Department of Energy
Washington, DC 20585

January 14, 2015

BY U.S. MAIL AND EMAIL

Mr. William T. Miller
Partner
McCarter & English, LLP
1015 15th Street, NW
12th Floor
Washington, DC 20005

Re: Remand from *APGA v DOE*, CADC No. 11-1485

Dear Bud:

DOE has considered APGA's November 14, 2014 letter, and while we regret that APGA did not believe its questions were answered at the November 7, 2014, public meeting, we disagree with the implication in your letter that DOE has not fully complied with the settlement agreement in *American Public Gas Association v. Department of Energy et al., No. 11-1485 (D.C. Cir. filed Dec. 23, 2011)*, which required DOE "to make available to the public the data gathered and analyzed by the agency prior to publication of a proposed rule." We believe that the data so gathered in connection with the remanded furnace rule, and made publicly available by DOE pursuant to the settlement, is extensive and provides ample opportunity for analysis prior to issuance of the proposed rule.

As explained in the meeting announcement published in the *Federal Register* on October 30, 2014, the purpose of the public meeting was to provide an opportunity for DOE to explain in more detail the data included in the three spreadsheets that were made publicly available on September 26, 2014, and to answer questions concerning the analytical tools operative in those spreadsheets. 79 FR 64517. In accordance with that goal, DOE provided a comprehensive four-hour tutorial on the spreadsheets and responded to questions. In particular, DOE provided detailed answers to all of APGA's questions to the extent that they did not implicate pre-decisional, deliberative matters with regard to the draft proposed rulemaking concerning non-weatherized and mobile home gas furnaces, which remains under review within the Executive branch.

As you know, Federal agency rulemaking is a deliberative process in which multiple

stakeholders within the Executive branch may conduct separate analyses of the issues being addressed in the rulemaking and form conclusions based on these analyses. These analyses are conducted using a fixed set of data. Although the data set remains fixed, the analyses and accompanying conclusions may change as the inter-agency process proceeds. To ensure robust debate within the government, the process of conducting and considering the analyses upon which an agency's ultimate policy decision is based is protected by a deliberative process privilege. A proposed rule that is the product of this inter-agency process is published in the Federal Register and the public is provided a period (usually between 30 and 60 days) in which to comment on the data, the agency's approach to analyzing the data, and the policy choices made in the proposed rule.

DOE does not typically provide data supporting the policy decisions at issue in developing a proposed rule prior to issuing that proposed rule document. However, in accordance with the Joint Statement supporting the settlement agreement in *APGA v. DOE*, DOE made "available to the public the data gathered and analyzed" in developing a *draft* proposed rule from DOE that was submitted to and remains under review at the Office of Management and Budget (OMB). (Joint Statement, pp. 7-8). The provision of these data at this stage of rule development is unprecedented in DOE's past rulemaking activities.

DOE understands that the data that were provided were complicated and voluminous, as is typical of most appliance standards rulemakings. Therefore, to address APGA's concerns about its ability to understand and utilize the data provided, DOE hosted a public meeting, on November 7, 2014, to explain the spreadsheets and the analytical tools underlying the spreadsheets in a comprehensive, step-by-step fashion and to answer questions that the public may have had regarding the calculations DOE conducted in producing the spreadsheets. When APGA submitted its questions prior to the meeting, at DOE's request, APGA was aware that the draft proposed rule was at OMB and thus was still undergoing the deliberative process applicable to agency rulemaking. Therefore, APGA could not reasonably have expected that DOE would answer any questions that involved the ongoing deliberative interagency process, and I was clear in my communication to you, that DOE would not answer any such questions. APGA claimed in its November 14, 2014 letter that its questions did not delve into the deliberative process since "we are not asking at this stage why DOE made certain choices." Yet, among the questions APGA provided in advance were several that involved the *reasoning* and the *rationale* behind DOE's regulatory decision, which is a focus of the ongoing deliberative process and is thus privileged. Nevertheless, during the course of the public meeting, DOE addressed every question APGA submitted that directly pertained to the data and the analytical tools.

APGA's November 14, 2014 letter claimed that DOE's tutorial on its "opaque and complex" spreadsheets "effectively answered none of [their] questions," and characterized answers where DOE provided as much information as possible without breaching the deliberative process privilege as "tantamount to no answer at all since the complete answer is required to permit further analysis." (APGA November 14, 2014 letter, p.1) DOE disagrees. DOE systematically walked APGA's technical team through each of the spreadsheets, addressing both previously

submitted questions and questions asked at the meeting. Nevertheless, in the spirit of cooperation, DOE is enclosing with this letter written responses to those questions submitted by APGA that can be and were answered without waiving the deliberative process privilege. Each answer provided in this document was discussed at the meeting. The answers in the enclosure are numbered so as to correspond to each APGA question. We are asserting deliberative process privilege only to four out of the 29 questions submitted by APGA.

APGA stated that "time is of the essence" with respect to APGA's ability to participate in the rulemaking at issue. (APGA November 14, 2014 Letter, p. 2). DOE would like to make clear that APGA currently has *all* the data that DOE used to develop the draft proposed rule currently under review at OMB. These data are available in this rulemaking process at an earlier point than in any other rulemaking issued by DOE. DOE will publish, after OMB concludes its review, the proposed rule, on which APGA and all other interested parties will have 90 days to comment—a time period that is 30 days longer than most DOE rulemakings. Consequently, DOE anticipates that APGA, along with the rest of the interested public, will have ample opportunity to participate in the related public meeting(s) and to ask DOE any and all pertinent questions about the proposed rule. DOE also expects that APGA will provide extensive comment on that proposed rule.

Consistent with its obligations under the settlement agreement, and in an effort to be as forthcoming as possible with the public, DOE has made its utmost effort to conduct a timely, open, and effective rulemaking process, and will continue to do so. We greatly appreciate APGA's participation in this process and trust that we can continue our mutual efforts to develop a robust and well-reasoned energy conservation standard applicable to non-weatherized gas furnaces and mobile home gas furnaces.

Sincerely,

Daniel Cohen
Assistant General Counsel
for Legislation, Regulation, and Energy Efficiency

Attachment

Attachment: DOE Response to APGA Questions
January 14, 2015

Questions below are regarding the spreadsheet EERE-2014-BT-STD-0031-002 unless otherwise noted.

1) **The 2011 LCC spreadsheet predicted lower LCC savings, especially for replacements in the south region and for the highest efficiency (98%) condensing furnace cases, compared to the 2014 LCC spreadsheet even though the 2011 LCC spreadsheet did not include the potential of fuel switching.**

   a) What are the major reasons for the significant changes in LCC savings?

   DOE response: DOE used the same model in both 2011 and 2014, if the analysis is run without the potential for fuel switching.[1] *Nearly all values of inputs changed for a variety of reasons. For example, the price of natural gas, one of the LCC spreadsheet inputs, was lower in the 2014 LCC spreadsheet than it was in the 2011 LCC spreadsheet.*

   b) Why do consumer impacts for replacements in the south not sum to 100% in the 2014 LCC spreadsheet?

   DOE response: The reported values have been corrected in the latest LCC spreadsheet published in DOE's website. The correction has no impact on analysis results.

   c) The 2014 LCC spreadsheet predicts first year operations cost savings averaging between $54 and $88 depending on the mandated efficiency level while the fuel switching impact analysis model provided by AGA and dated 7/11/2014 predicts a first year cost increase of $62 even though both consider fuel switching impacts. What are potential reasons for this significant discrepancy in top level results?

