

**APPENDIX 12A MANUFACTURER IMPACT ANALYSIS INTERVIEW GUIDES  
AND GOVERNMENT REGULATORY IMPACT MODEL OVERVIEW**

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**12A.1 STORAGE-TYPE RESIDENTIAL WATER HEATERS MANUFACTURER  
IMPACT ANALYSIS INTERVIEW GUIDE**

April 6, 2009

As part of the rulemaking process for amended energy conservation standards for storage-type residential water heaters, the Department of Energy (DOE) conducts the manufacturer impact analysis (MIA). In this analysis, DOE uses publicly available information and information provided by manufacturers during interviews to assess possible impacts on manufacturers due to amended energy conservation standards. DOE is currently considering 7 efficiency levels (EL) for both electric and oil-fired storage-type water heaters and 6 ELs for gas-fired storage-type water heaters. In responding to this questionnaire, please refer to the efficiency levels in the table below. DOE analyzed one representative rated storage volume for each product class, including 50 gallons for electric, 40 gallons for gas-fired, and 30 gallons for oil-fired storage-type water heaters. DOE extrapolated the results to other rated storage volumes using energy-efficiency equations (see section 16 for additional information).

#### **Efficiency Levels Under Consideration for Storage-Type Residential Water Heaters**

<b>Product Class (Representative Rated Volume)</b>	<b>Efficiency Metric</b>	<b>Baseline Efficiency Level</b>	<b>EL 1</b>	<b>EL 2</b>	<b>EL 3</b>	<b>EL 4</b>	<b>EL 5</b>	<b>EL 6</b>	<b>EL 7</b>
Electric Storage-Type (50 Gallons Rated Storage Volume)	Energy Factor (EF)	0.90	0.91	0.92	0.93	0.94	0.95	2.0	2.2
Gas-Fired Storage-Type (40 Gallons Rated Storage Volume)	Energy Factor (EF)	0.59	0.62	0.63	0.64	0.65	0.67	0.80	
Oil-Fired Storage-Type (30 Gallons Rated Storage Volume)	Energy Factor (EF)	0.53	0.54	0.56	0.58	0.60	0.62	0.66	0.68

## **1 KEY ISSUES**

- 1.1 In general, what are the key issues for your company regarding amended energy conservation standards for storage-type residential water heaters and this rulemaking?
- 1.2 For the issues identified, how significant are they at each listed efficiency level?
- 1.3 How can we most effectively incorporate these issues in the MIA?

## **2 COMPANY OVERVIEW AND ORGANIZATIONAL CHARACTERISTICS**

DOE is interested in understanding manufacturer impacts at the plant or profit center level directly pertinent to storage-type residential water heaters production. However, the context within which the plant operates and the details of plant production and costs are not readily available from the published literature. Therefore, DOE invites you to provide these details confidentially in your own words to the extent possible and practical. Understanding the organizational setting around the residential water heater industry profit center will help DOE understand the probable future of the manufacturing activity with and without amended energy conservation standards.

2.1 Do you have a parent company, and/or any subsidiaries relevant to the storage-type residential water heater industry?

2.2 Do you manufacture any products other than storage-type residential water heaters? If so, what other products do you manufacture?

2.3 What percentage of your total manufacturing corresponds to electric, gas-fired, and oil-fired storage-type residential water heaters?

2.4 Where are your production facilities located, and what type of product is manufactured at each location? Could you provide figures for your company's manufacturing at each location by product type (i.e., electric, gas-fired, and oil-fired storage-type residential water heaters), size, and efficiency?

2.5 At your manufacturing facilities, would potential storage-type residential water heater redesigns be difficult to implement? If so, would your company modify the existing facility or develop a new facility?

2.6 What are your employment levels at each of these facilities?

2.7 What are your product lines, niches, and relative strengths in the residential storage-type

water heater market?

2.8 What is your company's approximate market share in the electric, gas-fired, and oil-fired storage-type residential storage-type water heater industry?

2.9 Would you expect your market share to change once amended energy conservation standards become effective?

### **3 MANUFACTURER PRODUCTION COSTS AND SELLING PRICES**

DOE estimated the manufacturer production costs of three-types of residential water heaters at various rated storage volumes. DOE defines manufacturer production cost as all direct costs associated with manufacturing a product. It includes direct labor, direct materials, and overhead (which includes depreciation costs). The breakdown of manufacturer production cost has implications for the quantitative impacts on electric, gas-fired, and oil-fired storage-type residential water heater manufacturers. The per unit production costs are necessary for DOE to estimate labor expenditures and other cash flow calculations.

