	78%	63%	$ 13	$ 13	$ 131	13.6
Oklahoma	126	75%	36%	$ 111	$ 19	$ 132	10.6
Oregon	91	74%	52%	$ (2)	$ 11	$ 127	12.0
Pennsylvania	364	79%	47%	$ 15	$ 15	$ 134	10.1
Rhode Island	27	81%	18%	$ 115	$ 19	$ 115	6.2
South Carolina	62	84%	52%	$ 7	$ 15	$ 126	9.4
South Dakota	26	81%	76%	$ (28)	$ 10	$ 121	13.3
Tennessee	116	78%	59%	$ 33	$ 16	$ 135	10.8
Texas	809	76%	62%	$ 11	$ 13	$ 133	13.7
Utah	137	79%	43%	$ 36	$ 14	$ 125	10.1
Vermont	11	73%	25%	$ 398	$ 43	$ 121	4.3
Virginia	202	78%	35%	$ 67	$ 19	$ 134	8.5
Washington	154	84%	55%	$ 29	$ 15	$ 136	10.7
West Virginia	40	85%	44%	$ 61	$ 19	$ 136	8.8
Wisconsin	215	78%	48%	$ 43	$ 15	$ 130	10.5
Wyoming	23	87%	55%	$ 14	$ 16	$ 132	9.2
	10000	78%	47%	$ 52	$ 17	$ 133	10.1

Table: Regional Impact of GSWH Rule on Low-Income Households

	Total Simulated Trial Count	Low Income Weighted Trial Count	Percent Affected	Percent of Low Income Affected that are Negatively Impacted	Average LCC Savings for Low Income	Average First Year Savings for Low Income	Low Income Higher Install Costs	Low Income Payback
Alabama	64	14	91%	44%	$ 58	$ 17	$ 117	8.1
Alaska	18	-			$ -	$ -	$ -	-
Arizona	199	43	77%	28%	$ 204	$ 30	$ 121	6.4
Arkansas	101	14	84%	39%	$ 38	$ 15	$ 130	9.0
California	1,674	248.4	83%	36%	$ 70	$ 18	$ 132	8.7
Colorado	290	27	83%	36%	$ 71	$ 15	$ 118	9.3
Connecticut	71	18	83%	30%	$ 64	$ 22	$ 120	6.1
Delaware	19	-			$ -	$ -	$ -	-
District of Columbia	27	8	88%	55%	$ 41	$ 17	$ 140	8.6
Florida	121	18	69%	29%	$ 133	$ 24	$ 129	7.4
Georgia	212	32	81%	58%	$ 18	$ 15	$ 137	9.7
Hawaii	9	2	100%		$ 486	$ 38	$ 112	3.0
Idaho	56	3	51%	100%	$ (75)	$ 11	$ 117	11.0
Illinois	565	46	90%	61%	$ (1)	$ 13	$ 135	10.8
Indiana	214	20	87%	64%	$ 39	$ 16	$ 140	13.7
Iowa	128	5	85%	100%	$ (43)	$ 11	$ 130	12.3
Kansas	136	9	71%	37%	$ 32	$ 16	$ 147	9.9
Kentucky	108	13	82%	56%	$ 23	$ 16	$ 121	8.3
Louisiana	128	6	85%	77%	$ (7)	$ 12	$ 128	10.8
Maine	14	-			$ -	$ -	$ -	-
Maryland	195	19	70%	14%	$ 192	$ 27	$ 122	5.5
Massachusetts	188	52	75%	11%	$ 172	$ 30	$ 129	4.9
Michigan	467	68	84%	50%	$ (1)	$ 11	$ 134	12.4
Minnesota	205	26	91%	52%	$ 7	$ 13	$ 133	11.9
Mississippi	62	30	82%	30%	$ 153	$ 22	$ 129	8.0
Missouri	185	16	74%	67%	$ (10)	$ 11	$ 118	11.9
Montana	44	-			$ -	$ -	$ -	-
Nebraska	95	6	100%	47%	$ 40	$ 16	$ 147	10.4
Nevada	115	26	89%	68%	$ (11)	$ 11	$ 126	14.3
New Hampshire	23	9	86%	25%	$ 81	$ 23	$ 132	7.5
New Jersey	361	43	84%	56%	$ 7	$ 15	$ 136	10.1
New Mexico	116	3	66%	79%	$ (25)	$ 12	$ 148	12.1
New York	741	146	86%	48%	$ 61	$ 19	$ 134	9.6
North Carolina	152	20	82%	25%	$ 42	$ 20	$ 142	7.6
North Dakota	23	5	71%	58%	$ 27	$ 12	$ 120	11.3
Ohio	471	65	81%	74%	$ (7)	$ 13	$ 132	12.8
Oklahoma	126	6	81%	57%	$ 6	$ 9	$ 107	14.1
Oregon	91	2	66%	83%	$ (95)	$ 11	$ 196	18.9
Pennsylvania	364	36	86%	65%	$ (9)	$ 14	$ 138	11.0
Rhode Island	27	2	100%	19%	$ 90	$ 19	$ 121	6.6
South Carolina	62	3	100%	65%	$ (3)	$ 16	$ 128	9.0
South Dakota	26	3	53%		$ 59	$ 13	$ 125	10.3
Tennessee	116	14	79%	34%	$ 69	$ 19	$ 138	7.4
Texas	809	114	80%	60%	$ 36	$ 14	$ 132	12.6
Utah	137	11	82%	42%	$ 5	$ 12	$ 118	11.0
Vermont	11	3	100%		$ 671	$ 68	$ 124	1.9
Virginia	202	30	75%	29%	$ 52	$ 16	$ 133	8.7
Washington	154	20	85%	67%	$ (14)	$ 11	$ 134	12.1
West Virginia	40	8	92%	54%	$ 34	$ 15	$ 124	8.4
Wisconsin	215	9	78%	37%	$ 32	$ 13	$ 126	10.6
Wyoming	23	2	50%	100%	$ (126)	$ 7	$ 157	22.4
	10000	1322	82%	46%	$ 53	$ 17	$ 132	9.9

Table: Regional Impact of GSWH Rule on Senior Households

	Total Simulated Trial Count	Senior Weighted Trial Count	Percent Affected	Percent Senior Affected that are Negatively Impacted	Average LCC Savings for Seniors	Average First Year Savings for Seniors	Higher Install Cost for Seniors	Payback for Seniors
Alabama	64	8	83%	40%	$ 29	$ 15	$ 126	10.0
Alaska	18	3	29%	91%	$ (24)	$ 10	$ 124	13.1
Arizona	199	65	75%	29%	$ 148	$ 24	$ 127	8.0
Arkansas	101	5	71%	40%	$ 15	$ 14	$ 144	10.5
California	1,674	218	78%	28%	$ 130	$ 23	$ 144	7.4
Colorado	290	46	85%	39%	$ 49	$ 14	$ 123	9.8
Connecticut	71	5	100%	60%	$ 10	$ 20	$ 117	5.8
Delaware	19	3	50%		$ 24	$ 15	$ 102	7.1
District of Columbia	27	-			$ -	$ -	$ -	-
Florida	121	23	71%	34%	$ 76	$ 20	$ 124	8.1
Georgia	212	28	86%	29%	$ 76	$ 20	$ 128	7.4
Hawaii	9	-			$ -	$ -	$ -	-
Idaho	56	10	86%	100%	$ (55)	$ 10	$ 128	12.8
Illinois	565	95	78%	50%	$ 16	$ 13	$ 143	11.7
Indiana	214	49	80%	80%	$ (35)	$ 9	$ 133	15.7
Iowa	128	35	65%	51%	$ 0	$ 17	$ 133	9.9
Kansas	136	28	73%	40%	$ 39	$ 18	$ 141	8.4
Kentucky	108	14	76%	73%	$ (39)	$ 12	$ 143	11.8
Louisiana	128	19	63%	45%	$ 98	$ 15	$ 129	9.5
Maine	14	6	75%		$ 619	$ 44	$ 152	3.4
Maryland	195	8	91%		$ 311	$ 26	$ 112	4.7
Massachusetts	188	38	82%	8%	$ 447	$ 45	$ 130	3.4
Michigan	467	66	74%	68%	$ (11)	$ 11	$ 137	13.1
Minnesota	205	36	64%	71%	$ (9)	$ 13	$ 139	12.0
Mississippi	62	11	83%	9%	$ 210	$ 28	$ 121	6.3
Missouri	185	45	65%	52%	$ 80	$ 17	$ 119	10.1
Montana	44	6	50%	67%	$ 97	$ 17	$ 104	6.2
Nebraska	95	17	73%	84%	$ 5	$ 13	$ 144	12.9
Nevada	115	23	82%	80%	$ (36)	$ 9	$ 128	15.4
New Hampshire	23	4	77%	29%	$ 275	$ 38	$ 146	3.9
New Jersey	361	55	85%	49%	$ 20	$ 14	$ 138	11.4
New Mexico	116	38	76%	40%	$ 28	$ 15	$ 123	9.1
New York	741	109	76%	34%	$ 144	$ 24	$ 123	7.2
North Carolina	152	28	74%	25%	$ 77	$ 19	$ 139	8.1
North Dakota	23	6	67%	67%	$ 34	$ 14	$ 142	10.4
Ohio	471	62	67%	61%	$ (15)	$ 11	$ 129	13.8
Oklahoma	126	34	69%	30%	$ 79	$ 17	$ 133	11.7
Oregon	91	27	80%	55%	$ 7	$ 11	$ 118	11.6
Pennsylvania	364	80	82%	50%	$ 22	$ 15	$ 137	10.1
Rhode Island	27	7	52%		$ 216	$ 22	$ 103	4.7
South Carolina	62	6	57%	40%	$ (4)	$ 12	$ 137	11.6
South Dakota	26	3	67%	100%	$ (40)	$ 10	$ 97	9.9
Tennessee	116	31	79%	69%	$ 30	$ 16	$ 125	10.7
Texas	809	186	72%	59%	$ 53	$ 16	$ 135	12.7
Utah	137	41	75%	50%	$ 17	$ 15	$ 131	9.6
Vermont	11	-			$ -	$ -	$ -	-
Virginia	202	48	77%	40%	$ 40	$ 19	$ 142	8.7
Washington	154	49	82%	58%	$ 49	$ 18	$ 133	9.3
West Virginia	40	9	92%	54%	$ 3	$ 16	$ 134	8.7
Wisconsin	215	27	82%	51%	$ 44	$ 17	$ 136	10.3
Wyoming	23	6	83%	40%	$ 59	$ 17	$ 119	7.4
	10000	1767	76%	46%	$ 67	$ 18	$ 133	10.0

Attachment C

Comments of Petitioners
for Docket No. EERE-2018-BT-STD-0018
(Sept. 9, 2019)

EERE-2017-BT-STD-0019

BEFORE THE

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

UNITED STATES DEPARTMENT OF ENERGY

WASHINGTON, D.C.

Energy Conservation Program: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters

Notice of Proposed Interpretive Rule and Response to Petition for Rulemaking

84 Fed. Reg. 33011 (July 11, 2019)

Docket No. EERE–2018–BT– STD–0018

Comments of Petitioners
Spire Inc.
The American Public Gas Association
The American Gas Association
The National Propane Gas Association
The Natural Gas Supply Association
And
The National Association of Home Builders
The Air Conditioning Contractors of America
The Plumbing-Heating-Cooling Contractors—National Association
The National Multifamily Housing Council
The National Apartment Association
The National Leased Housing Association
The Manufactured Housing Association for Regulatory Reform

September 9, 2019

Introduction

As signatories to the petition for rulemaking that is the subject of the above-referenced proceeding (the "Petition"), Spire Inc. ("Spire"), the American Public Gas Association ("APGA"), the American Gas Association ("AGA"), the National Propane Gas Association ("NPGA") and the Natural Gas Supply Association ("NGSA") (collectively "Petitioners") appreciate the opportunity to provide comments to the Department of Energy ("DOE") on its proposed response to the Petition – most notably its proposed interpretive rule – published in the *Federal Register* on July 11, 2019 (hereinafter the "Proposal").[1] Petitioners are joined in this submission by the National Association of Home Builders ("NAHB"), the Air Conditioning Contractors of America ("ACCA"), the Plumbing-Heating-Cooling Contractors—National Association ("PHCC-NA"), the National Multifamily Housing Council ("NMHC"), the National Apartment Association ("NAA"), the National Leased Housing Association ("NLHA") and the Manufactured Housing Association for Regulatory Reform (MHARR), which – though not signatories to the Petition – will also be referred to by the collective term "Petitioners" for purposes of these comments.

Petitioners appreciate DOE's thorough consideration of the issues raised by the Petition and support DOE's proposal to issue an interpretive rule confirming that:

> adoption of energy conservation standards that would limit the market to natural gas and/or propane gas furnaces, water heaters, or similarly situated products/equipment . . . that use condensing combustion technology would result in the unavailability of a performance related feature within the meaning of 42 U.S.C. [§§] 6295(o)(4) and 6313(a)(6)(B)(iii)(II)(aa).[2]

In general, Petitioners believe that DOE appropriately considered the Petition and comments submitted in response to its publication. Nevertheless, Petitioners believe that DOE should take more decisive action to resolve the issues raised by the Petition and to advance the rulemaking process in its pending residential furnace and commercial water heater rulemaking proceedings.[3] Petitioners also respectfully urge DOE to clarify or reconsider its analysis in certain respects, as discussed in more detail below.

---

[1] *Granting in part and denying in part a petition for rulemaking; notice of proposed interpretive rule; request for comment*, Docket No. EERE-2018-BT0STD-0018, 84 Fed. Reg. 33011 (July 11, 2019). Petitioner's previous comments in this proceeding, filed March 1, 2019 ("Petitioners' Previous Comments") are identified in the docket for this proceeding as Document No. EERE-2018-BT-STD-0018-0044.

[2] 84 Fed. Reg. at 33020-21.

[3] Energy Conservation Standards for Residential Furnaces, Docket No. EERE 2014-BT-STD-031, and Energy Conservation Standards for Commercial Water Heaters, Docket No. EERE-BT-STD-042, respectively.

Discussion

A. Why We Are Here

The Petition seeks to resolve the issue of whether DOE can impose energy conservation standards that would make atmospherically vented gas products such as furnaces and water heaters unavailable. In practical terms, this issue matters because standards that would make atmospherically vented products unavailable to consumers would do more to promote electrification than to promote the efficiency of gas products. Petitioners are not "aggrieved by a proposed federal energy conservation standard whereby gas furnaces would consume less natural gas or propane gas" as one electrification advocate suggests;[4] instead they are aggrieved by energy conservation standards for gas products that – by making important product characteristics unavailable – would force many consumers to give up gas appliances in favor of electric alternatives. That's why the Petition was filed and why manufacturers of electric products have participated so vigorously in a proceeding that is specific to gas products.[5]

Suggestions that Petitioners are opposed to condensing technology or that favorable action on the Petition would "create missed opportunities for consumers, businesses, and governments"[6] are meritless. Condensing gas products are already available to purchasers who want (and can reasonably use) them, and they increasingly dominate the market in regions in which the economic justification for them is strong. Petitioners do not oppose the operation of that market.[7] However – as DOE has recognized – condensing products are not suitable for all installations, because they lack important performance characteristics (or "features") that many consumers want or need due to the constraints of existing building configurations. The Petition seeks to preserve the availability of those product characteristics so that gas products will continue to be available to serve the full range of consumer needs. It is *the opponents of the Petition* – not the Petitioners – that seek to deny consumers access to the products that best serve their needs.

---

[4] National Electrical Manufacturers Association comments identified in the docket for this proceeding as Document No. EERE-2018-BT-STD-0018-0046 ("NEMA Comments") at p. 5.

[5] DOE's summary of the range of interests involved in this proceeding did not refer to electrification interests as such (*see* 84 Fed. Reg. at 33012 and 33014). However, such interests have vigorously opposed the Petition despite their lack of standing with respect to the issues involved. *See Hazardous Waste Treatment Council v. EPA*, 861 F.2d 277, 285 (D.C. Cir. 1988) (business interests seeking commercial advantage through governmental regulation of their competitors lacked standing to challenge purported regulatory laxity because they were not suitable advocates for the environmental interests embodied by the statute and had "no common law interest, much less a constitutional one, in having the government drive business [their] way").

[6] Comments submitted by the Attorney General of New York *et al* ("AG Comments"), identified in the docket for this proceeding as Document No. EERE-2018-BT-STD-0018-0049 at p. 9.

[7] *E.g.,* "Comments of the American Public Gas Association," Docket Number EERE-2014-BT-STD-0031, at pp. 34-37 (filed July 10, 2015) ("what APGA does not support is interfering with a well-functioning market with a standard that will promote fuel switching").

The practical issue is that standards that would eliminate atmospherically vented gas products would too often result – not in the sale of more efficient gas products – but in the sale of *fewer gas products*. That difference in outcomes is critical, as illustrated by the impact condensing standards would have on low income consumers. Suggestions that favorable action on the Petition would be "quite harmful to the economic interests of consumers, especially low-income consumers"[8] are based on the premise that condensing standards for residential furnaces would give low income renters the benefits of condensing gas furnaces, which they frequently would not. Existing multifamily properties provide much of the country's affordable housing, and the owners and managers of older properties already face significant challenges to maintaining affordable housing options for renters. Unfortunately, it is this existing housing stock that faces some of the most serious technical impediments to the installation of condensing gas furnaces. Where it would be impractical to install condensing furnaces, the unavailability of atmospherically vented gas furnaces would force many property owners to turn to alternatives such as electric resistance heating, which would be the low-cost option in terms of initial investment and – in the context of multi-family housing – would often be the only *practical* option.[9] While electrification advocates might be pleased with any outcome that results in the substitution of electric products for gas products, these scenarios would adversely affect all residents, but would impose the greatest burdens on low income renters who are least able to afford substantially higher utility bills.[10]

B. DOE Should Take Decisive Action to Resolve the Issues Raised by the Petition

Petitioners urge DOE to take further action consistent with its proposed interpretive rule by:

- Issuing written findings pursuant to 42 U.S.C. §§ 6295(o)(4) and 6313(a)(6)(B)(iii)(II)(aa), respectively, in its pending residential furnace and commercial water heater rulemaking proceedings;[11] and

- Withdrawing the pending proposed rules in those proceedings on the basis of those written findings.

Such findings are justified by the evidence, warranted by DOE's proposed interpretive rule, and sufficient to establish that adoption of the pending proposals would be contrary to law. DOE

[8] Comments of the National Consumer Law Center and Consumer Federation of America, identified in the docket for this proceeding as Document No. EERE-2018-BT-STD-0018-0050, at p. 1.

[9] As indicated in Spire's comments on DOE's pending proposal for residential furnaces, the cost and installation requirements for heat pumps makes them an unlikely option in scenarios in which building owners are unwilling or unable to install condensing gas furnaces. *See* Spire's January 1, 2017 comments, identified as Document No. EERE-2014-BT-STD-0031-0309 in in Docket No. EERE-2014-031 ("Spire's Residential Furnace Comments") at pp. 32-33.

[10] In fact, the proposed residential furnace standards would be harmful for low income consumers for a number of reasons and raise issues warranting an Environmental Justice review. *See* Spire's Residential Furnace Comments at pp. 35-43.

[11] Energy Conservation Standards for Residential Furnaces, Docket No. EERE 2014-BT-STD-031, and Energy Conservation Standards for Commercial Water Heaters, Docket No. EERE-BT-STD-042.

notes that it intends to develop new supplemental proposed rules if its proposed interpretive rule is finalized and suggests that withdrawal of the two pending proposed rules (both of which would impose standards achievable only for condensing products) is therefore "unnecessary."[12] Petitioners respectfully disagree.

If DOE adopts its interpretive rule as proposed, it will have determined that the pending proposals in DOE's residential furnace and commercial water heater rulemaking proceedings are legally defective and cannot be adopted as proposed. In that case, a failure to withdraw those proposals would be a disservice to the public in at least three respects.

First, DOE has a statutory obligation to complete these rulemaking proceedings and it is important that it make constructive progress. If DOE issues its interpretive rule as proposed and the findings Petitioners have requested, it will have resolved an issue that has been a substantial impediment in both of the rulemaking proceedings at issue and – as DOE correctly notes – it will be necessary for DOE to prepare new proposed rules consistent with its interpretive rule. To do so, DOE will need to consider (or reconsider) a number of issues, including the issue of whether separate, more stringent standards for condensing products would be justified. Rather than devoting substantial time and resources to the consideration of such issues without the benefit of public input, DOE should expedite its rule development process by issuing notices confirming that new proposed rules will be required and requesting public comment to help inform the development of those proposals.[13] This approach would also serve to give all interested parties a clearer understanding of the status of DOE's deliberations and would document material progress in the respective rulemaking proceedings.

Second, withdrawal of the pending proposals is warranted to correct the public record. Both proposals were the subject of substantial adverse comment to which DOE has never responded. Far from being all-but-final products of agency deliberation, they were highly controversial proposals issued for notice and comment. Moreover, the standards proposed were objectively problematic – not just for the reasons stated in the Petition – but because they were based on analyses that significantly underestimated the installed cost of condensing products,[14] significantly overestimated the value of potential energy savings,[15] and relied upon a defective

[12] 84 Fed. Reg. at 33021.

[13] As indicated in Petitioners' Previous Comments, it would be particularly helpful for DOE to acknowledge the error in its modeling approach and take comment on the issue of how it should modify its analysis to ensure that model results are based on the economic consequences of efficiency investments that are reasonably representative of the efficiency investments that would occur only if new standards are imposed. *See* Petitioner's Previous Comments at pp. 1-2 and 11-12.

[14] *See* Spire's Residential Furnace Comments at pp. 71-73 and 91-94; Spire's August 30, 2016 comments, identified as Document No. EERE-2014-BT-STD-0042-0045 in in Docket No. EERE-2014-045 ("Spire's Commercial Water Heater Comments") at pp. 24-26 and 43-45.

[15] *See* Spire's Residential Furnace Comments at pp. 81-86; Spire's Commercial Water Heater Comments at 35-39.

modeling approach that systematically skewed the results of its analysis.[16] These objectively substantial criticisms (among others) were raised in robust comment submissions timely filed in response to both proposals. Subsequently, DOE received a formal request that these proposed rules be withdrawn as meritless.[17] That request has been pending since early 2017, and DOE has publicly recognized that preparation of a supplemental proposed rule will be necessary at least in the residential furnace rulemaking. However, despite all of these facts, DOE has been subject to persistent criticism for its purportedly unjustified "failure" to adopt the proposed rules as final. Opponents of the Petition have advanced this familiar chorus, as though the outcome of these rulemaking proceedings had already been determined and the energy savings claimed to justify the proposed standards are real.[18] These unjustified claims will persist – and will continue to have traction they don't deserve – as long as the proposed rules are left pending as though they might still have merit. If DOE determines that its proposed rules are not, in fact, meritorious – a determination the proposed interpretive rule would require – it would be misleading for DOE to leave the proposed rules pending as the most recent embodiment of its views until such time as new proposed rules can be developed and issued. Transparency demands that DOE promptly correct the record that the proposed rules created by issuing notices documenting DOE's determination that the proposed standards are unwarranted and cannot be adopted.

Third, DOE should note that its proposal not to take any near-term action consistent with its proposed interpretive rule is already being used to undermine the significance of DOE's response to the Petition.[19] DOE should not risk having the credibility of its response undermined by its own efforts to minimize the potential that litigation challenging its proposed interpretation might be filed sooner rather than later. Although Petitioners understand DOE's desire to avoid litigation, that desire should not impair DOE's ability to take meaningful action as requested by the Petitioners, because such action is warranted and would be easy to defend on the merits.

C. DOE Should Clarify the Text of its Proposed Interpretation

The Proposal presents DOE's proposed interpretation of the Energy Policy and Conservation Act of 1975 ("EPCA")[20] as follows:

---

[16] *See* Spire's Residential Furnace Comments at pp. 5-6 and 58-62; Spire's Commercial Water Heater Comments at 23-24.

[17] A copy of this request was submitted as Attachment A to Petitioners' Previous Comments.

[18] *See e.g.*, Comments of Pacific Gas and Electric Company, San Diego Gas and Electric, and Southern California Edison, identified in the docket for this proceeding as Document No. EERE-2018-BT-STD-0018-0045 ("Cal. Electric Comments") at pp. 5-6; AG Comments at pp. 3-4.

[19] For example, an Energywire report of July 3, 2019 quoted Steven Nadel, executive director of the American Council for an Energy-Efficient Economy, as follows: "Nadel noted that DOE stated the new rule was 'just an interpretation.' It's like DOE is saying, 'Don't sue us now. This is not a final decision,' he said).

[20] 42 U.S.C. 6291 *et seq*. As is customary for DOE, references to EPCA in this document refer to the statute as amended through America's Water Infrastructure Act of 2018, Public Law 115–270 (Oct. 23, 2018).

> adoption of energy conservation standards that would limit the market to natural gas and/or propane gas furnaces, water heaters, or similarly situated products/equipment (where permitted by EPCA) that use condensing combustion technology would result in the unavailability of a performance related feature within the meaning of 42 U.S.C. [§§] 6295(o)(4) and 6313(a)(6)(B)(iii)(II)(aa) and 42 U.S.C. 6316(a).[21]

In the interests of clarity, Petitioners urge DOE to conclude that standards limiting the market to products that use condensing combustion technology "would result in the unavailability of a performance characteristic or feature" within the meaning of the cited provisions. Petitioners do not believe that this would be any substantive change, but this wording more closely tracks the language of 42 U.S.C. §§ 6295(o)(4) and 6313(a)(6)(B)(iii)(II)(aa). In addition – as explained below – Petitioners are confused by the parenthetical clause and the citation to 42 U.S.C. § 6316(a) in DOE's proposed interpretation and request that both be omitted.

Petitioners raised – and DOE proposes to address – a specific issue as to what constitutes a "performance characteristic" (or "feature") for purposes of 42 U.S.C. §§ 6295(o)(4) and 6313(a)(6)(B)(iii)(II)(aa) (the "Unavailability Provisions"). The Proposal goes on to suggests that these provisions do not apply in cases in which DOE is adopting ASHRAE 90.1 standards pursuant to 42 U.S.C. § 6313(a)(6)(A)(ii)(I),[22] and Petitioners infer that the parenthetical clause may be intended as a reference to that point. However, the question of when DOE's authority is constrained by the Unavailability Provisions is a separate issue that has no bearing on question of what constitutes a "performance characteristic" (or "feature") for purposes of those provisions.[23] In addition, the meaning of the parenthetical clause isn't clear, and the placement of that clause in the text of DOE's interpretation suggests that it speaks to the "performance characteristic" issue rather than to the applicability of the Unavailability Provisions. The reference to 42 U.S.C. § 6316(a) is confusing for a similar reason: that provision – rather than being another Unavailability Provision as its placement in the text suggests – is a complicated applicability provision that governs some of the cases in which the Unavailability Provisions apply. Again, that is an issue separate from that addressed by the text to which the citation is attached.

Petitioners do not believe that DOE needs to address the applicability of the Unavailability Provisions in the text of its interpretive rule, but – to the extent it chooses to do so – Petitioners request that DOE address the applicability issues in separate text rather than in the text of its interpretation as to what constitutes a "performance characteristic" (or "feature") for purposes of those provisions.

In sum, in the in the interest of clarity, Petitioners request that DOE revise its proposed interpretation regarding the "performance characteristic" issue as follows:

---

[21] 84 Fed. Reg. at 33020.

[22] 84 Fed. Reg. at 33013, 33021.

[23] In cases in which the Unavailability Provisions don't apply, DOE's interpretation as to what constitutes a "performance characteristic" for purposes of those provisions would be irrelevant, and nothing in the interpretation Petitioners request suggests otherwise.

adoption of energy conservation standards that would limit the market to natural gas and/or propane gas furnaces, water heaters, or similarly situated products/equipment ~~(where permitted by EPCA)~~ that use condensing combustion technology would result in the unavailability of a performance <u>characteristic or</u> ~~related~~ feature within the meaning of 42 U.S.C. §§ 6295(o)(4) and 6313(a)(6)(B)(iii)(II)(aa) ~~and 42 U.S.C. 6316(a)~~.

If necessary, issues as to when that interpretation serves to constrain DOE's rulemaking authority can be addressed in an additional sentence.

D. <u>DOE Should Clarify or Reconsider Aspects of its Analysis</u>

1. <u>DOE should renounce the asserted legal basis for its previous tentative conclusion that standards effectively banning atmospherically vented gas products are permissible</u>.

As the Proposal states, DOE previously "viewed venting of condensing vs non-condensing as a technological and economic issue incidental to the appliance's purpose of providing heat or hot water to a dwelling or business."[24] Petitioners appreciate the fact that "DOE has now come to see that it may have been too narrow in its focus" and that "a consumer's interaction with and perception of a furnace or water heater may go beyond its primary function."[25] However, Petitioners respectfully submit that DOE should more clearly renounce the asserted legal basis for its previous tentative conclusion.

DOE's previous tentative conclusion that condensing standards would not have the unlawful effect of making performance characteristics (or features) unavailable was based on specific legal grounds: the assertion that *the only product characteristics that EPCA protects* are characteristics that provide utility to consumers *beyond the basic function of the product at issue*. DOE was explicit on this point in the residential furnace rulemaking, stating that it "has no statutory basis" to protect product characteristics that "do not provide unique utility to consumers beyond the basic function of providing heat, which all furnaces perform."[26] DOE then asserted that "the consumer utility of a furnace is that it provides heat to a dwelling, and that the type of venting used for particular furnace technologies does not impact that utility" or "provide any separate performance-related utility."[27] These assertions did not reflect a factual conclusion that there is no difference between atmospherically vented products and condensing products, because DOE acknowledged that there are such differences and that – due to those differences – atmospherically vented products have advantages that condensing products lack. Instead these assertions amounted to a legal claim that those differences "don't count" for purposes of the Unavailability Provisions.

[24] 84 Fed. Reg. at 33016.

[25] *Id.*

[26] 81 Fed. Reg. 65720, 65753 (September 23, 2016).

[27] 81 Fed. Reg. at 65752-53.

The first problem with this legal assertion is that nothing in the statute suggests that the only product characteristics protected under the Unavailability Provisions are those that provide utility to consumers *beyond the basic function of the product at issue*. The statute simply says that DOE may not adopt standards that are "likely to result in the unavailability . . . of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those" currently available to consumers.[28] Rather than applying these provisions of the statute as they are written, DOE asserted – without any legal basis– that there are performance characteristics or features that the Unavailability Provisions do not protect. Similarly, in interpreting the requirement that DOE consider "the utility to the consumer" of a feature when considering the need for separate product classes,[29] DOE's position was that it only had to consider *certain kinds of utility*: "utility as an aspect of the product *that is accessible to the layperson and is based on user operation*."[30] Again, this simply is not what the statute states. In both instances, DOE simply read unqualified statutory language to include qualifications of DOE's own creation.

Because there is no legal basis to suggest that any performance characteristics that matter to consumers do not qualify as "performance characteristics" (or "features" for purposes of the statutory provisions that govern the need for separate product classes), DOE's previous analysis was clearly "too narrow in its focus" and questions as to whether "a consumer's interaction with and perception of a furnace or water heater may go beyond its primary function"[31] are legally irrelevant. Under EPCA, the legally relevant question is whether atmospherically vented furnaces have "performance characteristics" (or "features") that are important to consumers, and – as DOE has now recognized – they plainly do.[32] There is no legal basis for DOE to dismiss the significance of such characteristics on the basis of abstract extra-statutory considerations such as whether those characteristics are "accessible to the layperson"[33] or have separate utility beyond the basic function of the product, and DOE should recognize these points expressly.

The root of the problem with DOE's previous analysis was that it characterized the differences between condensing and atmospherically vented products strictly as a matter of cost, and dismissed them on the theory that all cost-related characteristics are "incidental to the appliance's purpose" and thus do not qualify as characteristics warranting protection under EPCA.[34] As already indicated, this is incorrect as a matter of statutory interpretation, because there is no basis to dismiss characteristics that matter to consumers on the grounds of extra-statutory abstractions involving the nature of the characteristic involved. However, suggestions

[28] *See* 42 U.S.C. §§ 6295(o)(4) and 6313(a)(6)(B)(iii)(II).

[29] *See* 42 U.S.C. § 6295(q)(1)(B).

[30] 84 Fed. Reg at 33013.

[31] 84 Fed. Reg. at 33016.

[32] *See* 84 Fed. Reg. at 33016 and 33020.

[33] 84 Fed. Reg. at 33013.

[34] 84 Fed. Reg. at 33013; *see* 81 Fed. Reg. 65720, 65752 (September 23, 2016) (features that make a product less costly to install do not warrant protection because such features do not provide any separate utility beyond the basic product function).

that the difference in product characteristics between condensing products and atmospherically vented products is simply a matter of cost are also incorrect from a factual standpoint, because atmospherically vented products have operating capabilities that condensing products lack. If the market for residential furnaces were limited to condensing furnaces, these characteristics would be unavailable, and consumers would be left with no residential furnaces capable of operating with existing atmospheric venting systems, capable of operating with other commonly-vented appliances, or capable of operating without a condensate disposal system. The fact that unavailability of these characteristics would impose significant cost on consumers does nothing to change the fact that material differences in performance characteristics are involved or that those differences have significant utility for consumers.

For some consumers, the utility of these performance characteristics is the same utility DOE recognized in the case of vented clothes dryers: "the ability to have [the product] in a living area where vents are impossible to install."[35] For others it is the same utility DOE recognized in the case of "space constrained" appliances: the ability to have a product that will fit into the space provided for the product without the need for building modifications.[36] For some consumers, these characteristics make it possible to replace one product without having to scrap another perfectly good appliance. For many consumers they make it possible to use the product without having to accept actively undesirable building modifications (such as modifications that require a sacrifice of existing window, balcony, or interior living space). There is simply no basis to characterize the loss of such utilities as a matter of cost rather than of the unavailability of performance characteristics for purposes of the Unavailability Provisions.

Sacrifices of window and balcony space are also a significant issue in the context of new construction, as illustrated by the following photograph of an apartment building with condensing furnaces. Condensing products are normally installed along an exterior wall with short horizontal venting directly through the wall. This requires a requires a sacrifice of available window or balcony space that can be particularly obvious in the case of apartment buildings or townhouses. In the example shown in Figure 1, the furnace in each unit is located in a utility space (accessed from the balcony of each apartment) that consumes over half as much space as the balcony itself:

[35] 84 Fed. Reg. at 33013 *see* 76 Fed. Reg. 22454, 22485 (April 21, 2011) (discussing separate product classes and the unique utility that ventless clothes dryers offer to consumers). Although the venting issues are slightly different, the practical issues are similar and even more pronounced in the case of atmospherically vented furnaces than in the case of vented clothes dryers.

[36] 84 Fed. Reg. at 33016 and 33020. Although the particular characteristics involved are different (size in the case of space-constrained products and venting in the case of atmospherically vented furnaces), both characteristics provide exactly the same utility, though the value of that utility to consumers is generally far greater in the case of atmospherically vented furnaces than in the case of space-constrained appliances.

Figure 1

In similar buildings with atmospherically vented furnaces, the furnaces are generally located in the interior of the building (e.g., along the central hallway separating the apartments on one side of the building from those on the other) and vented vertically through the roof of building. The latter type of design eliminates the need for the vent-studded columns of vertically-stacked utility spaces along the outside wall of the building and the resulting loss of available window or balcony space.

Congress did not authorize DOE to impose energy conservation standards that would leave consumers to bear the collateral damage caused by the elimination of product performance characteristics, and it certainly did not authorize DOE to dismiss such damage merely by accounting for the out-of-pocket costs such damage would impose. In this regard, it is important to recognize that the range of issues that can appropriately be addressed as a simple matter of economic analysis is narrower than DOE has previously recognized.

EPCA expressly directs DOE to compare the savings in operating costs that a required efficiency improvement would provide "to any increase in the price of, or in the initial charges for, or maintenance expenses *of the covered product*" (*i.e.*, the product that is the subject of the standard).[37] One need not determine the precise limits of what qualifies as an "initial charge for" a product to conclude that the cost of substantial building modifications are beyond them. This

[37] 42 U.S.C. § 6295(o)(2)(B)(i)(II).

is especially true where a standard would result in the unavailability of product characteristics that many consumers need to be able to replace a product without having to accept *undesirable* building modifications, because it would be patently unreasonable to account for such scenarios as a mere matter of "installations costs" and force consumers to accept the undesirable building modifications (or do without the product in question). Similarly, it is objectively unreasonable to characterize the cost of scrapping and replacing a "stranded" (but otherwise perfectly good) *water heater* as part of the "initial charges for" (or "installation cost" of) *a furnace*. Rather than being "initial charges for" condensing products, these are costs of collateral damage caused by the unavailability of performance characteristics or features. The fact that these costs can be substantial makes the significance of the loss of product characteristics more obvious, but it does not make the issue one that is "primarily a matter of cost" rather than a matter of performance characteristics for purposes of the Unavailability Provisions.

This is clear as a matter of statutory interpretation, because adverse impacts on product reliability are a matter of product performance – not just cost – which is why the "incidence and cost o[f] repair" was specifically identified as a "performance characteristic" for purposes of the Unavailability Provisions.[38] Similarly, if the need for building modifications could be dismissed as a matter of "installation costs," the ability of a product to "fit in standard building spaces" would not be protected under 42 U.S.C. § 6295(o)(4) as Congress plainly intended,[39] and the statute would not have specified separate product classes for three different categories of "direct heating equipment" that differ principally in the manner of their installation.[40] As a straight-forward matter of statutory interpretation, it is absurd to suggest that Congress intended to ensure the continued availability of products with the sizes – but not products with venting or other performance characteristics – needed to "fit in standard building spaces" without the need for building modifications. The governing principle is the same in both cases: *where it has been shown that buildings are architecturally designed to accommodate products with some characteristics but not others, DOE must preserve the availability of products with those characteristics instead of imposing standards that would require modification of the buildings designed for them.*

Petitioners have not previously focused on the comparative physical size of condensing and atmospherically vented products, in large part because the differences in venting requirements for condensing products generally present far more serious practical issues than differences in product size. However, DOE did request comment on the extent to which condensing standards would raise issues with regard to product size, and also discussed issues with respect to manufactured housing, a context in which space constraints are a particularly important

[38] H.R. Rep. 100-11 at 23 (1987).