   DOE response: There are many inputs to both the DOE model and the AGA model. While fuel switching impacts the results cited in the question above, there are many other inputs and assumptions in the modeling that may yield different results. A user comparison of the LCC spreadsheet used in the 2011 final rule with the current LCC spreadsheet will divulge the changes and magnitude of those changes.

[1] To run the simulation without switching, select "0" under "user options" in the "Summary" tab.

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	efficiency	2011 Baseline LCC and Average LCC savings 2013$	2011 % LCC savings	2014 Baseline LCC and Average LCC savings	2014 % LCC savings	2011 Net Consumer Cost	2011 No Consumer Impact	2011 Net Consumer Benefit		2014 Net Consumer Cost	2014 No Consumer Impact	2014 Net Consumer Benefit	
National - All Installations	80% AFUE	12,310		$12,560									
	90% AFUE	94	0.8%	$231	1.8%	25.2%	52.4%	22.4%	100%	21%	47%	32%	100%
	92% AFUE	148	1.2%	$301	2.4%	26.0%	41.8%	32.2%	100%	19%	41%	39%	100%
	95% AFUE	223	1.8%	$379	3.0%	36.2%	16.9%	46.9%	100%	24%	23%	52%	100%
	98% AFUE	50	0.4%	$424	3.4%	64.2%	0.5%	35.4%	100%	41%	0%	59%	100%
		-											
North - All Installations	80% AFUE	14,609		$15,379									
	90% AFUE	168	1.2%	$209	1.4%	10.0%	71.4%	18.6%	100%	11%	67%	22%	100%
	92% AFUE	233	1.6%	$281	1.8%	10.9%	56.5%	32.6%	100%	10%	60%	30%	100%
	95% AFUE	351	2.4%	$374	2.4%	22.8%	22.9%	54.3%	100%	14%	40%	46%	100%
	98% AFUE	215	1.5%	$456	3.0%	58.7%	0.6%	40.7%	100%	38%	1%	61%	100%
		-											
South - All Installations	80% AFUE	8,882		$9,383									
	90% AFUE	(14)	-0.2%	$256	2.7%	47.9%	24.1%	28.0%	100%	33%	24%	43%	100%
	92% AFUE	21	0.2%	$323	3.4%	48.4%	19.9%	31.7%	100%	30%	20%	50%	100%
	95% AFUE	30	0.3%	$384	4.1%	56.1%	8.0%	35.9%	100%	35%	5%	60%	100%
	98% AFUE	(197)	-2.2%	$389	4.1%	72.3%	0.2%	27.4%	100%	44%	0%	56%	100%
		-											
National - Replacements	80% AFUE	11,978		$12,059									
	90% AFUE	(12)	-0.1%	$109	0.9%	31.3%	52.1%	16.6%	100%	28%	46%	19%	92%
	92% AFUE	43	0.4%	$176	1.5%	31.6%	41.6%	26.8%	100%	25%	41%	26%	92%
	95% AFUE	121	1.0%	$253	2.1%	41.2%	16.8%	42.0%	100%	28%	26%	39%	93%
	98% AFUE	(29)	-0.2%	$302	2.5%	67.1%	0.4%	32.5%	100%	45%	0%	59%	104%
		-											
North - Replacements	80% AFUE	14,308		$14,924									
	90% AFUE	98	0.7%	$111	0.7%	12.6%	71.8%	15.6%	100%	14%	67%	19%	100%
	92% AFUE	164	1.1%	$179	1.2%	13.2%	57.0%	29.8%	100%	12%	62%	26%	100%
	95% AFUE	285	2.0%	$260	1.7%	25.0%	22.8%	52.2%	100%	15%	46%	39%	100%
	98% AFUE	172	1.2%	$351	2.4%	60.0%	0.5%	39.4%	100%	40%	1%	59%	100%
		-											
South - Replacements	80% AFUE	8,561		$8,931									
	90% AFUE	(173)	-2.0%	$106	1.2%	58.8%	23.2%	18.0%	100%	42%	22%	19%	83%
	92% AFUE	(135)	-1.6%	$172	1.9%	58.7%	19.0%	22.3%	100%	38%	19%	26%	83%
	95% AFUE	(120)	-1.4%	$246	2.8%	65.0%	7.9%	27.1%	100%	41%	5%	39%	86%
	98% AFUE	(323)	-3.8%	$249	2.8%	77.5%	0.2%	22.3%	100%	50%	0%	59%	109%
		-											
National - New Construction	80% AFUE	13,311		$13,405									
	90% AFUE	416	3.1%	$589	4.4%	6.9%	53.3%	39.8%	100%	3%	49%	48%	100%
	92% AFUE	466	3.5%	$657	4.9%	8.9%	42.4%	48.7%	100%	3%	42%	55%	100%
	95% AFUE	529	4.0%	$727	5.4%	20.9%	17.4%	61.7%	100%	14%	15%	71%	100%
	98% AFUE	287	2.2%	$744	5.6%	55.3%	0.7%	44.0%	100%	29%	0%	71%	100%
		-											
North - New Construction	80% AFUE	15,493		$15,882									
	90% AFUE	372	2.4%	$486	3.1%	2.4%	70.2%	27.5%	100%	2%	65%	33%	100%
	92% AFUE	438	2.8%	$557	3.5%	4.2%	55.0%	40.8%	100%	2%	56%	42%	100%
	95% AFUE	545	3.5%	$662	4.2%	16.2%	23.2%	60.6%	100%	12%	24%	63%	100%
	98% AFUE	342	2.2%	$685	4.3%	54.8%	0.9%	44.4%	100%	33%	1%	67%	100%
		-											
South - New Construction	80% AFUE	9,891		$10,479									
	90% AFUE	484	4.9%	$709	6.8%	13.9%	26.9%	59.2%	100%	5%	30%	65%	100%
	92% AFUE	510	5.2%	$776	7.4%	16.3%	22.8%	60.9%	100%	5%	24%	71%	100%
	95% AFUE	503	5.1%	$804	7.7%	28.2%	8.4%	63.4%	100%	15%	4%	81%	100%
	98% AFUE	200	2.0%	$814	7.8%	56.2%	0.4%	43.4%	100%	24%	0%	76%	100%

