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**Cc:** [Zelmar, Karen](#); [Eilert, Patrick L](#); [Hunt, Marshall](#)  
**Subject:** DOE Condensing Furnace Standard  
**Date:** Tuesday, August 18, 2015 5:25:43 PM  
**Attachments:** [Replacement of existing Furnace JSB Comments v5 mbh9 changes accepted.docx](#)  
[DOE Furnace Rulemaking Summary V6 \(2\).docx](#)

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Nick,

This is a follow-up to our phone call of July 29 in which we discussed DOE's proposed condensing furnace standard. You asked for additional information on the replacement costs assumed in DOE's analysis, and our view on whether these cost assumptions are reasonable. The attached 4-page document provides a brief discussion of the cost assumptions, and our review which was supplemented by consulting firm TRC. I've also included the original 1-pager we used during the July 29 call.

Please feel free to follow up with Marshall Hunt and Pat Eilert, our experts on this subject, as well as Karen Zelmar. I'm in route to Indonesia, and will be cut off from wifi in another day or 2 once I board the dive boat and we enter more remote locations. Back in September,

Thanks,  
--Jan

## **Condensing Furnace Standard Department of Energy Residential Furnace Standards Rulemaking**

PG&E supports DOE proposed condensing furnace standard as cost effective for the nation and California. Based upon PG&E independent analysis PG&E believes DOE's analysis is accurate. Other supporters of the standard include:

- NEEP
- ACEEE
- California Energy Commission (CEC)
- NRDC
- EEI
- The Consumer Federation of America
- National Consumers Law Center
- Massachusetts Union of Public Housing Tenants
- Texas Ratepayers' Organization to Save Energy
- Earth Justice

Opponents of the Furnace standard believe DOE should withdraw rulemaking since it is not cost effective because the analysis is flawed. Opponents of the standard include:

- SoCal Gas
- AGA
- APGA
- AHRI
- HARDI
- ACCA
- NAHB

### **Key Issues**

- PG&E supports the ruling because we believe customers in colder climates and buyers of new homes will benefit significantly, costs of condensing furnaces will decrease over time with the passage of the standard as has occurred for many other technologies, and that rental markets will function to prevent costs being passed to renters.
- SoCalGas' opposes the rulemaking because they believe it will result in higher gas bills for the majority of their customers, and may lead to switching to electric heat pumps in their climate zone. Based upon PG&E's research this isn't a substantial issue.
  - PG&E believes DOE's research supporting the cost-effectiveness of a condensing furnace standard is rigorous and accurate, and has concerns about opposition research.
  - PG&E conducted an independent review of DOE cost effectiveness methods and assumptions (by TRC) which verified DOE's analysis.
  - Feasibility issues related to difficult installations (row houses in Philadelphia) were researched and found to be either exaggerated or properly incorporated into the DOE analysis.
  - Opposition analysis by Gas Technology Institute (GTI) uses the DOE LCC tool to develop the worst case results based on their choice of inputs.
  - Negawatt, hired by SoCalGas, skewed their analysis by limiting it to the warm climates of coastal LA and San Diego where the technology may not be cost effective at current prices, omitting colder climates where the technology results in significant savings.
- Energy Efficiency reduces revenues for non-decoupled gas utilities.
- Furnace standards have not been updated for more than 30 years.
- PG&E's support for federal furnace standards aligns with the CPUC and CEC climate goals and efficiency objectives.

## **PG&E Review: Installation Cost for Replacement Condensing Furnaces**

Supporters of DOE's proposed condensing furnace standard view the standard as cost effective based on DOE's analysis, which supporters believe to be accurate. Supporters include:

- PG&E
- NEEP
- ACEEE
- California Energy Commission (CEC)
- Natural Resource Defense Council (NRDC)
- EEI
- The Consumer Federation of America
- National Consumers Law Center
- Massachusetts Union of Public Housing Tenants
- Texas Ratepayers' Organization to Save Energy
- Earth Justice

Opponents of the Furnace standard believe DOE should withdraw the rulemaking as they believe it is not cost effective and the DOE analysis is flawed. Opponents of the standard include:

- SoCal Gas
- AGA
- APGA
- AHRI
- HARDI
- ACCA
- NAHB

A key issue in contention is the estimated cost to replace noncondensing with condensing furnaces, which depends upon the complexity of the replacement and the distribution of "easy" to "complex" replacements. PG&E conducted an independent review of DOE's analysis of installation cost for replacement condensing furnaces, using consulting firm TRC, and concluded DOE's analysis is accurate. Replacement costs cover a fairly wide range, but, on average, replacement condensing furnaces are cost-effective.