[39] *See* H.R. Rep. No. 100-11 at 22 (1987).

[40] *See* 42 U.S.C. § 6295(e)(3). Opponents of the Petition suggest that Congress didn't know what it was doing when it enacted this provision. *See* comments submitted by the Natural Resources Defense Council and EarthJustice identified in the docket for this proceeding as Document No. EERE-2018-BT-STD-0018-0055 ("NRDC/EarthJustice Comments") at p. 12. However, this claim is insufficient to rebut the basic principle that the provisions of a statute must not be read in isolation, but as part of the statute as a whole, and interpreted in their context as part of a coherent and harmonious statutory scheme. *FDA v. Brown & Williamson Tobacco Corp.*, 529 U.S. 120, 132-33 (2000).

consideration.[41] In that regard, condensing products are at least typically larger than comparable atmospherically vented products, and even small differences can have significant practical impacts in cases in which (for example) a furnace and air handler must fit inside a closet or other confined space with required clearances on all sides.

2. DOE should reconsider its analysis concerning the significance of fuel switching in the context of efficiency regulation.

As the Proposal recognizes, opponents of the Petition argue that fuel switching "is a cost impact" that can be appropriately addressed in DOE's economic analysis and that there is no reason to view fuel switching as a cause for concern.[42] In fact, the potential for standards to cause fuel switching is a critical consideration in standards rulemaking for several different reasons.

First, fuel switching can occur because a standard would result in the unavailability of important product characteristics. This would be the case if condensing standards were imposed on residential furnaces or commercial water heaters, because there are many cases in which it would be impractical to install condensing products or in which such products could not be installed without the need for undesirable building modifications that purchasers would be unwilling to accept. Where this is the case, the Unavailability Provisions would not preclude the adoption of the standard because fuel switching would occur, but because of the unavailability of product characteristics that would cause that fuel switching to occur.

Second, it is important to recognize that the purpose of energy efficiency standards is to produce energy conservation benefits by increasing the efficiency of the products subject to those standards: a purpose that can be served only to the extent products with required efficiency improvements would actually be sold. While electrification advocates would be delighted with efficiency standards that would drive gas products out of the market, that is not a legitimate objective for regulation authorized by statutory provisions that are specifically designed to promote the efficiency of the regulated products.

The related point is that DOE must justify standards on the basis of *the economics of required efficiency improvements*, which DOE cannot do if – instead of accounting for the economics of cases in which poor economic outcomes would drive consumers to alternative products – it excludes those outcomes from its analysis and substitutes more favorable economic outcomes based on assumed product substitution. EPCA makes this explicit by requiring DOE to prepare and consider both "payback" and life-cycle cost ("LCC") analyses in determining whether standards are economically justified. Specifically, DOE must consider:

- Whether "the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy . . .

[41] 84 Fed. Reg. at 33016-17.

[42] 84 Fed. Reg. at 33017-18.

savings during the first year that the consumer will receive as a result of the standard" (*i.e.*, a payback analysis);[43] and

- The "savings in operating costs throughout the estimated average life of the covered product . . . compared to any increase in the price of, or in the initial charges for, or maintenance expenses of" the product "likely to result from the imposition of the standard (*i.e.*, a life cycle cost analysis).[44]

The statutory language makes it clear that both types of analysis are designed to assess the economic justification of standards through a comparison of the cost of required efficiency improvements and the operating cost savings those efficiency improvements would provide.

DOE recognizes that consumers may react to the increased cost of higher-efficiency products by declining to purchase such products, and consideration of such market impacts is critical for evaluation of some of the issues DOE must consider in standards development. However, *the way consumers would react to* the economics of required efficiency improvements does not change the economics consumers would be reacting to, and it is *those* economics – the economics of the required efficiency improvements – that payback and LCC analyses must address.

Unfortunately, DOE's analysis in the residential furnace rulemaking "accounted for instances where installation of a condensing furnace was either too difficult or costly, with the result being substitution of another type of heating product."[45] Specifically, in the residential furnace rulemaking DOE preferentially excluded high-cost efficiency investments from its analysis, assumed that purchasers in those cases would choose alternative products, and prepared purported payback and LCC analyses reflecting the investment outcomes for the resulting mix of products.[46] This analysis was problematic in several respects. Most obviously, it failed to answer the core question that payback and LCC analysis is supposed to address: the question of how the cost consumers would pay for a required efficiency improvement would compare with the operating cost savings that efficiency improvement would provide. In addition, rather than accounting for the unreasonable costs that would induce fuel switching, DOE's analysis claimed regulatory benefits resulting – not from the efficiency improvements its proposed standards would require – but from assumed actions taken in response to the *costs of the required efficiency improvements*. By this logic, standards could be "economically justified" on the grounds that they are *so economically unjustified* that consumers would no longer purchase the regulated products at all.

DOE should recognize that the purpose of payback and LCC analysis is to determine what the economics of a required efficiency improvement would be, and that it is improper to skew that analysis by excluding unfavorable economic outcomes from its analysis on the basis of

[43] 42 U.S.C. § 6295(o)(2)(B)(iii).

[44] 42 U.S.C. § 6295(o)(2)(B)(i)(II).

[45] 84 Fed. Reg. at 33017.

[46] *See* Spire's Residential Furnace Comments at pp. 6-7 and 62-65.

assumptions as to *how purchasers would be expected to react to the economics of those unfavorable outcomes.* By doing the opposite in the residential furnace rulemaking, DOE effectively used evidence that consumers would consider required efficiency improvements to be economically unjustified (*i.e.*, fuel switching in response to particularly unfavorable economic outcomes) as a basis to exclude unfavorable data from its analysis of the economics of the efficiency improvements at issue. In the future – to ensure that payback and LCC analyses appropriately accounts for the economics of required efficiency improvements – DOE should account for all of the relevant economic outcomes by assuming that the standard under consideration would not reduce the number of products sold.[47]

3. DOE should acknowledge that the systemic error in its base-case efficiency assignment invalidates the economic analysis underlying its pending proposals.

As explained in Petitioners' Previous Comments, a systemic defect in DOE's economic analysis provides a separate and independently-sufficient basis for DOE to withdraw its pending proposed rules.[48] In short, DOE's modeling is supposed to provide an assessment of the economic impacts of the efficiency investments that would only occur if a proposed standard were adopted, and – due to the use of random base-case efficiency assignment – DOE's modeling fails to provide such an assessment. DOE's response – that its "base-case efficiency distributions . . . are not entirely random"[49] – is not responsive to the issue.

With respect to the commercial water heater rulemaking, DOE states that:

> the no-new-standards case and the selection in the LCC model were . . . based on distributions of models in DOE's data base, which included all commercially-available equipment on the market at the time and which (due to the absence of shipments data) represents the best data available to the DOE at the time.[50]

The fundamental problem with DOE's modeling approach is that it is supposed to analyze the economics of the efficiency investments that would occur only if a new standard were adopted but – instead of doing so – it analyzes the economics of a *random selection of all potential efficiency investments*, including those that consumers would make on their own in the absence of regulation. The suggestion that DOE's modeling was based on a reasonable assessment of the relative market shares of products with different efficiencies has no bearing on this issue, because the problem is not that DOE's analysis is based on the wrong *number* (or percentage) of

[47] While the adverse impact a standard would have on product sales should be ignored *for purposes of payback and LCC analysis*, it does not follow that it should be ignored for purposes of other analyses as well. For example, the impact a standard would have on product sales is critical in the consideration of manufacturer and utility impacts, and is also important when DOE is estimating the energy savings a standard would provide (because required efficiency improvements can only provide energy savings to the extent that the more efficient products are purchased and used). These differences in analytical approach are required by the different purposes the analyses serve.

[48] *See* Petitioner's Previous Comments at pp. 11-12 and Attachments A and B.

[49] 84 Fed. Reg. at 33018.

[50] *Id.*

efficiency investments; it is that its analysis is based on *the wrong efficiency investments*: a random selection of investments rather than those purchasers would decline to make in the absence of regulatory compulsion. As a result, DOE's payback and lifecycle cost analyses do not provide assessments of regulatory impacts (*i.e.*, of the efficiency investments that would occur only if new standards were imposed): they provide results for a random selection of all potential efficiency investments including those that consumers would choose to make on their own.[51] Whether DOE's analysis was based on the right *number* of efficiency investments is completely beside the point.[52]

With respect to the residential furnace rulemaking, DOE states that:

> assignment of efficiency in the base case was based on both the region and specific building in which it is installed, with the market shares of furnaces first being assigned by region based on historical shipments data and then allocated to specific buildings based on the existing furnace being replaced.[53]

Consideration of regional differences in market share simply ensures that DOE's analysis is based on the right number (or percentage) of efficiency investments in each region; it does not address the fundamental problem that DOE's analysis is not based on the *right* efficiency investments. The suggestion that baseline efficiencies are "allocated to specific buildings based on the existing furnace being replaced" also fails to address the problem, *because DOE's model randomly assigns the efficiencies of the existing furnaces being replaced*, with the result that efficiency assignments based on those efficiencies are equally random.

For an abstract illustration of the problem with DOE's analysis, consider a region in which condensing furnaces already account for 90% of all new furnace sales. For purposes of illustration, assume that:

- 10% of the new furnace installations in the region involve furnace replacement scenarios in which it would be particularly difficult to replace an atmospherically vented furnace with a condensing furnace (*i.e.*, "bad installations"); and

- 80% of the cases in which condensing furnaces are *not already being sold* are cases involving "bad installations."

Under these assumptions:

---

[51] DOE had no basis to assume that the results for these two different universes of efficiency investments would be the same; it simply chose to characterize the wrong universe of efficiency investments as rule outcomes.

[52] However, it should be noted that DOE did not consider the right number of efficiency investments either. Lacking any credible information about the distribution of commercial water heater efficiencies, DOE simply made the arbitrary assumption that sales are directly proportional to the number of available models, as though every individual model had the same number of sales. *See* Spire's Commercial Water Heater Comments at 12-13 and 24-26.

[53] 84 Fed. Reg. at 33018.

- 10% of the new furnace installations in the region would be "rule outcome" cases (*i.e.*, cases in which condensing furnaces would only be imposed if a standard requiring condensing furnaces were imposed);

- 80% of those "rule outcome" cases would involve "bad installations," and

- The economics of the "rule outcome" cases would look relatively bad.

Under DOE's modeling approach, DOE would use shipment data to conclude (correctly, based on the reality assumed above) that 10% of the new furnace installations in the region are "rule outcome" cases. However, instead of considering the economics of the actual rule outcome cases (80% of which would involve "bad installations"), DOE's approach considers the economics of a random 10% of *all new furnace installations*, only 10% of which involve "bad installations." The economics of this random selection of installations would obviously look much better than the economics of the actual rule outcome cases, and that is the point: because DOE's analysis is based on the *wrong installations* it does not actually provide an assessment of rule impacts. The practical impact is equally obvious: to the extent purchasers acting in the absence of regulation have *any* statistically significant preference for good economic outcomes or aversion to bad economic outcomes (as they unquestionably do), DOE's analytical approach produces a systematic overstatement of regulatory benefits and understatement of costs.

This fundamental problem with DOE's modeling approach fatally undermines the economic analysis in support of DOE's proposed rules in the residential furnace and commercial water heater rulemakings. As a result, there is no reasonable basis to conclude that the standards proposed are economically justified as EPCA requires. Neither the claim that DOE's "base-case efficiency distributions . . . are not entirely random"[54] nor the explanation of the basis for that claim have any bearing on this issue. Withdrawal of DOE's pending proposed rules is warranted for this reason alone.

E. DOE Was Right to Reject Adverse Comments on the Petition

Comments submitted in opposition to the Petition relied extensively on previous DOE statements that have already been addressed in these Comments, and suggest that the Petition seeks to reopen rulemaking proceedings in which the issues have already been resolved.[55] This is no argument at all, as agencies are free to reconsider their positions if they conclude that a change in position is warranted and provide a reasonable explanation for that change.[56] Moreover, as discussed above, the Petition concerns highly controversial notices of proposed rulemaking that were the subject of substantial adverse comments to which DOE has never responded. While

[54] 84 Fed. Reg. at 33018.

[55] *See* AG Comments at p. 6-8; Cal. Electric Comments at p. 11; Northeast Energy Efficiency Partnership comments identified in the docket for this proceeding as Document No. EERE-2018-BT-STD-0018-0048 at p. 1; NRDC/EarthJustice Comments at p. 13.

[56] *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502 (2009).

opponents of the Petition seem to suggest that the outcome of these proceedings had already been determined, the fact is that DOE's deliberations had not been concluded and *cannot lawfully be concluded* without consideration of substantial adverse comments in the record demonstrating that significant changes in DOE's proposed actions are necessary. Suggestions to the contrary notwithstanding,[57] DOE's obligation to comply with statutory deadlines does not obviate its responsibility to consider comment nor require it to proceed with its pending proposals without regard to its statutory obligations to comply with notice and comment requirements and ensure that new standards are lawful on the merits.

Besides urging DOE not to consider the issues raised by the Petition on the merits, comments submitted in opposition to the Petition largely mischaracterize the issues raised by the Petition and raise legal and factual arguments that DOE was right to reject.

1. Opponents of the Petition misread the legislative history.

The Natural Resources Defense Council, Inc. ("NRDC") and EarthJustice argue that the Unavailability Provisions only apply if the unavailability of the performance characteristics or features at issue would "completely destroy the market for a covered product."[58] This argument is based on a transparent misreading of (misquoted) legislative history that simply makes the point that standards can *result in the unavailability of product characteristics* by effectively pricing products with such characteristics out of the market. The legislative history states that 42 U.S.C. § 6295(o)(4):

> "would forbid a standard for small gas furnaces being set at a level that would increase the price to the point that the product would be noncompetitive and that would result in minimal demand for the product."[59]

In this example, "small" describes a product characteristic that would be made unavailable by a standard effectively pricing "small" products out of the market. The same point is stated more clearly in other legislative history as follows:

> A standard would result in the "unavailability" of characteristics, etc., if, as a result of the standard, a product containing such a characteristic would become prohibitively expensive, i.e., if there would be minimal demand for the product having such characteristic.[60]

---

[57] AG Comments at p. 4-5.

[58] NRDC/EarthJustice Comments at p. 3; *see* 42 U.S.C. § 6295(o)(4) ("… performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available…") and 42 U.S.C. § 6313(a)6)(B)(iii)(II)(aa) ("… performance characteristics (including reliability, features, sizes, capacities, and volumes) that are substantially the same as those generally available...").

[59] S. Rept. 100-6 at 8-9 (January 30, 1987) reprinted in 1987 U.S.C.C.A.N. 52, 59.

[60] H.R. Rep. No. 100-11 at 22 (1987).

This legislative history is not relevant to the issues raised by the Petition. Standards that can be achieved only through condensing technology would make products with the characteristics atmospherically vented products offer unavailable by banning such products outright, not by pricing them out of the market. Nothing in the statute or the legislative history suggests that standards resulting in the unavailability of gas furnaces with such characteristics would be precluded only if the unavailability of those characteristics would "completely destroy the market" for gas furnaces.

2. Opponents of the Petition misread the statutory text.

NRDC and EarthJustice also argue that a difference in the placement of a parenthesis mark between the two Unavailability Provisions somehow "dooms" the Petition with respect to residential furnaces.[61] However, NRDC and EarthJustice point out, the difference between the two provisions came to exist when 42 U.S.C. § 6313(a)(6)(B)(iii)(II) was adopted as a "technical correction" conforming the statutory provisions applicable to commercial products such as water heaters with those applicable to consumer products.[62] There was no indication at the time that any substantive difference between the two provisions was intended, and there is no reason why it would make sense for any substantive difference to exist. Under the circumstances, it seems clear that the difference was merely a typographical error. In any event, it is difficult to see any material difference between the two provisions, because both cover "performance characteristics (including reliability)" and both cover "features, sizes, capacities, and volumes." The only ostensible difference between them is whether "features, sizes, capacities, and volumes" are included (along with "reliability") under "performance characteristics," and it is difficult to see how that difference would matter. The ability of a product to function with atmospheric venting – and the ability to operate without generating liquid condensate – are "performance characteristics" in the literal sense that they relate directly to how the product performs and is capable of performing. While opponents of the Petition argue in circles trying to come up with some linguistic basis to argue that the specific characteristics that atmospherically vented products offer are somehow outside the scope of the protections the Unavailability Provisions provide, they ultimately fall back upon the same kinds of extra-statutory qualifications already discussed.[63] These efforts provide no basis to conclude that broadly-written statutory provisions that were intended "to ensure that an amended standard does not deprive consumers of product choices and characteristics, features, sizes, *etc*."[64] should, in the case of atmospherically vented gas products, be read to fail in that purpose.

3. No material facts are in dispute.

Opponents of the Petition also fail to generate any credible dispute as to the material facts. In particular, there is no question that:

---

[61] NRDC/EarthJustice Comments at p. 4-5.

[62] *See* NRDC/EarthJustice Comments at p. 2, note 1.

[63] *See* NRDC/EarthJustice Comments at pp. 4-5, NEMA Comments at pp. 13-14.

[64] H.R. Rep. No. 100-11 at 22 (1987).

- Standards that could only be achieved through the use of condensing technology would make atmospherically vented products unavailable;

- Atmospherically vented products can do things that condensing products cannot (specifically, they can operate with the atmospheric venting systems built into most of the existing buildings in which gas products are installed and can operate without generating liquid condensate);

- The unavailability of products with these capabilities would generally leave purchasers seeking to replace existing atmospherically vented products without the type of replacement products for which their buildings were designed; and

- In such cases, atmospherically vented products generally cannot be replaced with condensing products without the need for building modifications.

Claims that "Petitioners have not shown that any characteristic of the performance of furnaces – whether reliability, safety, heating, serviceability, incidence and cost of repair, or something else – is substantially different depending on whether the furnace does or does not rely on condensing technology"[65] sound like factual claims but are not. They simply reflect the baseless assertion that the substantial differences in performance characteristics between atmospherically vented products and condensing products can be characterized as "installation characteristics" and dismissed with the *ipse dixit*[66] that "[e]ase of installation is not a performance characteristic."[67] As already discussed, statements characterizing the issues involved as a matter of "increased cost of installation"[68] or "incremental costs" [69] that could be appropriately addressed in payback and lifecycle cost analysis are unreasonable efforts to reduce the loss of product characteristics to a matter of out-of-pocket costs, not factual claims that nothing more is involved. Opponents of the Petition do not actually contest the fact that more is involved, they simply ignore or seek to dismiss that fact. For example, a study prepared in opposition to the Petition repeatedly acknowledges that the installation of condensing appliances frequently presents non-economic problems for purchasers.[70] Although the report goes out of its way to characterize these other considerations as the "aesthetic" concerns of "building owners," the reality is that condensing

[65] NRDC/EarthJustice Comments at p. 5.

[66] Literally "he said": a bald assertion.

[67] NRDC/EarthJustice Comments at p. 4.

[68] NEMA Comments at p.4.

[69] Cal. Electric Comments at p. 3.

[70] *See* Investigation of Installation Barriers and Costs for Condensing Gas Appliances, identified in the docket for this proceeding as Document No. EERE-2018-BT-STD-0018-0062 ("Installation Barriers") at p. 7 ("20% of the time . . . [Building owners/architects] have a vision [and] don't want to see chases on the side of their building, gas exhaust fumes and smoke, *etc*."); p. 3 (citing "the building owner's design goals," and "building aesthetics") p. 6 (citing cases in which "[a] building owner does not want to drill through any walls or have any visible exterior vents" and acknowledging problems "caused by building owners' refusal to allow a vent in a certain location"), p. 8 (citing "[s]pecific building owner preferences" and "owner aesthetic preferences").

standards would leave many consumers facing the need to sacrifice window, balcony, or interior living space simply to replace an existing gas product. Rather than denying the existence of such considerations, the study simply declines to recognize them as a cognizable issue independent of out-of-pocket costs. As a result, the study only considers required building modifications to be "significant" – no matter what the impacts of such modifications might be – if their out-of-pocket costs would result in total "installation costs" that, by themselves, would be "more than double the total system cost of a typical retrofit."[71] Accordingly, the study's claims that "significant" building modifications are only infrequently required are based on an unreasonable definition of "significance" and are not really responsive to the factual basis for the Petition.

One particular *faux*-factual issue involves the question of whether there are cases in which it would be "impossible" to replace atmospherically vented gas products with condensing products. This purported debate is of limited legal significance, because it stems from the false premise that – unless "installation challenges" imposed by the loss of the product characteristics at issue would "absolutely preclude"[72] the installation of condensing products – the unavailability of those characteristics can be dismissed as matter of out-of-pocket cost.[73] In any event, much of this debate is semantic. Petitioners have been reluctant to speak in terms of technical (as opposed to practical) "impossibility" because it is *technically possible* to put a man on the moon, and – in that sense – there is very little of a mechanical nature that is truly *impossible*. For example, the owner of a condominium unit who cannot install a condensing furnace without violating applicable restrictive covenants or compromising a common venting system serving appliances in other separately-owned condominiums could simply buy out as many neighbors as it takes to resolve these issues. It's only money, after all, not a matter of *technical* or *physical* impossibility. However, it is only in that objectively ridiculous sense that it would always be possible to replace atmospherically vented products with condensing products. Petitioners think it is reasonable, speaking in practical terms, to say that it is impossible to install condensing products in circumstances of this kind, and that is certainly the kind of usage DOE employed when it referred to settings in which it is "impossible" to install vented clothes dryers.[74] It is therefore unreasonable to suggest that Petitioners have not shown that there are cases in which condensing products "cannot" be installed and are concerned only about cases in which the installation of condensing products would be "economically less convenient."[75] Similarly, assertions that it is *always possible* (or only rarely "impossible") to replace atmospherically vented product with condensing products are either false or limited to "physical" or "technical" impossibility[76] to an extent that makes them non-responsive to the point that there are many cases in which condensing products are not a practical option.

---

[71] Installation Barriers at p. 3.

[72] NRDC/EarthJustice Comments at p. 6 n.3

[73] Hence asserted puzzlement over whether "the installation challenges Petitioners allege mean that installing a furnace or water heater using condensing technologies is impossible, or only more expensive." NRDC/EarthJustice Comments at pp. 5-6.

[74] 84 Fed. Reg. at 33013.

[75] NEMA comments at p. 10.

[76] *See* NRDC/EJ Comments at p. 5 ("physically impossible").

There *are* many cases in which condensing products are not a practical option.[77] This has been documented repeatedly, including in numerous written comments volunteered in response to a survey addressing the cost of residential furnace replacements.[78] Based on a survey of fifteen individuals (including eleven installers), the study prepared in opposition to the Petition suggests that "[t]here is always a way of getting venting 'done.'"[79] However, many other installers have had different experience, reporting that:

> "There are multiple situations, especially in larger urban cities, where a condensing furnace installation is literally impossible. These include historic buildings, concrete buildings, and other buildings where distance to acceptable vent location violates manufacturer's install guidelines, or where the only way to vent a condensing furnace would be through other homeowner's condos."[80]

And:

> "We have had several installations where upgrading to a condensing furnace was not possible, not because of costs, but simply not being able to conform to Code with the venting requirements."[81]

---

[77] Affidavit of George L. Welsch, submitted as Attachment C to Petitioner's Previous Comments, at ¶¶ 11-14. *See* The Air-Conditioning, Heating & Refrigeration Institute's comment submission of July 10, 2015, available in Docket No. EERE-2014-BT-STD-0031 and identified as Document No. EERE-2014-BT-STD-0031-0159 (the "AHRI Furnace Comments") at pp. 58-63.

[78] The survey is documented in a study (entitled "Survey of Furnace Installation Contractors" and dated June 2015) that was prepared by Shorey Consulting, Inc., and submitted as Appendix A to the AHRI Furnace Comments and included in Document No. EERE-2014-BT-STD-0031-0159. Written comments provided in response to the survey are included in Appendix C of that document ("Appendix C"). For relevant comment, *see e.g.*, Appendix C at p. 14 ("Condensing furnaces "are great and we recommend them, but sometimes they just can't be installed"); p. 15 (There are cases in which condensing furnaces "could not be installed no matter what"); p. 16 ("[I]n some replacements it is impossible to get a high efficiency [product] installed"); p. 22 ("There are some installations where it is impossible to install a 90% furnace"); and p. 23 ("Sometimes an 80% furnace replacement is the only option due to building restraints" and "[o]f the standard (80%) efficient furnaces we installed, at least half of them were in homes where there was 0% chance of installing a high efficient furnace according to manufacturers' specifications and local codes").

[79] Installation Barriers at p. 6.

[80] Appendix C at p. 23.

[81] Appendix C at pp. 25-26. *See also* Appendix C at p. 13 ("Condensing furnaces are impossible to install in some older homes to satisfy the venting requirements"); p. 17 ("There are replacement applications that dictate an 80% furnace" because there is "physically no way to get a 90+ flues out of the premises"); p. 19 ("Sometimes it is impossible to find a safe location to vent a condensing furnace").

Similarly, the study prepared in opposition to the Petition suggests that condensate disposal "would never prevent a retrofit project,"[82] but other installers have had contrary experience.[83]

Most importantly, it is not only cases of "practical impossibility" that count. While there are a significant number of cases in which the unavailability of atmospherically vented products would leave consumers with no practical gas replacement option, there are many more cases in which the unavailability of such products would leave consumers without any products they could use without having to accept substantial and often undesirable building modifications. As one installer put it, "[t]here are MANY installations in the replacement areas that there is NO practical way to vent a 90% to the exterior of the home without EXTENSIVE cost and remodeling involvement."[84] As another explained:

> "Not all homes are able to use sidewall vented units. Here in the northeast we have houses with finished basements with the units in the middle of the house. To replace the unit you have to rip apart the basement for the venting and intake. Also many houses do not have the window clearance and/or ground clearance for direct vent. And the chimney can't be lined for it because it is being used for multiple appliances.[85]

This is a volume problem by any credible measure: *nearly half* of all residential furnaces in the northern part of the country are located in finished basements, over ten percent nationwide are in apartments, many more are in townhomes, and these are all installations in which the replacement of atmospherically vented products would routinely require significant building modifications.[86] There is no factual basis to assert otherwise.

Conclusion

The purpose of EPCA's Unavailability Provisions is to ensure that standards do not deprive purchasers of "product choices and characteristics, features, sizes, etc." and that energy savings

---

[82] Installation Barriers at p. 9.

[83] *See* Appendix C at p. 16 ("We have multiple locations" in which there is "no possibility of installing [a] condensate disposal system"); p. 13 ("In freezing locations, such as ventilated attics, 90+% condensing furnaces may not always fit the applications because of condensing lines freezing and furnaces failing to fire"); p. 15 ("We do not install condensing furnaces in non-conditioned spaces (attics) no matter what"); p. 24 ("We will not install a condensing furnace in an unconditioned attic"); and p. 27 ("I don't recommend a 90% furnace" in attic installations because "[d]rain freezing can be a bad event and heat taped drains seem counterproductive").

[84] Appendix C at p. 17 (emphasis in original). *See also* Appendix C at p. 19 ("There are many applications in the Boston area where a high efficiency condensing furnace is not possible without huge amounts of modifications to the building in order to vent outside").

[85] Appendix C at p. 14. *See also* Appendix C at pp. 23-24 ("Some installations, because we are a "basement" area of the country will be VERY difficult/costly because of finished basements. This can make accessing an exterior wall next to impossible without tearing out drywall and creating a new chase way for PVC"); Affidavit of George L. Welsch at ¶¶ 11-14.

[86] *See* AHRI Furnace Comments at pp. 62-63.

are achieved "without sacrificing the utility or convenience of appliances to consumers."[87] These provisions were intended, among other things, to preserve the availability of product characteristics that purchasers need to be able to use products without having to modify their existing buildings to do so. This is clear from the expressly stated intent that standards preserve "the availability of sizes that fit in standard building spaces"[88] and from the fact that Congress provided separate product classes for each of the three standard types of installations for direct heating equipment.[89] In general, the building modifications necessary to enlarge the "standard building space" for an appliance pale in comparison with building modifications required to replace atmospherically vented furnaces or water heaters with condensing products. There is no basis to suggest that Congress intended to spare purchasers from the need for the lesser kinds of modifications but not the greater; nor is there any basis to suggest that – by some accident of legislative drafting – Congress produced such a result inadvertently. Arguments to the contrary are based on abstract qualifications that have no statutory basis, have not been consistently applied, and serve only to confound an otherwise easy issue of statutory interpretation.

Petitioners commend DOE's willingness to take a fresh look at the relevant issues and welcome its proposal to recognize that condensing standards would indeed run afoul of the constraints imposed by the Unavailability Provisions. Petitioners urge DOE to recognize the issues presented are, in fact, straight-forward, and to take action to ensure that they are conclusively resolved.

Petitioners specifically urge DOE to withdraw the pending proposed rules in the residential furnace and commercial water heater rulemaking proceedings. Such a withdrawal is warranted not only by DOE's proposed interpretive rule, but by the fact that the economic justification for the standards proposed in both proceedings was based on defective modeling that resulted in a systematic overstatement of regulatory benefits and systematic understatement of the costs imposed. Rather than waiting until it has invested all the time required to prepare new proposed rules, Petitioners urge DOE to promptly acknowledge both problems with its pending proposals and request comment as to how it should address these problems in the development of new proposals. This approach would correct the existing record in both rulemaking proceedings, document material progress in the resolution of key issues, and provide a constructive basis for further progress in both proceedings.

Signatories

The following parties are signatories to these comments:

Spire
Spire Inc. is a holding company that owns and operates Spire Missouri Inc., the largest natural gas distribution company in the state of Missouri, Spire Alabama Inc., the largest natural gas distribution company in the state of Alabama, Spire Gulf Inc. and Spire Mississippi Inc.,

[87] H.R. Rep. No. 100-11 at 22-23 (1987).

[88] H.R. Rep. No. 100-11 at 23 (1987).

[89] 42 U.S.C. § 6295(e)(3).

operating in the Gulf Coast region of Alabama and in Mississippi, respectively. Spire's utility companies have been distributing gas in one form or another in their respective service areas for more than a century and a half. Today, they collectively provide natural gas distribution service to more than 1.7 million residential, commercial and industrial customers.

The American Public Gas Association

The American Public Gas Association (APGA) represents the interests of approximately 1,000 public gas systems in the United States. APGA members are retail distribution entities owned by, and accountable to, the citizens they serve. They include municipal gas distribution systems, public utility districts, county districts, and other public agencies that own and operate natural gas distribution facilities in their communities. Public gas systems' primary focus is to provide safe, reliable, and affordable natural gas service to their customers. APGA members serve their communities in many ways. First and foremost, they deliver natural gas for cooking, cleaning, and heating, as well as for various commercial and industrial applications.

The American Gas Association

The American Gas Association (AGA), founded in 1918, represents more than 200 local energy companies that deliver clean natural gas throughout the United States. There are more than 74 million residential, commercial and industrial natural gas customers in the U.S., of which 95 percent — more than 71 million customers — receive their gas from AGA members. AGA is an advocate for natural gas utility companies and their customers and provides a broad range of programs and services for member natural gas pipelines, marketers, gatherers, international natural gas companies and industry associates. Today, natural gas meets more than one-fourth of the United States' energy needs.

The National Propane Gas Association

The National Propane Gas Association (NPGA) is the national trade association of the propane industry with a membership of about 2,800 companies, and 38 state and regional associations that represent members in all 50 states. Membership in NPGA includes retail marketers of propane gas who deliver the fuel to the end user, propane producers, transporters and wholesalers, and manufacturers and distributors of equipment, containers, and appliances. Propane gas fuels millions of installations nationwide for home and commercial heating and cooking, in agriculture, industrial processing, and as a clean air alternative engine fuel for both over-the-road vehicles and industrial lift trucks. Residents throughout the country utilize propane to fuel home furnaces, but propane is uniquely popular in rural regions. Thus, the potential impact of the proposal on residential furnaces in the South and among low-income residents is an important concern to members of NPGA.

The Natural Gas Supply Association

The Natural Gas Supply Association (NGSA) represents integrated and independent companies that supply natural gas. Founded in 1965, NGSA is the only national trade association that solely focuses on producer-marketer issues related to the downstream natural gas industry.

The National Association of Home Builders

NAHB is a Washington, DC-based trade association that is affiliated with more than 660 state and local home builders' associations (HBAs) located in all 50 states and Puerto Rico and represents more than 140,000 members – many of whom will be directly affected by DOE's proposed rule. NAHB's builder members will construct 80 percent of the new housing units projected for this year; NAHB's *The Leading Home Suppliers* Council represents the nation's top manufacturers; the more than 14,000 firms that belong to NAHB Remodelers comprise about one fifth of all firms that specify remodeling as a primary or secondary business activity; and the NAHB Multifamily Council is comprised of more than 1,000 builders, developers, owners, and property managers of all sizes and types of condominiums and rental apartments. NAHB's members represent all aspects of the housing industry and work in concert to ensure that all Americans have access to safe, decent and affordable housing, whether they choose to buy a home or rent.

The Air Conditioning Contractors of America

The ACCA is the nation's premier trade association for heating, ventilation, air conditioning, and refrigeration contractors. ACCA's member companies provide quality service in heating, air conditioning, refrigeration, building and home performance, solar, hydronics, and plumbing. ACCA has created the nationally recognized and industry endorsed standards needed to ensure HVACR systems are properly installed and maintained.

The National Multifamily Housing Council

Based in Washington, D.C., the National Multifamily Housing Council (NMHC) is the leadership of the apartment industry. We bring together the prominent owners, managers and developers who help create thriving communities by providing apartment homes for 39 million Americans and contributing $1.3 trillion annually to the economy. NMHC provides a forum for insight, advocacy and action that enables both members and the communities they help build to thrive.

The National Apartment Association

The National Apartment Association (NAA) serves as the leading voice and preeminent resource through advocacy, education and collaboration on behalf of the rental housing industry. As a federation of nearly 160 affiliates, NAA encompasses over 82,000 members representing more than 9.7 million apartment homes globally. NAA believes that rental housing is a valuable partner in every community that emphasizes integrity, accountability, collaboration, community responsibility, inclusivity and innovation.

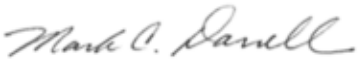
The National Leased Housing Association

The National Leased Housing Association is widely recognized as the only national organization serving all major participants – private and public – in the multifamily rental housing field. NLHA is a vital and effective advocate for 500-member organizations, including developers, owners, managers, public housing authorities, state housing finance agencies, local governments, investment bankers, attorneys, accountants, architects, non-profit sponsors and syndicators involved in government related rental housing. This unique coalition is committed to public and private sector interaction as the most pragmatic means of meeting this nation's rental housing needs.

The Plumbing-Heating-Cooling Contractors—National Association
The Plumbing-Heating-Cooling Contractors - National Association (PHCC) is a 135 year old association representing over 3200 contractor members who employ approximately 60,000 technicians. These contractor members believe in providing the best products and services for their consumer clients and support a practical and achievable approach to energy conservation.

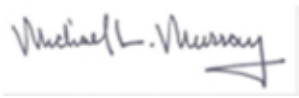
The Manufactured Housing Association for Regulatory Reform
MHARR is a Washington, D.C.-based national trade association representing the views and interests of producers of manufactured housing regulated by the U.S. Department of Housing and Urban Development (HUD) pursuant to the National Manufactured Housing Construction and Safety Standards Act of 1974, as amended by the Manufactured Housing Improvement Act of 2000, 42 U.S.C. 5401, ct seq. (2000 reform law). MHARR was founded in 1985. Its members include independent manufactured housing producers from all regions of the United States.