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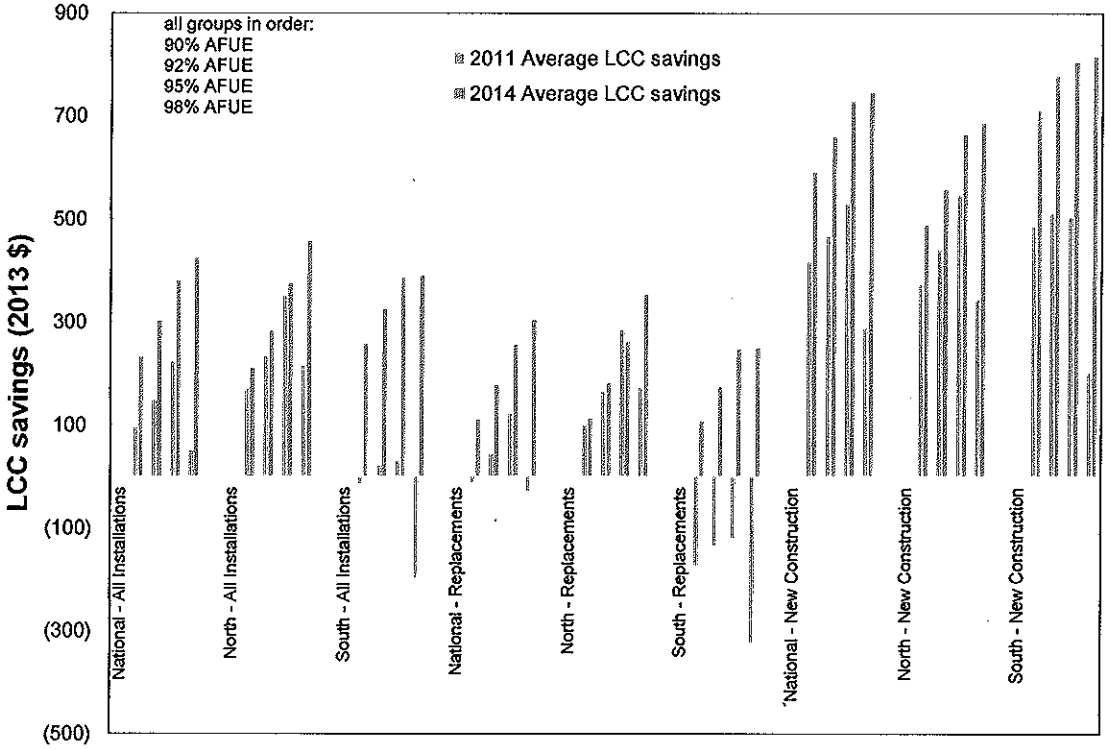

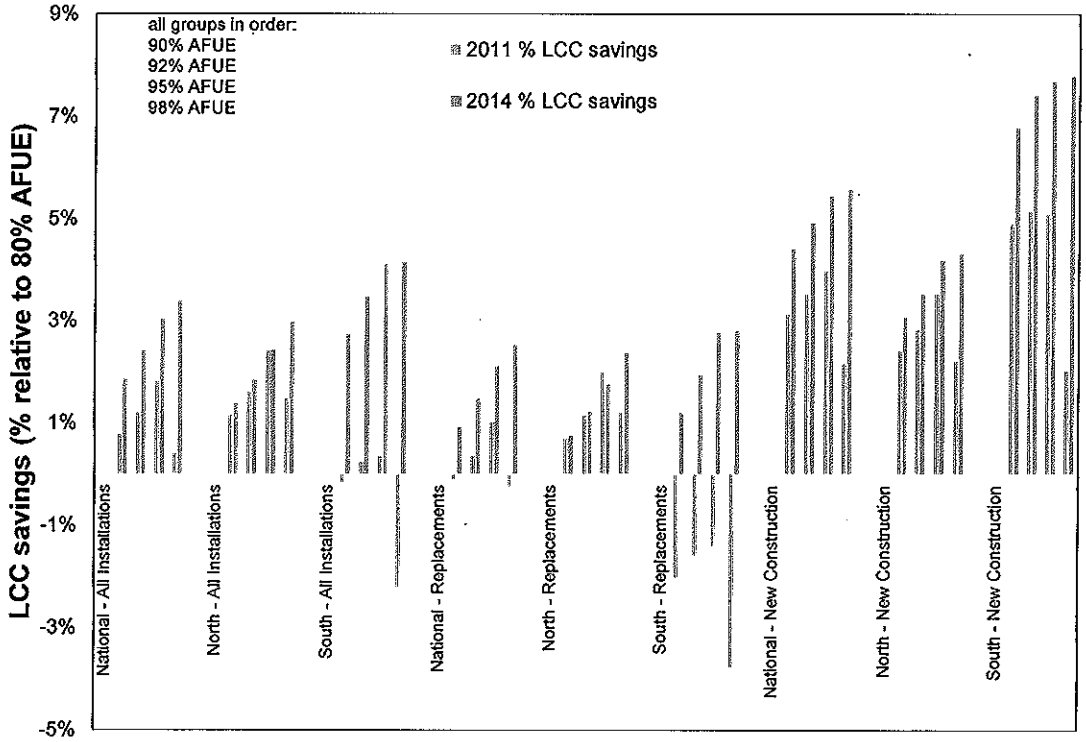

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2) 2014 LCC analysis Sheet: Statistics and 2011 LCC Sheet: Forecast Cells

a) The annual heating load in the 2014 LCC analysis using the RECS 2009 database is significantly higher, especially in the southern region, than the 2011 LCC analysis (based on the RECS 2005). What is the underlying rationale for the significant increase in heating loads, especially in the South region?

DOE response: DOE considers this question to seek deliberative process information.

	DOE 2014 (MMBtu/year)	DOE 2014 # Buildings	DOE 2011 (MMBtu/year)	DOE 2011 # Buildings	2014/2011 MMBtu %
Heating Load - NWGF - National	35.296	10,000	31.301	10,000	113%
Heating Load - NWGF - North	44.730	5,299	39.170	5,986	114%
Heating Load - NWGF - South	24.661	4,701	19.565	4,014	126%

b) The LCC spreadsheet contains over 100 Crystal Ball Monte Carlo simulation-controlled variables. It also contains parametric assumptions that are not evident in the spreadsheet, for example:

The approximate percentage of total heating load in the southern region of the total national heating load for buildings selected for analysis can be estimated by multiplying buildings' LBNL modified weighting factors by their annual heating NG consumption provided in the RECS 2005 database. In the 2011 LCC spreadsheet that numbers is 8.6%. It is relatively close to the 9.5% calculated for the same buildings with the RECS 2005 original weighing factors before they were modified by LBNL. This suggests that the ratio of building heating loads in the southern region to the rest of the country in the LBNL sample is similar to RECS 2005 weighting factors.

A similar calculation in the 2014 LCC spreadsheet shows that this number is 17%, or almost double that of the 2011 version. It is also much larger than the 12.2% calculated with the RECS 2009 original weighing factors demonstrating more aggressive modification of weighting factors in the southern region by LBNL in favor of increasing these loads. The processed/static weighting factor numbers in the 2014 LCC spreadsheet (in contrast to the 2011 version where factors are calculated in the spreadsheet) makes it impossible to evaluate the methodology used.

What is the methodology that was used to adjust these weighting factors?

DOE response: The weighting factors are adjusted to match historical shipment data by state. Total weight matches the 2021 projected shipments in the NIA spreadsheet.

3) DOE 2011 Furnace LCC Sheet "Forecast Cells" Installed Price (H8 to H12), 2009 Installed Price
DOE 2014 Furnace LCC Sheet "Labels" (M36 to M40)
DOE 2014 Furnace LCC Sheet "Forecast Cells" sum of non-switching retail price (O3123 to O3127) and installation cost (O3163 to O3167), 2013 Installed Price;

What is the basis of the large differential increase in the installed cost of a baseline 80% NWGF vs. the installed cost increase of condensing NWGFs in the 2014 LCC when compared with the 2011 LCC (in switching or non-switching configuration)?

DOE response: DOE considers this question to seek deliberative process information.