Manufacturer selling price is the average cost manufacturers charge their first consumers, but does not include all of the costs along the distribution channels. The manufacturer selling price includes a per unit research and development cost; selling, general, and administrative expense; shipping cost; and profit. The manufacturer markup is a multiplier applied to manufacturer production cost to cover the per unit research and development, selling, general, and administrative expense, and profit. For residential, storage-type water heaters, the manufacturer markup does not cover shipping costs. Shipping costs are calculated separately and are shown for each efficiency level in Table 3-1 through Table 3-3. Section 15 contains additional questions about the shipping assumptions and costs.

DOE estimated an industry-wide markup of 1.27 for electric storage-type water heaters, 1.30 for gas-fired storage-type water heaters, and 1.35 for oil-fired storage-type water heaters at baseline efficiency levels. DOE asks a series of questions about the manufacturer markup associated with premium products at higher efficiencies in section 4. As shown in Equation 3-1 below, the manufacturer production cost multiplied by the manufacturer markup would cover all costs in the manufacturer selling price of baseline products except for shipping costs.

**Equation 3-1. Calculation of Manufacturer Selling Price**

$(\text{Manufacturer Production Cost} \times \text{Manufacturer Markup}) + \text{Shipping Cost} = \text{Manufacturer Selling Price}$

3.1 Is there a significant difference between baseline markups DOE calculated and your company's baseline markups for electric storage-type water heaters, gas-fired storage-type water heaters, and oil-fired storage-type water heaters?

3.2 Table 3-1 through Table 3-3 provide DOE's estimates of the manufacturer production costs and manufacturer selling prices for storage-type residential water heaters at the representative rated storage volume and each efficiency level being considered. Could you please provide any comments on the estimated values?

**Table 3-1 Estimated Manufacturer Production Costs, Shipping Costs, and Manufacturer Selling Prices for Electric Storage-Type Residential Water Heaters (50 Gallons Rated Storage Volume)**

Efficiency Level (Energy Factor)	DOE's Manufacturer Production Cost Estimates* (2008\$)	DOE's per Unit Shipping Cost Estimates (2008\$)	DOE's Manufacturer Selling Price Estimates (2008\$)	Manufacturer Comments or Revised Estimates
Baseline Level (EF = 0.90)	\$156	\$17	\$198	
EL 1 (EF = 0.91)	\$162	\$17	\$208	
EL 2 (EF = 0.92)	\$166	\$17	\$213	
EL 3 (EF = 0.93)	\$170	\$17	\$219	
EL 4 (EF = 0.94)	\$177	\$25	\$221	
EL 5 (EF = 0.95)	\$195	\$25	\$246	
EL 6 (EF = 2.0)	TBD	TBD	TBD	
EL 7 (EF = 2.2)	\$490	\$33	\$523	

\* DOE's manufacturer production cost estimates were developed using a five-year average of raw material prices spanning 2004 to 2008.

**Table 3-2 Estimated Manufacturer Production Costs, Shipping Costs, and Manufacturer Selling Prices for Gas-Fired Storage-Type Residential Water Heaters (40 Gallons Rated Storage Volume)**

Efficiency Level (Energy Factor)	DOE's Manufacturer Production Cost Estimates* (2008\$)	DOE's per Unit Shipping Cost Estimates (2008\$)	DOE's Manufacturer Selling Price Estimates (2008\$)	Manufacturer Comments or Revised Estimates
Baseline Level (EF = 0.59)	\$179	\$17	\$233	
EL 1 (EF = 0.62)	\$186	\$25	\$234	
EL 2 (EF = 0.63)	\$193	\$25	\$245	
EL 3 (EF = 0.64)	\$304	\$50	\$377	
EL 4 (EF = 0.65)	\$312	\$50	\$388	
EL 5 (EF = 0.67)	\$326	\$50	\$407	
EL 6 (EF = 0.80)	\$433	\$50	\$558	

\* DOE's manufacturer production cost estimates were developed using a five-year average of raw material prices spanning 2004 to 2008.

**Table 3-3 Estimated Manufacturer Production Costs, Shipping Costs, and Manufacturer Selling Prices for Oil-Fired Storage-Type Residential Water Heaters (30 Gallons Rated Storage Volume)**

Efficiency Level (Energy Factor)	DOE's Manufacturer Production Cost Estimates* (2008\$)	DOE's Shipping Cost Estimates (2008\$)	DOE's Manufacturer Selling Price Estimates (2008\$)	Manufacturer Comments or Revised Estimates
Baseline Level (EF = 0.53)	\$524	\$17	\$707	
EL 1 (EF = 0.54)	\$532	\$17	\$718	
EL 2 (EF = 0.56)	\$544	\$17	\$734	
EL 3 (EF = 0.58)	\$554	\$25	\$740	
EL 4 (EF = 0.60)	\$549	\$17	\$741	
EL 5 (EF = 0.62)	\$562	\$25	\$751	
EL 6 (EF = 0.66)	\$555	\$17	\$749	
EL 7 (EF = 0.68)	\$567	\$17	\$765	

\* DOE's manufacturer production cost estimates for oil-fired storage water heaters were developed using a five-year average of raw material prices spanning 2003 to 2007 and shown in 2008\$.