Respectfully submitted,



Mark Darrell
Senior Vice President, General Counsel
& Chief Compliance Officer
Spire Inc.
700 Market Street
St. Louis, MO 63101
mark.darrell@spireenergy.com

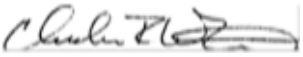
Bert Kalisch
President & CEO
American Public Gas Association
201 Massachusetts Avenue, NE, Suite C-4
Washington, DC 20002
bkalisch@apga.org



Michael L. Murray
General Counsel
Matthew J. Agen
Assistant General Counsel
American Gas Association
400 N. Capitol St., NW
Washington, DC 20001
mmurray@aga.org
magen@aga.org

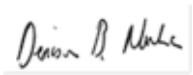
Michael A. Caldarera, P.E.
Sr. Vice President, Advocacy &
Technical Services
National Propane Gas Association
1899 L Street, NW, Suite 350
Washington, D.C. 20036
mcaldarera@npga.org

Daphne Magnuson
Vice President of Strategic Communications
Natural Gas Supply Association
900 17th St., NW, Suite 500
Washington, D.C. 20006
daphne.magnuson@ngsa.org



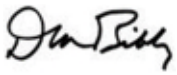
Charles R. White
Vice President Regulatory Affairs
PHCC—National Association
180 S. Washington Ste 100
Falls Church, VA 22046
white@naphcc.org

Robert Pinnegar, CAE
President & CEO
National Apartment Association
4300 Wilson Blvd., Ste. 800
Arlington, VA 22203
rpinnegar@naahq.org



Denise B. Muha
Executive Director
National Leased Housing Association
1900 L Street, NW #300
Washington, DC 20036
Dmuha@hudnlha.com

Mark Weiss
President & CEO
Manufactured Housing Association for Regulatory Reform
1331 Pennsylvania Ave. N.W., Suite 512
Washington, D.C. 20004
MHARRDG@AOL.COM



Doug Bibby
President
National Multifamily Housing Council
1775 Eye Street, N.W., Suite 1100
Washington, D.C. 20006
dbibby@nmhc.org

S. Craig Drumheller
Assistant Vice President, Construction Codes & Standards
National Association of Home Builders
1201 15th Street NW, Washington, DC 20005
cdrumheller@nahb.org

Todd Washam
Vice President, Public Policy & Industry Relations
Air Conditioning Contractors of America
2800 Shirlington Road, Ste. 300
Arlington, VA 22206
todd.washam@acca.org

Attachment D

Comments of the American Gas Association
for Docket No. EERE-2014-BT-STD-0031
(Oct. 6, 2022)

EERE-2017-BT-STD-0019

UNITED STATES OF AMERICA
BEFORE THE
DEPARTMENT OF ENERGY

Energy Conservation Program: Energy Conservation Standards for Consumer Furnaces	**)**	**EERE-2014-BT-STD-0031**
	)	**RIN 1904-AD20**
	)	**87 Fed. Reg. 40590**

COMMENTS OF THE AMERICAN GAS ASSOCIATION

Dated: October 6, 2022

TABLE OF CONTENTS

ATTACHMENTS

I. EXECUTIVE SUMMARY

The American Gas Association ("AGA") submits these comments on the U.S. Department of Energy's ("DOE" or "Department") notice of proposed rulemaking, which proposes to amend the energy conservation standards for non-weatherized gas furnaces and mobile home gas furnaces (the "NOPR" or "Proposed Rule").[1] These comments address a series of important issues, summarized as follows:

1. Energy efficiency is critical to any successful emissions reduction plan and consumer energy affordability, which is why AGA has long supported improved building and appliance energy codes and standards that are technologically feasible, economically justified, and follow statutory requirements. AGA and its members complement those codes and standards by pursuing a customer-centered approach to energy efficiency improvements, focusing on those most vulnerable to energy costs. Indeed, AGA and its members have been at the forefront of efficiency gains, from the delivery of natural gas to its end use, achieving significant benefits for consumers, environmental improvements, and economic contributions. AGA believes that federal policy should recognize that improving energy efficiency in residential, commercial, industrial, transportation, and other natural gas applications is a cornerstone strategy for reducing greenhouse gas emissions.

2. Unfortunately, however, the Proposed Rule suffers from an array of economic, technical, and procedural flaws that will render it harmful to consumers, counterproductive to energy efficiency goals, and unlawful. As detailed in these comments:

    a. **The Proposed Rule is procedurally flawed.** DOE has not followed its own "Process Rule" that governs the rulemaking process by, among other things, failing to provide stakeholders sufficient time to evaluate and comment on the rule and its underlying technical analyses. Furthermore, DOE has been unresponsive to repeated attempts by AGA to address critical flaws in DOE's analysis. DOE has similarly failed to follow recommendations from the National Academies of Sciences, Engineering, and Medicine designed to improve the integrity of DOE rules. The Proposed Rule relies on flawed assumptions and technical and factual errors. Many of those defects, failings, and mistakes have been carried over from earlier proposals that have been the focus of significant prior comments that DOE has not meaningfully addressed. This flawed process is especially problematic and even more inexplicable given the far-reaching scope of this proposed rulemaking

[1] *Energy Conservation Program: Energy Conservation Standards for Consumer Furnaces*, EERE–2014–BT–STD–0031, RIN 1904–AD20, 87 Fed. Reg. 40590 (July 7, 2022). DOE extended the comment period for the NOPR to until October 6, 2022. *See Energy Conservation Program: Energy Conservation Standards for Consumer Furnaces*, 87 Fed. Reg. 52861 (August 30, 2022).

and the impacts that would be imposed on millions of households' energy service choices and costs.

b. **The Proposed Rule cannot be economically justified using the analytical methods employed in this rulemaking.**

i. AGA has identified material errors in the data and assumptions (or "inputs") in the life cycle cost spreadsheet that DOE has used to analyze the costs and savings. Furthermore, there are critical methodological defects at the core of DOE's model simulation used to evaluate the economic impacts of its proposed standard. Among the critical and consequential flaws is that DOE's analysis assumes consumers act with no economic self-interest when selecting a consumer gas furnace. This unsupported material assumption affects the assignment of furnace efficiencies to DOE's non-standards case from which DOE's analysis of any trial standard levels are evaluated. However, it's evident that consumers act with economic self-interest when selecting consumer furnace equipment, as the market shows increasing shares of condensing-only gas furnaces in areas of the country where condensing furnace equipment is economical.

ii. Moreover, AGA has conducted an analysis using DOE's life cycle cost model that shows an undeniably strong relationship between life cycle cost savings and the market share of condensing furnace equipment. In other words, consumers do act with rational self-interest when selecting furnace equipment. As a result of this critical modeling flaw, the NOPR significantly underestimates the costs and overstates the benefits of the proposed standards. These material errors and defects mean DOE's economic analysis is unsupportable when used to justify the proposed standards or as the basis to analyze other trial standard levels, void any purported savings of the proposed standards, and render the NOPR's assumptions and conclusions unreasonable, unsupported by substantial evidence, arbitrary, capricious, and contrary to law.

iii. The NOPR's economic analysis unlawfully claims that purported savings from pushing consumers to switch from natural gas to electric appliances are among its benefits. Indeed, the claimed savings from switching from natural gas to electricity accounts for more than half of the total life cycle cost savings that DOE estimates for non-weatherized gas furnaces. Meanwhile, Congress specified that the energy conservation standards would be fuel neutral and focus on maximizing the energy efficiency of certain products, not favoring one fuel source over another. DOE's own analysis shows that consumers switching to electricity will *increase* energy use overall.

iv. Even if DOE's economic analysis were not deeply flawed, DOE itself shows that its proposed standards place a profound and unacceptable burden

on millions of consumers, including low-income households, senior households, and small businesses.

1. Before accounting for the errors and flaws previously mentioned, DOE's reports that 17% of consumers with a non-weatherized gas furnace will experience *higher* costs due to the proposed standards, including 15% of senior-only households, 14% of low-income households, and 20% of small-business consumers. For households with mobile home gas furnaces, 22% of consumers would be negatively affected by the proposed standard, including 15% of senior-only households and 13% of low-income households. These percentages reflect the impact on all natural gas consumers, not simply those that DOE considers to be affected by the Proposed Rule. Furthermore, the impacts on low-income consumers ignores owner-occupied units, and therefore significantly underrepresents the true impacts of the propose standards on low-income households. Given such significant impacts on some of the most cost-sensitive and vulnerable Americans, DOE's proposed standards cannot be considered economically justified.

2. However, DOE's presentation of the impacts of its rulemaking mask more profound and wide-reaching effects. A careful examination of DOE's life cycle cost analysis reveals that 29% of households with non-weatherized gas furnaces that are specifically affected by this rule will face negative impacts as a result of this proposed rule; 34% of all households in the South with non-weatherized gas furnaces affected by this rule will face higher costs; and 40% of all rule-affected low-income consumers nationally with non-weatherized gas furnaces will have higher costs forced on them. There are similarly high impacts on mobile home consumer subgroups. These impacts are unacceptable.

c. **DOE must establish separate product classes for condensing and non-condensing furnaces.** The Energy Policy and Conservation Act ("EPCA")[2] protects consumer choice by ensuring energy conservation standards are not "likely to result in the unavailability in the United States in any covered product type (or class) of performance characteristics" currently available to consumers. The Proposed Rule, however, would do exactly that. It would make conventional, non-condensing furnaces unavailable to consumers. Meanwhile, millions of American homes were designed with "atmospheric venting systems" that include chimneys, vents, and utility closets that cannot accommodate condensing furnaces. If non-condensing furnaces are eliminated from the market and made unavailable, those consumers would need to either remodel their homes to accommodate condensing furnaces or switch to less efficient electric appliances. That is not tenable. To be

[2] 42 U.S.C § 6291, *et seq.*

consistent with EPCA, DOE's past practices, and consumers' best interests, DOE should develop separate standards for condensing and non-condensing furnaces.

d. **The Proposed Rule would decrease energy efficiency and increase energy consumption for many consumers.** As noted above, the Proposed Rule would force many consumers to replace their conventional natural gas furnaces with electric appliances to avoid the enormous cost of remodeling their homes and installing the ventilation and plumbing equipment required to accommodate condensing appliances. DOE's own flawed analysis shows that millions of consumers would be pushed toward electric appliances. A careful review of DOE's analysis reveals that, in aggregate, consumers who switch from a non-weatherized gas furnace to an electric appliance will use more energy overall due to the proposed rule. One in three consumers that switch to electric appliances will pay more to heat their homes and use more energy than if they were able to replace their conventional furnace with a new conventional furnace. This increase in overall energy use more than offsets any energy efficiency gains from other consumers switching to electricity. That is, DOE's analysis shows that this rule will lead to fuel switching to electricity, increasing overall energy use for many consumers.

e. The Department is unlawfully promoting fuel switching. Congress designed the energy conservation standards to be fuel neutral and not favor one energy source over another. By considering fuel switching a benefit in some contexts and ignoring it in others, the Department improperly favors a single energy source, contrary to its authority and against consumers' interests.

f. The Department has failed to consider the impact on natural gas utilities from the Proposed Rule. DOE is required to analyze the "marginal impacts on electric and gas utility costs and revenues." While the NOPR explores some of the impacts on electric utilities, it performs only a cursory analysis of the effects on natural gas utilities. As DOE acknowledges, the Proposed Rule will drive millions of consumers away from efficient gas furnaces. Therefore, the Department must evaluate whether the loss of gas consumers negatively impacts natural gas local distribution companies and results in higher rates for remaining consumers. DOE must evaluate the negative effects on natural gas utility energy efficiency programs, which benefit millions of consumers and already provide rebates for gas furnaces in many instances. The effectiveness of gas utility energy efficiency programs, such as the rebates offered or claimable savings opportunities available, may be reduced. DOE should also better analyze the consequences of adding to further electric demand, including the potential to increase, rather than decrease, average and peak energy consumption, and emissions.

In short, AGA cannot support the Proposed Rule due to its unacceptably profound impacts on consumers, its analytical and procedural defects, its elimination of consumer energy choices, and its increased energy use. The Proposed Rule is ill-conceived, unlawful, analytically

unsupportable, and anti-consumer. DOE should rescind the Proposed Rule, follow the proper procedures, incorporate recommendations from the National Academies of Science, Engineering, and Medicine, and address the critical defects in its economic analysis. Once DOE addresses the critical material errors and methodological defects in its economic analysis, AGA encourages DOE and stakeholders to develop a solutions-oriented approach to energy conservation that ensures any proposed consumer furnace efficiency standards reduce energy use, protect consumers, and preserve the specific features to ensure continued availability of natural gas furnaces that function in homes designed with atmospheric venting systems.

II. IDENTITY AND INTEREST

AGA, founded in 1918, represents more than 200 local energy companies that deliver clean natural gas throughout the United States. There are more than 77 million residential, commercial, and industrial natural gas consumers in the U.S., of which 95 percent — more than 73 million consumers — receive their gas from AGA members. AGA is an advocate for natural gas utility companies and their consumers and provides a broad range of programs and services for member natural gas pipelines, marketers, gatherers, international natural gas companies, and industry associates. Today, natural gas meets more than one-third of the United States' energy needs.[3] AGA's members serve residential and commercial consumers, the majority of which use natural gas furnaces and therefore have a direct and vital interest in both the minimum efficiency standards for these products and the procedures used by DOE to adopt these standards.

[3] For more information, please visit www.aga.org.

III. AGA SUPPORTS ENERGY EFFICIENCY & CONSERVATION EFFORTS

A. AGA and its Members Actively Invest in and Promote Energy Efficiency

AGA supports energy efficiency and conservation efforts, including the efficient use of natural gas in homes and businesses. AGA appreciates the opportunity to comment on the Department's Proposed Rule, which proposes to amend energy conservation standards for non-weatherized gas furnaces ("NWGF") and mobile home gas furnaces ("MHGF"). AGA supports energy efficiency and conservation efforts, which includes the efficient use of natural gas in homes and businesses.

Over the past two decades, millions of additional homes and businesses have connected to the U.S. natural gas delivery system. Even as the number of consumers has grown, natural gas use in the residential, commercial, and industrial natural gas sectors has been virtually unchanged, and on a per-customer basis, residential natural gas use has declined by more than 50% since 1970. This steady improvement in residential natural gas use per customer is a direct result of energy efficiency improvements, including tighter building envelopes, more efficient appliances and equipment, behavioral changes in energy consumption, and the effectiveness of natural gas utility efficiency programs. Furthermore, this continual improvement in energy efficiency has helped lead to a decline in overall carbon dioxide emissions as consumers use natural gas more efficiently and substitute away from more carbon-intensive energy sources.

AGA believes that federal policy should recognize that improving energy efficiency in residential, commercial, industrial, transportation, and other natural gas applications is a cornerstone strategy in reducing greenhouse gas emissions.[4] AGA and its members actively invest

[4] American Gas Association Climate Change Position Statement, available at https://www.aga.org/globalassets/aga_climate-change-document_final.pdf (last visited October 5, 2022).

in and promote energy efficiency. AGA has been at the forefront of energy efficiency efforts, and the record is clear. Natural gas utilities lead the way in supporting appliance efficiency standards.

Notably, AGA's and utilities' efficiency efforts predate the creation of the Department. For decades, AGA and the industry have played a positive and active role in supporting efficiency requirements for natural gas appliances. For example:

- Decades before the Department was formed and its predecessor, the Federal Energy Administration, came into being in the 1970s, AGA and its members supported and promoted minimum efficiency requirements for most natural gas appliances through voluntary standards developed through the consensus process accredited by the American National Standards Institute ("ANSI").

- The ANSI-accredited standards committees that developed and maintained the voluntary standards for gas appliances comprised a broad cross-section of representatives from various private and public identities, including consumers, manufacturers, utilities, installers, governmental, testing laboratories, *etc*. AGA was the Secretariat of the ANSI-accredited standards that oversaw the standards development process and complied with the stringent standards development procedures required by ANSI, including provisions that encouraged an open and transparent standards development process.

- Most ANSI-accredited safety and performance standards for natural gas appliances historically included a minimum efficiency requirement that the appliances had to meet to comply. For example, the minimum efficiency requirement for natural gas furnaces was a 75 percent thermal minimum efficiency-based level (referred to as a flue loss) based on an energy output over energy input measurement. In addition, there was a requirement for consumer furnaces, that heat loss transmitted from the unit's cabinet, referred to as a "jacket loss," not exceed 5 percent.

- Detailed test methods for measuring and confirming these efficiency requirements were included in the ANSI-accredited standards. In the case of natural gas furnaces, products could not be listed as being designed certified to meet these efficiency requirements until the furnaces were tested by an independent third-party testing agency verifying compliance by actual tests.

- Gas appliances that met the ANSI-accredited standards requirements were permitted to include a seal of design certification approval and a listing in the third-party certification testing laboratories directory identifying that the model has met the ANSI-accredited standards provisions. The third-party testing laboratories, including at that time the AGA Laboratory, included an annual follow-up testing program that randomly

tested models from manufacturers' inventories or in the market to verify compliance with the applicable ANSI standard.

- Many states, local jurisdictions, military specifications, *etc.*, required that gas appliances bought or installed be in compliance with the ANSI-accredited standards with verification by a label or listing from an independent third-party testing agency.

- With the passage of EPCA[5] at the federal level, the efficiency requirements in the ANSI-accredited standards for natural gas appliances were phased out of the ANSI-accredited standards for natural gas appliances because of the legislation. The federal regulations preempted the efficiency requirements in the ANSI-accredited standards. However, the support for energy efficiency by the natural gas industry did not end there. Efficiency test methods developed by the National Bureau of Standards ("NBS") now known as the National Institute of Standards and Technology ("NIST") took the test methods from the ANSI-accredited standards for natural gas appliances and incorporated and expanded the efficiency measurement to an annual efficiency measurement that is still incorporated in most DOE federal test methods in place today.

It is also important to note that the efficiency requirements and certification programs outlined above were all voluntary. The costs to conduct the programs were borne by the natural gas industry and absorbed by the industries involved. No federal funds were used in support of the programs. History demonstrates that AGA and the natural gas industry support appliance efficiency requirements.

B. Natural Gas Utilities Across the Country Have Energy Efficiency Programs

AGA member companies invested $1.6 billion to support energy efficiency programs in 2019 and budgeted $1.7 billion for 2020.[6] The pace of annual natural gas utility energy efficiency investments has increased consistently since AGA began tracking data in 2007. The acceleration of energy efficiency deployment in the residential, multi-family, commercial, and industrial sectors, and programs targeted at low-income consumers, reflects the commitment of the natural gas utility industry toward improvements in energy efficiency, consumer energy affordability,

[5] Energy Policy and Conservation Act, 94 P.L. 163, 89 Stat. 871 (December 22, 1975).
[6] *See* https://www.aga.org/research/reports/natural-gas-efficiency-programs/

access to reliable energy, and greenhouse gas emissions reductions. Natural gas savings in North America from these programs amounted to just about 500 million therms or 49.96 trillion Btu, the equivalence of 2.64 million metric tons of avoided CO2 emissions in 2019 alone.[7] These programs reach nearly 7 million residential consumers, more than 380,000 low-income consumers, nearly 140,000 multi-family consumers, more than 130,000 commercial consumers, and 41,000 separate industrial program consumers. The 120+ gas utility ratepayer-funded energy efficiency programs offered span every region in the U.S., providing guidance and funding around weatherization, technical assessments, training, and existing and new building programs for equipment replacement and upgrades, *e.g.*, appliances, doors, windows, and thermostats, building retrofits, commercial foodservice, process equipment, energy management systems, and custom process improvements.[8] The industry is educating and doing outreach as one of its most adopted programs across each sector. The industry will continue to leverage these established gas energy efficiency programs to accelerate its contribution to the economy-wide decarbonization efforts and goals.

Natural gas utilities across 40 states have a natural gas efficiency program.[9] Some programs are voluntary utility programs, and others are funded via the state regulatory process. Specifically, a 2019 survey shows that 69 natural gas utilities in 28 states have some form of regulatory funding for efficiency programs.[10] Such programs take many forms and could be part of a regulatory program, a legislative bill, or both.[11] While many natural gas efficiency programs have been in place for years, the breadth and depth of programs continue to grow. Various goals

[7] *See* https://www.aga.org/globalassets/eereport-part-2-final.pdf (last visited October 5, 2022).
[8] *See* https://www.aga.org/globalassets/energy-efficiency-report-partone.pdf (last visited October 5, 2022).
[9] Natural Gas Efficiency Programs Report Natural Gas Efficiency Program Characteristics 2019 Program Year, March 2022, available at https://www.aga.org/globalassets/energy-efficiency-report-partone.pdf (last visited October 5, 2022).
[10] Natural Gas Efficiency Regulatory Requirements and Cost Recovery Treatment, April 2022, available at https://www.aga.org/globalassets/eereport-part-3-final.pdf (last visited October 5, 2022).
[11] *Id*.

drive efficiency program funding requirements within the U.S., including promoting energy conservation, reducing customer bills, and reducing low-income consumers' cost burden.[12]

According to an AGA survey of utilities with efficiency programs, 88 percent have residential efficiency programs, 77 percent have commercial, 68 percent have low income, 25 percent have multi-family programs, and 9 percent have separate industrial programs.[13] As noted above, during 2019, enrollments in natural gas efficiency programs reached more than 6.6 million residential consumers, over 380,000 low-income consumers, about 137,000 multi-family consumers, over 130,000 commercial consumers, and 41,000 separate industrial program consumers.[14]

As part of the aforementioned efforts, many AGA member natural gas utilities provide rebates and incentive programs to consumers to promote installing high-efficiency natural gas furnaces. AGA's local natural gas utility ("LDC") members offer customer incentives for condensing furnaces, including incentives for furnaces at 95% Annual Fuel Utilization Efficiency ("AFUE") or above.[15] Therefore, the share of high-efficiency natural gas furnaces continues to climb due to many consumer-perceived economic advantages of high-efficiency furnaces.

C. LDCs Have a Proven Track Record of Reducing GHG Emissions

It is important to note that LDCs have a proven track record of reducing greenhouse gas ("GHG") emissions. AGA and its members are committed to reducing GHG emissions through smart innovation, new and modernized infrastructure and advanced technologies that maintain

---

[12] *Id*.
[13] Natural Gas Efficiency Programs Report Natural Gas Efficiency Program Characteristics 2019 Program Year, March 2022, available at https://www.aga.org/globalassets/energy-efficiency-report-partone.pdf (last visited October 5, 2022).
[14] *Id*.
[15] *See* American Gas Association, Summary Report of AGA Membership Survey on Efficiency Levels of Residential Natural Gas Furnace Incentive Programs at 1 (June 2015), *available at* https://www.aga.org/sites/default/files/summary_report_of_aga_membership_survey_on_natural_gas_furnace_costs_and_installations.pdf (last visited October 5, 2022).

reliable, resilient, and cost-effective consumer energy service choices. With direction and guidance from policymakers and regulators, the natural gas utility industry continuously invests in modernizing the nation's natural gas delivery infrastructure to distribute safe, reliable, and cost-effective energy and improve customer efficiency.

Climate change is a defining challenge across the globe, and natural gas, natural gas utilities, and the delivery infrastructure are essential to meeting our nation's greenhouse gas emissions reduction goals. As companies continue to modernize natural gas infrastructure and connect homes and businesses to the system, new opportunities arise to achieve low-cost GHG emissions reductions by leveraging new and existing natural gas infrastructure, advanced technologies, and the nation's abundant natural gas resources.

In February 2022, AGA published a study titled "*Net-Zero Emissions Opportunities for Gas Utilities*"[16] to provide a comprehensive and rigorous analysis demonstrating the multiple pathways that exist to reach a net-zero future, and the role natural gas, gas utilities and delivery infrastructure will play in advancing decarbonization solutions. The study presents a national-level approach that leverages the unique advantages of gas technologies and distribution infrastructure and the foundational role of natural gas energy efficiency. The study underscores the range of scenarios and technology opportunities available as the nation, regions, states, and communities develop and implement ambitious emissions reduction plans. The key findings in the study include:

- Pathways that utilize natural gas and the vast utility delivery infrastructure offer opportunities to incorporate renewable and low-carbon gases, provide optionality for stakeholders, help minimize customer impacts, maintain high reliability, improve overall energy system resilience, and accelerate emissions reductions.

[16] "Net-Zero Emissions Opportunities for Gas Utilities," AGA, February 8, 2022, available at https://www.aga.org/research/reports/net-zero-emissions-opportunities-for-gas-utilities/ (last visited October 5, 2022). The study is appended at Attachment A.

- The ability of natural gas infrastructure to store and transport large amounts of energy to meet seasonal and peak day energy use represents an important and valuable resource that needs to be considered when building pathways to achieve net-zero GHG emissions goals.

- Continued utilization of natural gas and the vast utility delivery infrastructure can increase the likelihood of successfully reaching net-zero targets while minimizing customer impacts.

- The U.S. can achieve significant emissions reductions by accelerating the use of tools available today, including high-efficiency natural gas applications, renewable gases, methane reduction technologies, and enhanced energy efficiency initiatives.

- Large amounts of renewable and low-carbon electricity and gases, and negative emissions technologies, will be required to meet an economy-wide 2050 net-zero target.

- Supportive policies and regulatory approaches will be essential for natural gas utilities to achieve net-zero emissions.

Natural gas and its direct use in homes and businesses has been a cornerstone of America's energy economy for more than a century and will be needed in the future. Today, hundreds of millions of Americans rely on natural gas to heat their homes, power their businesses, and manufacture goods. An emphasis on climate change and reducing emissions has complemented the natural gas utility industry's focus on safety and reliability and enabled a steep decline in methane emissions. These commitments continue, and as our nation moves towards a lower-carbon economy and embraces new fuels and technologies, the natural gas utilities are ready to meet these changes and will remain foundational to the country's future.

All this is to say that the natural gas industry is ready, willing, and able to support cost-effective, consumer-friendly measures to increase efficiency standards. AGA and its members have no aversion to the energy conservation standards program or economically justified and technically feasible measures to improve appliance efficiency rates. Unfortunately, as described below, the Proposed Rule does not fit the bill. The numerous flaws, unsupported assumptions, inaccuracies, and technical errors that underpin the NOPR would render a final rule unlawful.

Furthermore, DOE's own analysis shows that its proposed rule will profoundly and negatively affect millions of Americans, particularly low-income, senior-only households, and small businesses. AGA urges the Department to address the issues discussed herein and work with stakeholders to propose revised standards that comply with the Department's legal, procedural, and technical obligations.

IV. BACKGROUND

In 2007, DOE issued a final rule that amended the energy conservation standards for residential furnaces to a minimum level of 80% AFUE.[17] Before the rule could be implemented, a group of states and efficiency advocates challenged the rule in court. In 2009, the U.S. Court of Appeals for the Second Circuit granted a motion filed by DOE to voluntarily remand the matter to the agency. The remand did not vacate the energy conservation standards set forth in the 2007 final rule, and during the remand, the standards went into effect as originally scheduled.

In 2011, DOE simultaneously issued a direct final rule ("DFR")[18] and a notice of proposed rulemaking to amend the energy conservation standards for residential central air conditioners and consumer furnaces. The DFR would have established a 90% AFUE minimum standard for furnaces in states with more than 5,000 annual heating degree days and an 80% AFUE minimum standard for states with less than 5,000 annual heating degree days. The DFR was consistent with a "Consensus Agreement" that DOE entered into with certain stakeholders. Stakeholders not included in the "Consensus Agreement" opposed the proposal on procedural and technical

[17] *Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnaces and Boilers*, 72 Fed. Reg. 65136 (Nov. 19, 2007).
[18] *See Energy Conservation Program: Energy Conservation Standards for Residential Furnaces and Residential Central Air Conditioners and Heat Pumps*, 76 Fed. Reg. 37408 (June 27, 2011).

grounds. The matter ultimately went to the U.S. Court of Appeals for the District of Columbia Circuit, which invalidated the rule as it pertained to non-weatherized gas furnaces in 2014.[19]

In March 2015, DOE issued a notice of proposed rulemaking proposing a national minimum efficiency standard of 92% AFUE.[20] In 2016, DOE published a supplemental notice of proposed rulemaking that proposed separate standards for small and large non-weatherized gas furnaces.[21]

In 2019, the American Public Gas Association ("APGA"), Spire, Inc., the Natural Gas Supply Association ("NGSA"), AGA, and the National Propane Gas Association ("NPGA") submitted a Petition for Rulemaking to DOE. The petition asked DOE to issue an interpretive rule confirming that energy conservation standards that would effectively limit the market for natural gas or propane furnaces or water heaters to products using condensing technology would, contrary to EPCA's requirements, result in the "unavailability of in the United States in any covered product type (or class) of performance characteristics . . . that are substantially the same as those generally available in the United States at the time of the finding".[22] In response to the petition, DOE published a final interpretive rule, in January 2021, determining that, in the context of residential furnaces, commercial water heaters, and similarly-situated products/equipment, the use of non-condensing technology and associated venting constitute a performance-related "feature" under EPCA that cannot be eliminated through adoption of an energy conservation standards and required the establishment of separate product classes for condensing and non-condensing natural gas appliances.[23] DOE, therefore, withdrew the March 2015 proposed rulemaking and September

[19] *See American Public Gas Association v. DOE*, 2014 U.S. App. LEXIS 7733 (April 24, 2014).
[20] *Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnaces*, 80 Fed. Reg. 13120 (March 12, 2015).
[21] *Energy Conservation Program: Energy Conservation Standards for Residential Furnaces*, 81 Fed. Reg. 65719 (Sept. 23, 2016).
[22] 42 U.S.C. § 6313(a)(6)(B)(iii)(II).
[23] *Energy Conservation Program for Appliance Standards: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters*, 86 Fed. Reg. 4776 (Jan. 15, 2021) ("January 15, 2021 Interpretive Rule").

2016 supplemental notice of proposed rulemaking because their focus on efficiency levels only achievable by condensing natural gas appliances would have made those performance-related features unavailable.[24]

In December 2021, DOE published a final interpretive rule that reversed the January 2021 interpretive rule.[25] The December 2021 DOE reversal wrongly asserted that "non-condensing technology (and the associated venting) does not provide unique utility to consumers separate from an appliance's function of providing heated air or water, as applicable."[26] In 2022, AGA, along with APGA, Spire, Inc, and Thermo Products, filed a joint petition for review of the December 2021 final interpretive rule in the U.S. Court of Appeals for the District of Columbia Circuit.[27] This case is currently in abeyance because certain DOE rulemaking proceedings, including the instant proceeding, may have a bearing on the appeal.

On July 7, 2022, DOE published the NOPR, proposing to require a 95% AFUE standard for all non-weatherized residential gas furnaces and mobile home gas furnaces and ignoring the distinctions between the important performance characteristics and features that conventional (or non-condensing) provide consumers.[28] On July 25, 2022, AGA, APGA, and NPGA, Spire Inc., Spire Missouri Inc., and Spire Alabama Inc. (collectively, "Spire") requested DOE extend the comment period in this proceeding to ensure that stakeholders had the ability to develop meaningful comments.[29] DOE rejected the request on July 28, 2022.[30] On August 11, 2022, AGA,

[24] *Energy Conservation Program for Appliance Standards: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters; Withdrawal,* 86 Fed. Reg. 3873 (Jan. 15, 2021).
[25] *Energy Conservation Program for Appliance Standards: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters*, 86 Fed. Reg. 73947 (Dec. 29, 2021) ("December 29, 2021 Interpretive Rule").
[26] *Id.*
[27] *See* American Gas Association, *et al.* v. DOE, D.C. Cir. No. 22-1030.
[28] *Energy Conservation Program: Energy Conservation Standards for Consumer Furnaces*, EERE–2014–BT–STD–0031, RIN 1904–AD20, 87 Fed. Reg. 40590 (July 7, 2022).
[29] AGA, *et al*., Extension Request, July 25, 2022 (Attachment B).
[30] DOE Letter Rejecting the Extension Request, July 28, 2022 (Attachment C).

APGA, NPGA, Spire, and Atmos Energy Corporation ("Atmos") requested that DOE hold a workshop to discuss fundamental defects in DOE's model and extend the comment period accordingly.[31] The request for the workshop included several examples of issues with the Life Cycle Cost ("LCC") model and noted that problems with the model were preventing stakeholders from meaningfully commenting on important aspects of the proposal because they could not make the model work, and the model produced absurd results.

On August 30, 2022, DOE scheduled a webinar for September 6, 2022, and extended the comment period until October 6, 2022.[32] DOE also issued a revised version of the LCC spreadsheet on August 30, 2022. Before the webinar, AGA, APGA, NPGA, Spire, and Atmos, filed a detailed letter that included a list of matters and questions that DOE should address at the event.[33] At the September 6 webinar, DOE did not address the substantive matters and questions concerning the LCC model and instead generally provided instruction on the operation of the LCC spreadsheet. On September 13, 2022, AGA, APGA, NPGA, Spire, and Atmos filed a letter thanking DOE for holding the webinar on the LCC model and reiterated the critical topics for the agency to address before the comment period closes that DOE did not address during the webinar.[34] The September 13 letter reiterated the points raised in the prior letters concerning the LCC model and also raised additional concerns. The Department has not addressed those concerns or provided sufficient time to meaningfully comment on the proposal.

[31] AGA, *et al*., Workshop Request, August 11, 2022 (Attachment D).
[32] *Energy Conservation Program: Energy Conservation Standards for Consumer Furnaces*, 87 Fed. Reg. 52861 (August 30, 2022).
[33] AGA, *et al*., Letter Regarding the Workshop Topics, August 29, 2022 (Attachment E).
[34] AGA, *et al*., Letter Following the Workshop, September 13, 2022 (Attachment F).

V. COMMENTS

A. Introduction

AGA and its members, as noted above, support energy efficiency and conservation efforts that are technologically feasible, economically justified, and consistent with the law. As discussed herein, DOE's analysis of the economic justification and energy savings that underpin the NOPR suffers from significant methodological and data flaws. Even accepting DOE's analysis at face value, DOE's modeling shows that the Proposed Rule is not economically justified and would impose significant costs on American consumers, especially low-income, senior-only households, and small businesses.

The Proposed Rule would also harm consumers. DOE's own analysis evidences that the Proposed Rule would leave many consumers worse off—particularly seniors and low-income consumers, consumers in warmer climates, and consumers replacing furnaces in existing homes. Critically, DOE's data evidences that the proposal will have a negative impact and result in higher overall costs for: 17% of all non-weatherized gas furnace consumers, including 15% of senior-only households, 14% of low-income households, and 20% of small business consumers. Notably, for consumers with mobile homes, 22% of all consumers would be negatively impacted, along with 15% of senior-only mobile home households and 13% of low-income mobile home households. In the replacement market, *i.e.*, where consumers are seeking to replace an existing furnace, 16.6% of all households would see a net cost increase. However, these percentages mask even more substantial impacts when AGA examined only consumers affected by this rule. In this case, 29% of rule-affected consumers will face negative impacts. Furthermore, when regional differences in impacts are accounted for, 34% of all households in the South with non-weatherized gas furnaces affected by this rule will face higher costs due to this proposed rule. For low-income households (including owner-occupied and renter-only households), 40% of low-income non-

weatherized gas furnace consumers nationally affected by this rule will be negatively impacted. As is demonstrated, there are many ways to report the profoundly negative impacts of this rule. Therefore, DOE should not find a standard economically justified when such a significant share of consumers will be rendered worse off. The Proposed Rule is not economically justified, as required by EPCA.

Furthermore, AGA cannot support regulatory outcomes that drive uneconomic and inefficient fuel switching. The Proposed Rule would cause homeowners to shift from non-condensing natural gas furnaces that have an 80% fuel conversion efficiency to electric heat sources that use electricity from largely fossil-fired generating plants. Those plants have a typical 30-50% fuel conversion efficiency, which is a significant loss of efficiency and manifestly unsound economic and environmental policy.[35]

Indeed, DOE has recognized the importance of considering the full-fuel-cycle impacts of its efficiency regulations as a basis to assess the potentially counterproductive effects of fuel-switching caused by its regulations.[36] DOE's own analysis estimates that its Proposed Rule would drive 15.6% of affected consumers to shift to electric heat who would otherwise have the option to purchase non-condensing natural gas furnaces. DOE's own analysis estimates that its Proposed Rule would drive 15.6% of affected consumers to shift to electric heat who would otherwise have the option to purchase non-condensing natural gas furnaces. Such fuel switching increases primary energy consumption and is inconsistent with EPCA.

Moreover, the Proposed Rule and the LCC model contain severe errors that impact the entire analysis. DOE's own flawed analysis shows significant adverse impacts due to the proposed

[35] U.S. Energy Information Administration, "More than 60% of energy used for electricity generation is lost in conversion," July 21, 2020, available at https://www.eia.gov/todayinenergy/detail.php?id=44436 (last visited October 5, 2022).
[36] *See, e.g.,* NOPR, 87 Fed. Reg. at 40593, n.5.

standards and thus does not support a conclusion that the proposed standards would be economically justified. Even with errors that overestimate the benefits and understate the costs, the NOPR's LCC analysis shows that many consumers would be worse off under the proposed standard. In 2020, approximately 59.2 million households had gas or propane space heating; therefore, DOE's proposal to eliminate an affordable heating option will negatively affect millions of consumers. While DOE projects that 43.3% of American consumers would not be impacted by the proposed standard 16.6% of households would face higher costs.

The negative consequences are exasperated by the NOPR's failure to recognize that condensing furnaces are appropriate for many consumers, but not for others, by proposing a separate product class for non-condensing furnaces. EPCA precludes DOE from setting standards that would make products with performance characteristics important to American consumers unavailable. As addressed in more detail below, to ensure the availability of options, while also promoting efficiency gains within different products classes, EPCA authorizes DOE to create separate product classes for products with different performance features. Conventional, non-condensing gas furnaces provide consumers with performance characteristics and features that are distinct from those of condensing furnaces. Most notably, non-condensing furnaces can be vented through masonry chimneys found in much of the nation's existing housing stock, while condensing furnaces cannot. The NOPR would make non-condensing furnaces unavailable to those consumers. As a result, the proposed standards would prevent many homeowners from replacing a broken natural gas furnace without incurring significant building renovation costs. For many, such as those that experience the need for an unplanned replacement of a broken furnace during the middle of winter, such renovations will be impracticable and infeasible.

Moreover, consumers are already adopting condensing-only gas furnace equipment, rendering DOE's rule unnecessary. A large number of higher-efficiency condensing furnaces are shipped and installed every year throughout the United States, and the market share of condensing furnace equipment has steadily increased over time. New home designs accommodate condensing technology, and during major or whole house renovations, homeowners install condensing furnaces or other high-efficiency units when appropriate. The current existing high-level adoption of condensing technology makes a new rule forcing market adoption across the entire United States unnecessary and counterproductive.[37]

AGA proposes that DOE and stakeholders develop energy conservation standards for residential furnaces that support the continued increase in market penetration of high-efficiency natural gas furnaces where practical and economical, without adopting a rigid policy that affirmatively harms significant subsets of consumers, drives up energy consumption for many consumers, and increases associated emissions. Within the broader portfolio of energy efficiency and energy affordability options available to consumers and utilized within the market, there are currently mechanisms available to meet the goals of increasing the use of high-efficiency furnaces while mitigating counterproductive results including: (1) rebate, incentive, and other non-regulatory programs to promote use of condensing furnaces; and (2) use of separate product classes to mitigate adverse impacts of a standard that would eliminate a vast number of furnaces from the market. A tailored approach to improving consumer space heating energy efficiency including improvements in consumer furnace efficiency that includes stakeholder input is more appropriate than DOE's proposal to force universal adoption of a technology that is not universally beneficial, cost effective, or even feasible.