	No Switching	No Switching	No Switching	
South	DOE 2014 2013 $	DOE 2011 2009 $	DOE 2011 2013 $	2014/2011 % Change
Retail Price				
NWGF 80%	$1,147.0	$831.2	$902.6	**127.1%**
NWGF 90%	$1,305.1	$1,035.0	$1,123.8	**116.1%**
NWGF 92%	$1,321.5	$1,096.6	$1,190.8	**111.0%**
NWGF 95%	$1,449.6	$1,237.4	$1,343.7	**107.9%**
NWGF 98%	$1,644.9	$1,502.1	$1,631.0	**100.9%**
Inst. Cost				
NWGF 80%	$847.0	$782.8	$850.1	**99.6%**
NWGF 90%	$1,038.1	$1,147.1	$1,245.5	**83.3%**
NWGF 92%	$1,038.1	$1,147.1	$1,245.5	**83.3%**
NWGF 95%	$1,038.1	$1,147.1	$1,245.5	**83.3%**
NWGF 98%	$1,038.1	$1,159.3	$1,258.8	**82.5%**
Total Installed				
NWGF 80%	$1,994.0	$1,614.1	$1,752.7	**113.8%**
NWGF 90%	$2,343.2	$2,182.0	$2,369.4	**98.9%**
NWGF 92%	$2,359.5	$2,243.7	$2,436.3	**96.8%**
NWGF 95%	$2,487.6	$2,384.5	$2,589.2	**96.1%**
NWGF 98%	$2,683.0	$2,661.3	$2,889.8	**92.8%**

	No Switching	No Switching	No Switching	
North	DOE 2014 2013 $	DOE 2011 2009 $	DOE 2011 2013 $	2014/2011 % Change
Retail Price				
NWGF 80%	$1,178.0	$876.5	$951.7	**123.8%**
NWGF 90%	$1,345.7	$1,083.1	$1,176.1	**114.4%**
NWGF 92%	$1,361.4	$1,145.4	$1,243.8	**109.5%**
NWGF 95%	$1,501.1	$1,294.1	$1,405.2	**106.8%**
NWGF 98%	$1,690.7	$1,537.6	$1,669.6	**101.3%**
Inst. Cost				
NWGF 80%	$1,229.8	$1,024.4	$1,112.3	**110.6%**
NWGF 90%	$1,662.6	$1,390.8	$1,510.2	**110.1%**
NWGF 92%	$1,662.6	$1,390.8	$1,510.2	**110.1%**
NWGF 95%	$1,662.6	$1,390.8	$1,510.2	**110.1%**
NWGF 98%	$1,662.6	$1,405.3	$1,525.9	**109.0%**
Total Installed				
NWGF 80%	$2,407.7	$1,900.8	$2,064.0	**116.7%**
NWGF 90%	$3,008.3	$2,473.9	$2,686.3	**112.0%**
NWGF 92%	$3,024.0	$2,536.2	$2,753.9	**109.8%**
NWGF 95%	$3,163.7	$2,684.8	$2,915.4	**108.5%**
NWGF 98%	$3,353.3	$2,942.8	$3,195.5	**104.9%**

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	No Switching	No Switching	No Switching	
National	DOE 2014 2013 $	DOE 2011 2009 $	DOE 2011 2013 $	2014/2011 % Change
Retail Price				
NWGF 80%	$1,163.4	$858.3	$932.0	**124.8%**
NWGF 90%	$1,326.6	$1,063.8	$1,155.1	**114.8%**
NWGF 92%	$1,342.6	$1,125.8	$1,222.5	**109.8%**
NWGF 95%	$1,476.9	$1,271.3	$1,380.5	**107.0%**
NWGF 98%	$1,669.2	$1,523.3	$1,654.1	**100.9%**
Inst. Cost				
NWGF 80%	$1,049.8	$927.4	$1,007.0	**104.2%**
NWGF 90%	$1,369.0	$1,292.9	$1,403.9	**97.5%**
NWGF 92%	$1,369.0	$1,292.9	$1,403.9	**97.5%**
NWGF 95%	$1,369.0	$1,292.9	$1,403.9	**97.5%**
NWGF 98%	$1,369.0	$1,306.5	$1,418.7	**96.5%**
Total Installed				
NWGF 80%	$2,213.2	$1,785.7	$1,939.1	**114.1%**
NWGF 90%	$2,695.6	$2,356.7	$2,559.1	**105.3%**
NWGF 92%	$2,711.6	$2,418.8	$2,626.4	**103.2%**
NWGF 95%	$2,845.9	$2,564.3	$2,784.4	**102.2%**
NWGF 98%	$3,038.2	$2,829.8	$3,072.8	**98.9%**

	Swiching	No Switching	No Switching	
South	DOE 2014 2013 $	DOE 2011 2009 $	DOE 2011 2013 $	2014/2011 % Change
Retail Price				
NWGF 80%	$1,147.0	$831.2	$902.6	**127.1%**
NWGF 90%	$1,242.3	$1,035.0	$1,123.8	**110.5%**
NWGF 92%	$1,256.9	$1,096.6	$1,190.8	**105.6%**
NWGF 95%	$1,359.2	$1,237.4	$1,343.7	**101.2%**
NWGF 98%	$1,493.2	$1,502.1	$1,631.0	**91.6%**
Inst. Cost				
NWGF 80%	$847.0	$782.8	$850.1	**99.6%**
NWGF 90%	$1,032.9	$1,147.1	$1,245.5	**82.9%**
NWGF 92%	$1,033.0	$1,147.1	$1,245.5	**82.9%**
NWGF 95%	$1,034.5	$1,147.1	$1,245.5	**83.1%**
NWGF 98%	$1,039.9	$1,159.3	$1,258.8	**82.6%**
Total Installed				
NWGF 80%	$1,994.0	$1,614.1	$1,752.7	**113.8%**
NWGF 90%	$2,275.2	$2,182.0	$2,369.4	**96.0%**
NWGF 92%	$2,289.9	$2,243.7	$2,436.3	**94.0%**
NWGF 95%	$2,393.7	$2,384.5	$2,589.2	**92.4%**
NWGF 98%	$2,533.1	$2,661.3	$2,889.8	**87.7%**

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	Switching	No Switching	No Switching	
North	DOE 2014 2013 $	DOE 2011 2009 $	DOE 2011 2013 $	2014/2011 % Change
Retail Price				
NWGF 80%	$1,178.0	$876.5	$951.7	**123.8%**
NWGF 90%	$1,325.2	$1,083.1	$1,176.1	**112.7%**
NWGF 92%	$1,340.9	$1,145.4	$1,243.8	**107.8%**
NWGF 95%	$1,471.5	$1,294.1	$1,405.2	**104.7%**
NWGF 98%	$1,646.8	$1,537.6	$1,669.6	**98.6%**
Inst. Cost				
NWGF 80%	$1,229.8	$1,024.4	$1,112.3	**110.6%**
NWGF 90%	$1,661.9	$1,390.8	$1,510.2	**110.0%**
NWGF 92%	$1,662.1	$1,390.8	$1,510.2	**110.1%**
NWGF 95%	$1,663.2	$1,390.8	$1,510.2	**110.1%**
NWGF 98%	$1,666.0	$1,405.3	$1,525.9	**109.2%**
Total Installed				
NWGF 80%	$2,407.7	$1,900.8	$2,064.0	**116.7%**
NWGF 90%	$2,987.0	$2,473.9	$2,686.3	**111.2%**
NWGF 92%	$3,003.0	$2,536.2	$2,753.9	**109.0%**
NWGF 95%	$3,134.7	$2,684.8	$2,915.4	**107.5%**
NWGF 98%	$3,312.8	$2,942.8	$3,195.5	**103.7%**