### **Inclusion of Installation Cost Scenarios in LCC Analysis**

DOE's analysis shows the condensing furnace standard to be Life Cycle Cost (LCC) cost effective for the Nation and California. Opponents of the standard have questioned whether the impact of difficult and high installation cost furnace replacements has been adequately accounted for in the LCC.

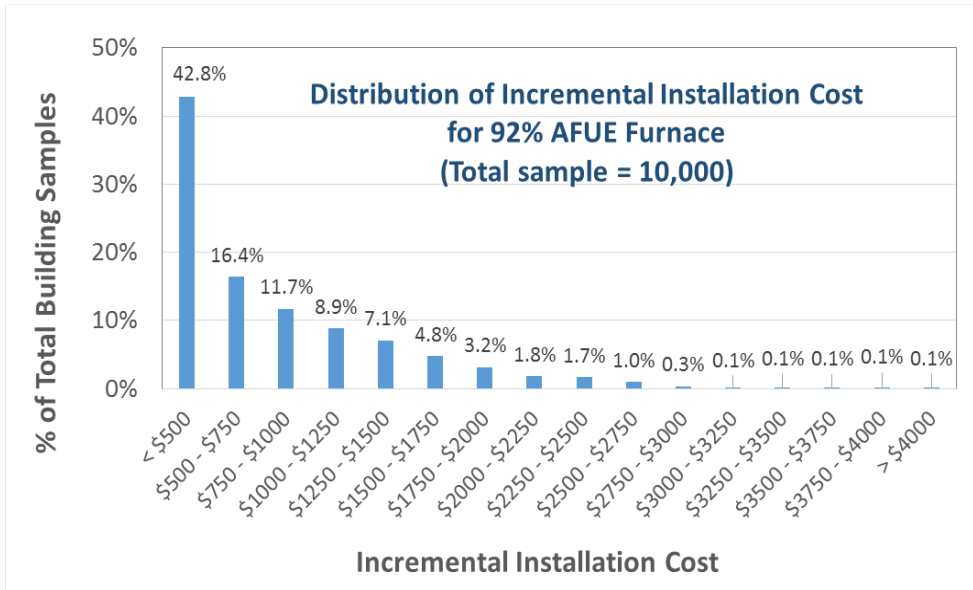
The table below shows the data resulting from DOE's methodology used in the LCC analysis. Depending on the complexity of the replacement, the increased installation cost for a condensing versus noncondensing furnace ranges from a low of \$371 to a high of \$1527. The "Percent of Annual Shipments" serves to put the results in perspective. High cost scenarios represent only 5.8% of shipments.

Replacement of Existing Noncondensing Furnace					Average Increased Installation Cost	Percent of Annual Shipments
					\$ 627	36.4%
Yes	Common Vent for Water Heater and Furnace					14.4%
	Water Heater Vent Resizing					
	Yes					6.1%
		High Cost				5.8%
			Single Family Detached		\$ 1,263	4.6%
			Single Family Attached		\$ 1,527	0.5%
			Multiple Family		\$ 1,212	0.7%
		Low Cost				0.3%
			Single Family Detached		\$ 517	0.2%
			Single Family Attached		\$ 320	0.02%
			Multiple Family		\$ 381	0.03%
	No					8.3%
			Single Family Detached		\$ 588	6.5%
			Single Family Attached		\$ 659	0.7%
			Multiple Family		\$ 708	1.1%
No	Common Vent for Water Heater and Furnace					21.1%
			Single Family Detached		\$ 443	17.7%
			Single Family Attached		\$ 435	1.4%
			Multiple Family		\$ 391	2.0%

### Distribution of Installation Costs

The DOE LCC analysis generates 10,000 results which are organized into “bins” for plotting. The graph shows the distribution of occurrences is concentrated around the \$627 average and that there is long “tail” of high cost installations. It is these few high cost cases that are memorable even though they represent a small fraction of cases. As discussed by DOE, these high incremental costs were driven by what is called “orphaned water heaters”, which represents 14.4% of the annual furnaces shipped and installed. In more than half of these cases (8.3 %) the water heater vent does not have to be sized but does need to be upgraded to a dual wall vent pipe.