[37] DOE should fully explain and justify the need for the Proposed Rule, in light of the fact that market appears to be encouraging the adoption of condensing technology, thereby rendering the proposal unnecessary.

B. The Proposed Rule Suffers from a Series of Procedural Errors that Render it Unlawful

The first fundamental problem with the NOPR is that it does not follow the procedural requirements under the EPCA, the Administrative Procedure Act ("APA"), and the Department's own rules.

1. The Department has Not Followed its Own Process

The Department has established procedural standards, known as the Process Rule, to foster fair and transparent rulemaking.[38] The Process Rule's procedures are intended to, among other things, increase predictability, eliminate problematic options early in the process, ensure thorough analysis of impacts, and guarantee the use of transparent and robust analytical methods.[39] While the Department asserts that it may deviate from the Process Rule in some circumstances, by its own terms, the Department may only do so "when necessary" and after providing stakeholders an explanation for why the deviation is necessary.[40] The NOPR, without explanation, cause, or reason, fails to adhere to the Process Rule and therefore fails to meet the Department's rulemaking standards.

The Process Rule pledges that the Department will use transparent, robust analytical methods, that can be reproduced by the public. Section 1(f) notes that "[t]he Department seeks to use qualitative and quantitative analytical methods that are fully documented for the public and that produce results that can be explained and reproduced, so that the analytical underpinnings for policy decisions on standards are as sound and well accepted as possible."[41] The NOPR, however, completely fails to do so. As noted in an August 11, 2022 letter requesting a public workshop and

[38] 10 C.F.R. Part 430, Subpt. C, Appendix A.
[39] *Id.*
[40] *Id.* § 3(a).
[41] 10 C.F.R. Part 430, Subpt. C, Appendix A § 1(f).

an extension of the comment period,[42] the LCC model used for the NOPR and provided to the public is broken. The model that DOE originally made publicly available produces summary table results that were inconsistent with those in the Technical Support Document ("TSD") for the NOPR.[43] Although DOE made a revised version of its LCC spreadsheet available on August 24, 2022, and DOE appeared to address a narrow technical issue in its LCC spreadsheet that led to the inconsistency between the as-presented life-cycle cost spreadsheet and the high-level summary of impacts presented in the TSD, the LCC model spreadsheet still possesses several incorrect assumptions, methods, errors.[44] AGA, *et al*., reiterated that fundamental defects and other identified problems persisted with the revised LCC spreadsheet in letters dated August 29, 2022, and September 13, 2022, and asked DOE to allow stakeholders to ask DOE staff questions that may explain or resolve some of the concerns with the LCC model.[45] DOE has not done so, and the "qualitative and quantitative methods" behind the LCC model and the "underpinnings for policy decisions on [the standards]" remain far from fully documented, reproducible, explained, and sound.

Similarly, the Process Rule promises that "there will be no less than 75 days for public comment on the NOPR."[46] In direct contravention of this promise, the Department initially allowed stakeholders only 60 days to comment. While AGA recognizes that DOE issued a short extension after making the revised LCC spreadsheet available, that extension does not afford stakeholders sufficient time to thoroughly analyze all of the complex, technical underpinnings of DOE's modeling. DOE has rejected repeated pleas that the comment period is not long enough to allow

[42] *See* Attachment D.
[43] Attachment D at 2.
[44] *Id*. at 2-3 (elaborating on the market share data and false assumptions).
[45] *See* Attachments E and F.
[46] Process Rule at § 6(f).

for meaningful comment on the array of technical issues, even if the models and other technical support materials did not suffer from deficiencies.[47] In a rule as complex as this, which includes profound and far-reaching impacts on the energy service options and costs for millions of consumers, it is questionable whether 75 days, the minimum contemplated by the Process Rule, would even be sufficient.

The Department's deviation from the Process Rule, especially without any explanation, is arbitrary and capricious and threatens the validity of the entire rule and the integrity of the rulemaking process. Among other things, the NOPR's failure to follow the Process Rule makes it impossible for stakeholders to fully test the methods underlying the rule or address obvious technical flaws including errors in the LCC spreadsheet, which is a necessary predicate for any discussion about the merits of DOE's proposed standards. DOE's flawed process further hampers stakeholders from evaluating compliance with other aspects of EPCA's and the Process Rule's requirements, including whether the NOPR's design options "have payback periods that exceed the median life of the product" or "result in life-cycle cost increases relative to the base case."[48] The Department should correct these deficiencies by allowing stakeholders access to "quantitative analytical methods that are fully documented for the public and that produce results that can be explained and reproduced" and sufficient time to comment on them.[49]

[47] *See*, *e.g.*, Attachments C and F.
[48] Process Rule at § 7 (c).
[49] *See, e.g.,* Process Rule § 1(f); *see also*, *Grand Canyon Air Tour Coal. v. FAA*, 154 F.3d 455, 468 (D.C. Cir. 1998) (under the APA "an agency is required to provide a meaningful opportunity for comments."); *Am. Pub. Gas Ass'n v. DOE*, 22F4th 1018 (D.C. Cir. 2022) (DOE required to provide fulsome notice and explanation for its decisions).

2. DOE's Process is Inconsistent with the Statutory Requirements

The APA[50] requires that agencies provide a "meaningful" opportunity for comment,"[51] and "in order to satisfy this requirement, an agency must also remain sufficiently open-minded."[52] "That means enough time with enough information to comment and for the agency to consider and respond to the comments."[53] Among the purposes of the APA's notice and comment requirements are: (1) to ensure that agency regulations are tested via exposure to diverse public comment, (2) to ensure fairness to affected parties, and (3) to give affected parties an opportunity to develop evidence in the record to support their objections to the rule and thereby enhance the quality of judicial review.[54] Due to the issues with the Proposed Rule and the supporting analysis, discussed herein, stakeholders have been denied a meaningful opportunity to evaluate the NOPR.

As discussed herein, the Proposed Rule lacks essential elements needed to fully understand and evaluate it, depriving stakeholders of the opportunity for meaningful comment. For example, AGA cannot fully reproduce DOE's subgroup analysis for low-income consumers after extensive efforts and expending considerable resources. Moreover, the flawed model and reasoning offered in support of the NOPR prevent stakeholders from engaging with the Department on its rationale for the proposed action or offering contrary evidence or alternatives. Specifically, as discussed in Section E, numerous errors and defects in DOE's economic analysis, which presents scenarios that are neither reasonable nor representative of the real world, render its simulation of the economic impacts of the proposed standard meaningless. AGA has endeavored to respond to the NOPR in

[50] Pub. L. No. 79-404, 60 Stat. 237 (1946) (codified as amended at 5 U.S.C. §§ 551, *et seq.*).
[51] *See, e.g., Rural Cellular Ass'n v. Fed. Commc'ns Comm'n*, 588 F.3d 1095, 1101 (D.C. Cir. 2009), *Gerber v. Norton*, 294 F.3d 173, 179 (D.C. Cir. 2002).
[52] *Rural Cellular Ass'n,* 588 F.3d at 1101.
[53] *Prometheus Radio Project v. FCC*, 652 F.3d 431, 450 (2011).
[54] *Id.* citing *I'nt'l Union, United Mine Workers of Am. v. Mine Safety & Health Admin*., 407 F.3d 1250 (D.C. Cir. 2005).

these comments; however, interested parties cannot meaningfully comment upon DOE's proposal if stakeholders do not have an accurate picture of the reasoning that led the Department to the Proposed Rule. The Department's approval of the Proposed Rule (or some variation thereof) would contravene the APA's paramount directive to engage in meaningful public comment and reasoned decision-making.

Also problematic is the unnecessary speed that DOE is conducting this proceeding in light of the sweeping nature of its impact, potentially affecting millions of consumers with significant cost implications. With so many consumers facing negative consequences due to the Proposed Rule, DOE should not run afoul of the APA requirements that it be open-minded and for the Department to consider and respond to the comments.

3. DOE Should Follow the National Academies of Sciences, Engineering, and Medicine's Recommendations

DOE should follow, or at a minimum respond to, the National Academies of Sciences, Engineering, and Medicine's ("NASEM") Recommendations on its process. NASEM issued a report titled "Review of Methods Used by the U.S. Department of Energy in Setting Appliance and Equipment Standards" ("NASEM Report").[55] The NASEM Report evaluated the Department's appliance rulemaking process and identified several key areas of DOE's rulemaking process that need improvement. Several of these recommendations align with suggestions AGA and others have made over the years regarding DOE's economic modeling and data availability and would greatly help all stakeholders better understand the agency's process and ensure that

[55] *Review of Methods Used by the U.S. Department of Energy in Setting Appliance and Equipment Standards*, NASEM (2021), available at https://www.nap.edu/read/25992/chapter/1 (last visited on October 5, 2022).

DOE bases its decisions on the most appropriate data and models. Some of the most pertinent recommendations include:

- **Recommendation 2-2:** DOE should pay greater attention to the justification for the standards, as required by executive orders and the EPCA requirement that standards be economically justified. DOE should attempt to find significant failures of private markets or irrational behavior by consumers in the no-standards case and should consider such a finding as being necessary to conclude that standards are economically justified.

- **Recommendation 3-5:** DOE should expand the Cost Analysis segment of the Engineering Analysis to include ranges of costs, patterns of consumption, diversity factors, energy peak demand, and variance regarding environmental factors.

- **Recommendation 4-1:** DOE should put greater weight on ex post and market-based evidence of markups to project a more realistic range of likely effects of a standard on prices, including the possibility that prices may fall. This would improve future analyses.

- **Recommendation 4-13:** DOE should place greater emphasis on providing an argument for the plausibility and magnitude of any market failure related to the energy efficiency gap in its analyses. For some commercial goods in particular, there should be a presumption that the market actors behave rationally, unless DOE can provide evidence or argument to the contrary.

- **Recommendation 4-14:** DOE should give greater attention to a broader set of potential market failures on the supply side, including not just how standards might reduce the number of competing firms, but also how they might impact price discrimination, technological diffusion, and collusion.

Despite NASEM's clear indication that DOE's analytical methods need improvement, the NOPR takes no effort to do so, essentially ignoring NASEM's recommendations. In contravention of Recommendation 2-2, the NOPR does not identify significant failures of private markets or even provide qualitative estimates of their magnitude in distorting rational economic behavior. Concerning Recommendation 3-5, DOE inadequately considers the diversity of markets and associated energy use patterns of consumers. Regarding Recommendation 4-1, DOE has neither addressed this recommendation nor proposed appropriate follow-up measures to assess errors in

its rulemaking assumptions. As related to Recommendation 4-13, in a crucial shortcoming, the Proposed Rule does not provide plausible arguments for market failure or even qualitative estimates of their magnitude in distorting rational economic behavior. In contrast to Recommendation 4-14, the NOPR fails to adequately assess the competitive dynamics on manufacturers and suppliers meeting the definition of small businesses, which may be extraordinarily vulnerable when having to meet over-reaching minimum efficiency standards. NASEM sent a letter to DOE on the recommendations.[56] DOE should revisit the Proposed Rule to address NASEM's recommendations and allow stakeholders an opportunity to comment on the revisions.

4. DOE Has Not Properly Addressed Critical Flaws Previously Identified in Earlier Rulemakings

The NOPR fails to recognize or address comments that AGA and other stakeholders have previously raised pointing out that the flawed legal rationale and the underlying analytical methodologies used for the economic justification for the Proposed Rule are unsupported by substantial evidence and rely on arbitrary and capricious reasoning. Since 2010, AGA has repeatedly pointed out flaws in DOE's prior suggestions that a condensing-only furnace standard would be economically justified and technically feasible.

More specifically, in a series of comments submitted by AGA from 2010 through 2018, AGA has pointed out that (1) a proposed standard at or above AFUE 90% would unlawfully render atmospherically-vented consumer gas furnaces unavailable to millions of consumers; (2) the economic analyses that DOE has relied on to justify the costs of similar proposed standards were based on materially flawed methods that, among other things, ignore evidence demonstrating actual and rational consumer purchasing behavior, fail to rely on the best available data on costs,

[56] *See* https://regulatorystudies.columbian.gwu.edu/joint-letter-dept-energy (last visited on October 5, 2022).

overestimate natural gas prices, and assume equipment life that is unsupported by evidence; (3) the proposed standards grossly underestimate the costs of installing condensing furnaces in homes with atmospheric venting systems (and fail to rely on substantial evidence to support those estimates); (4) the proposed standards ignored building code and other legal requirements that would prevent installation of condensing furnaces (due to venting issues) in many locations; (5) the proposed standards would actually increase lifecycle costs to consumers on a national basis; (6) DOE unlawfully failed to propose a separate class for non-condensing furnaces; (7) the proposals failed to consider impacts on local distribution utilities; (8) the proposals were premature because the proposed standards were issued before DOE promulgated testing procedures that could be used to evaluate performance and comply with them; and (9) the proposed standards would present negative effects on the environment, including increased emissions of certain pollutants.[57] Those prior comments also included a detailed and substantive critique of the technical analyses underlying similar proposals, including flaws in DOE's modeling approach and LCC analysis.[58] Like the current rulemaking, those prior comments pointed out deficiencies in the technical information that DOE made available to the public, including DOE's failure to make public information critical to understanding and analyzing DOE's LCC analysis and hindering a meaningful opportunity to comment.

[57] *See* Letter Regarding Energy Conservation Standards for Residential Furnaces, Nov. 4, 2010 (Attachment G); AGA Comments on Energy Conservation Standards for Residential Furnaces, Oct. 14, 2011 (Attachment H); Request for Opportunity to Speak at March 27, Public Meeting, March 20, 2015 (Attachment I); Energy Analysis, May 28, 2015 (Attachment J); AGA Response to NOPR on Energy Conservation Standards for Residential Furnaces, July 10, 2015 (Attachment K); Supplemental Comments on September 2015 NODA, Nov. 6, 2015 (Attachment L); Petition for Rulemaking by Spire Inc., APGA, NGSA, AGA, and NPGA, October 18, 2018 (Attachment M); and Comments of AGA, NGSA, and U.S. Chamber on Proposed Interpretive Rule, Oct. 12, 2021(Attachment N).

[58] Gas Technology Institute, Technical Analysis of DOE Notice of Proposed Rulemaking on Residential Furnace Minimum Efficiencies, July 7, 2015 (Attachment O).

To this date, DOE has not meaningfully addressed the issues above and carries the same flaws over to the current proposal. Accordingly, AGA is resubmitting the prior comments and technical analyses as attachments to these comments and as additional comments on the current proposal.[59] AGA also presents in these comments a new analysis that utilizes DOE's LCC spreadsheet model that demonstrates the fundamental defects in the underlying methods related to DOE's economic justification.

Given the significant procedural, evidentiary, and legal flaws identified in these and past comments, DOE should rescind the proposal and address the substantive procedural and analytical defects before a new rulemaking on consumer furnace standards can be proposed and presented for public review and comment. Failure to do so would result in the issuance of unlawful energy efficiency standards that the courts would vacate. As DOE is aware, it must support energy conservation standards with substantial evidence, follow the Process Rule, and afford stakeholders a meaningful opportunity to comment and address the issues raised by commenters.[60] It is not possible for DOE to address the proposal's legal, technical and procedural flaws without making significant revisions that must themselves be subject to stakeholder input through notice and comment procedures.

5. The NOPR Fails to Meet DOE's Evidentiary Burden

Congress specified that energy conservation standards must be "supported by substantial evidence" on the record.[61] This requires DOE to support its conclusions with evidence that "a reasonable mind might accept as adequate to support a conclusion."[62] The substantial evidence

[59] *See* n.57-58.
[60] *See* 42 U.S.C. § 6306(b).
[61] 42 U.S.C. § 6306(b).
[62] *Consolo v. Fed. Maritime Comm'n*, 383 U.S. 607, 619-20 (1966); *NRDC v. Herrington*, 768 F.2d 1355, 1422 (D.C. Cir. 1985).

standard does not "allow an agency to close its eyes to on-point record evidence without any explanation at all."[63] Where DOE relies on assumptions and inputs to support projections or models it must provide a sufficient explanation of those inputs and assumptions and why they were selected to allow the courts to determine whether those inputs and assumptions are supported by the evidence.[64]

The NOPR suffers from many evidentiary shortcomings that fail to meet DOE's burden. As noted repeatedly in these comments and previous comments that AGA provided regarding earlier iterations of the proposal, the NOPR's conclusion that the proposed standards would be economically justified and technically feasible rely on unexplained assumptions and conclusions. For example, the LCC analysis relies on unexplained assumptions about market conditions and consumer behavior that conflict with actual evidence regarding those conditions and behavior.[65] As AGA has repeatedly explained, the NOPR vastly underestimates the costs of installing condensing units in homes with atmospheric venting, which permeates the NOPR's erroneous evaluation of the costs and benefits of the proposed standards as well as their technical feasibility.[66] AGA details many other significant flaws in the following sections of these comments. Unless and until DOE corrects these flaws and provides stakeholders a meaningful opportunity to comment on those corrections, any version of the proposal will be rendered arbitrary and capricious and unsupported by substantial evidence. Furthermore, the flaws in DOE's issuance render it impossible to propose or consider alternative proposals. Only after the model used for the proposed standards economic justification is fixed can stakeholders truly evaluate the proposal and suggest cost effective and technically feasible alternatives.

[63] *Fogo de Chao (Holdings) Inc. v. U.S. Dep't of Homeland Sec.*, 769 F.3d 1127, 1147 (D.C. Cir. 2014).
[64] *NRDC*, 768 F.2d at 1422.
[65] *See, e.g.,* Section E.
[66] *See, e.g.,* Sections E. 1., E. 6, E. 8, E. 9.

C. DOE Should Establish Separate Product Classes for Condensing and Non-Condensing Furnaces

The NOPR is fatally flawed by the Department's failure to recognize that it must treat condensing and non-condensing furnaces as separate product classes for the purposes of setting energy conservation standards. In the last year and a half, the Department has arbitrarily changed its mind on this topic, ignoring EPCA's plain instructions.[67]

On January 15, 2021, the Department issued a final interpretive rule correctly determining that "in the context of residential furnaces, commercial water heaters, and similarly situated products/equipment, use of non-condensing technology (and associated venting) constitute a performance-related "feature" under the EPCA that cannot be eliminated through adoption of an energy conservation standard."[68] The January 15, 2021 Interpretive Rule noted that "EPCA precludes adoption of energy conservation standards that would limit the market to natural gas, propane gas, and/or oil fired furnaces, water heaters, or similarly-situated covered products/equipment that use condensing combustion technology," (as the NOPR would do) because that would "result in the unavailability of a performance related feature. . . .," namely "non-condensing technology (and associated venting)."[69] Among the important implications of the January 15, 2021 Interpretive Rule was that the Department must establish separate classes of condensing and non-condensing residential furnaces and water heaters to enable the Department to establish separate energy conservation standards without eliminating important products and features from the market.

---

[67] *See e.g.,* Attachments M and N.
[68] *Energy Conservation Program for Appliance Standards: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters*, 86 Fed. Reg. 4776 (Jan. 15, 2021) ("January 15, 2021 Interpretive Rule"). The Department Promulgated the January 15, 2021 final interpretive rule in response to a petition for rulemaking submitted by APGA, Spire, NGSA, AGA, and NPGA (collectively, " Petitioners").
[69] *See* 86 Fed. Reg. at 4816; 42 U.S.C. § 6295(o)(4).

Eleven months later, on December 29, 2021, the Department rescinded the January 21, 2021 Interpretive Rule, issuing a new interpretive rule. The new Proposed Rule wrongfully asserts that the differing constraints and functionality between condensing and non-condensing appliances do not constitute performance-related features.[70] The NOPR relies on the December 29, 2021 Interpretative Rule's flawed interpretation of EPCA to treat condensing and non-condensing products as the same class. Failure to correct this will render a final version of the NOPR arbitrary, capricious, and contrary to law.

The records for the January 21, 2021 Interpretive Rule and the December 29, 2021 Interpretive Rule include substantial comments, including the Petition, supporting comments, and the Petitioners' comments opposing the proposed version of the December 29, 2021 Interpretive Rule.[71] In the interest of expedience, AGA incorporates those materials by reference in these comments,[72] but highlights some of the key points below.

1. Non-Condensing Furnaces Provide Consumers with Unique Performance-Related Characteristics and Consumer Utility

The Proposed Rule would render natural gas heating products suitable to building design, climate, and consumer preferences unavailable to millions of consumers. It is undisputed that the proposed non-weatherized gas furnace and mobile home furnace energy conservation standards can only be met by natural gas furnaces if they use condensing technology. Replacing conventional natural gas furnaces that do not use condensing technology with those that do would require the renovation of millions of homes and would often be infeasible.

---

[70] *Energy Conservation Program for Appliance Standards: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters*, 86 Fed. Reg. 73947 (Dec. 29, 2021) ("December 29, 2021 Interpretive Rule").

[71] The as noted above, AGA and others filed a petition for review of the December 29, 2021 Interpretive Rule in the D.C. Circuit, because it is unlawful. American Gas Association, *et al.* v. DOE, No. 22-1030 (D.C. Cir. filed Feb. 22, 2022). That petition has been held in abeyance.

[72] *See, e.g.,* Attachments M and N.

Many conventional natural gas heating products, such as furnaces, commercial water heaters, and boilers, in American homes and businesses are designed for use with atmospheric venting systems. Atmospheric venting systems allow the exhaust gases produced in combustion, which are under negative pressure, to exit a building through a vertical or nearly vertical chimney or conduit using the heat and buoyancy of the gases to carry them outside. Atmospheric venting has been used in the United States for generations and remains the primary exhaust gas venting system in millions of homes, apartments, and businesses.

Natural gas products that use condensing combustion technology can achieve higher measured efficiencies than conventional or "non-condensing" products, but they are not compatible with conventional atmospheric venting systems. Condensing products increase thermal efficiency by extracting additional heat from the combustion gases before they are vented. This increases the efficiency of the products but creates two conditions that are significantly different than conventional furnaces. First, the condensing process generates cooler exhaust gases that lack sufficient buoyancy to exit a building through an atmospheric venting system and cannot be "common vented" with other appliances connected to an atmospheric venting system.[73] Instead, condensing products require positive pressure venting—generally through a horizontal conduit powered by a fan or other additional electronic device—to generate sufficient pressure and flow to vent the gases. They also require plumbing drains to dispose of the condensate developed in the operation of the appliance (in contrast, non-condensing appliances do not create condensate).

As such, condensing products are a viable option for many consumers, but they are also incompatible with millions of homes and workplaces. As noted, American buildings have been

[73] There are literally millions of installations throughout the United States that have two or even three gas appliances common vented into a single chimney or vent. Second, the condensing process generates liquid condensate that must be disposed.

using atmospheric venting for generations.[74] Millions of homes, townhomes, apartment buildings, offices, and other commercial buildings were built with utility closets, chimneys, and conduits designed for this technology. Non-condensing furnaces have the unique ability to share a common atmospheric vent with other non-condensing products, like non-condensing water heaters. Many of these structures also lack existing plumbing systems to dispose of the condensate.

As a result, installing condensing products can be problematic, requiring major modifications to these buildings. The homeowner or business must install a new positive pressure venting system, that includes new electric equipment, *e.g.,* fans to create positive pressure, new conduits for the exhaust, new plumbing for the condensate, and additional modifications to accommodate exhaust from other existing appliances that use atmospheric venting. Homeowners and their contractors must also consider specific building and safety code requirements and physical constraints (such as adjoining walls in many townhome and urban settings) that may constrain the ability to perform the needed modifications. The homeowner or business must also install plumbing to deal with the condensate. In the event the homeowner or business also has other common vented appliances, *e.g.,* a gas water heater, the homeowner or business must either resize the vent for the other appliance to be compatible to the existing venting system or replace it with another unit. AGA addresses additional installation concerns below.[75]

The bottom line is that non-condensing atmospherically-vented consumer furnaces provide an important performance-related feature to millions of homes and businesses: they work with the homeowner or business's existing utility structure venting system. The NOPR would make them

[74] For example, Energy Information Agency data shows that "more than half of all commercial buildings were constructed before condensing commercial water heaters were introduced to the market." *Energy Conservation Program for Appliance Standards: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters: Proposed rule*, 84 Fed. Reg. 33011 (July 11, 2019).
[75] *See, e.g.,* Section D. 1, and E. 9.

unavailable and push millions of Americans to drop natural gas furnaces altogether to avoid the necessary remodeling.

2. EPCA Requires that DOE Adopt a Product Class Structure that Maintains the Availability of Non-Condensing Furnaces to Consumers

EPCA authorizes the Department to establish energy conservation standards for certain "covered products," including residential furnaces, boilers, and water heaters.[76] However, Congress was careful to ensure that energy conservation standards would not eliminate the availability of preferred types of appliances or product features that consumers desire and on which they depend. The Department may not promulgate standards that are "likely to result in the unavailability in the United States in any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States at the time of the finding."[77] To help avoid doing so, Congress instructed the Department to prescribe standards for a separate "class" of products if it determines that the products have a capacity or other "performance-related feature," "which other products within a product class do not have" and "such feature justifies a higher or lower standard."[78] This provision is directly applicable to this rulemaking proposal. Unless the Department recognizes that non-condensing products' ability to function with existing atmospheric venting systems in millions of homes provides a performance-related feature warranting treatment as a separate class, the proposed conservation standards will render furnaces, boilers, and water heaters with important performance characteristics unavailable.

Congress did not specifically define "performance characteristics" or "performance-related features." However, EPCA's text, structure, and context show that the "performance

[76] 42 U.S.C. §§ 6295(a), (e), (f).
[77] *Id.* § 6294(o)(4).
[78] *Id.* § 6294(q)(1).

characteristics" and "performance related features" protected from elimination (or being rendered "unavailable") by energy conservation standards include the characteristic and/or feature of being able to work in one's home without requiring significant structural or aesthetic renovation.[79]

First, a "characteristic" is commonly understood to mean "a distinguishing trait, quality, or property."[80] "Performance" refers to a product's "ability to perform" or the "manner in which a mechanism performs."[81] So, a performance characteristic is a distinguishing trait, quality, or property relating to a product's ability to perform or the way it does so. Similarly, a "feature" is a "prominent part or characteristic" of a product or a "special attraction" such as "something offered to the public or advertised as particularly attractive."[82] Consistent with this understanding, Congress further directed the Department to consider, among other things, "the utility to the consumer of such a feature," *i.e.*, the characteristic's or feature's usefulness, when evaluating whether to develop separate classes. Through Sections 6294(o)(4) and 6295(q)(1), Congress, therefore, ensured that energy conservation standards would not eliminate traits, qualities, or characteristics of products that make them work for consumers or are otherwise attractive to them.

Second, Congress ensured that the energy conservation standards would be neutral as to which fuels that covered products use, protecting the standards from being used to favor one fuel source over another. Congress prescribed the initial energy conservation standards that it deemed appropriate for furnaces, boilers, and commercial water heaters.[83] It set separate standards for gas,

---

[79] *See Davis v. Mich. Dep't of Treasury*, 489 U.S. 803, 809 (1989) ("It is a fundamental canon of statutory construction that the words of a statute must be read in their context and with a view to their place in the overall statutory scheme.").
[80] Characteristic, Merriam-Webster Online Dictionary 2022 https://www.merriam-webster.com/dictionary/characteristic (Aug. 17, 2022).
[81] Performance, Merriam-Webster Online Dictionary 2022, https://www.merriam-webster.com/dictionary/performance (Aug. 17, 2022).
[82] Feature, Merriam-Webster Online Dictionary 2022, https://www.merriam-webster.com/dictionary/feature (Aug. 17, 2022).
[83] 42 U.S.C. § 6294(a), (e), (f).

oil, and electric appliances and then directed the Department to update them in certain circumstances, but only at efficiency rates that "the Secretary determines [are] not likely to result in a significant shift from gas heating to electric resistance heating."[84] EPCA thus treats classes or categories of products differently, based on the type of fuel they used, demonstrating that separate standards are appropriate to prevent the elimination of fuel-type and other performance-related features from the market. That is true even when it results in the availability of less efficient products that serve the same overall purposes, *e.g.*, heating water/steam.[85]

Third, Congress ensured that the energy conservation standards would not eliminate a class of covered products or render them unworkable through infeasible or overly costly standards. Any amended conservation standards must be "technologically feasible and economically justified."[86] To be "technologically feasible," a standard must be capable of being carried out. That is, the entire class of covered products, *e.g.*, all gas furnaces, must be capable of complying with the standards.

Fourth, recognizing the desire to foster both the development and marketing of new efficient technologies and to ensure consumers do not lose the ability to purchase the types of products they desire or, in the case of atmospheric venting, that their homes were designed to use, Congress specifically contemplated sub-categorizing covered products. As stated above, Congress prohibited the Department from promulgating standards that are "likely to result in the unavailability in the United States of any covered product type (or class) of performance characteristics (including reliability) features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States."[87] Congress recognized that products

[84] 42 U.S.C § 6295(f)(1)(B)(iii).
[85] *See id*.
[86] 42 U.S.C § 6294(o)(2)(A).
[87] 42 U.S.C. § 6295(o)(4); § 6313(a)(6)(B)(iii)(II).

using different fuel types, *e.g.*, gas, oil, and electricity, create valuable options for consumers but operate differently and warrant separate efficiency standards. For example, as noted above, Congress itself set statutory energy conservation standard levels for water heaters and boilers based on fuel type.[88] EPCA also provides for establishing separate classes where appliances "consume a different kind of energy from that consumed by other covered products within such type (or class)." [89]

Congress further recognized that subcategorization would allow for higher and lower energy conservation standards among competing products in a category. "A rule prescribing an energy conservation standard for a type (or class) of covered products shall specify a level of energy use or efficiency higher or lower than that which applies (or would apply) for such type (or class) for any group of covered products which have the same function or intended use," if the Secretary determines that covered products within such group "have a capacity or other performance-related feature which other products within such type (or class) do not have" and "such feature justifies a higher or lower standard."[90]

As such, when read in context, performance characteristics and performance-related features are at least characteristics that render a product useful for its intended use and that allow the Department to differentiate the product from others in a category. Here, that intended purpose would be providing heat or hot water in a home designed with atmospheric venting. Consistent with Congress' plan, creating separate classes would allow the Department to set robust efficiency levels for both condensing and non-condensing appliances while promoting consistent innovation. The Department must create a separate class for those products.

[88] *Id*. § 6295(e)(1), (f)(3).
[89] *Id*. § 6295(q)(1)(A).
[90] *Id*. § 6295(q)(1).

D. DOE's Treatment of Venting Issues Raised by Condensing-Level Standards is Unreasonable and Contrary to Law

The NOPR would impose standards that only condensing products can achieve. Although condensing consumer furnaces are readily available and have already captured a significant percentage of consumer furnace sales, condensing products are not suitable for all installations. As explained below, the imposition of standards that non-condensing products cannot achieve would raise significant practical, economic, and legal issues. The economic analysis in the NOPR fails to properly account for the necessary engineering relative to venting consumer furnaces or common venting of multiple appliances, including consumer water heaters. Cumulatively, inaccurate assumptions undermine the NOPR's economic evaluation and its estimate of the market impacts the proposed standards would have.

1. A Condensing Only Standard Would Impose Significant Burdens on Consumers

Condensing products can be an attractive option for consumers but their feasibility depends on a building's design, cost, and other factors. The modifications required to alter existing buildings to accommodate the use of condensing products are far more complicated, extensive, and burdensome than the NOPR assumes.[91] Millions of homes were built with mechanical rooms, chimneys, venting, and associated infrastructure designed for atmospherically-vented appliances and equipment. Non-condensing consumer furnaces have the unique ability to share a common atmospheric vent with other non-condensing products, like non-condensing water heaters. The heat and volumes of gases combine to create the conditions necessary to carry the gases out of the building without powered positive pressure systems. Therefore, the installation of non-condensing

[91] *Energy Conservation Program for Appliance Standards: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters: Proposed Rule*, 84 Fed. Reg. 33011 (July 11, 2019).

furnaces must be coordinated with the design configuration and functioning of other appliances. Additionally, many homes designed with atmospheric venting lack accessible drainage, waste, and vent systems to dispose of the condensate. The burdens required to transition from a non-condensing furnace to a condensing furnace would be substantial in many cases.

Atmospheric venting systems allow the exhaust gases produced in combustion, which are under negative pressure, to exit a building through a vertical or nearly vertical chimney or conduit using the heat and buoyancy of the gases to carry them outside. Atmospheric venting has been used in the U.S. for generations and remains the primary exhaust gas venting system in millions of homes, apartments, and businesses. Many of these installations throughout the country have multiple vented gas appliances common vented into a single vent or chimney.

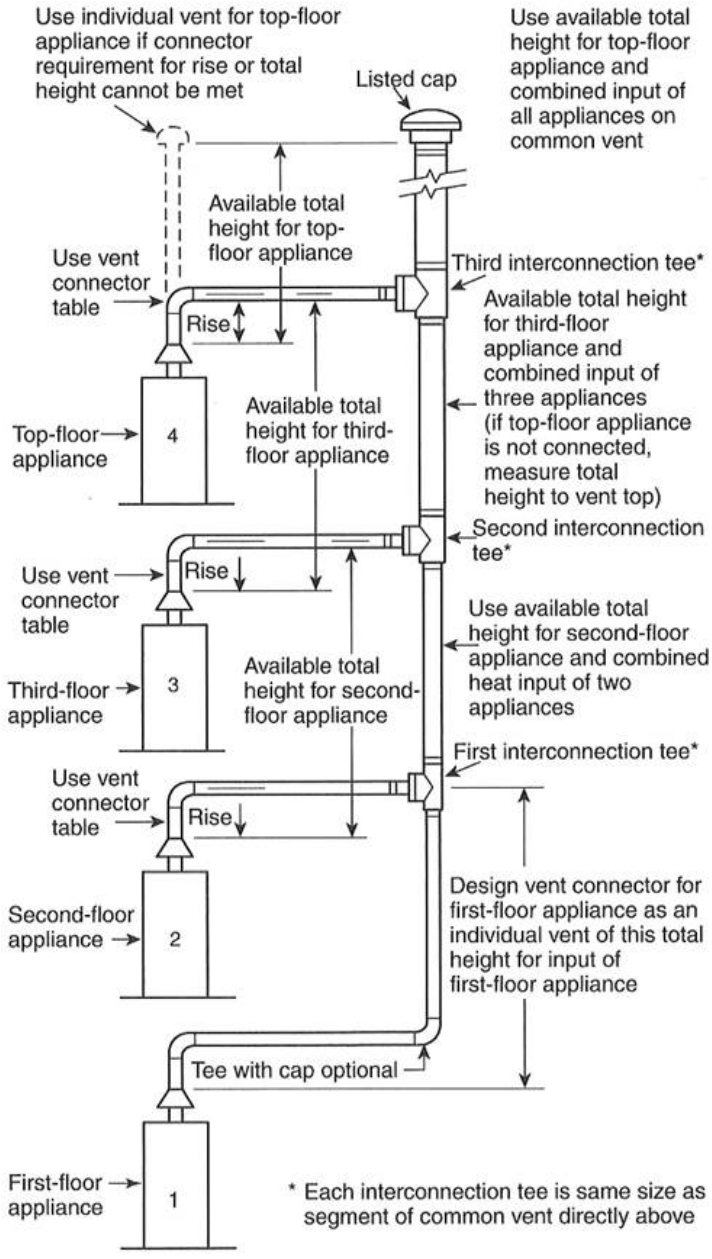
In condensing appliances, the condensing process generates cooler exhaust gases that the appliances discharge into the venting system under positive pressure. Additionally, the condensing process generates liquid condensate that must be disposed. Because of these conditions, condensing products require positive pressure venting—generally through a horizontal conduit powered by a fan or other additional electronic device—to generate sufficient pressure and flow to vent the gases. They also require plumbing drains to dispose of the condensate developed in the operation of the appliance. They lack sufficient buoyancy to exit a building through an atmospheric venting system and cannot be "common vented" with other appliances already connected to an atmospheric (non-positive) venting system.

Condensing furnaces are generally classified as either a power vent furnaces, either induced draft or forced draft. A power vent furnace is typically vented horizontally and vents exhaust through a horizontal pipe that leads out of a building or home. An added fan/blower pushes the exhaust gases through this pipe. Extra power is required to power the blower, and this power source

is separate from powering the furnace. A direct vent furnace uses special coaxial venting that has separate chambers for intake air and exhaust in a single assembled vent piece. The venting runs from the furnace through the side of a building or home. They pull and push air from outside to negate any back-drafting within the building or home.

Without non-condensing consumer gas-fired furnaces and their ability to utilize commonly vented Category 1 venting systems (described below), owners of a building designed with a common vent would often have no satisfactory options when it comes to replacing the furnace. As noted, atmospherically vented buildings are typically located in urban centers. Many homes in those areas have restricted exterior locations, *e.g.,* townhomes with adjoining walls, thus limiting a building owner's options for the side wall venting required for condensing products when an appliance needs to be replaced. Additionally, there are interior considerations a purchaser must consider when replacing a non-condensing appliance with a condensing appliance, including accessibility to condensate drain lines and often extensive renovations to accommodate new venting systems. Similarly, multistory buildings can not utilize horizontal venting for the same reasons traditional vented dryers can't, as it is impossible to install and service vent terminations. In many cases, wall penetrations would compromise the structural integrity of the building. Additionally, on lower floors, terminations would have to be seven feet above public sidewalks and streets, which is often impossible in an urban area. Finally, removing one or more consumer furnace would disrupt the venting systems of the other locations. Non-condensing furnaces can offer "unique utility." They are the only suitable gas replacement option in many existing applications that utilize common venting or masonry chimneys. Furthermore, they are the only gas space heating option that can be installed without the necessity of disposing of condensate and without electrical systems for the added load of electric furnaces.