	Switching	No Switching	No Switching	
National	DOE 2014 2013 $	DOE 2011 2009 $	DOE 2011 2013 $	2014/2011 % Change
Retail Price				
NWGF 80%	$1,163.4	$858.3	$932.0	**124.8%**
NWGF 90%	$1,286.2	$1,063.8	$1,155.1	**111.3%**
NWGF 92%	$1,301.4	$1,125.8	$1,222.5	**106.5%**
NWGF 95%	$1,418.7	$1,271.3	$1,380.5	**102.8%**
NWGF 98%	$1,574.6	$1,523.3	$1,654.1	**95.2%**
Inst. Cost				
NWGF 80%	$1,049.8	$927.4	$1,007.0	**104.2%**
NWGF 90%	$1,366.2	$1,292.9	$1,403.9	**97.3%**
NWGF 92%	$1,366.4	$1,292.9	$1,403.9	**97.3%**
NWGF 95%	$1,367.6	$1,292.9	$1,403.9	**97.4%**
NWGF 98%	$1,371.7	$1,306.5	$1,418.7	**96.7%**
Total Installed				
NWGF 80%	$2,213.2	$1,785.7	$1,939.1	**114.1%**
NWGF 90%	$2,652.4	$2,356.7	$2,559.1	**103.6%**
NWGF 92%	$2,667.8	$2,418.8	$2,626.4	**101.6%**
NWGF 95%	$2,786.3	$2,564.3	$2,784.4	**100.1%**
NWGF 98%	$2,946.3	$2,829.8	$3,072.8	**95.9%**

Attachment: DOE Response to APGA Questions
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4) Sheet: Forecast Cells. Rows 3143-3152 and 3183-3192

The installation and retail cost of electric water heating equipment predicted by the model is higher than the cost of gas equipment. This is an unexpected result. For example, RSMeans costs for electric water heaters are lower than for comparable gas water heaters, as expected. What is the rationale for higher electric water heater costs?

DOE response: When households with gas water heaters switch to electric, they incur a high installation cost to wire the water heater location for electric.

											Mean	Median	Min	Max
R4														
LCC&PB Calc 0	Retail Price (($)	Calcs'!$R$40	Retail Price (switching)	Gas Water Heate	0	40	18	6838	8319	680.0	616.6	48.6	3309.5
R4														
LCC&PB Calc 1	Retail Price (($)	Calcs'!$R$41	Retail Price (switching)	Gas Water Heate	1	41	18	6839	8140	675.3	615.6	48.6	3309.5
R4														
LCC&PB Calc 2	Retail Price (($)	Calcs'!$R$42	Retail Price (switching)	Gas Water Heate	2	42	18	6840	8138	674.8	615.2	48.6	3309.5
R4														
LCC&PB Calc 3	Retail Price (($)	Calcs'!$R$43	Retail Price (switching)	Gas Water Heate	3	43	18	6841	8125	674.8	615.6	48.6	3309.5
R4														
LCC&PB Calc 4	Retail Price (($)	Calcs'!$R$44	Retail Price (switching)	Gas Water Heate	4	44	18	6842	8079	674.3	615.2	48.6	3309.5
R4														
LCC&PB Calc 5	Retail Price (($)	Calcs'!$R$45	Retail Price (switching)	Electric Water He	0	45	18	6833	0	---	---	---	---	
R4														
LCC&PB Calc 6	Retail Price (($)	Calcs'!$R$46	Retail Price (switching)	Electric Water He	1	46	18	6834	179	844.8	696.7	459.6	3092.6
R4														
LCC&PB Calc 7	Retail Price (($)	Calcs'!$R$47	Retail Price (switching)	Electric Water He	2	47	18	6835	181	871.3	696.7	459.6	3092.6
R4														
LCC&PB Calc 8	Retail Price (($)	Calcs'!$R$48	Retail Price (switching)	Electric Water He	3	48	18	6836	194	884.8	696.7	459.6	3092.6
R4														
LCC&PB Calc 9	Retail Price (($)	Calcs'!$R$49	Retail Price (switching)	Electric Water He	4	49	18	6837	240	907.1	692.2	459.6	3092.6
S4														
LCC&PB Calc 0	Installation C ($)	Calcs'!$S$40	Installation Cost (switching	Gas Water Heate	0	40	19	6456	8319	592.4	589.1	245.4	1155.2
S4														
LCC&PB Calc 1	Installation C ($)	Calcs'!$S$41	Installation Cost (switching	Gas Water Heate	1	41	19	6457	8140	592.6	589.1	245.4	1155.2
S4														
LCC&PB Calc 2	Installation C ($)	Calcs'!$S$42	Installation Cost (switching	Gas Water Heate	2	42	19	6458	8138	592.5	589.1	245.4	1155.2
S4														
LCC&PB Calc 3	Installation C ($)	Calcs'!$S$43	Installation Cost (switching	Gas Water Heate	3	43	19	6459	8125	592.4	589.1	245.4	1155.2
S4														
LCC&PB Calc 4	Installation C ($)	Calcs'!$S$44	Installation Cost (switching	Gas Water Heate	4	44	19	6460	8079	593.0	589.1	245.4	1155.2
S4														
LCC&PB Calc 5	Installation C ($)	Calcs'!$S$45	Installation Cost (switching	Electric Water He	0	45	19	6451	0	---	---	---	---	
S4														
LCC&PB Calc 6	Installation C ($)	Calcs'!$S$46	Installation Cost (switching	Electric Water He	1	46	19	6452	179	713.2	716.3	441.3	996.7
S4														
LCC&PB Calc 7	Installation C ($)	Calcs'!$S$47	Installation Cost (switching	Electric Water He	2	47	19	6453	181	716.3	719.6	441.3	996.7
S4														
LCC&PB Calc 8	Installation C ($)	Calcs'!$S$48	Installation Cost (switching	Electric Water He	3	48	19	6454	194	719.0	714.0	426.7	1260.8
S4														
LCC&PB Calc 9	Installation C ($)	Calcs'!$S$49	Installation Cost (switching	Electric Water He	4	49	19	6455	240	698.9	689.3	426.7	1260.8

Retail prices are rows 3143 - 3152

Installation costs are rows 3183 - 3192

The source of equipment cost data in the 2014 LCC spreadsheet is "CAC and HP - 2011 Direct Final Rule; EWH and GWH 2010 Heating Products Final Rule" (see "Equip Price" sheet Table located at Y27 and listed below).

Numbers from this table are first multiplied by local Total Distr./Const. Markup and Sales Tax than by Learning Curve Coeff. and by GDP Deflator. (See "Equip Price" sheet AD8 to 12 and listed below)

Implicit Price Deflators for Gross Domestic Product (Gross private domestic Investment 2013 vs. 2009) used is 1.04039.

Source: http://www.bea.gov/national/pdf/dpga.pdf

Engineering Analysis Data

	Mnfr. Production Cost (MPC)* (2009$)						Shipping Cost Estimate (2009$)					
	2-Ton	3-Ton	5-Ton				2-Ton	3-Ton	5-Ton			
13 SEER CAC	$573.87	$642.12	$894.62				$16.02	$20.51	$28.42			
14 SEER CAC	$633.96	$705.76	$984.85				$20.30	$24.83	$29.50			
14 SEER HP (HP, Indoor Unit)	$900.47	$1,075.56	$1,352.70				$25.45	$30.54	$38.42			
	30 gal	40 gal	50 gal	66 gal	75/80 gal	119 gal	30 gal	40 gal	50 gal	66 gal	75/80 gal	119 gal
GWH - Default	$172.00	$187.00	$200.00	$537.00	$565.00		$17.00	$20.00	$40.00	$56.00	$61.00	
GWH - Ultra Low NOx	$273.00	$290.00	$303.00	$631.00	$659.00		$20.00	$26.00	$54.00	$56.00	$61.00	
EWH	$142.00	$159.00	$170.00	$569.00	$592.00	$655.00	$21.00	$21.00	$56.00	$64.00	$67.00	$107.00

Source: CAC and HP - 2011 Direct Final Rule; EWH and GWH 2010 Heating Products Final Rule

5) Sheet: NWGF Switching. D48 and D49

a) What is the rationale for choosing a single payback (3.5 years) as the basis of fuel switching decisions?