The results of the LCC analysis are best understood by viewing the distribution in the chart below. 80% of cases have an incremental cost less than \$1250.



**Technology Solution for High Cost Installations**

An example of the creative and innovative response to condensing furnace standards comes from a major supplier of materials for heating contractors. One type of high cost case is an attached dwelling (e.g. row house) in the Northeast with a masonry chimney into which the furnace and water heater are venting flue gases. The DuraVent technology provides for the condensing furnace to be vented in a flexible stainless steel pipe that is located inside the atmospheric venting water heater flue.

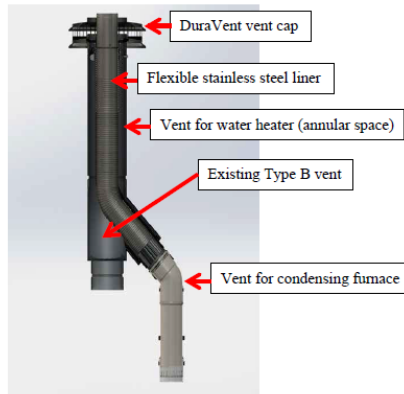


Figure 8L.2.1 Common Venting of a Condensing Furnace and an Atmospheric Combustion Water Heater in a Type B Double-Wall Metal Vent using DuraVent Retrofit\*

As shown in the second illustration, the dual flue vent provides a less expensive solution to the need to line the existing masonry chimney. In discussions with Philadelphia Gas staff, it was determined that they were visualizing that condensing furnaces required horizontal venting. However, they have now verified that the existing furnace and water heater vented through a masonry chimney that is straight and goes from the basement to the roof can be addressed with the DuraVent solution.

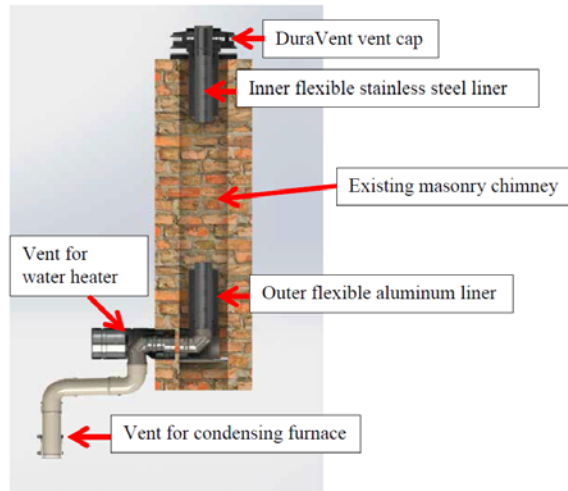


Figure 8L.2.2 Common Venting of a Condensing Furnace and an Atmospheric Combustion Water Heater in a Masonry Chimney using DuraVent Retrofit<sup>b</sup>

Table 8L.3.2 Average Venting Installation Costs for Households where DuraVent Technology is Applicable (Installation Cases C and D)

Installation Type	2013\$			
	Reference Case	DuraVent Scenario	Difference	Fraction Benefiting
Replacement of Common Vent (+Need to Resize Orphaned Water)*	\$1,206	\$753	-\$453	85%

\* These cases require orphaned water heater vent resizing, chimney relining, or new water heater vent connector.

The DuraVent solution reduces installation costs for this scenario from \$1206 to \$753. Running the lower cost through the LCC analysis results in negative LCCs becoming positive, as shown in the table below. The first column is the AFUE level where 92% is the DOE proposed level. The second is the LCC with DuraVent showing that all but the 90% levels are positive. The third column lists the LCC without DuraVent.

High Cost Row House/Condos Sample			
1 (90%)	-\$51	-\$297	
2 (92%)	\$84	-\$243	
3 (95%)	\$178	-\$205	
4 (98%)	\$204	-\$180	

In the 5 years until condensing furnaces become mandatory it can be predicted that other companies will develop and market solutions to compete with DuraVent and solve other high cost installation problems.