Principles of Design of Multistory Vents Using Vent Connector and Common Vent Design Tables[92]



Replacing an existing non-condensing with a condensing furnace requires significant building renovations. At a minimum, a new horizontal venting system compatible with a condensing furnace is required as well as a means to dispose of condensate. The existing vertical

[92] Figure F.1(n), *National Fuel Gas Code*, ANSI Z223.1/NFPA 54, 2021 edition.

venting system simply cannot be used. Additional complications exist when two or more non-condensing appliances are common vented through a single vertical venting system. When one (or more) non-condensing appliance is replaced with a condensing appliance, the existing venting system needs to be redesigned and configured to account for the lower number of appliances.

Failing to recognize the differences between condensing and non-condensing products is inconsistent with how building and safety code experts treat these products. For example, the safety standard, *Gas-fired Central Furnace*, CSA/ANSI Z21.47:2021 • CSA 2.3:2021, defines furnace categories as:

> **Furnace - Central** — a self-contained, gas-burning appliance for heating air by transfer of heat of combustion through metal to the air, and designed to supply heated air through ducts to spaces remote from or adjacent to the appliance location. Central furnaces are divided into four categories based on the static pressure produced in the vent and the flue loss.
>
> > **Category I** — a central furnace that operates with a non-positive vent static pressure and with a flue loss not less than 17%.
> >
> > **Category II** — a central furnace that operates with a non-positive vent static pressure and with a flue loss less than 17%.
> >
> > **Category III** — a central furnace that operates with a positive vent static pressure and with a flue loss not less than 17%.
> >
> > **Category IV** — a central furnace that operates with a positive vent static pressure and with a flue loss less than 17%.

A central furnace can be of the following types:

> **Down-flow furnace** — a furnace designed with air flow discharge vertically downward at or near the bottom of the furnace.
>
> **Forced air furnaces** — a furnace equipped with a fan or blower which provides the primary means for circulation of air.
>
> **Forced air furnace with cooling unit** — a single-package unit, consisting of a gas-fired forced air furnace of one of the types listed in forced air furnaces, above, combined with an electrically or gas-operated summer air conditioning system, contained in a common casing.

For installation in a manufactured (mobile) home — a forced air furnace for alcove or closet installation, or an enclosed furnace, which is intended for installation in a manufactured (mobile) home and designed to be readily convertible for use with natural gas and propane gas.

For recreational vehicle installation — a forced air direct vent furnace that is intended for installation in a recreational vehicle and designed to be readily convertible for use with natural gas and propane gas or for use with propane gas only.

Horizontal furnace — a furnace designed for low headroom installation with air flow across the heating element essentially in a horizontal path.

Up-flow furnace — a furnace designed with air flow discharge vertically upward at or near the top of the furnace. This classification includes "highboy" furnaces with the blower mounted below the heating element and "lowboy" furnaces with the blower mounted beside the heating element.

Regarding direct vent central systems, such systems consist of the following:

a. a central furnace for indoor installation;
b. combustion air connections between the central furnace and the vent-air intake terminal;
c. flue gas connections between the central furnace and the vent-air intake terminal; and
d. a vent-air intake terminal for installation outdoors, constructed so all air for combustion is obtained from the outdoor atmosphere and all flue gases are discharged to the outdoor atmosphere.

Direct vent central furnaces are divided into four categories based on the pressure produced in the vent and the difference between actual vent gas temperature and the dew point temperature. (See above definitions of Category I, II, III and IV.) Direct vent central furnaces can also be divided into the following two types:

Type FSP — a direct vent central furnace system in which the combustion air connections, the flue gas connections, and the vent-air intake terminal may be specified by the furnace manufacturer to be supplied by the installer.

Type MSP — a direct vent central furnace that has all elements of the system supplied by the manufacturer

The Method of Test in Clause 5.7 (*Category Determination*) of this standard determines the venting category required for the furnaces equipped with draft hoods or draft diverters. Table 12, *Determination of Category*,[93] and Figure 7, *Chart for Determination of Furnace Category*,[94] uses the test data produced to classify the necessary venting system as Category I, II, III or IV based on two specific results, the vent pressure and the net flue gas temperature.

Table 13

Determination of Category[95]

	Vent Pressure	**Net flue gas temperature °F (°C) (see Figure 7)**
Category I	Non-positive	On or above curve[1]
Category II	Non-positive	Below curve[1]
Category III	Positive	On or above curve1[1]
Category VI	Positive	Below curve[1]
[1] Reference American Gas Association Laboratories Report 1509 (Copyright © 1976) with curve based upon a 17 percent flue loss.		

Further, when installing a venting system for a furnace, the building owner must comply with existing fuel gas code provisions, which restrict the location of the vent terminations in relationship to:

[93] CSA/ANSI Z21.47:2021 • CSA 4.2.3:2021, *Standard for Gas-fired Central Furnaces.*
[94] CSA/ANSI Z21.47:2021 • CSA 4.2.3:2021, *Standard for Gas-fired Central Furnaces.*
[95] Table 7, Chart for the Determination of Vent Category, from CSA/ANSI Z21.47:2021 • CSA 4.2.3:2021, *Standard for Gas-fired Central Furnaces*, is applicable to both natural gas and propane-fired appliances.

- Clearance to operable windows and doors - 6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 9 in (23 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW), 12 in (30 cm) for appliances > 50,000 Btuh (15 kW).
- Clearance above grade – 6 inches.
- Clearance above a jurisdiction's expected snow line.
- Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance – 4 ft (1.2 m) below or to side of opening; 1 ft (300 mm) above opening.
- Clearance to a mechanical air supply inlet – 3 ft (91 cm) above if within 10 ft (3 m) horizontally.
- Clearance above paved sidewalk or paved driveway located on public property – 7 ft (2.13 m) for mechanical draft systems (Category I appliances). Vents for Category II and Category IV appliances cannot be located above public walkways or other areas where condensate or vapor cause a nuisance or hazard.

2. Failure to Adopt Separate Product Classes Would Be Inconsistent with DOE Precedent

Failing to adopt a separate class for non-condensing furnaces also is inconsistent with the Department's historical interpretation and application of EPCA. The Department has repeatedly recognized that performance-related features include those that affect a product's intended utility, conditions under which the products can be used, and design-specific factors that influence energy consumption. For example, when the Department reevaluated the standards for central air-conditioners and heat pumps and packaged terminal air conditioners, it recognized separate classes of "space constrained" and "non-standard sized" units from standard air conditioners because of their performance-related feature: accommodating the space constraints of many homes and apartments. The Department specifically noted that EPCA instructs it to avoid promulgating standards that would render a class of covered products, like window air-conditioning units, unavailable by failing to recognize the space constraints. It justified maintaining the separate classes of products, in part, on the need to avoid imposing standards that would require extensive building modifications. As the Department put it, "[t]he space-constrained product class acts as a

safe harbor for product types . . . [like window units] whose efficiency is limited by physical dimensions that are rigidly constrained by the intended application."

Similarly, the Department has recognized different product classes for electric residential clothes dryers to address differences in product features concerning installation space constraints—e.g., small laundry machine closets—and differences in electrical power supply. It adopted a product class for tabletop water heaters in 2001 to accommodate "strict size limitations" for the products. It similarly treats high-speed/small-diameter, highly decorative, and belt-driven ceiling fans as separate classes than standard ceiling fans to preserve "consumer options."

Perhaps most importantly, the Department previously recognized that condensing and non-condensing furnaces present significant design differences that warrant different product classes for the separately regulated furnace fans that work with them. The Department created nine different classes of residential furnace fans based on "application-specific design differences" that impact energy consumption and are, therefore, "performance-related features." The Department explained that "[t]he presence of a secondary heat exchanger [in condensing furnaces] increases static pressure," which causes furnace fans used with condensing furnaces to consume more electricity than furnace fans used with non-condensing furnaces. Similarly, the Department noted that "[s]pace and design constraints are different for products installed indoors compared to outdoors," and those constraints "will impact furnace fan performance differently because furnace fan energy consumption is dependent on clearances and airflow path." That is, the Department focused on the impact that non-consumer-facing, highly technical equipment factors had on the functionality and efficiency of the equipment when recognizing separate classes.

The Department has similarly proposed creating a separate class for "small" mobile home gas furnaces.[96] The Department correctly proposes to do so in recognition of the space constraints consumers face with these products and the increased costs uniform standards would impose on those consumers.[97]

The Department's assertion that it views a product's "utility" only "as an aspect of a product that is accessible to the layperson and is based on user operation and interaction with the product" is unreasonable and belied by these past rules. To justify this, the Department has argued that it recognizes user-facing features, such as having a window on an oven door or a front-loading washing machine door, as performance-related features because some consumers prefer those interfaces. That is true as far as it goes. But regardless of whether consumers regularly interface with the condensing equipment in their gas-fired appliances, a furnace serves a consumer limited or no utility if it can only be used after renovating a home or business. As the Department recognized in the furnace fan rule, the "application-specific design" differences between condensing and non-condensing appliances create performance-related features that must be differentiated.

Just like dryers that can fit in consumer's apartment buildings without remodeling or losing living space serve a vital utility, natural-gas appliances that function with existing chimneys and plumbing designed around non-condensing appliances serve a vital utility. Just like air conditioners that can replace window units or other smaller units without requiring renovation provide an important feature and utility to consumers, natural-gas appliances that can replace existing non-condensing appliances without requiring renovation provide and important feature

[96] NOPR, 87 Fed. Reg. at 40614.
[97] *Id.* The Department's consideration of costs in relation to developing a separate class of mobile home gas furnaces directly controverts its assertion that it can only consider costs when evaluating whether standards are cost justified.

and utility to consumers. Just like the space constraints in mobile homes justify a separate class of mobile home gas furnaces, the physical constraints of homes designed for atmospheric venting justify a separate class for non-condensing furnaces that use atmospheric venting. Just as the design demands for condensing and non-condensing furnaces warranted separate classes for the furnace fans that work with them, those design demands warrant separate classes for the furnaces themselves. While features that consumers regularly interface with, like oven windows and dryer doors, are important performance-features too, it is absurd to suggest features that make the product work in a consumer's existing homes are not.

In addition to supporting the January 15, 2021 Interpretive Rule's reading of EPCA, the examples above show that the December 29, 2021 withdrawal of that reading was arbitrary and capricious and a breach of due process. The Department cannot consider the space and functional constraints a "performance-related feature" justifying separate standards for the covered products discussed above, but not for furnaces, commercial water heaters, and boilers with similar constraints. Nor can the Department consider costs when evaluating whether to develop a separate class for mobile home furnaces while ignoring cost for the same analysis with regard to standard furnaces. The Department should follow its past practice and continue to recognize non-condensing furnaces that work in homes constrained by existing exhaust and plumbing systems as a separate class from condensing products.

3. The Proposal Violates the "Unavailability" Provision of EPCA

The NOPR's failure to create a separate class for non-condensing furnaces also ensures that the proposed energy conservation standards would violate EPCA's "unavailability provision." As noted above, EPCA prohibits the Department from prescribing standards that are "likely to result in the unavailability in the United States in any covered product type (or class) of

performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States."[98] In 2018, the Gas Industry Petitioners submitted a rulemaking petition establishing that standards like these, which require condensing technology, would result in the unavailability of non-condensing natural gas furnaces needed to millions of consumers and would render all natural gas furnaces unavailable to consumers uninterested or unable to modify their homes to accommodate positive pressure venting. AGA incorporates the submission here as Attachment M. The evidence has not been controverted.[99] AGA also reincorporates the October 12, 2021 comments submitted by AGA, *et al.* (Attachment N), which demonstrate that the factual findings from the January 2021 Interpretive Rule remain uncontroverted.[100] Pursuant to 42 U.S.C. §§ 6295(o)(4), AGA requests that any final rule in this proceeding include a written finding that interested persons have established by a preponderance of the evidence that the proposed standards are likely to result in the unavailability in the U.S. of residential furnaces with "performance characteristics (including reliability, features, sizes, capacities, and volumes) that are substantially the same as those generally available in the United States" on the date any such rule issues.

4. The Proposal Unlawfully Imposes "Design Requirements" on Furnaces

The NOPR exceeds DOE's authority because it effectively imposes "design requirements" on furnaces. EPCA authorizes DOE to develop "energy conservation standards" for furnaces. "Energy conservation standards" are (i) "a performance standard which prescribes a minimum level of energy efficiency or a maximum quantity of energy use," or (ii) "a design requirement for

[98] 42 U.S.C. § 6295(o)(4).
[99] Indeed, the December 2021 Interpretive Rule did not disagree with the factual assertions in the petition. It just concluded that it would evaluate the complexities of trying to install a condensing appliance in a home designed for non-condensing appliances as part of its analysis of the costs of the new standards. *E.g.*, 86 Fed. Reg. at 73968; *see also id*. at 73952 ("DOE agrees with the commenters that little has changed in terms of the technology or operation of the products/equipment at issues since promulgation of the January 2021 Final Interpretive Rule.")
[100] Attachment N at p. 28-33.

the products specified in paragraphs (6), (7), (8), (10), (15), (16), (17), and (20) of section 6292(a) of this title . . . ."[101] The products specified in the enumerated paragraphs of Section 6292(a) are dishwashers, clothes washers, clothes dryers, kitchen ranges and ovens, showerheads, water closets, and metal halide lamp fixtures, *not* furnaces. Congress's decision to exclude furnaces from the list of products for which DOE can include design requirements demonstrates that DOE may not develop design requirements for furnaces. As stated by the D.C. Circuit in ruling against DOE that standing pilot lights were not an authorized design requirement for decorative fireplaces: "Whereas Congress authorized DOE to impose performance requirements on *all* covered products, it specifically limited its authority to impose design requirements to just a handful of product classes. *Id.* § 6291(6)."[102]

However, imposing design requirements is exactly what the proposal would do. It would require furnaces to have a condenser—a design element of a furnace. It carries other design requirements that the proposed standards would effectively impose on homeowners. As noted above, condensing furnaces require a positive-pressure exhaust system with horizontal piping made from different materials than those typically found in millions of American homes with vertical atmospheric (negative pressure) vents. Condensing furnaces also require additional equipment, including electric fans to push out the exhaust and drainage systems to dispose of the condensate. In short, by setting standards that require condensers, the proposal includes design requirements that will force compliant furnaces to be designed in a way that makes them

[101] 42 U.S.C. § 6291(6). The definition of "energy conservation standard" also "includes any other requirements which the Secretary [of Energy] may prescribe under section 6295(r) of this title." Section 6295(r), in turn, says that "[a]ny new or amended energy conservation standard prescribed under this section shall include, where applicable, test procedures prescribed in accordance with section 6293 of this title and may include any requirement which the Secretary determines is necessary to assure that each covered product to which such standard applies meets the required minimum level of energy efficiency or maximum quantity of energy use specified in such standard." It does not include design requirements.

[102] *Hearth, Patio & Barbecue Ass'n*, 706 F.3d., 499, 509 (2013).

incompatible with millions of homes, absent renovation. This is contrary to EPCA's exclusion of furnaces from DOE's ability to impose design requirements on certain products. While the furnace standard is phrased in numerical terms, the result is the same: the requirement of a condenser and other design elements. "DOE cannot now escape these limits [in EPCA] through its 'linguistic jujitsu.'"[103]

5. The Courts Will Not Defer to the Department's Proposed Interpretation of the "Unavailability" and "Performance-Related Features" Provisions

Any intent by the Department to rely on Chevron deference to defend the use of the December 2021 Interpretive Rule's position on developing separate classes is misplaced. The starting point for any inquiry into whether an agency has the authority to promulgate a rule is the words of the governing statute. An agency may not exercise its authority "in a manner that is inconsistent with the administrative structure that Congress enacted into law."[104] Rather the agency and the courts "must give effect to the unambiguously expressed intent of Congress."[105] Even where, as here, an agency relies on a purported ambiguity, the courts will not defer to an agency's interpretation until first "exhausting all the 'traditional tools'" of statutory interpretation and determining the statute is genuinely ambiguous.[106] Only after making such a determination will the courts evaluate whether the "agency's answer is based on a permissible construction of the statute" and therefore subject to deference.[107]

The courts will pay particular scrutiny to the Department's interpretation in this case because the Department asserts the authority to eliminate the availability of a class of natural gas

[103] *Id.* at 507 (quoting *Sherley v. Sebelius*, 644 F.3d 388, 399 (D.C.Cir.2011) (Henderson, J., dissenting)).
[104] *ETS Pipeline Project v. Missouri*, 484 U.S. 495, 517 (1988).
[105] *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 842-843 (1984).
[106] *Kisor v. Wilkie*, 139 S. Ct. 2400, 204 L. Ed. 2d 841 (2019); *Chevron U.S.A. Inc.*, 467 U.S. at 843 n. 9.
[107] *Chevron U.S.A. Inc.*, 467 U.S. at 843.

appliances to millions of Americans.[108] Courts presume that "Congress intends to make major policy decisions itself,"[109] and "[e]xtraordinary grants of regulatory authority are rarely accomplished through 'modest words,' 'vague terms,' or subtle device[s]."[110]

As discussed above, Congress made its intentions quite clear in EPCA. The Department must consider characteristics or aspects of a class of covered products that make them useful to consumers, "a performance-related feature" that warrants separate standards and it must not set standards that would be "likely to result in the unavailability" of currently available "performance characteristics." The Department's interpretation to the contrary is not based on any ambiguity in the statute, but rather a desired policy outcome that fails to adhere to the structure Congress enacted into law. Even if there was ambiguity, the Proposal does not present a "permissible interpretation of the statute."

E. DOE's Assessment of the Maximum Technical Feasibility Levels and Cost Justification for the Proposal Overestimates the Benefits and Underestimates the Costs

DOE's modeling of consumer purchasing behavior in the absence of a revised standard – that is, its development of a baseline used to evaluate each of its proposed standard levels – is flawed. In particular, DOE's baseline assigns natural gas furnace technologies of varying efficiency to consumers without any regard to consumer costs and benefits. For instance, DOE randomly assigns non-condensing furnaces to consumers who have what DOE calls a "negative payback period" for a more-efficient furnace, *i.e.*, the purchase and installation cost and the first-year energy costs of the more efficient condensing furnace is lower than the purchase and

[108] Indeed, the rule implicates "major questions" of political and economic significance. *See West Virginia v. EPA*, 142 S. Ct. 2587 (2022).
[109] *United States Telecom v. FCC*, 855 F.3d 381, 319 (D.C. Cir. 2017).
[110] *West Virginia v. EPA*, 142 S. Ct. 2587, 2609.

installation cost and first-year energy costs of the non-condensing furnace. In addition, DOE's analysis underestimates the number of consumers likely to fuel switch and misidentifies which consumers are likely to fuel switch due to the Proposed Rule. These methodological defects have led DOE to overestimate the proposed standards' benefits and underestimate the costs.

AGA has submitted to DOE technical analysis that uncovered critical technical flaws in the modeling approach DOE uses as the basis of its life-cycle-cost analysis. The previously identified critical methodological issues persist in the modeling used for this rulemaking and continue to undermine the integrity of the results in the life-cycle-cost analysis used to justify the rule.

1. DOE's Energy Efficiency Distribution for Furnaces in the No-New-Standards Cases Suffers Critical Defects that Voids DOE's Economic Analysis

DOE's economic analysis suffers from a critical defect in the economic criteria of how gas furnace efficiencies are assigned to consumers in the No-New-Standards or "Base Case" referred to here. DOE uses so-called "random assignment" to determine which consumers in the Base Case would be assigned specific furnace efficiencies and whether they install condensing or non-condensing furnaces. At its core, random assignment is based on the assumption that gas furnace consumers do not consider economics when selecting the type of furnace to install in a home or business. In other words, DOE assumes that consumers act perfectly irrationally concerning furnace economics when DOE assigns furnace efficiencies within its base case scenario. Since the No-New-Standards or "Base Case" scenario forms the basis from which the energy and economic impacts of any proposed standard can be evaluated, a critical defect in the development of the Base Case renders void and unusable all subsequent analysis of any proposed trial standard level.

Stakeholders have raised with DOE concerns about this technical defect on multiple occasions, as well as a proposed alternative, and DOE has failed to address these concerns in this

NOPR adequately or logically. The Gas Technology Institute ("GTI"), in an analysis of the March 2015 proposed rulemaking,[111] uncovered the critical error in the base case furnace assignment methodology that continues to plague DOE's economic analysis in this NOPR. GTI describes the issue:[112]

> The DOE NOPR LCC model includes economic criteria and a distribution of allowable cost recovery times in its 92 trial standard level (TSL) furnace analysis and fuel switching decision algorithm. However, DOE's Base Case furnace assignment algorithm ignores economic decision making parameters. Instead, the Base Case AFUE, which is the efficiency of the furnace that is chosen by an individual consumer without the influence of DOE's rule, is assigned randomly to each of the 10,000 trial cases in the DOE LCC model. The economics of a particular efficiency level selection compared to other levels (e.g., 80% AFUE vs. 92% AFUE) are not considered in DOE's baseline furnace decision for any of the 10,000 Crystal Ball trial cases.

The GTI report continues:[113]

> DOE's decision to use a random assignment methodology to assign base case furnace efficiency to each of the trial cases in the Crystal Ball simulation is a significant technical flaw with meaningful impact on the DOE NOPR LCC results. A random assignment methodology misallocates a random fraction of consumers that use economic criteria for their decisions and results in higher LCC savings compared to rational economic decision-making criteria. DOE's Base Case furnaces in the 10,000 Crystal Ball trial case homes are intended to be representative of the RECS survey furnace distribution across various locations and categories. Random assignment of the Base Case furnace does not achieve this key objective and is not a technically defensible proxy for rational residential decision-making processes. Figure 7 shows GTI's Base Case furnace assignment algorithm that incorporates a CED framework into the trial case assignments to provide a reasonable, technically defensible Base Case furnace assignment algorithm for the LCC analysis.

To reiterate what this means in practice, *i.e.,* in the context of the analytical logic underlying this economic model, is that DOE completely ignores economic decision making by the consumer.

---

[111] *Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnaces*, 80 Fed. Reg. 13120 (March 12, 2015).
[112] Attachment O at p. 13.
[113] *Id*.

DOE does not assume that economics are partially ignored when consumers select furnace efficiencies; DOE is assuming that consumers *completely* disregard economics when selecting a gas furnace. What is worse is that this fundamental choice to ignore consumer economics does not adhere to the model logic related to consumer fuel switching to electricity. As discussed below, DOE assumes consumers *consider economics when choosing to* fuel switch. This inherent contradiction that forms the fundamental basis of the economic analytics at the heart of DOE's LCC modeling cannot be justified.

Furthermore, random assignment of individual household gas furnace efficiencies has a material impact on the actual economic outcomes determined by the life cycle cost model. As GTI wrote in its report, and which is still relevant to this NOPR, "DOE's random assignment puts non-condensing furnaces in buildings that would purchase condensing furnaces based on economic criteria" and "DOE's random assignment puts condensing furnaces in buildings that would not purchase condensing furnaces based on economic criteria."[114] Random assignment methodologies lead to an overstatement of benefits associated with the proposed rulemaking and an underestimation of the total costs.

In the NOPR, DOE acknowledges earlier stakeholder comments expressing concerns regarding DOE's use of random assignment.[115] DOE's defense of this methodology has been that some academic literature indicates that consumers do not consider economics, or at least do not consider economics accurately, when making purchasing decisions. Some of the literature is quite old and likely does not apply to purchases with the cost significance of furnaces. Again, DOE relies on an economically driven consumer choice model to determine fuel-switching decisions.

[114] Attachment O at p. 15.
[115] *See, e.g.,* NOPR, 87 Fed. Reg. at 40639.

Furthermore, some of the critical inputs in that model are derived from survey data which indicates that consumers do consider economics when making purchasing decisions.

DOE has failed to address the core issue at the heart of this critical defect in its model. Moreover, the NOPR preamble contradicts DOE's decision to continue to use random assignment in this manner. DOE states in the NOPR that, "[w]hile DOE acknowledges that economic factors may play a role when consumers, commercial building owners, or builders decide on what type of furnace to install, assignment of furnace efficiency for a given installation, based solely on economic measures such as life-cycle cost or simple payback period most likely would not fully and accurately reflect annual real-world installations."[116] Thus, DOE acknowledges that consumers consider economics when selecting furnace efficiencies but then proceeds to utilize random assignment in the context of its analysis, which assumes that consumers do not consider economics when choosing furnace efficiencies on a building level. In other words, DOE's says that "economic factors may play a role" but assumes consumers act without considering any economics when choosing furnaces.

To demonstrate the absurd results that arise from the use of random assignment of furnace efficiencies, one can look at the 10,000 trial cases presented in the LCC analysis. These trial cases represent the output of a model simulation of the economic impacts on individual consumers from potential energy efficiency standards for non-weatherized gas furnaces and mobile home furnaces. Of the 10,000 trials for non-weatherized gas furnaces, AGA can identify 607 trials, representing 6% of buildings with non-weatherized gas furnaces, that have favorable economics and lower upfront costs to install a condensing furnace relative to a non-condensing furnace, but, due to random assignment, these trials were randomly selected, *i.e.*, assumed, to have chosen a lower

[116] NOPR, 87 Fed. Reg. at 40640.

AFUE furnace. These consumers have every economic incentive to choose a lower-cost condensing furnace. Instead, DOE assumes those consumers will utilize a non-condensing 80% AFUE furnace in its base case. On average, these consumers would have saved $503 on lower installation costs and saved $45 in the first year on operating costs.

This failure to properly account for consumers who would have already invested in condensing technology in the No-New-Standards case is also shown for consumers assigned a 95% or 98% AFUE furnace in the base case by the model. There are 3,096 out of 4,328 trial cases unaffected by the rule (thus, those consumers have a 95% AFUE or higher efficiency furnace installed in the base case) who would have had a lower upfront installation cost with an 80% AFUE furnace. In this case, DOE's random assignment methodology assumes these consumers disregard economics once again and install more expensive first-cost equipment, regardless of payback. The average installation cost for these households was $867 higher because of the condensing furnace, with an average savings of $81 in the first year.

In both instances, where DOE is counting as rule-affected consumers that likely would have selected a condensing furnace anyway and consumers as non-rule-affected consumers that would never have selected a condensing furnace, DOE is simultaneously overestimating the proposed standards' benefits and overestimating the proposed standards' costs. Indeed, one would expect *some* level of market failure insofar that some consumers make economically irrational decisions, and therefore some of these cases may exist in the real world. However, DOE provides no evidence that they can justify an economic simulation that is based on the assumption that *consumers are perfectly irrational in all cases when selecting a condensing furnace.*

a. DOE's LCC Model Demonstrates that Consumers Consider Economics, and Therefore the Use of Random Assignment as Applied by DOE is Not Justified

If consumers do not consider economics, as suggested by DOE's use of random assignment of energy efficiency distributions, then there should *not* be a relationship between condensing furnace market share and LCC savings because consumers are not responsive to consumer furnace economics. If, however, there *is* a relationship between the LCC savings and condensing furnace market share, then it is also reasonable to assume that economics does affect the adoption of higher efficiency furnaces, and many of the outcomes for consumers that are mostly positive will already have been realized by consumers.

In the LCC spreadsheet model, DOE provides market share data of consumer furnaces of various efficiencies for new construction and replacements at a state level. It is possible to consider the relationship between consumer choice and economics that can be found in DOE's own LCC model. This can be accomplished by comparing the market share data to the life cycle cost savings calculated by the model for 80% AFUE and condensing furnaces at 90% AFUE and higher. Details of this analysis and results follow.

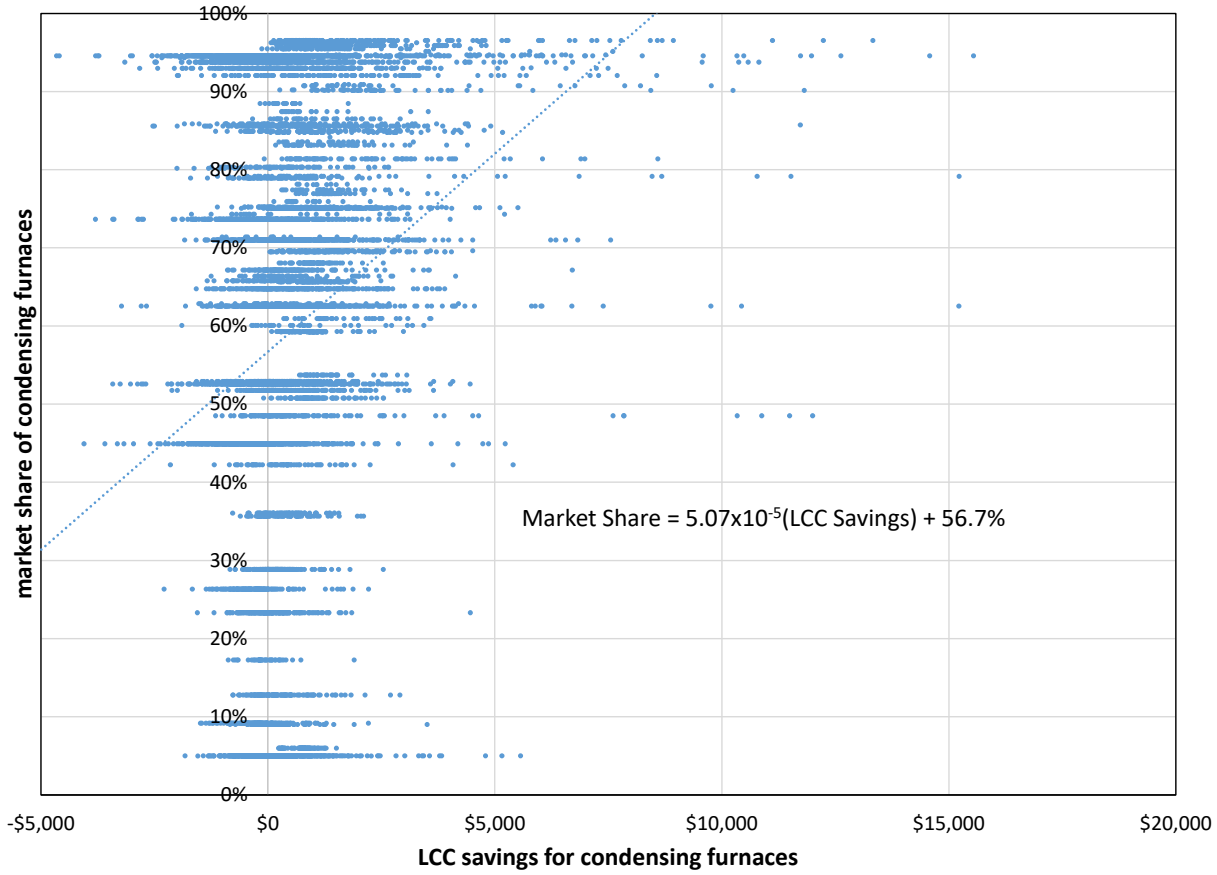
In the LCC model, DOE provides market share data of various efficiencies of furnaces for new construction and replacements at a state level. The as-received DOE LCC was modified to make all consumers affected by the rule and to prevent fuel switching. LCC savings was then analyzed as a function of market share. AGA modified the "Basecase AFUE" in the 'No New Standards AFUE' sheet in cell D18 to 80% to force all 10,000 trial cases in the model to be considered rule affected, as all consumers are "choosing" an 80% AFUE furnace in this case. Turning off the flag for fuel switching prevents any products other than gas furnaces from being considered. The LCC outputs of the model can then be compared to the market share data to

identify any relationships between the two. Note that if DOE's assertion that consumers do not consider economics in purchasing decisions is true, there should be no relationship between the market share of high-efficiency furnaces and the economics of those products.

The first indication that consumers are responding at some level to economics is that the market share of condensing furnaces ranges from 5% (Florida, Georgia, and Texas) to 95% (Colorado, Iowa, and New York) for replacements and 6% (Florida) to 97% (Colorado and Iowa) for new construction. Because the market share of condensing furnaces is generally high in cold weather states relative to warm weather states and the opportunity for savings is highest in the cold weather states, forcing all consumers to choose 80% AFUE furnaces in the base case for purposes of this analysis increases the LCC savings predicted by the model. LCC savings are $305, $430, $612, and $578 for 90, 92, 95, and 98% AFUE respectively.

Figure 1 shows the market share of condensing furnaces, 90% AFUE and higher, vs. the blended LCC savings for condensing furnaces. The blended LCC savings is the weighted average of LCC savings for each condensing furnace efficiency weighted by the relative market share of those efficiencies. Market shares are specific to each state and installation type (replacement or new).

Figure 1: Market share of condensing furnaces vs. LCC savings



While there is a scatter in the data, this should be expected (the 10,000 trials contain different buildings, new and replacement furnaces, different incomes, *etc*.). The least squares best-fit line indicates a relationship between market share and LCC savings and that increasing LCC savings correlates with increasing market share. Further, the Pearson correlation coefficient between these variables is 0.243, with a p-value of 0.000. It is, therefore, more than 99.9% certain that these variables are positively correlated. Note also that the use of blended LCC savings is not necessary for a positive correlation; the Pearson correlation coefficient for condensing furnace market share for 90, 92, 95, and 98% AFUE LCC savings relative to 80% AFUE is 0.215, 0.228, 0.239, and 0.233 respectively, all have a p-value of 0.000. While this analysis is sufficient to prove beyond a reasonable doubt that the opportunity consumers have to save money relative to an 80%

AFUE furnace is positively correlated with the market share of condensing furnaces, it may not be the easiest or most intuitive way to look at the data.

Another interesting feature of Figure 1 is that the intercept of the y-axis is above 50%, meaning that the expected market share of condensing furnaces is above 50%, even if there is no economic incentive to install them. This suggests that if there is a market failure, according to DOE's LCC model, the market failure is that consumers choose more efficient products slightly more often than they should be based on economics alone.

Figures 2 and 3 show the market share of condensing furnaces vs. average LCC savings with individual data points averaged by state. Again, there is a positive correlation between savings and market share in replacement and new construction applications. Unsurprisingly, in the case of new construction, LCC savings are higher, and there are no regions with a negative average LCC savings (because serious venting issues in new construction, designed for a condensing furnace, should never occur). Note that this portion of the analysis weights each region the same even though the number of data points between regions is not the same.