DOE response: DOE considers this question to seek deliberative process information.

b) Why is a single time period used for all buildings and owners rather than one dependent on discount rates, income, etc.? For example, there are discount rates in Sheet: Discount Rate. Rows 26-116 that could be used to create a distribution of payback periods for this decision.

DOE response: DOE considers this question to seek deliberative process information.

6) Sheet: NWGF Switching. Column AG

a) What is the decision making criteria for choosing which non-NWGF option is selected when fuel switching occurs?

DOE response: This is the 3.5 year payback (which was discussed in detail at the public meeting).

b) Why are values negative and What happens in the formula when negative values occur(meaning the first year operations cost of the switching option is lower than the first year operations cost of the high efficiency NWGF)?

DOE response: A negative value occurs in this formula if the operating cost and total installed cost is lower for the switching option compared to the high efficiency NWGF. Switching always occurs when there is a negative value in this formula.

c) Why does fuel switching remain high even at extreme payback times whether negative values are excluded or not?

DOE response: Switching only occurs when payback of the higher efficiency option compared to the switching option is greater than 3.5 years or a negative value occurs (in the case when the

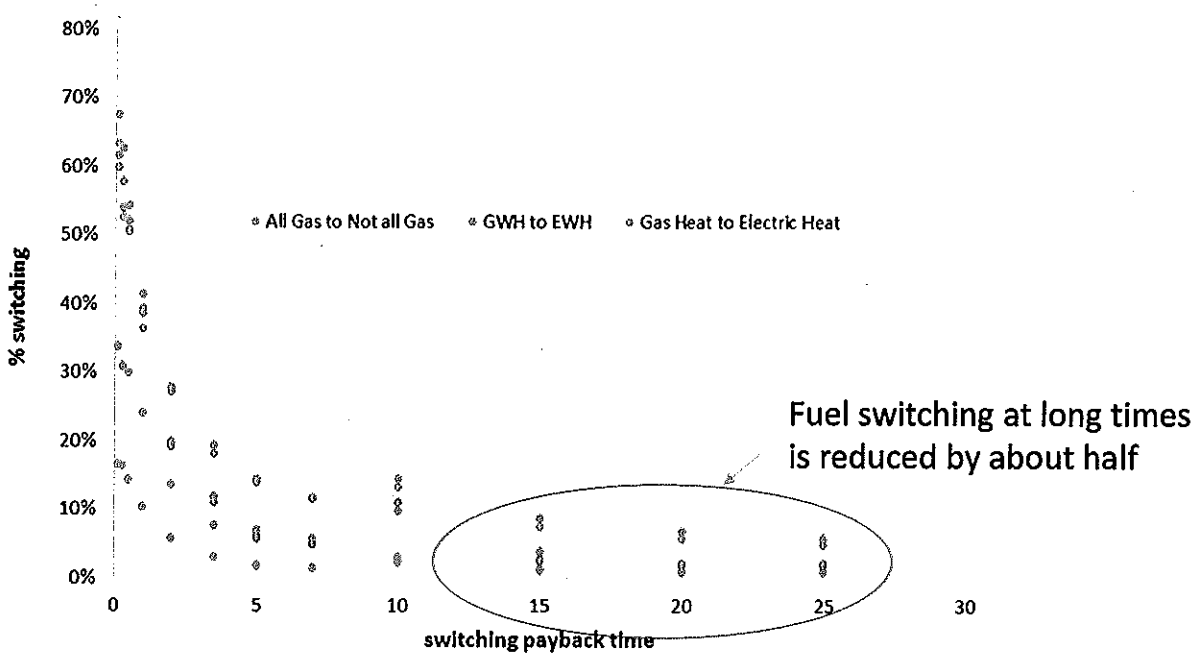
operating cost and total installed cost is lower for the switching option compared to the high efficiency NWGF).

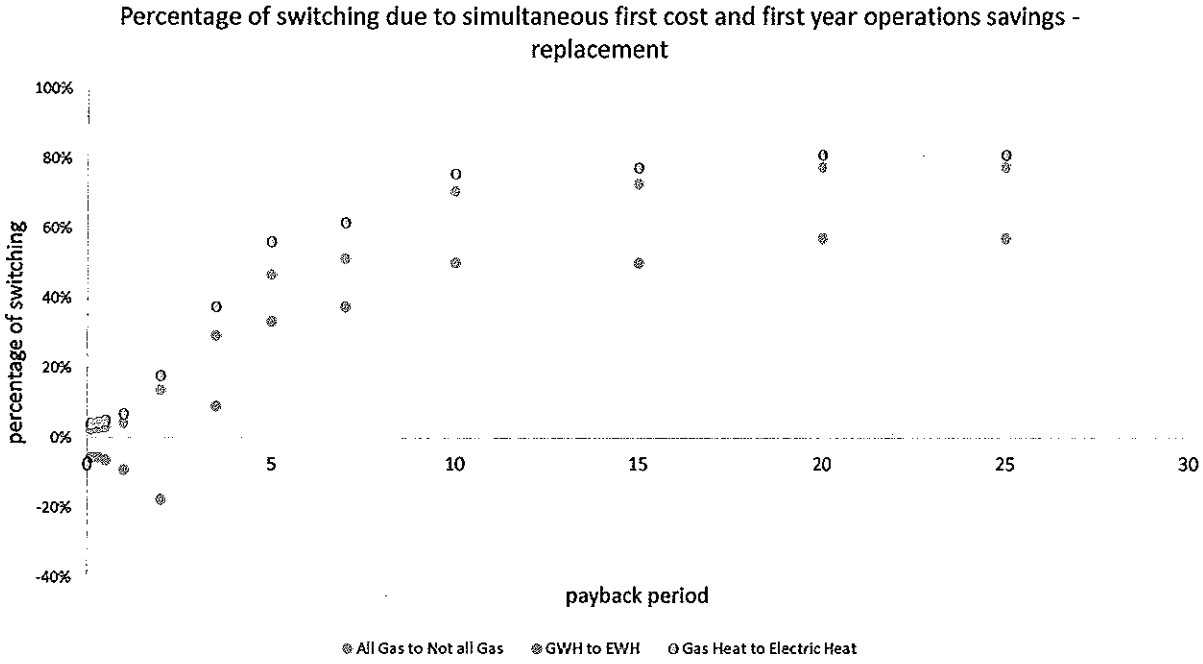
d) Pushing the "payback period" up (changing D48&49 to high values) does not eliminate fuel switching. Even at 15 years it remains around 10 %. In part this is because options that have a negative "payback period" will always allow switching and also because some fuel switching options make economic sense even when considering a long time horizon. This switching behavior is entirely rational. A significant fraction of these switching events would be expected to occur in the absence of a DOE rule. Are these rational fuel switching cases included in an estimate of LCC savings due to a DOE rule change?