Figure 2: Average LCC savings vs. market share of condensing furnaces for replacement applications

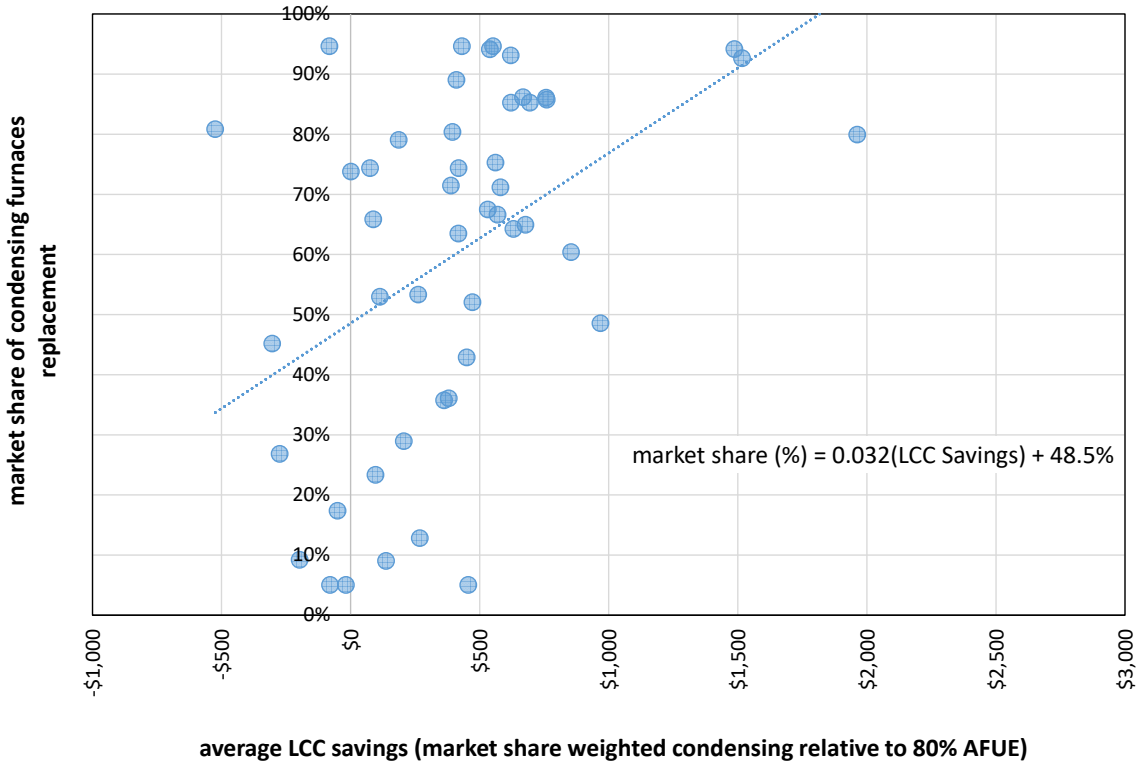
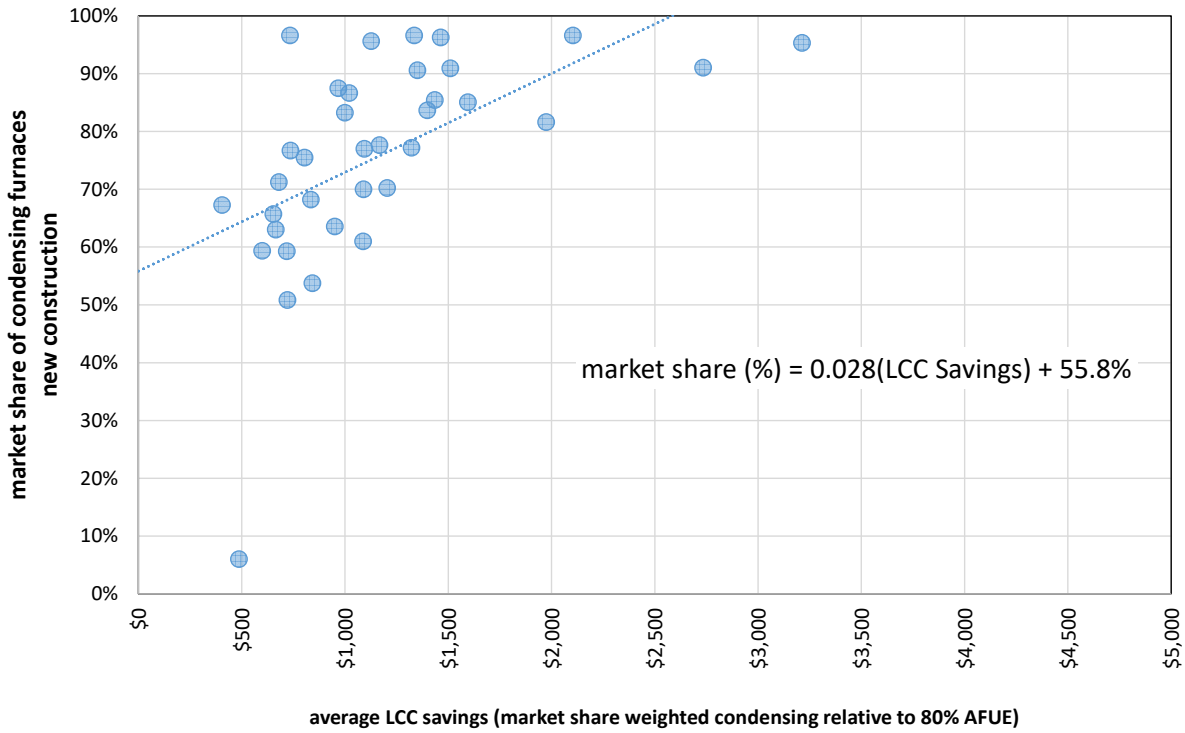
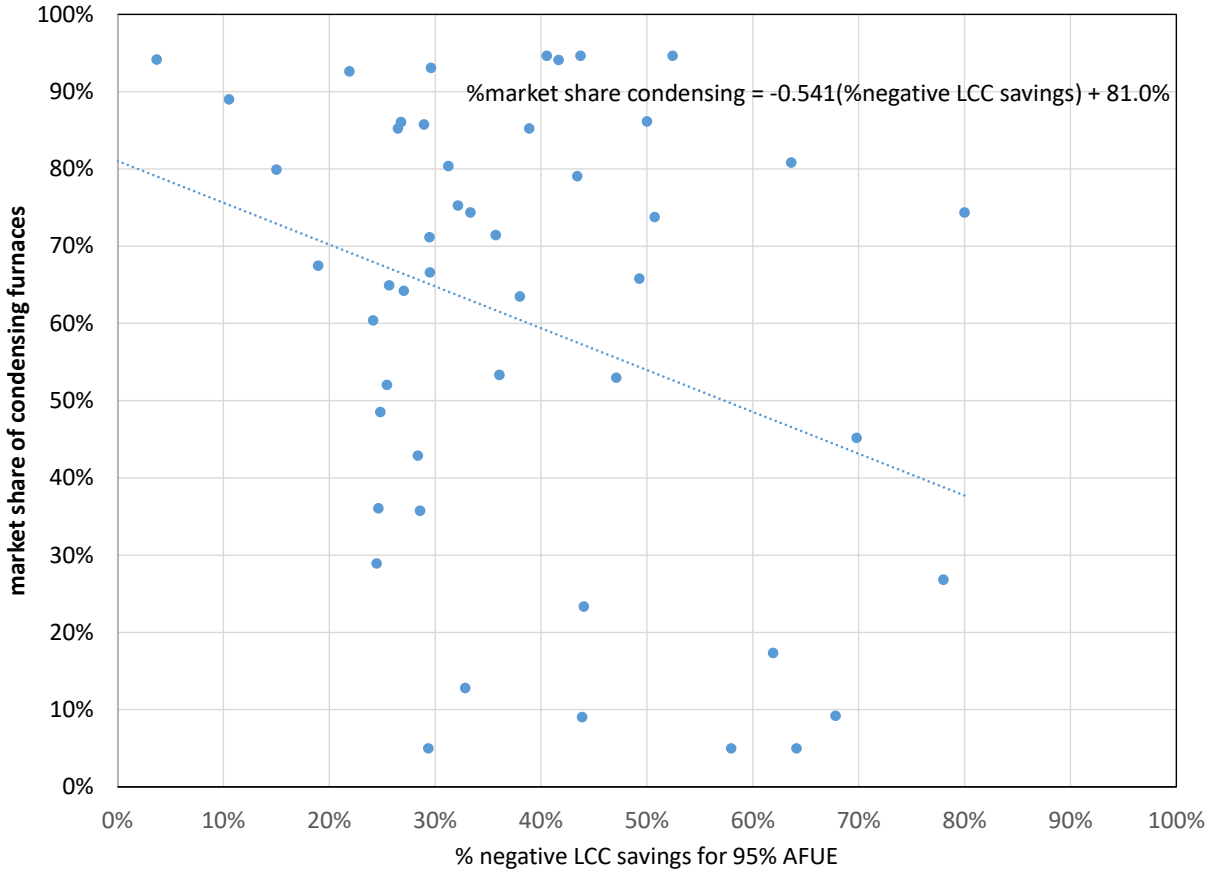


Figure 3: Average LCC savings vs. market share of condensing furnaces for new construction applications



Percent of negative outcomes is another way to look at the data produced by this analysis. One would expect that if consumers were paying attention to economics, however imperfectly, there would be a negative correlation between the percent of negative LCC outcomes in a region and the market share in that region. If a large fraction of consumers experienced negative financial consequences from adopting condensing furnaces, one would expect that the market share of condensing furnaces in that region would be low. In this case, the analysis was limited to replacement situations as there are few negative outcomes in new construction situations. The Pearson correlation coefficient for the data displayed in Figure 4 is -0.321 with a p-value of 0.026, meaning that these data are negatively correlated with 97.4% certainty.

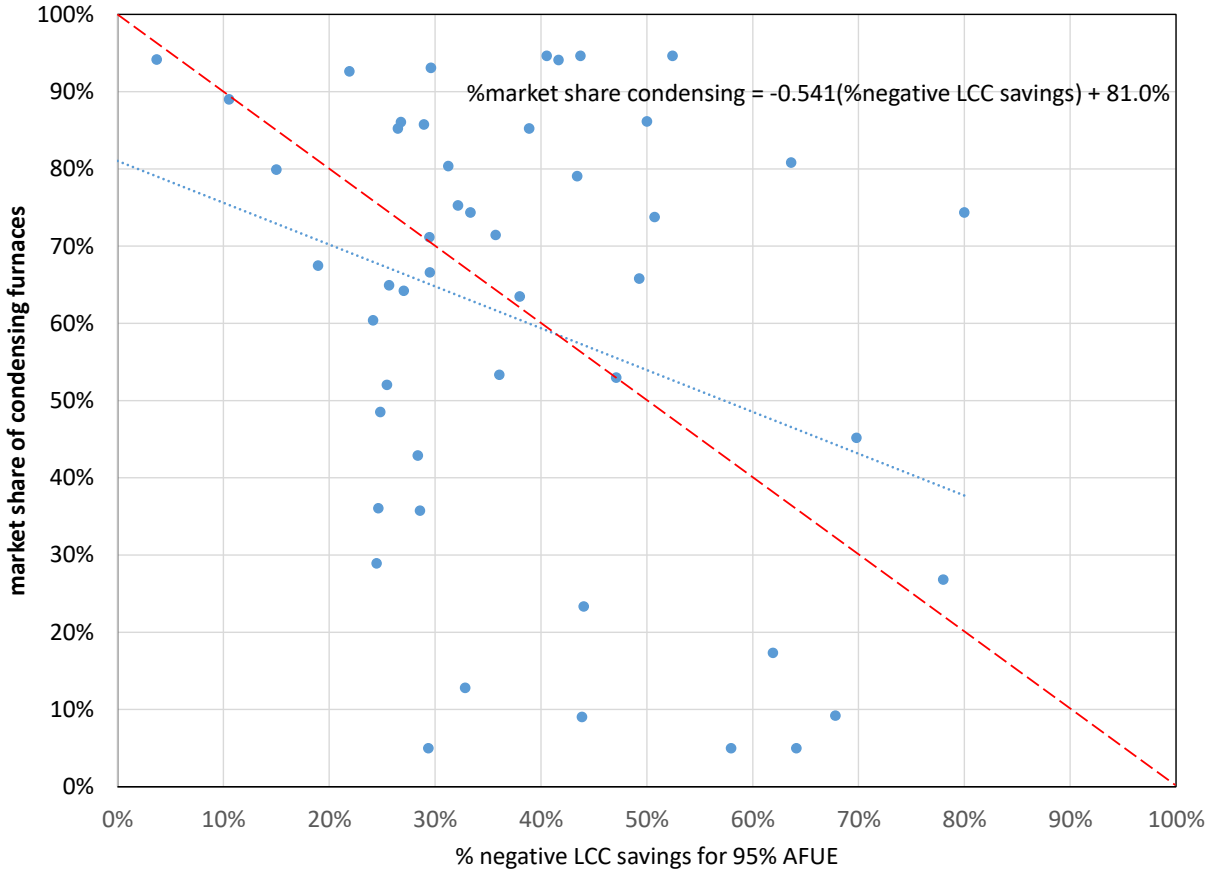
Figure 4: Percent of negative LCC outcomes for a 95% AFUE furnace relative to an 80% AFUE furnace vs. market share of condensing furnaces



If consumers were perfectly assessing economic impact, all of the data points would fall on a line with 100% market share at 0% negative LCC outcomes and 0% market share where there are 100% negative LCC outcomes. Outcomes above the line indicate that the market share of efficient products is higher than it should be, and outcomes below the line indicate that the market share of efficient products is lower than it should be in a given region. Figure 5 shows this red line added to the prior Figure 4. There are 48 total data points on the graph, and 25 of them are above the line. These 25 points represent 53.6% of the underlying replacement trial cases. This shows again that if there is a systematic market error, the error is more likely that consumers are choosing overly efficient products than are economically justified than the opposite. However, on

the whole, it appears that consumers, on average, are doing an excellent job of assessing economics and choosing products accordingly.

Figure 5: Percent of negative LCC outcomes for a 95% AFUE furnace relative to an 80% AFUE furnace vs. market share of condensing furnaces with "perfect" market line added.



This analysis, using DOE's LCC modeling spreadsheet, irrefutably and conclusively demonstrates that DOE's method of randomly assigning furnace efficiencies in its base case is improper. Moreover, it demonstrates that any market failure results in greater adoption of high-efficiency equipment than would be expected by economics alone

Therefore, DOE's use of random assignment of furnace efficiencies is a fatal defect in its methods of the economic justification of the proposed standards. As a result, DOE overstates the

benefits of the proposed standards for NWGF and MHGF in this rulemaking. This analysis is sufficient to show that DOE's LCC model is flawed; therefore, the economic justification for the proposed standards in this rulemaking proceeding is unsound. DOE should not issue a final rule based on this fatal analytical error—the defect being that consumers do not consider economics at all when selecting furnace efficiencies.

2. DOE's Economic Analysis is Highly Sensitive to Equipment Lifetime Assumptions, but the Assumed Consumer Furnace Lifetime Used in that Analysis is Neither Reasonable Nor Justified, Rendering the Economic Modeling Arbitrary and Capricious

DOE's Consumer Furnace Life-Cycle Cost and Payback Period Analysis Spreadsheet used to analyze the economic impacts of the proposed standards relies on unsupported assumptions regarding equipment lifetime that render its results unsupported, unreasonable, and arbitrary. More specifically, the LCC Spreadsheet incorrectly assumes that all consumer gas furnaces have the same lifetime regardless of energy efficiency. Since condensing furnaces are subject to condensing, acidic water vapor, contain more parts and are generally more complex, it is unreasonable to assume condensing furnaces would not have a shorter lifetime than non-condensing furnaces. Indeed, the shorter lifespan of condensing products is well documented by actual data and studies that the NOPR fails to confront. The most reliable source for residential furnace life expectancy is provided by the American Society of Heating, Refrigeration and Air-Conditioning Society ("ASHRAE"), which indicates that 18 years is the most accurate factor that DOE should use.[117] Additionally, the DOE model also arbitrarily assumes, contrary to experience and data, that the mean equipment lifetime is 22.5 years in the North, where heating equipment is subject to more strain and use, and 20.2 years in the rest of the country. These unsupported

[117] *See* HVACR Equipment Life Expectancy, available at https://hvac-eng.com/hvacr-equipment-life-expectancy (last visited October 5, 2022).

assumptions render the NOPR's economic analysis equally unreasonable and would render any final rule that relies on it arbitrary, capricious, and contrary to law.

To understand the impacts of different lifetimes on the life-cycle-cost savings of NWGF products, AGA conducted an analysis using DOE's LCC model spreadsheet. The effect of a shorter assumed lifetime is a reduced LCC because fewer years of operation and maintenance are included in the calculation. The subsequent analysis presented in these comments demonstrates that even modest changes in assumed equipment lifetime produce significant changes in the life-cycle cost savings.

The default DOE LCC model calculates the cost of non-weatherized gas furnaces over the lifetime of the furnace discounted back to the present. This approach is valid if, and only if, the different furnaces being compared are considered to have the same lifetime, which DOE assumes is the case in its analysis. However, the assumption that the lifetime of condensing and non-condensing furnaces is the same is not supported by any evidence.

To examine the effect of different lifetimes on DOE's economic LCC analysis, AGA tested the sensitivity of DOE's LCC model to equipment life. Specifically, in the LCC model spreadsheet, and within the tab "LCC&PB Calcs," AGA changed cells AH6:AH10 and AH18:AH22 to 20 years. AGA then modified the LCC calculation to add a cost for a replacement furnace in the event the lifetime is lower than 20 years and discount it back to the present value. AGA chose twenty years because it is close to the mean lifetime specified in the DOE model, where the mean lifetime is 22.5 years in the north and 20.2 years in the rest of the country. Initially, both lifetime and discount rates were not modified relative to the baseline DOE LCC model-generated values. The added cost is the retail cost of the furnace at the indicated efficiency plus the minimum installation cost for each. The rationale for using the minimum is that even if there were an extra

cost associated with venting for the initial installation, this cost would not be incurred for a replacement.

Making this change to the lifetime assumption slightly changes the 20-year cost relative to the LCC in the DOE baseline model because the periods over which costs are calculated are different and because, in some cases, the cost of replacements is included in the 20-year cost (if the lifetime of the furnace is less than 20 years). The adjusted model shows savings in the range of $407 to $464 over 20 years:

	20 year cost/LCC cost (80% AFUE)	20 year cost/LCC cost (95% AFUE)	Cost Savings (95% AFUE)
DOE baseline model	$13,864	$13,217	$464
20 year cost model	$14,023	$13,468	$407

The overall intent of this work is to look at the effect that a difference in furnace lifetime would produce in expected savings. Because different lifetimes are used for some of the electric fuel switching options, and the effects of fuel switching are not relevant to the test explored in this particular analysis, the remainder of this analysis was conducted with fuel switching turned off. Turning off fuel switching in the DOE model and using a 20-year cost assumption produces the following results.

	20 year cost/LCC cost (80% AFUE)	20 year cost/LCC cost (95% AFUE)	Cost Savings (95% AFUE)
DOE baseline model	$13,864	$13,250	$246
20 year cost model	$14,040	$13,513	$200

As discussed earlier, it's reasonable to assume that condensing furnaces may have shorter lifetimes relative to non-condensing furnaces. To simulate this impact of a shorter condensing furnace lifetime relative to non-condensing furnaces, the lifetime given by the DOE model was discounted by small amounts to look at the effect on savings. This was done by multiplying the

DOE-generated equipment lifetime by a constant factor (0.95 for a 5% reduction in equipment lifetime, 0.93 for a 7% reduction in equipment lifetime, and so on). This analysis, using a reasonable modification of DOE's LCC model, demonstrates that if the lifetime of condensing equipment is less than non-condensing equipment by even 11%, LCC savings are negative, and the proposed standard for NWGFs cannot be economically justified. Notably, the 11% reduction from 20 years would make the life 17.8 years, which is below the 18 years life assumed by ASHRAE.

Reduction in condensing equipment lifetime	**20 year cost/LCC cost (80% AFUE)**	**20 year cost/LCC cost (95% AFUE)**	**Cost Savings (95% AFUE)**
20 year cost model (no reduction)	$14,040	$13,513	$200
5% reduction	$14,040	$13,633	$114
6% reduction	$14,040	$13,661	$94
7% reduction	$14,040	$13,688	$77
8% reduction	$14,040	$13,722	$57
9% reduction	$14,040	$13,754	$35
10% reduction	$14,040	$13,790	$13
11% reduction	$14,040	$13,822	-$8
12% reduction	$14,040	$13,855	-$32

Note the sensitivity to lifetime equipment assumptions alone is enough to erode any purposed economic savings of banning non-condensing equipment and requiring condensing equipment to meet a 95% AFUE or higher efficiency standard. This analysis examines the impacts on LCC savings and the demonstrated sensitivity of DOE's simulated approach by adjusting in a reasonable manner just one variable in DOE's LCC modeling spreadsheet. Numerous other obvious flaws in the modeling spreadsheet and methodology, such as random furnace assignment errors that create absurd outcomes such as trial cases where the first cost of condensing equipment is lower than non-condensing equipment. These flaws are detailed in other areas of these comments.

3. DOE's Economic Analysis Depends on Completely Random Factors that are Not Supported by Evidence, Logic or Reason

On top of the LCC model's numerous flaws, its results, which the NOPR relies on for justification, depend on wholly random factors that are not supported by evidence, reason, or logic. As previously noted, DOE first presented for public review an LCC modeling spreadsheet dated June 15, 2022. When operated as presented and instructed, the LCC model spreadsheet produced summary results inconsistent with DOE's TSD provided in support of this rulemaking. That is, stakeholders could not reproduce or test DOE's results.

AGA and several other groups expressed concerns regarding the inconsistency of the TSD and DOE's LCC model.[118] DOE must have recognized its error because it released a new version of the LCC model spreadsheet on August 24, 2022. This updated version did produce summary results consistent with the TSD. The core difference between the two LCC model spreadsheets was that the August 24, 2022 version used a random "seed" number to drive a random number generator utilized within the LCC model's Monte Carlo analysis. Using a seed number like this ensures that future simulations run the exact same random (or in this case pseudo-random) simulations.

Use of a seed number generator in a Monte Carlo analysis is not by itself concerning. Monte Carlo analyses model various outcomes based on different scenarios. When those scenarios are randomly generated, a seed number allows others to run the same scenarios to see the same results. However, even when different random scenarios are used, *i.e.,* without the same "seed," one would expect any reasonably accurate model to generate at least similar results under a similar range of random but similar scenarios. In other words, the determining factor of whether a Monte

[118] *See e.g.,* Attachments E and F and transcripts of the August 3 and September 6, 2022 webinars.

Carlo analysis shows that a regulatory choice is cost-justified should not be based on one random scenario, but rather outcomes that are most likely. That is not the case here.

This is exemplified by comparing the results from using DOE's June 15, 2022 LCC spreadsheet to its August 24, 2022 spreadsheet. First, by modifying the June 2022 LCC model so that the cost comparisons are made assuming a 20-year lifetime (as before) results in the following:

	20 year cost/LCC cost (80% AFUE)	20 year cost/LCC cost (95% AFUE)	Cost Savings (95% AFUE)
DOE baseline model	$12,533	$11,918	$507
20 year cost model	$12,710	$12,181	$456

Performing the exact same test in the August 24, 2022 spreadsheet generates the following:

	20 year cost/LCC cost (80% AFUE)	20 year cost/LCC cost (95% AFUE)	Cost Savings (95% AFUE)
DOE baseline model	$13,864	$13,217	$464
20 year cost model	$14,023	$13,468	$407

Next, turning off fuel switching and making the same modifications to the model to produce a 20-year cost comparison results in the following with the June 15, 2022 LCC Spreadsheet.

	20 year cost/LCC cost (80% AFUE)	20 year cost/LCC cost (95% AFUE)	Cost Savings (95% AFUE)
DOE baseline model	$12,533	$12,115	$153
20 year cost model	$12,722	$12,387	$105

But the following with the August 24, 2022 spreadsheet:

	20 year cost/LCC cost (80% AFUE)	20 year cost/LCC cost (95% AFUE)	Cost Savings (95% AFUE)
DOE baseline model	$13,864	$13,250	$246
20 year cost model	$14,040	$13,513	$200

Finally, to simulate the sensitivity of shorter equipment lifetime, the lifetime given in the DOE model was discounted by small amounts to look at the effect on savings.

Reduction in condensing equipment lifetime	20 year cost/LCC cost (80% AFUE)	20 year cost/LCC cost (95% AFUE)	Cost Savings (95% AFUE)
20 year cost model (no reduction)	$12,722	$12,387	$105
5% reduction	$12,722	$12,507	$27
6% reduction	$12,722	$12,534	$6
7% reduction	$12,722	$12,561	-$16
8% reduction	$12,722	$12,592	-$37
9% reduction	$12,722	$12,620	-$53
10% reduction	$12,722	$12,655	-$80

Note in this case, using the earlier as-released LCC model, if the lifetime of condensing equipment is less than non-condensing equipment by only 7%, the resulting LCC savings of the proposed standard are negative. Again, this is without removing or modifying the other identified flaws in DOE's analysis. However, the following table uses the August 24, 2022 spreadsheet, indicating that an 11% reduction in the lifetime of condensing equipment results in negative LCC savings.

Reduction in condensing equipment lifetime	20 year cost/LCC cost (80% AFUE)	20 year cost/LCC cost (95% AFUE)	Cost Savings (95% AFUE)
20 year cost model (no reduction)	$14,040	$13,513	$200
5% reduction	$14,040	$13,633	$114
6% reduction	$14,040	$13,661	$94
7% reduction	$14,040	$13,688	$77
8% reduction	$14,040	$13,722	$57
9% reduction	$14,040	$13,754	$35
10% reduction	$14,040	$13,790	$13
11% reduction	$14,040	$13,822	-$8
12% reduction	$14,040	$13,855	-$32

By analyzing in this manner the two different as-presented DOE LCC model spreadsheets released as part of this rulemaking, it is clear that the modification of an arbitrary random number in the LCC model spreadsheet alters in a fundamental and meaningful manner not only the results

of a LCC analysis but the conditions within which assumptions may be tested and understood. A random number should not be the critical factor that alters the experimental result of a test conducted to test various assumptions within the LCC model spreadsheet.

DOE's modeling approach is fundamentally flawed, being shaped by random numbers producing inconsistent results and, in some cases, profoundly different economic analyses. The only conclusion that can be reached is that DOE's LCC model is fundamentally flawed in its basic analytical structure. Any conclusions that DOE draws from the LCC model, including using numbers from the LCC Spreadsheet to calculate payback periods and other elements of whether the standards would be economically justified, are therefore equally flawed.

4. DOE's Analysis of Projected Energy Savings is Flawed

DOE's analysis of energy savings is flawed. As an initial matter, it is improper for DOE to include fuel switching in the energy saving and economic justification of a consumer natural gas furnace standard. In the NOPR, DOE erroneously claims that it does not need to limit its analysis to the consideration of the covered product or covered products likely to result from the Proposed Rule to the covered product type (or class) that would be subject to the Proposed Rule.[119] EPCA, however, requires that DOE consider "the savings in operating costs throughout the estimated average life of the covered product in the type (or class) compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered products which are likely to result from the imposition of the standard."[120] In short, this provision directs DOE to compare savings in operating costs throughout the estimated average life of a category of products, *i.e.*, a natural gas furnace.

[119] NOPR, 87 Fed. Reg. at 40628.
[120] 42 U.S.C. § 6295(o)(2)(B)(II).

Furthermore, EPCA states that the comparison includes any increase in the price of, or in the initial charges for, or maintenance expenses of a category of products, *i.e.*, a natural gas furnace. EPCA does not direct or permit the comparison of savings or expenses for a particular category of products with the savings or expenses of a different category of products. In other words, the same category of products must be compared, *i.e.*, natural gas appliances are compared to natural gas appliances. EPCA does not envision DOE comparing an electric furnace versus an oil furnace versus a natural gas furnace. Such an analysis contradicts EPCA and what must be considered in determining whether standards are economically justified.[121]

Moreover, DOE's own analysis, which includes fuel switching, concludes that the Proposed Rule will increase energy use, which contradicts the purpose of EPCA. DOE's LCC Model is DOE's method for analyzing the economic and energy usage impacts on individual consumers from potential energy efficiency standards for non-weatherized gas furnaces and mobile home gas furnaces. DOE is required to demonstrate that the proposed standards would save energy. However, an analysis of the projected energy savings demonstrates that consumers that fuel switch due to the proposed standards for non-weatherized gas furnaces result in higher overall energy consumption. DOE does not correctly report the aggregate energy increases resulting from the Proposed Standard.

AGA analyzed the results of the 10,000 simulation trials provided by DOE. AGA compared the consumption for each building simulated and the average consumption over the 2025-2050 timeframe developed in the technical support document, Appendix 10B, and Full Fuel Cycle Analysis. AGA conducted an additional sensitivity analysis by setting all of DOE's 10,000 trials to an 80% AFUE baseline to evaluate the maximum savings potential, *i.e.,* a baseline that

[121] *See* 42 U.S.C. § 6295(o)(2)(B)(i)(I).

incorrectly assumes all installed furnaces have an 80% AFUE and no consumers have installed more efficient furnaces, which demonstrated a positive savings of 8.1 MMBtu per year, based on assuming replacement with 95% AFUE furnaces. However, based on the randomly assigned distribution of 5,672 rule-affected trials, the average savings is much lower and only reduce consumption by 4.1 MMBtu per year. This equates to a 9% reduction in consumption based on an average usage of 46.2 MMBtu. For consumers who had fuel switched, the overall impact was negative, *i.e.*, it resulted in *more* energy being used than the baseline gas or propane furnace. Of the 887 trials that fuel switched, the average usage grew by 0.9 MMBtu because of fuel switching.

Even still, the rule would negatively impact energy efficiency for far more consumers in multiple regions of the country than DOE's national or regional comparison summaries suggest. For NWGF only, which represents more than 90% of all gas and propane furnaces in use today, DOE has concluded that the overall positive net benefit of $464 is a reasonable representation of the rule's impact on the average U.S. consumer. The technical support document states that 56.7% of buildings in the U.S. will be affected by the rule and that only 16.6% of all buildings will have a negative outcome. This means that nearly one in three residential and small commercial buildings that see an impact from this rule will pay more to heat than otherwise over the life of the equipment. The 16.8% of buildings with lower efficiency condensing furnaces (90% and 92%) see far fewer negative outcomes because of the rule. Under the NOPR, 95% of all negative outcomes affected buildings, with an 80% efficiency NWGF accounts for 70% of all rule-affected cases. The analysis done by DOE misses the disproportionate impact on a specific product class by combining condensing and non-condensing furnaces into a single modeled output.

DOE also fails to acknowledge that with a condensing furnace, consumers will use more electricity in addition to fuel savings. This exchange in site energy usage, which results in higher

electricity usage, is not reflected in the marketed AFUE of 95%. DOE's model may also be underestimating the impact from a higher fan load while using a condensing furnace because the overall difference between the two for all rule-affected trials that were assigned an 80% efficiency unit in the baseline is 31 kWh (344 kWh vs. 375 kWh).

In short, DOE should not incentivize fuel switching in the Proposed Rule, and DOE should recognize that fuel switching, under the Proposed Rule, would increase overall energy consumption, which runs counter to the objectives of an energy conservation standard. DOE cannot economically justify efficiency improvements when its analysis is based on fuel switching, as such an action is not authorized by EPCA. Moreover, the Department should not issue a final rule claiming that such an action will save energy when it increases energy consumption.

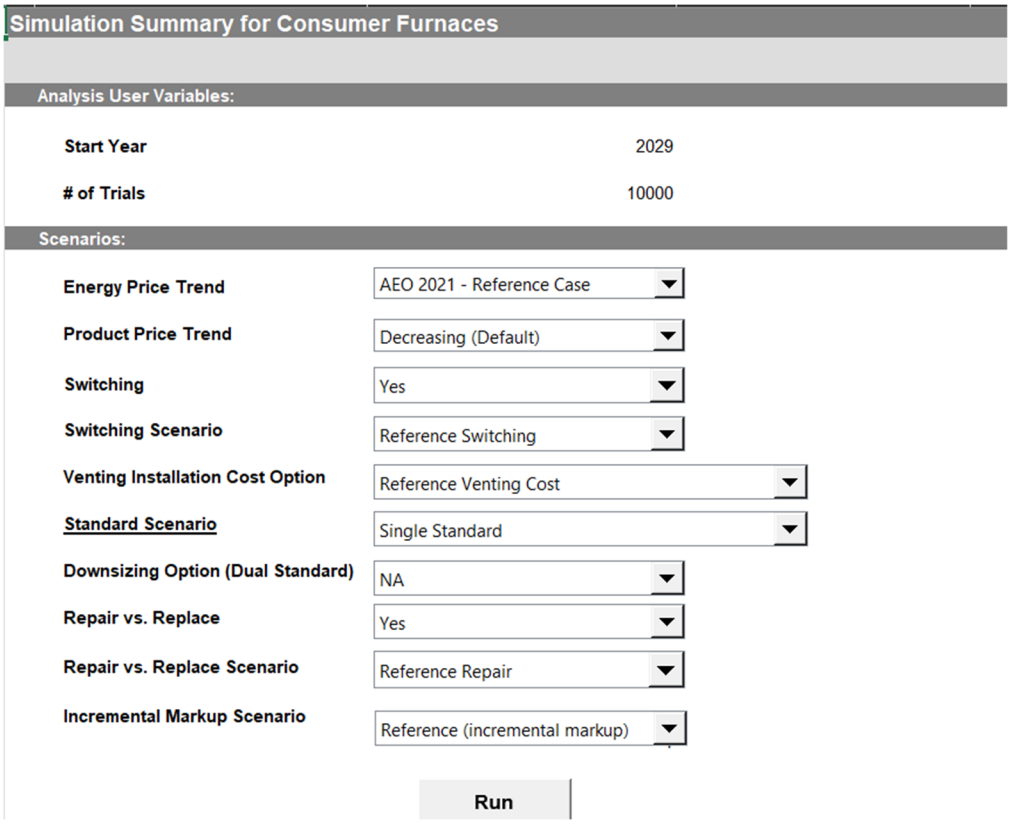
a. DOE's Economic Justification is Flawed and Fuel Switching Should Not be Used to Justify the Proposed Rule

DOE's economic justification suffers a critical defect as it relies on cost savings associated with fuel switching to justify its proposed standards for covered consumer gas furnaces. The use of any savings in operating costs resulting from the elimination of a covered product and the substitution for a different energy source and appliance cannot be used to justify the standard for that product.

DOE reports an average life cycle savings of $464 to justify its proposed non-weatherize gas furnace standard. However, most of the purported cost savings that comprise this average result from consumers switching from natural gas to electricity, which is highly regionally sensitive, *i.e.*, more significant amounts of fuel switching in southern states. DOE's model determined that 8.9% of all buildings would switch from natural gas to electric heating or 15.7% of all buildings affected by the rule. In addition, while the average LCC savings is $464, the median LCC savings is $160. This would suggest that half of all rule-affected buildings would save $160 or less from this rule.

The LCC model spreadsheet utilized for this rulemaking allows DOE and the public to independently assess the rule's economic costs and benefits, including the direct impacts of fuel switching. More specifically, the model projects the degree of fuel switching and its impacts through an input that can be switched off. This option within the LCC model spreadsheet is shown in the following exhibit:

LCC Model Spreadsheet Summary Tab Scenarios Selection – Indicates that Fuel Switching May Be Toggled "Yes or No" (i.e., On or Off)



When the "Switching" tab is changed to "No"— that is, fuel switching is "turned off" and excluded from the analysis— the model produces an average savings of $246, a 47% decrease in average savings. Turning off fuel switching in the model also increases the average payback for a 95% AFUE non-weatherized gas furnace to 25.2 years, which is three years beyond the average 21.6-year lifespan of the new furnace assumed in the model and 7.2 years beyond the 18-years

lifespan for furnaces estimated by ASHRAE. In other words, nearly half of the LCC savings that DOE claims will result from the Proposed Rule are the direct result of fuel switching to electricity, which is presented as evidence that the rule is economically justified. When fuel switching is not an option within the model, the total payback period for a 95% AFUE non-weatherized gas furnace is longer than the lifetime of the equipment itself.

Summary Table from DOE's Furnace Rule LCC Model – Fuel Switching Turned Off

Simulation Results NATIONAL - 10000 samples — *Note: Fractions refer to Large furnaces* — AEO 2021 - Reference Case

			Average LCC Results									Payback Results		
	Level	Description	Installed Price	First Year Oper. Cost	Lifetime Oper. Cost*	LCC	LCC Savings	Simple LCC Savings	Net Cost	No Impact	Net Benefit	Simple PBP	Average	Median
NWGF	0	NWGF 80%	$3,310	$664	$10,554	$13,864	NA	NA	NA	100%	NA			
NWGF	1	NWGF 90%	$3,767	$622	$9,791	$13,558	$57	$306	22%	60%	18%	10.9	47.6	19.8
NWGF	2	NWGF 92%	$3,778	$613	$9,655	$13,433	$143	$431	20%	60%	20%	9.2	39.9	16.6
NWGF	3	NWGF 95%	$3,786	$601	$9,464	$13,250	$246	$614	18%	43%	39%	7.5	25.2	7.7
NWGF	4	NWGF 98%	$3,963	$592	$9,326	$13,289	$104	$575	56%	2%	42%	9.0	34.6	16.3
MHGF	0	MHGF 80%	$2,084	$521	$8,447	$10,531	NA	NA	NA	100%	NA			
MHGF	1	MHGF 90%	$2,409	$488	$7,961	$10,370	$144	$161	28%	30%	42%	9.8	23.7	8.7
MHGF	2	MHGF 92%	$2,423	$481	$7,844	$10,267	$243	$264	24%	30%	46%	8.3	16.5	7.8
MHGF	3	MHGF 95%	$2,434	$474	$7,737	$10,172	$308	$360	23%	21%	55%	7.4	13.2	5.9
MHGF	4	MHGF 96%	$2,440	$475	$7,747	$10,187	$230	$344	40%	1%	59%	7.7	12.7	6.0

To further illustrate the impacts of fuel switching on the reported average LCC savings DOE is using to justify its Proposed Rule, AGA developed an alternative review of DOE's as-presented LCC model spreadsheet and trial runs. This alternative approach was developed by examining all 10,000 trial cases and identifying the trials that resulted in fuel switching. To be clear, AGA was examining the as-presented LCC spreadsheet model DOE uses to justify the proposed standard. In this case, "Switching" is toggled "Yes"—that is, fuel switching is turned on and allowed in the model simulation.

As indicated previously, DOE's model shows that the Proposed Rule would result in 8.9% of households with non-weatherized gas furnaces to fuel switch. Those fuel-switching consumers correspond to 887 trial cases out of the 5,672 rule-affected trials. If the LCC savings associated with those 887 trials correspond to simulated households that switched to electricity due to the proposed standard, the average LCC savings drop by 52% to $226. Again, this alternative approach demonstrates that half of the LCC savings DOE claims will result from the proposed standard and

are the direct result of fuel switching to electric appliances. The significantly lower savings reflects the actual cost savings associated with the proposed standard on consumer furnace consumers and is not influenced by the impacts of fuel switching. The NOPR relies inappropriately on the purported economic savings of fuel switching to justify the proposed standard for consumer gas furnaces. Note that these average LCC savings of $226 are close to the $246 average LCC savings achieved when the "fuel switching" option in the LCC model spreadsheet is togged off. However, it is unclear why there is any difference, which further calls into question the modeling logic related to fuel switching.

DOE should not include LCC savings associated with fuel switching in its economic justification of consumer gas furnace standards. DOE must consider the cost savings from efficiency improvements without fuel switching. Furthermore, fuel switching, which takes place in 8.9% of trial cases, has a disproportionate impact (half) on the final LCC savings submitted as evidence for the economic justification of this rule.

To be sure, DOE has provided in the TSD an LCC savings analysis that appears to analyze costs under a no-switching scenario (Table 8J.6.1 in the TSD, page 887, copied in part below). However, the results of Table 8J.6.1 presented in the TSD do not entirely match the summary page within the LCC spreadsheet model. While the first year operation costs of $601 appear to be the same, AGA has not been able to validate the DOE-reported $291 savings under a no-switching scenario (Table 8J.6.1 in the TSD) within the model or in the output file provided in the docket. Stakeholders cannot assess how DOE came up with this number or meaningfully comment on it.