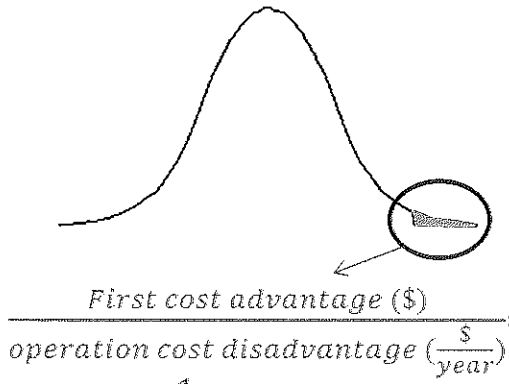
DOE response: *The user needs to re-run the Monte Carlo simulation to see the results change in the spreadsheet.*

e) The switching "payback period" is essentially the ratio of the first cost advantage of a switching option to the annual operation cost disadvantage of same option. Because this analysis is a Monte Carlo analysis this will tend to choose situations which are low operations cost disadvantage and/or high first cost advantage. This is likely to underestimate the true cost of fuel switching. How does this inherent aspect of the Monte Carlo methodology work??

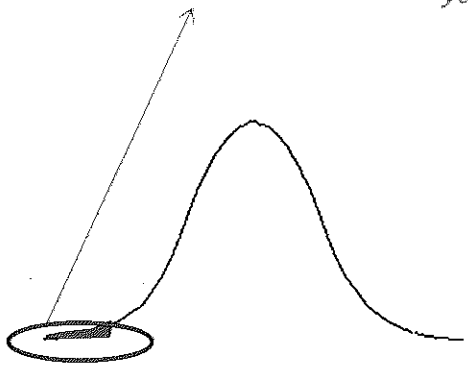
DOE response: *Fuel switching is based on economics for each sampled household. The sampled households are randomly selected by the Monte Carlo approach.*







$$\frac{First\ cost\ advantage\ (\$)}{operation\ cost\ disadvantage\ (\frac{\$}{year})} = \text{“payback for switching”}$$



When you start bringing the good:bad ratio down it is the overlapping tails of high first cost advantage and low operation cost disadvantage that will cross the threshold.

7) Sheet: Overall Spreadsheet

How are the negatively and positively impacted homes segmented? This includes north/south, and new construction/replacement segments. Included in the segmentation would be replacement costs of different options in different home locations, sizes, and configurations, as

well as other factors that would impact consumer classes differently. Averages do not show the marginal affected consumers.

DOE response: RECS provides regional location by household. DOE developed a method to designate which households can be considered as new construction.

8) Sheet: Summary Switching. Columns H and I

How were the GTI survey numbers processed?

DOE response: These numbers are not used in the analysis and are not part of the latest LCC spreadsheet.

DOE reported GTI results

		Builders				Installation contractors			
		North		South		North		South	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post
Low-eff gas	Gas	12.7%	0.0%	13.6%	0.0%	23.1%	0.0%	45.0%	0.0%
Hi-eff gas	Gas	59.9%	61.7%	46.6%	59.2%	61.6%	78.0%	26.2%	58.0%
⊟ HP	Gas	0.3%	8.4%	9.4%	6.1%	3.6%	7.0%	3.5%	12.4%
⊟ furnace	Gas	0.0%	0.0%	0.6%	0.1%	0.9%	2.2%	1.5%	1.6%
Low-eff gas	Elec	4.3%	0.0%	9.6%	0.0%	1.9%	0.0%	2.6%	0.0%
Hi-eff gas	Elec	18.2%	24.8%	14.1%	26.9%	2.6%	4.0%	3.1%	6.5%
⊟ HP	Elec	1.8%	4.0%	5.4%	6.8%	3.5%	4.5%	8.7%	10.6%
⊟ furnace	Elec	2.5%	0.6%	0.4%	0.5%	0.9%	1.7%	1.7%	1.5%
Other		0.3%	0.5%	0.3%	0.4%	1.8%	2.6%	7.6%	9.3%

GTI results

		Builders				Installation contractors			
		North		South		North		South	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post
Low-eff gas	Gas	16.3%	0.0%	13.7%	0.0%	25.1%	0.0%	39.6%	0.0%
Hi-eff gas	Gas	65.8%	78.8%	54.7%	62.1%	58.0%	77.2%	30.3%	61.2%
⊟ HP	Gas	2.0%	3.2%	3.8%	9.8%	2.9%	6.6%	4.4%	10.9%
⊟ furnace	Gas	0.1%	0.1%	1.1%	0.4%	0.9%	1.7%	1.5%	1.8%
Low-eff gas	Elec	1.6%	0.0%	5.7%	0.0%	2.2%	0.0%	2.7%	0.0%
Hi-eff gas	Elec	9.1%	12.3%	7.9%	13.7%	2.9%	4.8%	3.7%	5.9%
⊟ HP	Elec	2.3%	3.5%	8.3%	9.2%	3.0%	4.0%	9.9%	11.7%
⊟ furnace	Elec	1.2%	0.4%	3.1%	2.7%	1.0%	1.4%	1.8%	1.7%
Other		1.6%	1.8%	1.7%	2.1%	4.0%	4.2%	6.1%	6.9%

Attachment: DOE Response to APGA Questions
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DOE

% Switching

Replacement	Fraction of Non-Condensing NWGF Switching			Fraction of All NWGF Switching		
Census Div	All Gas to Not All Gas	GWH to EWH	Gas Furn to Elec Heat	All Gas to Not All Gas	GWH to EWH	Gas Furn to Elec Heat
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	2.7%	2.0%	4.2%	2.7%	2.0%	1.4%
3	6.9%	2.0%	8.5%	6.9%	2.0%	2.5%
4	20.4%	5.6%	22.1%	20.4%	5.6%	6.5%
5	20.8%	0.3%	21.5%	20.8%	0.3%	11.5%
6	24.7%	2.5%	29.4%	24.7%	2.5%	16.3%
7	13.4%	2.0%	15.3%	13.4%	2.0%	14.6%
8	8.2%	2.0%	7.4%	8.2%	2.0%	4.4%
9	37.0%	5.4%	35.8%	37.0%	5.4%	27.5%
10	20.0%	5.2%	18.6%	20.0%	5.2%	14.7%
National	15.6%	2.8%	16.658%	15.6%	2.8%	9.0%

New	All Gas to	GWH to	Gas Furn to
Census Div	Not All Gas	EWH	Elec Furn
1	0.00%	0.00%	0.00%
2	9.72%	8.33%	13.79%
3	13.56%	5.93%	16.78%
4	25.00%	22.92%	21.31%
5	13.44%	1.61%	14.41%
6	17.91%	5.97%	16.67%
7	5.80%	2.23%	5.51%
8	12.05%	4.82%	13.83%
9	62.22%	22.22%	58.82%
10	33.85%	11.98%	31.22%
National	19.98%	7.68%	19.84%

GTI

Overall fraction Switching

	all gas to not all gas	gas water heater to electric water heater	gas heat to electric heat
Replacement	6.8%	1.3%	7.0%
New	5.8%	2.2%	4.4%

Fraction of affected homes switching

	all gas to not all gas	gas water heater to electric water heater	gas heat to electric heat
Replacement	20.7%	3.9%	21.3%
New	27.4%	10.3%	21.0%

9) Sheet: Bldg Sample and general methodology

The buildings sampled are only those that use natural gas or LPG as a heat source and it is used as a primary or secondary source of heat. Are there any other criteria for selecting buildings to specifically select for buildings where an 80% NWGF would have been installed in the absence of a DOE rule mandating higher efficiencies?

DOE response: The fraction of buildings where an 80% NWGF would have been installed in the absence of higher efficiency standards is determined in the base case distribution worksheet. The fraction varies by region and whether it is a replacement or new construction installation. The specific household assignments are done randomly.

10) Sheet: Summary Switching

Switching statistics should be different for different efficiency levels; however, the spreadsheet shows only one set. Is it a composite, how it is calculated, and how do the statistics look in each group? It appears that this is supposed to be the content of M35 – R58 on the same sheet but these all contain #REF! rather than data.

DOE response: The reported values have been corrected in the latest LCC spreadsheet published in DOE's website. The correction has no impact on analysis results.

11) Sheet: Summary Switching, National Summary tables Replacement AC18 and New Construction AC32

Why does the summary of national switching and no switching cases add to 11,129 cases when only 10,000 cases were analyzed?

DOE response: The reported values have been corrected in the latest LCC spreadsheet published in DOE's website. The correction has no impact on analysis results.

12) Using the 2014 LCC spreadsheet and allowing fuel switching improves LCC savings compared to disallowing fuel switching if the 'payback' for switching decisions is long (15 years for sheet NWGF Switching cells D48 and D49 is shown below). The effect is even larger in the south. Does this mean that fuel switching should be expected to reduce costs to consumers (e.g., in the South) as a result of the new minimum efficiency level?

DOE response: Fuel switching is based on economics for each sampled household. Depending on the household economics the switching may or may not result in economic benefits.

Simulation Results NATIONAL - 10000 samples Fuel Switching Allowed — AEO 2014 - Reference Case

			Average LCC Results									Payback Results		
	Level	Description	Installed Price	Lifetime Oper. Cost*	First Year Oper. Cost	LCC	LCC Savings	Simple LCC Savings	Net Cost	No Impact	Net Benefit	Average	Median	Simple PBP
NWGF	0	NWGF 80%	$2,209	$10,369	$644	$12,579	NA	NA	NA	100%	NA			
NWGF	1	NWGF 90%	$2,644	$9,434	$590	$12,079	$227	$500	21%	48%	31%	16.6	10.6	8.1
NWGF	2	NWGF 92%	$2,660	$9,276	$580	$11,935	$292	$643	19%	42%	38%	13.0	8.0	7.1
NWGF	3	NWGF 95%	$2,779	$9,039	$566	$11,818	$387	$760	24%	24%	52%	12.6	8.9	7.4
NWGF	4	NWGF 98%	$2,943	$8,821	$555	$11,764	$421	$815	41%	0%	59%	16.9	12.2	8.2
MHGF	0	MHGF 80%	$1,551	$10,913	$700	$12,463	NA	NA	NA	100%	NA			
MHGF	1	MHGF 92%	$1,722	$9,705	$622	$11,426	$695	$1,037	7%	26%	67%	5.4	1.9	2.2
MHGF	2	MHGF 95%	$1,865	$9,461	$607	$11,326	$774	$1,137	13%	14%	73%	8.5	4.4	3.4
MHGF	3	MHGF 97%	$1,980	$9,339	$599	$11,319	$782	$1,144	25%	0%	74%	12.5	6.7	4.2

Simulation Results NATIONAL - 10000 samples Fuel Switching NOT Allowed — AEO 2014 - Reference Case

			Average LCC Results									Payback Results		
	Level	Description	Installed Price	Lifetime Oper. Cost*	First Year Oper. Cost	LCC	LCC Savings	Simple LCC Savings	Net Cost	No Impact	Net Benefit	Average	Median	Simple PBP
NWGF	0	NWGF 80%	$2,213	$10,347	$645	$12,560	NA	NA	NA	100%	NA			
NWGF	1	NWGF 90%	$2,696	$9,437	$588	$12,133	$169	$427	22%	47%	31%	18.6	12.0	8.5
NWGF	2	NWGF 92%	$2,712	$9,271	$578	$11,982	$243	$578	20%	41%	39%	14.5	8.8	7.5
NWGF	3	NWGF 95%	$2,846	$9,028	$563	$11,874	$311	$687	25%	23%	52%	14.1	9.7	7.7
NWGF	4	NWGF 98%	$3,038	$8,822	$550	$11,860	$324	$700	42%	0%	57%	18.2	13.1	8.7
MHGF	0	MHGF 80%	$1,551	$10,885	$700	$12,436	NA	NA	NA	100%	NA			
MHGF	1	MHGF 92%	$1,721	$9,679	$622	$11,399	$701	$1,037	7%	26%	67%	5.7	1.7	2.2
MHGF	2	MHGF 95%	$1,864	$9,435	$607	$11,299	$780	$1,137	13%	14%	73%	8.8	4.4	3.3
MHGF	3	MHGF 97%	$1,979	$9,313	$599	$11,292	$787	$1,144	25%	0%	75%	12.9	6.5	4.2

13) Sheet: Statistics and Forecast Cells O3043 to O3052

Why is the national annual fuel usage per efficiency group in the 'Statistics' sheet different than the one listed in the 'Forecast Cells' sheet?

DOE response: The reported values include switching, while forecast cells O3043 and O3052 are for NWGFs only and do not include households that switch to other equipment.

14) Sheet: Energy Price, Table Marginal Energy Prices

What is the source of the marginal electric and gas prices? Did the analysis incorporate any of the marginal gas price information provided by AGA based on its member survey?

DOE response: Marginal electric and gas prices are based on EIA data. DOE considered AGA member survey data along with all the other data DOE has (such as RECS billing data and tariff data provided by AGA). The full methodology will be explained in the NOPR TSD.

Attachment: DOE Response to APGA Questions
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15) Sheet: Equip Price. AC50

What is the source of the factor of 1/3 that is multiplied by the cost differential (EF vs. NWGF)?

DOE response: The ⅓ factor is the conversion factor between RS Means retail price and manufactured production cost. It corresponds to the overall markup used to convert manufacturers' cost to consumer price.

16) Sheet: Base Case AFUE

What is the source of the distributions of furnace efficiencies (new and replacement)?

DOE response: It is based on manufacturer interviews, historical shipments data by efficiency, and number of models at each efficiency level.

17) Sheet: Bldg Sample, E67, E61

What is the source of the uniform distribution chosen for remaining lifetimes for cooling and water heating equipment?

DOE response: The analysis assumes that the remaining lifetime will be from 1 year to the average lifetime (19 for CAC/HP or 12 years for WHs); this applies only to equipment that does not fail at the same time as the furnace.

18) Sheet: Installation Cost, Columns E and F

The source for the assumptions regarding venting options and conditioned vs. unconditioned space is given as "Consultant Report." Is this report available?

DOE response: Consultant report is a part of Appendix 8-B of the 2011 DFR TSD.

19) Sheet NWGF Switching and LCC&PB Calcs

It appears that in NWGF Switching column AA, equipment age related discounting incorporates a present worth factor from columns AJ and AK. But the source of the cost numbers is generated in the LCC&PB Calcs sheet, where the same present worth factor is used to discount costs in cells D44 and D46. Is this double counting the present worth factor?

DOE response: The latest LCC spreadsheet published in DOE's website has been corrected and the updated results reflect the correction.

20) Summary Sheet

a) Why are the National, North and South Region Installed Prices in "Summary" sheet (row K) different (smaller) than the calculated weighted average of Replacement and New values (rows AA and AP)?

DOE response: The reported values have been corrected in the latest LCC spreadsheet published in DOE's website. The correction has no impact on analysis results.

b) 2014 LCC CB 10,000 cases default simulation run includes 9,717 residential and 283 commercial buildings. Are the commercial buildings results included in the Simulation Results NATIONAL - 10000 samples tables in the "Summary" sheet? ?

DOE response: Commercial buildings were included in the analysis.