LCC, PBP, and Switching Results and Comparisons Presented in the Technical Support Document Table 8J.6.1

Table 8J.6.1 Results for No Switching Scenario for Non-Weatherized Gas Furnaces with Input Capacity Cutoffs

Input Cutoff	AFUE (%)	All Consumers*					Impacted Consumers**	
		Installed Cost	First Year Oper. Cost	Lifetime Oper. Cost*	LCC	Simple PBP	LCC Savings	Net Cost
0	80	3,310	664	10,554	13,864	NA	NA	0.0%
0	90	3,767	622	9,941	13,708	10.9	57	25.3%
0	92	3,778	613	9,805	13,583	9.2	145	23.5%
0	95	3,786	601	9,614	13,400	7.5	291	21.7%
0	98	3,963	592	9,476	13,439	9.0	193	58.4%

Summary Table from DOE's Furnace Rule LCC Model – No Switching Scenario

Simulation Results NATIONAL - 10000 samples — *Note: Fractions refer to Large furnaces* — AEO 2021 - Reference Case

			Average LCC Results									Payback Results		
	Level	Description	Installed Price	First Year Oper. Cost	Lifetime Oper. Cost*	LCC	LCC Savings	Simple LCC Savings	Net Cost	No Impact	Net Benefit	Simple PBP	Average	Median
NWGF	0	NWGF 80%	$3,310	$664	$10,554	$13,864	NA	NA	NA	100%	NA			
NWGF	1	NWGF 90%	$3,767	$622	$9,791	$13,558	$57	$306	22%	60%	18%	10.9	47.6	19.8
NWGF	2	NWGF 92%	$3,778	$613	$9,655	$13,433	$143	$431	20%	60%	20%	9.2	39.9	16.6
NWGF	3	NWGF 95%	$3,786	$601	$9,464	$13,250	$246	$614	18%	43%	39%	7.5	25.2	7.7
NWGF	4	NWGF 98%	$3,963	$592	$9,326	$13,289	$104	$575	56%	2%	42%	9.0	34.6	16.3
MHGF	0	MHGF 80%	$2,084	$521	$8,447	$10,531	NA	NA	NA	100%	NA			
MHGF	1	MHGF 90%	$2,409	$488	$7,961	$10,370	$144	$161	28%	30%	42%	9.8	23.7	8.7
MHGF	2	MHGF 92%	$2,423	$481	$7,844	$10,267	$243	$264	24%	30%	46%	8.3	16.5	7.8
MHGF	3	MHGF 95%	$2,434	$474	$7,737	$10,172	$308	$360	23%	21%	55%	7.4	13.2	5.9
MHGF	4	MHGF 96%	$2,440	$475	$7,747	$10,187	$230	$344	40%	1%	59%	7.7	12.7	6.0

5. The NOPR Fails to Address Significant Regional Differences in Costs and Benefits

The NOPR also fails to address significant regional differences in costs and benefits that will disproportionately impact millions of Americans. Regionally, the share of all buildings with condensing furnace equipment installed is higher in the north, where space heating requirements are higher and where DOE's model shows a greater share of high-efficiency condensing furnaces shipped and installed. Within the north, minimal fuel switching takes place in the model, but the average LCC savings and payback periods are still less or take longer than the national averages.

AGA developed the following tables based on the 10,000 simulated trial cases that DOE presented as evidence supporting the proposed rule for non-weatherized gas furnaces. For each analysis, tables marked in yellow correspond to DOE's No Switching Scenario and tables labeled in white correspond to DOE's unedited model.

Table 5.1: Regional Impact of 95% AFUE NWGF Rule

Region	Total Simulated Trial Count	Percent Affected	Percent of Total Negatively Impacted	Percent that Fuel Switched	Percent of Affected that are Negatively Impacted	Average Affected LCC Savings	Average First Year Savings (95% vs 80% Only)	Higher Residential Install Costs (95% vs 80% Only)	Total Affected Payback	Total Simple Payback
New England	276	42%	7%	1%	17%	$ 417.44	$ 125.54	$ 550.24	6.8	4.4
Middle Atlantic	1,579	37%	5%	1%	12%	$ 261.51	$ 77.55	$ 669.92	8.1	8.6
East North Central	2,376	43%	12%	1%	29%	$ 388.65	$ 65.76	$ 554.92	15.8	8.4
West North Central	750	41%	9%	3%	23%	$ 577.01	$ 58.93	$ 381.90	8.7	6.5
South Atlantic	1,326	79%	18%	23%	23%	$ 950.39	$ 79.63	$ 179.02	8.4	2.2
East South Central	672	77%	23%	14%	30%	$ 528.26	$ 40.44	$ 295.40	8.8	7.3
West South Central	1,040	79%	29%	21%	37%	$ 497.04	$ 36.12	$ 176.31	16.0	4.9
Mountain	987	66%	21%	13%	32%	$ 385.01	$ 42.80	$ 316.92	16.0	7.4
Pacific	994	61%	31%	8%	50%	$ (115.62)	$ 9.55	$ 426.49	31.0	44.7
Total	10,000	57%	17%	9%	29%	$ 463.96	$ 57.96	$ 417.06	14.1	7.2
North	5,697	41%	9%	1%	22%	$ 350.17	$ 68.06	$ 543.40	12.1	8.0
South	4,303	78%	27%	19%	34%	$ 543.18	$ 44.60	$ 249.78	15.5	5.6

There are many aspects of this table to note. While slightly smaller in terms of total market share, the south is where most consumers will see an impact from this rule and where 2/3rds of all negatively impacted trials are located. The Pacific region has the highest negative impact overall, with a negative LCC of $116 and 31% of all trials in Pacific states resulting in negative LCC savings (higher costs). The South Atlantic, East, and West South-Central regions present findings where nearly a quarter of all buildings, regardless of base case AFUE, will be negatively affected and between 10% and 20% are assumed to fuel switch. DOE's current rule must not ignore these negatively impacted sub-regions and consider alternatives to justify savings for all US consumers.

Table 5.2: Regional Impact of 95% AFUE NWGF Rule – No Switching Scenario

Region	Total Simulated Trial Count	Percent Affected	Percent of Total Negatively Impacted	Percent of Affected that are Negatively Impacted	Average LCC Savings	Average First Year Savings (95% vs 80% Only)	Higher Residential Install Costs (95% vs 80% Only)	Total Payback	Total Simple Payback
New England	276	42%	6%	14%	$ 457.09	$ 137.76	$ 551.42	7.3	4.0
Middle Atlantic	1,579	37%	5%	12%	$ 252.06	$ 88.19	$ 675.06	10.2	7.7
East North Central	2,376	43%	11%	25%	$ 417.16	$ 74.00	$ 562.88	18.7	7.6
West North Central	750	41%	9%	22%	$ 398.98	$ 68.01	$ 399.70	13.3	5.9
South Atlantic	1,326	79%	24%	31%	$ 368.14	$ 68.60	$ 330.73	25.3	4.8
East South Central	672	77%	21%	28%	$ 318.97	$ 52.58	$ 387.05	13.6	7.4
West South Central	1,040	79%	35%	44%	$ 157.02	$ 38.53	$ 305.17	27.8	7.9
Mountain	987	66%	28%	42%	$ 28.26	$ 33.70	$ 387.82	33.4	11.5
Pacific	994	61%	31%	50%	$ (78.21)	$ 28.79	$ 500.41	49.6	17.4
Total	10,000	57%	18%	32%	$ 246.13	$ 63.24	$ 475.15	24.4	7.5
North	5,697	41%	8%	20%	$ 341.25	$ 77.04	$ 552.29	15.8	7.2
South	4,303	78%	31%	40%	$ 179.91	$ 44.96	$ 373.01	30.4	8.3

Fuel switching has a disproportionate impact on projected LCC savings for consumers in the south. DOE reports savings of $543 when fuel switching is allowed. However, in the "No Switching" scenario, LCC savings in the South dropped to $181, a dramatic drop of 66%. Savings of $181 represent only 1.5% of the total LCC of the 95% AFUE non-weatherized gas furnace. Consumers in the south also have higher payback periods, with the average payback nearly exceeding the average lifespan of the furnace or 30.4 years, which far exceeds the expected lifetime of the furnace equipment of 18 years according to ASHRAE and 21.6 according to DOE's modeled averages. Because 92% of all trial cases where fuel switching occurs in the south, DOE has done a disservice to stakeholders by reporting LCC as national averages and for Northern states failing to illustrate (and possibly masking) the full breadth of regional impacts related to its proposed rule.

6. DOE's Analysis of Energy and Emissions Factors is Flawed

As previously discussed, DOE claims average LCC savings of $464 for 95% AFUE non-weatherized gas furnace standard. DOE's model is based on 10,000 simulated trials, with each simulated LCC worth a fraction of the total number of furnaces shipped yearly. DOE assumed that

approximately 3.3 million furnaces would be shipped in 2029 based on the current number of units shipped at the end of the 2010s. Therefore, the rule will impact millions of consumers annually and as many as 56 million natural gas and propane furnaces in use today.

To further examine the aggregate impacts of this rulemaking, AGA examined the individual LCC savings, installation costs, and first-year savings. To scale individual average impacts to a national scale, these individual values were multiplied by 323.9409, which is the average weighted worth of an individual trial AGA derived based on DOE's use of NWGF furnace shipment data.

In the first year the proposed rule would go into effect, DOE's model estimated it could cost all 3.3 million NWGF consumers $712.4 million in net increased installation costs, save $76.1 million in net first year operating costs, and save a net $852.5 million over the lifetime of the equipment with an average payback of 15.7 years. While the overall net savings are positive, the initial investment by consumers nearly matches the total net savings and takes over a decade to make a return on it.

The use of fuel switching as an alternative, which impacts 8.9% of all NWGF trials or 15.7% of all rule-affected outcomes, significantly impacts DOE's estimates of total savings from the proposed rule. Consumers that fuel switched in the model accounted for 59% of all lifetime savings or net savings of $502.3 million. Low assumed installation costs primarily drive these savings, which may not be a reasonable assumption. For example, the DOE assumes that if a building already has a heat pump for cooling or partial heating, it will not need to replace or upgrade the unit and will operate the unit just like a new one with a full lifespan (*See* Section 12, Worksheet Errors, below). Based on DOE's model, net installation costs for fuel-switched trials were negative $1.52 million, and net energy savings was $21.6 million.

Without using the fuel switching feature and only accounting for the potential savings from upgrading gas appliances to a 95% AFUE standard, the total net LCC savings is cut by 47% to $452.2 million. Total net installation costs are higher as well. Consumers pay during the first year of the new rule $901.8 million and provide $93.1 million in net first-year operating cost savings.

Not all consumers would experience a net positive impact from the rule. DOE's analysis shows that 16.6% of all trials or 29.3% of rule-affected trials face negative LCC savings. Isolating the trials with net negative LCC savings resulted in a total consumer cost of $305.9 million more over the life of the equipment. By contrast, the net positive LCC trials could save consumers $1,158.4 million, which includes fuel switching. The sum of these values equals the $852.5 million reported earlier. Under the no-switching scenario, the net loss to consumers is reduced to $258.2 million, while net positive trials were cut to $710.5 million in LCC savings, resulting in net savings of $452.2 million.

Annual energy cost savings are proportionally low compared to the total cost to heat all homes in the U.S. every winter. Based on the latest winter fuels outlook from the Energy Information Administration, the average natural gas customer spent $746 for the 2021-2022 winter season on space heating and $573 on the previous winter. Propane consumers spent more with the average reported winter heating cost of $1,789 for the 2021-2022 season and $1,157 the winter season before. During the winter of 2021-2022, 60.5 million homes were heated with natural gas, and 6.2 million were heated with propane.

Total expenditures for space heating using either fuel amounted to $56,191 million during the 2021-2022 winter heating season and $41,817 million the year prior. Comparing these actual annual costs to DOE's purported cost savings, the total savings from the proposed rule in the first year would reduce total expenditures on gas and propane space heating relative to recent

winters by 0.135% and 0.187%. Twenty years later, assuming most furnaces with an AFUE below 95% would have been replaced, this could amount to savings of 2.7% to 3.6% based on DOE's modeled results and historically low assumed adoption rate of condensing furnaces in their baseline.

7. Most of DOE's Negative Outcomes Are Associated with Buildings Utilizing Non-Condensing Furnaces; However, These Impacts are Masked by Including Benefits from Consumers that Have Homes Designed for Condensing Furnaces

Most of DOE's negative outcomes on the NOPR are related to building that utilize non-condensing furnaces. These impacts, however, are masked by the inclusion of consumers that have buildings designed for condensing furnaces. Specifically, ninety-five percent of the negative outcome trials are associated with buildings assumed to install 80% efficiency NWGF, which accounts for 70% of all rule-affected cases. For NWGF only, which represents more than 90% of all gas and propane furnaces in use today, DOE has concluded that the overall positive net benefit of $464 is a reasonable representation of the Proposed Rule's impact on the average U.S. consumer. The TSD states that 56.7% of buildings will be affected by the rule but that only 16.6% of all buildings will have a negative outcome. However, DOE's analysis shows that nearly one in three residential and small commercial buildings that are impacted by the rule will pay more to heat the structure than otherwise over the life of the equipment. The 56.7% rule affected market share also includes buildings with lower efficiency condensing furnaces (90% and 92%) that see fewer adverse outcomes because of the rule since these homes are already designed to accommodate condensing furnace equipment. In other words, DOE is masking the impacts of the Proposed Rule on consumers with non-condensing gas furnace equipment, which face significantly higher purchase and installation costs, by including the energy savings and lower installation costs of consumers that already have condensing furnace equipment installed.

This failure to properly account for consumers who would have already invested in condensing technology is also shown for consumers assigned a 95% or 98% AFUE furnace in the base case by the model. 3,096 out of 4,328 not affected trials would have had cheaper installation costs with an 80% AFUE furnace. The average installation cost for these households was $867 higher because of the condensing furnace, with an average savings of $81 in the first year. Many of these buildings are in regions with high penetration of condensing furnaces, which means many consider energy efficiency a priority over cost. DOE should revise its analysis to ensure that impacts are not inappropriately included by the inclusion of buildings that are designed for condensing equipment and consumer that already have condensing furnaces.

8. DOE's Cost Analysis is Flawed

A review of the assumptions in the DOE cost analysis calls into question the basis that the Department used in its cost determination of non-weatherized residential and manufactured home gas furnace, installation, and maintenance costs from what occurs in the marketplace. These assumptions are critical elements in determining the cost impacts of DOE's proposed minimum efficiency requirement of 95% AFUE for furnaces will have on consumers. AGA recommends that DOE undertake additional evaluation of cost installation and annual maintenance costs of non-weatherized residential and manufactured home gas furnaces to ensure a complete LCC and payback period analysis. A comprehensive analysis of the average installed replacement cost of an 80,000 BTU/hour, 80% AFUE non-condensing residential non-weatherized natural gas furnace is needed. The installed cost can be from approximately $3,100 to $7,200. For an 80,000 BTU/hour, 90%-Plus AFUE non-weatherized condensing natural gas furnace, the installed cost can be from approximately $5,300 to $9,100. It is understood that the wide differences between the 80% AFUE non-condensing residential non-weatherized natural gas furnace and the 90%+ AFUE models can be attributed to the region that it is installed and operating features such as 2-

stage or variable capacity models. The result is that DOE must assess the wide range of consumer costs of furnaces across the country to determine the basis of the LCC and payback period and the economic impacts on individual consumers of the proposed 95% AFUE minimum efficiency requirement for these products. Even with some sensitivity analysis, establishing averages on furnace cost, installation costs, annual maintenance cost, energy consumption, *etc.*, is not appropriate for this type of DOE consumer-covered product. As stated above, an extensive reevaluation of residential gas furnaces, both non-weatherized and manufactured home types, non-condensing, and condensing types, with their wide range of annual energy consumption depending on the climate and structure they serve and the variations of installation, particularly in the replacement market is not only warranted but vital in assessing the LCC and payback period for consumers.

a. DOE has Potentially Overestimated the Cost of Venting for Non-Condensing Furnaces

DOE has potentially overestimated the cost of venting for non-condensing furnaces. Looking at only new construction, where builders would ideally have better control over the design and installation of a new vent, the cost of a new vent is, on average, $1,520 based on what is presented in the TSD Table 8.2.12. This value includes several parts, labor, and markups. Compared to relining retrofits, this is double the cost presented in the replacement market.

The cost of a new construction vent is defined as being the parts of a new 4" vent type B, a 4" connector, and a 3" connector for the water heater. Each of these costs are based on a combination of material and labor costs with most of the expense going to labor. Other pieces of equipment also are comprised of several separate calculations. However, many of the same individual calculations used to build the vent are reused to determine other pieces of the installation.

One area where DOE may have overestimated is the length of pipe, which makes up half the cost of a new 4" vent. For buildings where the furnace was installed in the basement, the calculations appear to fit a typical 2-story home where the average vent length is 26 feet. However, for buildings where the furnace is in the attic the average length is 10 feet, which means up to 15 feet would more than extends beyond the roof. This impact is particularly sensitive to the South, where 5 out of 6 new homes have a furnace installed in the attic. This extra-long vent is also found with existing units as well.

DOE's method for calculating labor overestimates time spent on tasks because it includes an average unit of type for each individual part. In many cases, completing any given task takes the same 0.4-0.5 hours. For example, it takes 0.21-0.27 hours to install each foot of straight pipe, with the average attic pipe taking 2.1 hours to install. This total does not include each elbow or adjustment piece to fit the installation, which typically takes 0.4-0.5 hours each. This method of calculating labor oversimplifies the totals and results in higher estimates. Many tasks may have been completed concurrently with other pieces, such as the installation of an elbow or short 12" extension piece.

Actual Commerical Historical Prices vs Annual Energy Outlook Forecast

	Historical Data	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
		$ 11.34	$ 12.23	$ 10.06	$ 9.47	$ 8.91	$ 8.10	$ 8.08	$ 8.90	$ 7.91	$ 7.28	$ 7.88	$ 7.79	$ 7.61	$ 7.49	$ 8.78
Forecast Release Year Data	2010	$ 11.53	$ 12.29	$ 9.31	$ 8.92	$ 10.01	$ 10.36	$ 10.20	$ 10.14	$ 10.28	$ 10.38	$ 10.40	$ 10.46	$ 10.53	$ 10.65	$ 10.76
	2011		$ 12.32	$ 9.94	$ 9.15	$ 9.30	$ 9.03	$ 8.80	$ 8.52	$ 8.60	$ 8.68	$ 8.74	$ 8.84	$ 8.96	$ 9.19	$ 9.37
	2012			$ 10.06	$ 9.32	$ 8.82	$ 8.90	$ 8.86	$ 8.67	$ 8.82	$ 8.82	$ 8.85	$ 8.94	$ 9.06	$ 9.21	$ 9.49
	2013				$ 9.61	$ 9.04	$ 8.26	$ 8.66	$ 8.42	$ 8.29	$ 8.76	$ 9.03	$ 9.38	$ 9.57	$ 9.69	$ 9.83
	2014					$ 9.16	$ 8.29	$ 8.49	$ 9.29	$ 9.11	$ 8.91	$ 9.21	$ 9.62	$ 9.76	$ 9.70	$ 9.90
	2015						$ 8.36	$ 8.35	$ 8.82	$ 8.73	$ 8.76	$ 8.77	$ 8.81	$ 9.32	$ 9.82	$ 10.15
	2016								$ 9.24	$ 7.92	$ 7.46	$ 7.93	$ 8.54	$ 9.19	$ 9.58	$ 9.67
	2017									$ 8.28	$ 7.42	$ 8.14	$ 8.69	$ 9.33	$ 9.96	$ 10.07
	2018										$ 7.50	$ 8.11	$ 7.96	$ 8.33	$ 8.69	$ 8.88
	2019											$ 8.12	$ 8.01	$ 7.94	$ 8.14	$ 8.26
	2020													$ 7.80	$ 7.43	$ 7.58
	2021														$ 7.51	$ 7.95
	2022															$ 8.76

*Red highlighted cells note forecasted prices that were higher than what was reported historically by EIA.

9. DOE Continues to Utilize Energy Price Projections with an Upward Bias, Consistently Overestimates Future Natural Gas Costs, and Should Utilize Price Distributions Instead of a Mean

In the NOPR, DOE uses an energy price forecast based on the AEO that has consistently overestimated future natural gas energy costs. AGA conducted a review of forecasted prices versus actual prices using historical AEOs back to 2010. The AEO reported higher prices for residential consumers actually faced 70% of the period analyzed and 86% for commercial consumers nationally. The only year with higher actual versus forecasted prices is the most recent year or 2021 ("2022 AEO"), which is heavily impacted by the COVID-19 pandemic and widespread supply chain issues. The commercial water heater and boiler rule use the 2021 release year AEO.

While uncertainty is a significant factor in any projection or forecast, the statistically biased outcome towards higher prices in the AEO compared to what is actually reported historically presents a need for DOE's analysis to utilize a distribution of prices in its model simulations and not a forecasted mean. The figures below compare what EIA reports as actual prices versus what was projected in each AEO.

DOE uses EIA historical price data to generate an estimate of what the first year of usage should be for any given appliance and customer. In the Monte Carlo simulation, with the exception of fuel prices, all costs are reported in $2020 dollars and rely on 2020 or 2021 data. DOE did not update fuel or marginal pricing to match other base year costs despite the data being available before the last update on March 25, 2022. DOE noted but did not explain why it cannot update prices with the following comment "2020 prices incomplete within NG Navigator," even though the data is accessible on the EIA website.

Actual Residential Historical Prices vs Annual Energy Outlook Forecast

Forecast Release Year Data	Historical Data	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
		$ 13.08	$ 13.89	$ 12.14	$ 11.39	$ 11.03	$ 10.65	$ 10.32	$ 10.97	$ 10.38	$ 10.05	$ 10.91	$ 10.50	$ 10.51	$ 10.78	$ 12.24
	2010	$ 13.32	$ 13.87	$ 11.72	$ 11.21	$ 12.12	$ 12.21	$ 11.81	$ 11.74	$ 11.89	$ 11.99	$ 12.03	$ 12.10	$ 12.18	$ 12.30	$ 12.42
	2011		$ 13.99	$ 12.20	$ 11.31	$ 10.56	$ 10.44	$ 10.39	$ 10.28	$ 10.39	$ 10.50	$ 10.61	$ 10.74	$ 10.90	$ 11.16	$ 11.38
	2012			$ 12.25	$ 11.36	$ 10.65	$ 10.78	$ 10.69	$ 10.38	$ 10.56	$ 10.61	$ 10.67	$ 10.80	$ 10.94	$ 11.11	$ 11.42
	2013				$ 11.62	$ 11.05	$ 10.71	$ 10.72	$ 10.49	$ 10.39	$ 10.91	$ 11.24	$ 11.66	$ 11.89	$ 12.05	$ 12.24
	2014					$ 11.22	$ 10.69	$ 10.62	$ 11.44	$ 11.24	$ 10.92	$ 11.25	$ 11.71	$ 11.88	$ 11.85	$ 12.06
	2015						$ 10.86	$ 10.29	$ 10.80	$ 10.62	$ 10.48	$ 10.65	$ 10.84	$ 11.38	$ 11.92	$ 12.29
	2016								$ 11.08	$ 10.40	$ 9.70	$ 9.87	$ 10.28	$ 10.67	$ 11.08	$ 11.19
	2017									$ 10.58	$ 10.22	$ 10.91	$ 10.92	$ 11.06	$ 11.20	$ 11.31
	2018										$ 10.30	$ 11.17	$ 10.77	$ 11.19	$ 11.47	$ 11.59
	2019											$ 11.18	$ 10.75	$ 10.71	$ 11.00	$ 11.08
	2020													$ 10.80	$ 10.39	$ 10.53
	2021														$ 10.54	$ 10.81
	2022															$ 12.15

*Red highlighted cells note forecasted prices that were higher than what was reported historically by EIA.

10. DOE's LCC Model Makes Unreasonable Assumptions About Future Market Share of Condensing Furnace Equipment Shipments

The LCC model's cost savings relies on unreasonable and unsupported assumptions about what share of the market non-condensing furnaces would hold without the Proposed Rule's requirements. The model relies on data from the Air-Conditioning, Heating, and Refrigeration Institute ("AHRI") that shows the percentile of the market with furnaces that meet various AFUE levels from 1997 through 2015.[122] In 2015, non-condensing furnaces held 41% of the market for AFUE 80 furnaces. But that rate has trended down over time and continues to do so. For example, non-condensing natural gas furnaces held 54% of the market for AFUE 80 furnaces in 2006, 45% in 2009, and 41% in 2015. Despite this clear trend, the LCC model assumes non-condensing natural gas furnaces will retain 41% of the market through 2029.

[122] *See* DOE's model, excel tab labeled "AFUE Existing".

U.S. Consumer Furnace Shipment Market share by AFUE Reported in DOE Excel Model

AFUE Percentiles by Year (NWGF)																		
AFUE	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
65	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
65	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
66	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
67	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
68	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
69	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
70	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
71	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
72	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
73	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
74	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
75	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
76	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
77	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
78	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
79	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
80	41%	41%	48%	49%	48%	42%	45%	51%	56%	54%	56%	58%	59%	68%	72%	76%	73%	75%	77%
90	41%	41%	48%	51%	51%	46%	50%	57%	62%	62%	64%	67%	69%	76%	79%	83%	80%	81%	83%
91	41%	41%	48%	51%	52%	47%	52%	59%	64%	64%	67%	70%	72%	79%	82%	85%	83%	84%	85%
92	60%	60%	65%	69%	71%	70%	74%	80%	84%	86%	89%	92%	94%	97%	97%	98%	97%	98%	98%
93	61%	60%	65%	69%	71%	71%	75%	81%	85%	87%	90%	93%	96%	98%	99%	99%	99%	99%	99%
94	61%	61%	66%	69%	71%	71%	76%	81%	85%	87%	90%	93%	96%	98%	99%	99%	99%	99%	99%
95	76%	76%	79%	81%	82%	82%	85%	88%	91%	92%	94%	95%	97%	98%	99%	99%	99%	99%	99%
96	97%	97%	97%	98%	98%	98%	98%	99%	99%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%
97	98%	98%	98%	99%	99%	99%	99%	99%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
98	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

This is not only contrary to clear trends but also to DOE's assessment of the market in other parts of its Proposed Rule. DOE claims in the NOPR that "[f]or each considered efficiency level in each product class, DOE calculated the LCC and PBP for a nationally representative set of housing units and, for NWGFs, commercial buildings."[123] For example, DOE's TSD provided a forecast for each AFUE level through 2058. That forecast projected that non-condensing furnaces would lose 10% of the market (from 40% to 30%) for AFUE 80 furnaces between 2029 and 2058. Found in DOE's TSD, Section 10 Figure 10.2.1. But even that assumption is unreasonable. As noted above, AHRI's data showed that non-condensing furnaces lost 10% of the AFUE 80 market between 2006 and 2015. DOE does not explain why that trend would not continue over the next 10 years (i.e., 2015-2025) or why it is reasonable to expect a slowdown in the trend that would reflect a loss in market share of only 10% over 43 years (2015-2058).

[123] NOPR, 87 Fed. Reg. at 40627.

DOE's Projection of NWGF Shipments by AFUE:

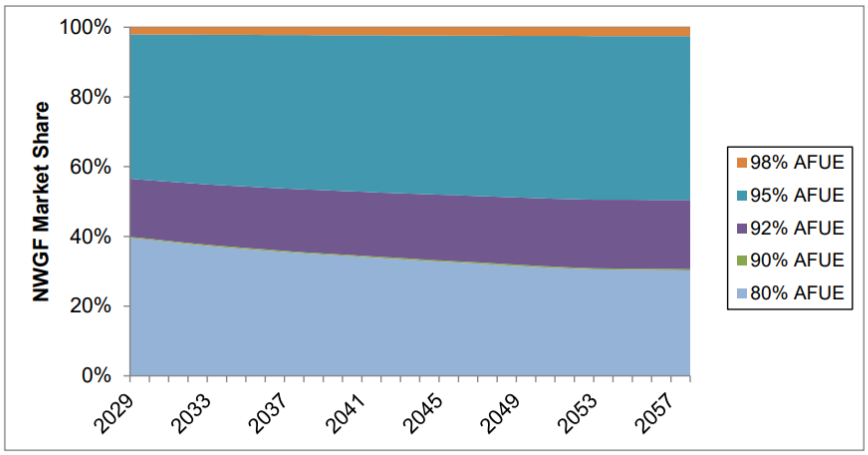


Figure 10.2.1 Projection of No-New-Standards Case Efficiency Distribution for Non-Weatherized Gas Furnaces, 2029-2058

In short, it is arbitrary and capricious for DOE to assume no change to the market for AFUE 80 furnaces in its LCC analysis. Even the Department's TSD suggests at least a 10% decrease in non-condensing furnace sales, and that number is unreasonably low because it fails to account for market trends. As with other aspects of the LCC analysis, DOE must revisit its unsupported assumptions about market share and replace them with data, assumptions, or estimates that are actually supported by evidence.

11. Shipment Data Relied on By DOE Could Not Be Verified

The model developed by DOE relies on data from the Residential Energy Consumption Survey ("RECS") 2015 database to randomly select buildings to model and determine if the rule would theoretically save money and lower consumption for the average U.S. consumer. The model randomly picks buildings based on probability weights created by DOE specifically for this rule, despite having weights used in the RECS database that can be verified by other governmental organizations. During the September 6, 2022 webinar, DOE said that the weights are representative of furnace shipment data, not RECS data. Unfortunately, the model only provides

the market share percentages and not the total number of shipments per state needed to verify this fact. Because of this lack of data, no one outside DOE can verify how they developed their probability weights and if they correctly represent the U.S. consumer. Put another way, this data is not supported by substantial evidence and appears to be an arbitrary and capricious selection by DOE.

Some cross-analysis has revealed that these weights do very closely resemble the RECS database in terms of North vs Rest of Country, but never match what the total market shares are for specific states or regions in the RECS survey. This suggests that DOE wants the numbers to resemble some of what is in the RECS database but failed to sync up individual states and possibly other characteristics like income. It is possible, though impossible to verify, that the furnace shipment data is for a single year and that state would not be 100% the same. However, many regions show such high margins of change that the model under-reports entire states by as much as 33%. Because the model depends on state-level price, cost multiplier, demographics, and climate to generate the final national average LCC, the model should represent the longer-term trend of customer growth and not a lagging indicator of shipments in the past year. If DOE uses weights based on shipment data, that data should reflect a multiyear average that fits the long-term trend of consumers as reported in the RECS, U.S. Census, and other Energy Information Administration surveys such as EIA 176.

Using furnace shipment data along with the RECS database may also present a problem not discussed by DOE. The model only simulates a single furnace for a given building. Single-family, multifamily, and commercial units can have multiple furnaces, even within a single residence, as shown in the RECS data. The use of 3.3 million units shipped per year can never properly be linked to the number of buildings being serviced per year or in total existence. Units

may have been shipped but not installed or returned to the manufacturer before installation. This is simply one example of how the use of furnace shipment data rather than the RECS market share data could distort the value of a given trial simulation by misrepresenting the probability that that building represents the average U.S. consumer.

Table M.1.1: Regional Differences Between Furnace Rule Market Shares and the 2020 Residential Energy Consumption Survey

Region	Total Trial Count	Residential Natural Gas Trials	Residential Natural Gas Retrofits	2020 RECS Natural Gas Count	Modeled Residential Retrofit % Market	2020 RECS Gas Residential % Market
New England	276	198	179	2,380,743	2.5%	4.3%
Middle Atlantic	1,579	1,433	1,185	9,130,573	16.4%	16.7%
East North Central	2,376	2,190	1,824	12,224,900	25.2%	22.3%
West North Central	751	652	493	4,898,790	6.8%	8.9%
South Atlantic	1,326	1,178	934	5,802,284	12.9%	10.6%
East South Central	671	564	486	2,059,091	6.7%	3.8%
West South Central	1,042	940	738	4,861,069	10.2%	8.9%
Mountain	985	923	680	4,776,645	9.4%	8.7%
Pacific	994	930	719	8,669,799	9.9%	15.8%
	10,000	9,008	7,238	54,803,892	100.0%	100.0%

Region	Total Trial Count	Total Propane Trials	Residential Propane Retrofits	2020 RECS Propane Count	Modeled Residential Retrofit % Market	2020 RECS Propane Residential % Market
New England	276	71	30	303,196	16.6%	6.9%
Middle Atlantic	1,579	118	29	519,192	16.0%	11.8%
East North Central	2,376	127	24	1,186,960	13.3%	27.1%
West North Central	751	55	12	755,772	6.6%	17.2%
South Atlantic	1,326	114	16	481,499	8.8%	11.0%
East South Central	671	81	28	213,617	15.5%	4.9%
West South Central	1,042	48	25	276,616	13.8%	6.3%
Mountain	985	37	15	264,213	8.3%	6.0%
Pacific	994	28	2	383,552	1.1%	8.7%
	10,000	679	181	4,384,618	100.0%	100.0%

The mismatches between modeled residential retrofit percentages and the 2020 RECS data for the residential natural gas and propane market lead to unrepresentative samples of households that undermine the validity of the model simulation used to justify the Proposed Rule.

12. Worksheet Errors

The worksheet suffers from several errors that must be corrected. For example, the Tab "Bldg Sample" includes weather data used to calculate the efficiency of a heat pump. From the EIA Residential Energy Consumption Survey "RECS" 2015 data, columns BP-BQ or DBT1 and DBT99 use data from one specific year and not the 10-year average provided on the Tab "Weather Data." However, the CBECS table under column GA-GB or Heating ODT and Cooling ODT does use the 10-year averages found in the Tab "Weather Data." The 10-year data provided in the "Weather Data" tab is colder than the single-year data used in the RECS 2015. This discrepancy has a noticeably negative impact on the overall LCC results in the model and does not reflect the data, evidence, or sound judgment.

Additionally, the worksheet's calculation of building energy use includes the waste heat from the blower motor used in the existing home. This waste heat is being doubled counted in the model because it is included in the intermediate calculations for space heating load. On the tab "Energy Use within cell E69," the model includes a 100% conversion of the rated wattage of the fan motor into thermal energy. This increased load is added to the estimated load taken from the RECS and CBECS database for all furnaces. This load should not be added as it is contrary to physics to consider the waste heat as both a load and a draw.

Moreover, the thermal load should already be included as part of the total load for gas furnaces using a similarly sized motor. It should not be added to the heating load for condensing furnaces unless those furnaces use a smaller or more efficient motor than originally present in the building. Where that is the case, only the difference in thermal waste heat between the original unit and the condensing or heat pump unit would need to be added to the new space heating or cooling demand load. Additionally, the thermal load assumed a 100% conversion based on the motor wattage. Fan motors have an electrical efficiency of at least 70%, which would cut the

thermal waste conversion to 30% or below the annual wattage of the unit. These inputs and related calculations in the model must be changed to reflect facts, data, and physics.

Importantly, there is a critical error identified in a subset of the 730 trials where an electric heat pump was selected for fuel switching. Of those trials, 151 have a $0 rule-affected retail cost to convert to electric heating because the baseline home was assumed to have already had an electric heat pump installed for air cooling with a gas furnace. The model assumes that the original heat pump can handle the entire heating load of the home without a gas furnace or electric backup system after the removal of the gas furnace. It's not reasonable to assume that the original heat pump was always sized or installed with auxiliary backup space heating because the initial gas load was high for many of these buildings, and the electric load was low before the projected conversion. The model does not consider additional costs from missing auxiliary backup heat or mix-matched sizing of the unit because the system was sized with an NWGF for space heating before the rule change. The existing heat pump is also not necessarily an 8.8 HSPF unit (which will be the new minimum efficiency requirement for air source heat pumps) and would either need to be replaced or have lower performance than modeled. For these reasons, the model's assumption that the retail cost of using the existing heat pump is zero is not supported by facts and evidence. The model must be reworked to account for the actual anticipated costs.

The worksheet also fails to reflect rational consumer behavior. Based on the outputs from all 10,000 trials, 887 trials resulted in fuel switching, with 334 or 38% of the trials resulting in fuel switching, demonstrating positive LCC savings prior to fuel switching. However, because of DOE's model logic in the fuel switching module, consumers make perfectly informed decisions, resulting in fuel switching rather than upgrading to a condensing furnace. Of the 334 with positive LCC savings from gas or propane, 37 had negative LCC savings because of the fuel switching.

These 37 trials should never have been counted as fuel switched because it would be irrational for those consumers to make that switch. The other 297 trials with positive LCC savings from natural gas or propane should also have installed a condensing unit because of the same market failures that DOE implemented using random assignment. Because DOE believes the gas furnace market is perfectly irrational, consumers that would see a benefit from a condensing furnace would likely not seek out other alternatives.

F. The Proposed Rule Would Disproportionately Impact Certain Communities

DOE claims to have provided a complete analysis of low-income and senior households impacted by the rule. A careful analysis of DOE's TSD reveals that the reported percentage impacts for low-income consumers only include the results of low-income renters that pay their gas bills. The remainder of low-income households is substantial and includes owner-occupied units and renters that do not pay their bills. It is unreasonable to assume that the low-income subgroup DOE reports represent most consumers. Nearly 38% of low-income households own and pay for natural gas (Table 11.2.4 of TSD), and some renters may still pay utility bills via membership fees like HOAs. Even if low-income consumers aren't responsible for paying utility bills, the negative impacts of this rule should not be ignored in the low-income subgroup analysis. One primary concern is that owners will have lower savings due to additional investments than renters and that the landlords of rental units may not always have the best long-term interest of their tenants (the principal-agent problem). DOE states in the TSD 11.2.3 that the model considers the potential for landlords to install equipment and or fuel switch to the lowest installation cost option but provides no explanation of how this was done or its impact. The technical support document also assumes different final installation costs for low-income households than what is represented in the 10,000 trials, where the average installation cost for low-income consumers is

about one-third of what all other buildings pay. For low-income households, the average installation cost for a 95% AFUE furnace was $1,326 vs. $3,727 for all households.

Table 11.3.3 Average LCC and PBP Results by Efficiency Level for Non-Weatherized Gas Furnaces for Low-Income Households for AFUE Standards

EL	Input Capacity Cutoff *kBtu/h*	AFUE (%)	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Costs	LCC		
0	0	80	1,142	411	6,414	7,556	NA	21.6
1	0	90	1,319	386	5,969	7,288	3.1	21.6
2	0	92	1,322	381	5,885	7,207	2.6	21.6
3	0	95	1,326	373	5,767	7,093	2.1	21.6
4	0	98	1,379	375	5,741	7,120	2.8	21.6
0	0 (North)	80	381	411	6,414	6,795	NA	21.6
1	0 (North)	90	415	392	6,132	6,546	1.8	21.6
2	0 (North)	92	415	388	6,071	6,486	1.5	21.6
3	0 (North)	95	416	383	5,989	6,405	1.2	21.6
4	0 (North)	98	425	382	5,957	6,382	1.5	21.6

DOE claims in section 11 of the TSD that the savings to low-income and seniors are significant, with an average LCC savings of $292 and $327. DOE also states that the impact on consumers will only negatively affect 13.7% of low-income and 15.1% of seniors. AGA found that after using the weights (developed by DOE in section 11.2 of the TSD) provided by the model on all rule-affected low-income and senior trials, low-income would only save $222, and seniors would save $548. Twenty-five percent of all low-income consumers would be negatively impacted, and 16.6% of all seniors. By leaving out the full low-income and senior market, DOE has misrepresented the full impact in the subgroup analysis.

Like the national average LCC savings, the inclusion of fuel switching in the overall LCC savings significantly impacts the total and average LCC savings for low-income and senior households. Fuel switching occurs in 12% of all low-income households and 9% of all senior households. The LCC savings under the no-switching scenario as an option for low-income households is only $40; for senior households, it decreases to $272. The payback period for low-

income also exceeds the lifespan of the equipment leaving many households with equipment with no potential savings from the investment.

AGA developed the following tables based on the 10,000 simulated trial cases that DOE presented as evidence supporting the proposed rule for non-weatherized gas furnaces. For each analysis, tables marked in yellow correspond to DOE's No Switching Scenario and tables labeled in white correspond to DOE's unedited model.

Table J.1: Regional Impact of 95% AFUE NWGF Rule on Low-Income Consumers

Region	Total Simulated Trial Count	Low-Income Weighted Trial Count	Percent Affected	Percent Low-Income Negatively Impacted	Percent Low-Income that Fuel Switched	Percent of Low-income Affected that are Negatively Impacted	Average LCC Savings for Low-Income	Average First Year Savings for Low-Income (95% vs 80% Only)	Low-Income Higher Install Costs (95% vs 80% Only)	Low-Income Payback	Low-Income Simple Payback
New England	276	42	43%	14%	2%	31.8%	$ 28.15	$ 30.42	$ 818.41	11.9	26.9
Middle Atlantic	1,579	212	40%	5%	1%	11.6%	$ 275.29	$ 59.09	$ 611.02	6.3	10.3
East North Central	2,376	206	54%	21%	2%	39.3%	$ 101.81	$ 50.75	$ 667.58	20.3	13.2
West North Central	750	52	39%	12%	2%	31.9%	$ 368.51	$ 56.87	$ 655.88	13.2	11.5
South Atlantic	1,326	145	85%	37%	32%	43.8%	$ 342.17	$ 36.46	$ 438.13	19.1	12.0
East South Central	672	124	79%	24%	14%	30.0%	$ 538.57	$ 32.06	$ 264.36	10.4	8.2
West South Central	1,040	75	92%	50%	36%	54.2%	$ 199.54	$ 16.66	$ 229.45	26.4	13.8
Mountain	987	88	79%	44%	25%	55.8%	$ 155.65	$ 24.19	$ 444.13	40.6	18.4
Pacific	994	89	66%	41%	7%	62.8%	$ (291.37)	$ 13.92	$ 617.94	29.0	44.4
Total	10,000	1,034	63%	25%	12%	40.1%	$ 221.74	$ 62.93	$ 525.80	19.9	8.4
North	5,697	572	46%	14%	2%	30.6%	$ 148.08	$ 50.68	$ 644.80	17.5	12.7
South	4,303	462	85%	39%	25%	46.5%	$ 271.27	$ 26.27	$ 378.54	21.6	14.4

Table J.2: Regional Impact of 95% AFUE NWGF Rule on Senior Consumers

Region	Total Simulated Trial Count	Senior Weighted Trial Count	Percent Affected	Percent Senior Negatively Impacted	Percent Senior that Fuel Switched	Percent of Senior Affected that are Negatively Impacted	Average LCC Savings for Seniors	Average First Year Savings for Low-Income (95% vs 80% Only)	Senior Higher Install Costs (95% vs 80% Only)	Senior Payback	Senior Simple Payback
New England	276	58	37%	3%	1%	9%	$ 635.69	$ 186.09	$ 165.21	3.3	0.9
Middle Atlantic	1,579	304	38%	4%	1%	10%	$ 339.44	$ 103.73	$ 570.20	4.2	5.5
East North Central	2,376	362	47%	12%	1%	25%	$ 347.95	$ 63.77	$ 650.25	8.1	10.2
West North Central	750	129	46%	12%	3%	26%	$ 606.83	$ 57.08	$ 455.40	8.2	8.0
South Atlantic	1,326	175	79%	23%	28%	28%	$ 1,553.32	$ 98.12	$ 360.31	16.7	3.7
East South Central	672	117	79%	19%	19%	24%	$ 569.10	$ 10.10	$ 316.27	5.9	31.3
West South Central	1,040	153	86%	40%	25%	46%	$ 365.89	$ 2.76	$ 355.29	13.8	128.6
Mountain	987	193	74%	25%	10%	34%	$ 326.08	$ 47.13	$ 302.31	15.3	6.4
Pacific	994	168	53%	20%	5%	37%	$ 171.34	$ 35.88	$ 467.48	18.8	13.0
Total	10,000	1659	58%	17%	9%	29%	$ 547.59	$ 64.27	$ 463.25	11.4	7.2
North	5,697	994	43%	8%	1%	19%	$ 384.46	$ 81.35	$ 547.57	6.7	6.7
South	4,303	665	80%	29%	20%	37%	$ 678.06	$ 38.74	$ 337.18	15.1	8.7

Regionally, the impacts are not centered on just the South, though after factoring in fuel switching, the impacts are greater where more households assumed fuel switching as an option. Average LCC savings are the highest in the East South-Central region and lowest in the New England or Pacific regions. All but one region has an average payback longer than ten years, and five have payback near or longer than the lifespan of the equipment of 21.6 years. These results are all without turning off fuel switching.

Table J.3: Regional Impact of 95% AFUE NWGF Rule on Low-Income Consumers No Switching Scenario

Region	Total Simulated Trial Count	Low-Income Weighted Trial Count	Percent Affected	Percent Low-Income Negatively Impacted	Percent Low-Income that Fuel Switched	Percent of Low-Income Affected that are Negatively Impacted	Average LCC Savings for Low-Income	Average First Year Savings for Low-Income (95% vs 80% Only)	Low-Income Higher Install Costs (95% vs 80% Only)	Low-Income Payback	Low-Income Simple Payback
New England	276	42	43%	11%	2%	26.4%	$ 39.81	$ 82.40	$ 819.58	13.6	9.9
Middle Atlantic	1,579	212	40%	5%	1%	12.7%	$ 270.01	$ 59.25	$ 625.65	8.6	10.6
East North Central	2,376	206	54%	19%	2%	34.8%	$ 208.05	$ 52.78	$ 682.01	22.7	12.9
West North Central	750	52	39%	14%	2%	36.0%	$ 274.39	$ 57.36	$ 684.48	17.3	11.9
South Atlantic	1,326	145	85%	50%	32%	59.0%	$ (113.26)	$ 30.97	$ 616.98	63.9	19.9
East South Central	672	124	79%	26%	14%	33.0%	$ 278.82	$ 44.28	$ 352.50	18.3	8.0
West South Central	1,040	75	92%	61%	36%	66.7%	$ (103.10)	$ 19.87	$ 459.10	52.8	23.1
Mountain	987	88	79%	57%	25%	71.9%	$ (269.50)	$ 13.84	$ 575.20	48.6	41.6
Pacific	994	89	66%	38%	7%	58.4%	$ (232.00)	$ 21.22	$ 673.96	51.7	31.8
Total	10,000	1,034	63%	29%	12%	45.5%	$ 40.26	$ 43.04	$ 601.54	36.1	14.0
North	5,697	572	46%	13%	2%	28.9%	$ 189.84	$ 55.82	$ 661.31	20.4	11.8
South	4,303	462	85%	48%	25%	56.6%	$ (60.33)	$ 27.24	$ 527.58	46.6	19.4

Table J.4: Regional Impact of 95% AFUE NWGF Rule on Senior Consumers No Switching Scenario

Region	Total Simulated Trial Count	Senior Weighted Trial Count	Percent Affected	Percent Senior Negatively Impacted	Percent Senior that Fuel Switched	Percent of Senior Affected that are Negatively Impacted	Average LCC Savings for Senior	Average First Year Savings for Low-Income (95% vs 80% Only)	Senior Higher Install Costs (95% vs 80% Only)	Senior Payback	Senior Simple Payback
New England	276	58	37%	3%	1%	9%	$ 686.81	$ 186.05	$ 168.27	3.4	0.9
Middle Atlantic	1,579	304	38%	3%	1%	9%	$ 353.28	$ 104.09	$ 579.15	5.9	5.6
East North Central	2,376	362	47%	9%	1%	20%	$ 440.49	$ 79.05	$ 659.03	9.8	8.3
West North Central	750	129	46%	12%	3%	25%	$ 487.96	$ 86.74	$ 479.19	12.8	5.5
South Atlantic	1,326	175	79%	35%	28%	44%	$ 369.96	$ 62.15	$ 485.14	29.2	7.8
East South Central	672	117	79%	19%	19%	24%	$ 294.15	$ 55.22	$ 453.32	10.7	8.2
West South Central	1,040	153	86%	45%	25%	52%	$ 11.07	$ 31.99	$ 488.53	23.7	15.3
Mountain	987	193	74%	29%	10%	39%	$ 66.05	$ 37.74	$ 362.29	24.2	9.6
Pacific	994	168	53%	22%	5%	41%	$ 144.45	$ 41.90	$ 512.14	24.4	12.2
Total	10,000	1,659	58%	18%	9%	32%	$ 272.36	$ 71.58	$ 515.39	17.6	7.2
North	5,697	994	43%	7%	1%	16%	$ 411.95	$ 91.04	$ 558.15	8.8	6.1
South	4,303	665	80%	35%	20%	44%	$ 160.71	$ 42.49	$ 451.45	24.7	10.6

Low-income consumers in four separate regions have negative LCC savings under a no-switching scenario. The south, on average, presented an average of negative $60 with an extreme payback period of 46.6 years. Fuel switching has such a high impact on low-income consumers in the south that the rule will negatively impact a third of low-income consumers, and half will be negatively affected if fuel switching is disallowed in the model. Senior households also present similar challenges concerning fuel switching. The model shows significant positive savings in both the north and the south. However, without using DOE's fuel-switching model, senior households only save $161 and have an average payback period of 24.7 years.

While DOE reviews the impact of the Proposed Rule on a regional basis, appended as Attachment P, are the impacts on low-income and senior consumers state-by-state.[124]

G. DOE's Propose Rule Would Compel Fuel Switching, Contrary to EPCA

The Proposed Rule would unlawfully compel many consumers to switch from gas to electric appliances. Indeed, the NOPR expects that millions of consumers will switch from natural gas furnaces to electric heat pumps because of its requirements.[125] This intended outcome, however, is contrary to EPCA.

Congress made it clear that the energy conservation standards must not force fuel switching in several ways. First, when Congress gave the Department authority to establish new standards for furnaces, it specified that those standards must not be "likely to result in a significant shift from gas heating to electric resistance heating with respect to either residential construction or furnace

[124] *See* State Impact Summary of DOE's Rule, Attachment P at pages. 3-6.
[125] 87 Fed. Reg. at 40666-67, 40647; TSD Figure 9.5.8 (projected heat pump shipments due to switching); TSD Table 10.3.5; and *see* Attachment N at pages 20-22. AGA believes that the NOPR vastly underestimates the degree of fuel switching that proposed standards would force, particularly in light of the incentives for heat pumps under various state and federal programs and the enormous costs involved with modifying a home to accommodate positive pressure venting. *See*, *e.g.*, 87 Fed. Reg. at 40654. Moreover, the NOPR presents its estimate of the number pushed to electric furnaces as a national average. This ignores regional differences that will cause a far higher percentage of fuel switching in certain markets.

replacement."[126] Indeed, Congress itself set separate standards for gas and electric products.[127] Second, as noted in Sections C and D. 3., above, Congress prohibited the standards from rendering performance characteristics unavailable.[128] Third, Congress ensured that the standards would be technologically and economically feasible for the entire product class.[129] Fourth, Congress authorized the Department to create separate classes specifically to allow the Department to increase efficiency standards for some products within a class without eliminating "performance related features" important to consumers.

If there were any confusion about the intention behind these provisions, the legislative history demonstrates that Congress did not intend for the energy conservation standards to allow DOE to favor one fuel over another or limit consumer choice. The original conference report on the energy conservation standards program explicitly stated that, "[i]n providing the Secretary the authority to establish different standards based upon the type of energy consumed, the conferees intend to provide the Secretary flexibility *so that energy efficiency standards will not result in the elimination of any type of covered product using a particular form of energy."*[130] As the Chairmen of the Senate Committee on Energy and Natural Resources later clarified when presenting legislation that would revise the program, "[w]e don't want this bill to have the effect of creating a significant biase against any fuel—be it oil, gas, or electricity—so as to favor one over the other."[131] The Committee Report further noted that EPCA includes "several safeguards against a standard for small gas furnaces being set at a level that results in a buying preference or significant

[126] 42 U.S.C. § 6295(f)(1)(B)(iii).
[127] *Id*. § 6295(f)(3).
[128] *Id*. § 6295(o)(4).
[129] *Id*. § 6294(o)(2)(A).
[130] 124 Cong. Rec. 35050 (1978) (conference report and statement submitted by Rep. Dingell) (emphasis added).
[131] 133 Cong. Rec. 545 (1987).

switching from gas heating to electric resistance heating."[132] It would be an anathema to the drafters to interpret EPCA in a way that would allow the energy conservation standards to force fuel switching or electrification.

The NOPR's approach to its evaluation of fuel-switching concerns also is arbitrary and capricious. To evaluate the degree of fuel switching that the proposed standards would cause, the Department created a consumer choice model.[133] The model relied, in part, on the NOPR's evaluation of the installation costs to accommodate a new product.[134] As noted in Section E, however, the NOPR vastly underestimates the installation costs associated with installing condensing appliances in homes with atmospheric venting. These same problems permeate the NOPR's evaluation of the payback period for new condensing furnaces, which also heavily influences the fuel switching analysis.[135] Until the Department corrects its flawed analysis of the installation costs and payback period estimates, its fuel-switching analysis will remain arbitrary and unsupported by substantial evidence.

Moreover, in deciding not to create a separate class for non-condensing appliances, the Department completely ignored the impacts of fuel switching. In its December 29, 2021 Interpretive Rule, the Department brushed aside the impacts of fuel switching arguing that only "[i]n a limited number of cases, a consumer facing a difficult installation situation may decide it to be impracticable . . . to replace a product with another that relies on the same fuel source."[136] It similarly asserted "the mere potential for fuel switching does not serve as a basis for establishment of a performance-related feature under EPCA."[137] In contrast, the NOPR's own underestimate of

[132] S. Rep. No. 99-497, at 5 (1986); *see also* Report of the Senate Commerce Committee on Energy and Natural Resources, S. Rep. No. 100-6, at 5–6 (noting safeguards against fuel switching).
[133] *See* 87 Fed. Reg. at 40646.
[134] *Id.*
[135] *See id*.
[136] December 29, 2021, Interpretive Rule, 86 Fed. Reg. at 73962.
[137] *Id*.

fuel switching shows that over 7% of consumers will do so.[138] Another several percent of consumers will make major repairs to their existing furnaces, rather than replace them, undermining the NOPR's purported efficiency benefits. The NOPR and the Department's decision to reject creating separate classes are rendered arbitrary and unsupported by substantial evidence of their failure to grapple with the impacts of fuel switching meaningfully.

For similar reasons, it is improper for DOE to rely on the impacts of fuel switching to support its economic justification for the rule. As noted above, Congress designed the energy conservation standard program to be fuel neutral and prevent fuel switching. It is, therefore, improper for DOE to consider fuel switching as one of the benefits of the proposed standards. Nevertheless, at least half of the purported nationwide LCC savings that the proposal asserts would result from the rule are due to fuel switching. In some regions of the country, that number increased to nearly three-quarters of the purported savings. To be consistent with EPCA's text, purpose, structure, and intent, those purported savings must be subtracted from EPCA's analysis of whether the standards would be economically justified.

H. DOE Should Fully Examine the Impacts of Fuel Switching on the Entire Energy System

While it is improper to consider fuel switching one of the benefits of the proposed standard, it is essential to understand the consequences of fuel switching impacts on the overall energy system. Therefore, DOE should fully examine, and not ignore, the impacts fuel switching would have on the entire energy system, including utilities and end-use residential consumers. Fuel switching can impact existing and future natural gas utility consumers and existing and future electricity consumers. For example, electrifying buildings can lead to additional infrastructure

[138] NOPR, 87 Fed. Reg. at 40666-67, 40647; TSD Figure 9.5.8 (projected heat pump shipments due to switching); TSD Table 10.3.5.

costs if it's necessary to add additional generation capacity and electric transmission and distribution infrastructure to meet new peaks in electricity demand. As pertinent to the topics raised in this proceeding and the questions raised above, in 2018, AGA engaged a cross-functional team of experts to evaluate policy-driven electrification of the U.S. residential sector. The study, "Implications of Policy-Driven Residential Electrification," appended as Attachment Q,[139] identified numerous challenges to electrification including:

- Cost-effectiveness
- Consumer impacts
- Transmission capacity constraints on the existing electrical system
- Current and projected electric grid emissions levels
- Requirements for new investments in the power grid to meet new growth in peak generation demand during winter periods

Furthermore, the impacts of fuel switching on the reliability and resilience of the energy system must be fully examined. The Department should consider the performance of electric end-use equipment on the coldest and hottest days of the year. Concerning the infrastructure requirements of fuel switching, the Department should thoroughly examine how fuel switching would impact the determination of future electric generation, transmission, or distribution infrastructure requirements. The natural gas pipeline, distribution, and storage systems can deliver large capacity to meet variable demand. The U.S. natural gas system delivers three times more energy on the coldest day of the year than the electricity grid provides on the hottest.[140] In some regions, "on a peak demand day, the natural gas network delivers up to four times as much energy as the electric network on a peak day."[141] To that end, the Department should determine if electric

[139] AGA, Implications of Policy-Driven Residential Electrification, July 2018 (Attachment Q).
[140] Based on Energy Information Administration and market data.
[141] *See* Columbia SIPA, Center on Global Energy Policy, "Investing in the US Natural Gas Pipeline System to Support Net-Zero Targets," April 22, 2021, at p. 25, available at https://www.energypolicy.columbia.edu/research/report/investing-us-natural-gas-pipeline-system-support-net-zero-targets (last visited Oct. 5, 2022).

system planning adequately anticipates the peak requirements based on design-day and better understand if there will be a shift from summer to winter peak due to the NOPR.

I. DOE Should Fully Assess the Impacts of the Proposed Rule on Natural Gas Distribution Utilities

The Process Rule requires DOE to conduct a utility impact analysis in its standards rulemakings.[142] Specifically, the Process Rule requires DOE's utility impact analysis to "include estimated marginal impacts on electric and gas utility costs and revenues."[143] In the NOPR, DOE states that the "utility impact analysis estimates several effects on the electric power generation industry that would result from the adoption of new or amended energy conservation standards." While DOE defines the analysis as only relating to electric power generation, it discusses DOE's utility impact analysis related to gas utilities.[144] Regarding gas utilities, DOE asserts that energy efficiency can reduce utility revenues through lower volumetric sales.[145] DOE notes that it is difficult to ascertain the precise financial impacts on specific gas utilities. Despite the difficulty noted by DOE, the NOPR nevertheless concludes that negative impacts on gas utilities in certain states would be minimal and for several other States there would be a potential for negative financial impacts on gas utilities.[146] DOE claims that revenue decoupling is the reason for the minimal impact. However, based on a single state, it also asserts that the impact of the standard would be minimal even where revenue decoupling is not in place.[147] In short, the Department states it did not ascertain the precise financial impacts on utilities, but in the few cases it looked

[142] *See* 10 C.F.R. part 430, subpart C, App. A § 6(e)(4)(iv) (Factors to be considered in selecting a proposed standard include an "analysis of utility impacts will include estimated marginal impacts on electric and gas utility costs and revenues.").
[143] *Id.*
[144] NOPR, 87 Fed. Reg. at 40663.
[145] *Id.*
[146] NOPR, 87 Fed. Reg. at 40664.
[147] *Id.*

at, the impact was minimal despite certain sample jurisdictions having very different rate and revenue mechanisms.

This is insufficient. DOE should adhere to the Process Rule and conduct a complete impact analysis that quantifies and evaluates the marginal impacts to gas utility costs and revenues of a reduction in gas deliveries due to fuel switching driven by the Proposed Rule. In addition to its analysis of impacts to gas distribution utilities, DOE should analyze whether the imposition of furnace standards could have adverse impacts on retail natural gas ratepayers. As referenced by DOE, decoupling will not fully protect consumers from increased rates if a utility's fixed costs are allocated across lower volumes that may result from the removal of non-condensing furnaces from the market and fuel switching caused by the Proposed Rule. Furthermore, decoupling takes on different forms: 1) full revenue decoupling, 2) partial revenue decoupling, where only a portion of losses are recovered, and 3) revenue decoupling with certain restrictions. If the Department plans to rely on decoupling as the basis for claiming minimal impacts, it must fully examine the Proposed Rule's impact on utilities subject to differing regulatory mechanisms and different forms of decoupling. Because DOE acknowledges that its proposed efficiency standards threaten to drive many consumers to shift from natural gas heat to electric heating, the Department should evaluate whether the loss of demand for natural gas local distribution companies could lead to higher rates on remaining consumers to cover fixed distribution costs. DOE should consider and understand the nature and magnitude of these effects before it finalizes any revised furnace efficiency standards. To the extent it believes it does not have to follow the Process Rule's requirements with regard to utility impacts, it must explain why deviation from the Process Rule is necessary (or at least appropriate) and allow stakeholders to comment on that explanation.

DOE also failed to analyze the impact of the Proposed Rule on natural gas utility efficiency programs. As noted above, in Section III. B., AGA member companies invested $1.6 billion to support energy efficiency programs in 2019 and budgeted $1.7 billion for 2020. These programs reach nearly 7 million consumers, more than 380,000 low-income consumers, nearly 140,000 multi-family consumers, more than 130,000 commercial consumers, and 41,000 separate industrial program consumers. DOE should fully analyze the impact of the Proposed Rule on utility efficiency programs. For the Department to fully consider the impact of the Proposed Rule, it should understand if programs that assist utility consumers will be negatively impacted.

J. DOE has a Duty to Respond to these Comments

In these comments, AGA has raised a number of issues regarding faulty assumptions, unsupported data and assumptions, legal errors, and other critical flaws with the Proposed Rule. As noted above, EPCA requires DOE to support the Proposed Rule with substantial evidence. Where, like here, AGA has raised concerns about crucial parts of DOE's analysis, the Department must respond to those concerns with "a cogent and reasoned response" that itself is supported by substantial evidence. Several of the concerns raised herein have permeated multiple efforts by DOE to address efficiency standards for furnaces, including the Department's modeling assumptions, approach to consumer choice and economics, assumptions regarding installation costs, and others. Failure to provide a reasoned, evidence-based response to these comments will render any final version of the Proposed Rule vulnerable to challenge.

VI. CONCLUSION

The American Gas Association respectfully requests that the Department of Energy consider these comments in this proceeding and rescind the Proposed Rule for the reasons stated herein. If you have any questions regarding this submission, please do not hesitate to contact the undersigned.

Respectfully submitted,

Matthew J. Agen
Assistant General Counsel
American Gas Association
400 N. Capitol Street, NW
Washington, DC 20001
magen@aga.org

Attachment E

Regional Impact Tables for GIWHs

EERE-2017-BT-STD-0019

Table: Regional Impact of GIWH Rule

	Total Simulated Trial Count	Affected	Percent of Affected that are Negatively Impacted	Average LCC Savings	Average First Year Savings	Higher Install Costs	Total Payback
Alabama	213	37%	11%	$ 371	$ 39	$ 146	3.5
Alaska	41	51%	48%	$ (62)	$ 25	$ 139	20.2
Arizona	167	44%	44%	$ (4)	$ (9)	$ 145	11.9
Arkansas	51	37%	58%	$ 44	$ (3)	$ 112	10.0
California	1,814	37%	30%	$ 186	$ 15	$ 5	8.7
Colorado	175	36%	11%	$ 208	$ 8	$ 136	8.8
Connecticut	18	33%	33%	$ 68	$ 17	$ 37	6.5
Delaware	10	10%		$ 228	$ 12	$ 247	-
District of Columbia	5	40%	100%	$ (199)	$ 34	$ 61	-
Florida	427	37%	32%	$ 200	$ 45	$ 234	7.5
Georgia	197	34%	37%	$ 71	$ 14	$ 139	9.1
Hawaii	23	30%	29%	$ 514	$ 57	$ (13)	2.9
Idaho	6	67%	25%	$ 38	$ 16	$ 259	9.4
Illinois	448	37%	52%	$ (1)	$ 1	$ 17	23.9
Indiana	208	42%	53%	$ (27)	$ (25)	$ 141	17.8
Iowa	272	34%	41%	$ 22	$ 9	$ 187	10.6
Kansas	52	50%	54%	$ 1	$ (24)	$ 133	19.1
Kentucky	53	38%	45%	$ 424	$ 166	$ 152	47.6
Louisiana	391	31%	74%	$ (69)	$ 10	$ 151	23.2
Maine	10	50%	20%	$ 69	$ 18	$ 124	7.7
Maryland	260	31%	14%	$ 344	$ 28	$ 163	2.4
Massachusetts	221	40%	14%	$ 320	$ 5	$ 81	5.8
Michigan	849	40%	20%	$ 293	$ 21	$ 88	6.4
Minnesota	67	39%	50%	$ (88)	$ (3)	$ 113	26.8
Mississippi	36	39%	50%	$ 42	$ 2	$ 161	16.9
Missouri	140	39%	44%	$ 22	$ (24)	$ 12	16.6
Montana	29	41%	17%	$ 71	$ 20	$ 179	6.5
Nebraska	157	47%	15%	$ 65	$ 11	$ 75	4.9
Nevada	29	28%	38%	$ (1)	$ (10)	$ (126)	21.8
New Hampshire	6	67%	25%	$ 957	$ 40	$ (28)	3.0
New Jersey	198	38%	43%	$ (1)	$ 9	$ (6)	13.8
New Mexico	68	35%	42%	$ 3	$ 8	$ 65	8.0
New York	327	34%	33%	$ 89	$ 38	$ 43	15.4
North Carolina	123	37%	40%	$ 117	$ 11	$ 146	7.8
North Dakota	7	43%	33%	$ (15)	$ (2)	$ 316	4.1
Ohio	274	44%	65%	$ (24)	$ 8	$ 111	21.6
Oklahoma	464	36%	18%	$ 209	$ (0)	$ 155	6.4
Oregon	26	69%	44%	$ 20	$ 0	$ 111	11.0
Pennsylvania	194	39%	37%	$ 31	$ 12	$ 46	13.3
Rhode Island	94	47%	55%	$ 176	$ (5)	$ 104	16.9
South Carolina	371	33%	45%	$ 14	$ 17	$ 260	11.6
South Dakota	4	50%		$ 79	$ 10	$ (775)	9.8
Tennessee	186	35%	50%	$ 52	$ 17	$ 218	9.0
Texas	573	36%	47%	$ 86	$ 32	$ 171	14.0
Utah	43	40%	53%	$ 69	$ 37	$ 155	7.7
Vermont	135	36%	12%	$ 349	$ 20	$ 217	4.4
Virginia	125	45%	18%	$ 280	$ 54	$ 220	11.2
Washington	68	53%	56%	$ (11)	$ 10	$ 86	20.0
West Virginia	143	27%	49%	$ 33	$ 21	$ 260	5.1
Wisconsin	197	41%	20%	$ 241	$ 20	$ 72	5.9
Wyoming	5	20%		$ 755	$ 16	$ 220	0.3
	10000	38%	35%	$ 135	$ 16	$ 105	11.3

Table: Regional Impact of GIWH Rule on Low-Income Households

	Total Simulated Trial Count	Low Income Weighted Trial Count	Percent Affected	Percent of Low Income Affected that are Negatively Impacted	Average LCC Savings for Low Income	Average First Year Savings for Low Income	Low Income Higher Install Costs	Low Income Payback
Alabama	213	5	41%	53%	$ 39	$ 20	$ 512	60.2
Alaska	41	-			$ -	$ -	$ -	-
Arizona	167	4	41%	45%	$ 337	$ 4	$ 1,764	21.6
Arkansas	51	2	60%	88%	$ (71)	$ 16	$ 126	5.0
California	1,814	182.0	36%	38%	$ 27	$ 6	$ (2)	6.7
Colorado	175	56	47%	5%	$ 240	$ 2	$ 41	2.5
Connecticut	18	2	30%	100%	$ (23)	$ -	$ -	-
Delaware	10	-			$ -	$ -	$ -	-
District of Columbia	5	-			$ -	$ -	$ -	-
Florida	427	4	55%	57%	$ (34)	$ 167	$ 1,138	139.2
Georgia	197	7	40%	60%	$ (37)	$ 13	$ 108	72.9
Hawaii	23	-			$ -	$ -	$ -	-
Idaho	6	-			$ -	$ -	$ -	-
Illinois	448	14	66%	27%	$ 53	$ (57)	$ (247)	5.6
Indiana	208	3	38%		$ 120	$ (334)	$ 1,409	41.1
Iowa	272	1	100%	100%	$ (170)	$ 138	$ 935	419.5
Kansas	52	3	56%	29%	$ 45	$ 4	$ 78	8.7
Kentucky	53	3	31%		$ 103	$ 26	$ 75	-
Louisiana	391	-			$ -	$ -	$ -	-
Maine	10	-			$ -	$ -	$ -	-
Maryland	260	4	51%		$ 134	$ 41	$ 901	25.4
Massachusetts	221	35	54%	14%	$ 263	$ 7	$ 77	3.5
Michigan	849	72	34%	59%	$ (53)	$ 12	$ 205	17.6
Minnesota	67	5	69%	13%	$ 33	$ 8	$ 117	19.4
Mississippi	36	11	40%	41%	$ 27	$ 8	$ 49	2.2
Missouri	140	4	60%	75%	$ (193)	$ 6	$ 66	10.1
Montana	29	-			$ -	$ -	$ -	-
Nebraska	157	1	100%		$ 85	$ 279	$ 758	39.0
Nevada	29	4	36%	18%	$ (8)	$ 11	$ 84	69.5
New Hampshire	6	1	100%	54%	$ 347	$ 2	$ 11	3.8
New Jersey	198	11	51%	34%	$ (37)	$ 8	$ 104	14.0
New Mexico	68	-			$ -	$ -	$ -	-
New York	327	28	53%	38%	$ 14	$ 38	$ 5	4.8
North Carolina	123	44	40%	39%	$ 100	$ 5	$ 30	3.1
North Dakota	7	1	47%	100%	$ (246)	$ -	$ -	-
Ohio	274	14	53%	46%	$ 128	$ (50)	$ 2	22.2
Oklahoma	464	1	28%		$ 576	$ 847	$ 9,125	958.2
Oregon	26	0	100%		$ 10	$ -	$ -	-
Pennsylvania	194	7	54%	36%	$ 4	$ 10	$ 87	13.8
Rhode Island	94	0			$ -	$ -	$ -	-
South Carolina	371	1			$ -	$ -	$ -	-
South Dakota	4	1	100%		$ 154	$ 3	$ (645)	1.6
Tennessee	186	4	80%	100%	$ (104)	$ 52	$ 269	21.5
Texas	573	48	43%	30%	$ 115	$ (9)	$ 224	17.4
Utah	43	3	34%	100%	$ (305)	$ 0	$ 8	7.9
Vermont	135	-			$ -	$ -	$ -	-
Virginia	125	6	43%	79%	$ (56)	$ 273	$ 381	16.8
Washington	68	10	54%	67%	$ (24)	$ 2	$ 14	0.9
West Virginia	143	3			$ -	$ -	$ -	-
Wisconsin	197	2	54%	100%	$ (34)	$ 127	$ 832	80.0
Wyoming	5	1			$ -	$ -	$ -	-
	10000	609	43%	37%	$ 67	$ 11	$ 138	15.8

Table: Regional Impact of GIWH Rule on Senior Households

	Total Simulated Trial Count	Senior Weighted Trial Count	Percent Affected	Percent Senior Affected that are Negatively Impacted	Average LCC Savings for Seniors	Average First Year Savings for Seniors	Higher Install Cost for Seniors	Payback for Seniors
Alabama	213	105	35%	14%	$ 184	$ 19	$ 76	5.2
Alaska	41	23	47%	59%	$ (61)	$ 26	$ 94	3.3
Arizona	167	95	46%	42%	$ (28)	$ (2)	$ 41	4.1
Arkansas	51	1			$ -	$ -	$ -	-
California	1,814	164	32%	43%	$ 40	$ 35	$ (31)	28.9
Colorado	175	9	47%	75%	$ (111)	$ 41	$ 81	20.3
Connecticut	18	2			$ -	$ -	$ -	-
Delaware	10	1			$ -	$ -	$ -	-
District of Columbia	5	-			$ -	$ -	$ -	-
Florida	427	110	39%	45%	$ 9	$ 45	$ 183	14.5
Georgia	197	5			$ -	$ -	$ -	-
Hawaii	23	1			$ -	$ -	$ -	-
Idaho	6	-			$ -	$ -	$ -	-
Illinois	448	105	43%	55%	$ (28)	$ 7	$ 65	8.9
Indiana	208	10	60%	66%	$ (71)	$ 36	$ 351	53.5
Iowa	272	9	30%		$ 97	$ 34	$ 2,151	109.7
Kansas	52	3	100%	63%	$ (9)	$ 14	$ 98	2.7
Kentucky	53	2	33%		$ 198	$ 2,098	$ (226)	31.1
Louisiana	391	4	41%	59%	$ (31)	$ (40)	$ 2,379	183.6
Maine	10	2	67%		$ 172	$ 11	$ 133	16.7
Maryland	260	2	67%	50%	$ 48	$ 169	$ 288	160.2
Massachusetts	221	7	40%		$ 268	$ 213	$ 845	66.6
Michigan	849	29	50%	37%	$ 83	$ 82	$ 401	69.2
Minnesota	67	26	68%	68%	$ (181)	$ 9	$ 54	3.9
Mississippi	36	4	29%	93%	$ (39)	$ 38	$ 593	68.0
Missouri	140	14	45%	89%	$ (89)	$ (36)	$ 104	14.1
Montana	29	6	33%		$ 29	$ 11	$ 300	43.3
Nebraska	157	3			$ -	$ -	$ -	-
Nevada	29	5			$ -	$ -	$ -	-
New Hampshire	6	2	58%		$ 594	$ -	$ -	-
New Jersey	198	16	40%	58%	$ (125)	$ 53	$ (123)	59.3
New Mexico	68	13	43%	13%	$ 56	$ (35)	$ (11)	6.3
New York	327	61	26%	26%	$ 75	$ 83	$ (26)	14.8
North Carolina	123	92	40%	43%	$ 87	$ 1	$ 22	1.7
North Dakota	7	2	33%		$ 23	$ 9	$ (19)	-
Ohio	274	63	41%	73%	$ (34)	$ 26	$ 66	23.3
Oklahoma	464	308	35%	17%	$ 215	$ 5	$ 35	3.2
Oregon	26	7	60%	49%	$ (25)	$ 8	$ 70	4.0
Pennsylvania	194	105	40%	54%	$ (80)	$ 6	$ (12)	5.4
Rhode Island	94	1			$ -	$ -	$ -	-
South Carolina	371	1	100%	90%	$ (28)	$ 726	$ 6,887	180.5
South Dakota	4	-			$ -	$ -	$ -	-
Tennessee	186	60	38%	52%	$ (2)	$ 15	$ 57	6.1
Texas	573	247	32%	44%	$ 38	$ 32	$ 90	11.3
Utah	43	10	56%	35%	$ 66	$ 2	$ 51	8.5
Vermont	135	-			$ -	$ -	$ -	-
Virginia	125	76	41%	13%	$ 238	$ 2	$ 57	3.7
Washington	68	34	68%	69%	$ (68)	$ 2	$ 26	1.5
West Virginia	143	76	24%	35%	$ 71	$ 9	$ 118	6.5
Wisconsin	197	11	33%	60%	$ (3)	$ 108	$ 959	135.2
Wyoming	5	-			$ -	$ -	$ -	-
	10000	1931	38%	40%	$ 53	$ 23	$ 95	14.1