3.3 Please compare your manufacturer production cost percentages<sup>1</sup> to the estimates tabulated below. The manufacturer production cost breakdown is used to calculate the total cost of goods sold (COGS) for the industry. Having an accurate estimate of the production costs for the industry allows DOE to better examine impacts on profitability and employment due to amended energy conservation standards. Are the different percentages of each cost representative of your company or the electric, gas-fired, and oil-fired storage-type residential water heater industry? Please explain any differences.

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<sup>1</sup> The manufacturer production cost percentages shown in Table 3-4 through Table 16-7 are the values that make up COGS. These are percentages of total COGS.



**Table 3-4 Breakdown of Manufacturer Production Costs for Baseline Electric Storage-Type Residential Water Heaters (50 Gallons Rated Storage Volume)**

Components of Manufacturer Production Costs	DOE's Estimated Percentage of Manufacturer Production Cost	Manufacturer Feedback
Materials	79.5%	
Labor	11.5%	
Overhead	5.9%	
Depreciation	3.1%	

**Table 3-5 Breakdown of Manufacturer Production Costs for Baseline Gas-Fired Storage-Type Residential Water Heaters (40 Gallons Rated Storage Volume)**

Components of Manufacturer Production Costs	DOE's Estimated Percentage of Manufacturer Production Cost	Manufacturer Feedback
Materials	82.8%	
Labor	9.8%	
Overhead	5.4%	
Depreciation	2.1%	

**Table 3-6 Breakdown of Manufacturer Production Costs for Baseline Oil-Fired Storage-Type Residential Water Heaters (30 Gallons Rated Storage Volume)**

Components of Manufacturer Production Costs	DOE's Estimated Percentage of Manufacturer Production Cost	Manufacturer Feedback
Materials	66.2%	
Labor	6.1%	
Overhead	13.4%	
Depreciation	14.1%	

## 4 MARKUPS AND PROFITABILITY

One of the primary objectives of the MIA is to assess the impact of amended energy conservation standards on industry profitability. In this section, DOE would like to understand the current markup structure of the industry and how setting an amended energy conservation standard would impact your company's markup structure and profitability. As discussed in Section 3, the manufacturer markup is a multiplier applied to manufacturer production cost to cover per unit research and development, selling, general, and administrative expenses, and profit. For the residential, storage-type water heaters analysis, the manufacturer markup does not cover shipping costs. The manufacturer production cost multiplied by the manufacturer markup along with shipping costs would cover all costs involved in manufacturing the product.

4.1 Do profit levels currently vary by product class? Do profit levels vary by efficiency

level? Please explain why or why not.

4.2 Within each product class, do profit levels vary by storage capacities?

4.3 Do profit levels change with longer warranties?

4.4 DOE would like to understand how the baseline manufacturer markup changes at higher efficiency levels. Could you provide your company's markup for any products that meet the efficiency levels shown below?

**Table 4-1 Electric Storage-Type Water Heater Manufacturer Markups**

	Electric Storage-Type Residential Water Heaters (50 Gallons Rated Storage Volume)
Efficiency Level (Energy Factor)	Estimated Manufacturer Markup
Baseline (EF = 0.90)	
EL 1 (EF = 0.91)	
EL 2 (EF = 0.92)	
EL 3 (EF = 0.93)	
EL 4 (EF = 0.94)	
EL 5 (EF = 0.95)	
EL 6 (EF = 2.0)	
EL 7 (EF = 2.2)	

**Table 4-2 Gas-Fired Storage-Type Water Heater Manufacturer Markups**

	Gas-Fired Storage-Type Residential Water Heaters (40 Gallons Rated Storage Volume)
Efficiency Level (Energy Factor)	Estimated Manufacturer Markup
Baseline (EF = 0.59)	
EL 1 (EF = 0.62)	
EL 2 (EF = 0.63)	
EL 3 (EF = 0.64)	
EL 4 (EF = 0.65)	
EL 5 (EF = 0.67)	
EL 6 (EF = 0.80)	

**Table 4-3 Oil-Fired Storage-Type Water Heater Manufacturer Markups**

	Oil-Fired Storage-Type Residential Water Heaters (30 Gallons Rated Storage Volume)
Efficiency Level (Energy Factor)	Estimated Manufacturer Markup
Baseline (EF = 0.53)	
EL 1 (EF = 0.54)	
EL 2 (EF = 0.56)	
EL 3 (EF = 0.58)	
EL 4 (EF = 0.60)	
EL 5 (EF = 0.62)	
EL 6 (EF = 0.66)	
EL 7 (EF = 0.68)	

4.5 Would you expect changes in your estimated profitability following an amended energy conservation standard? If so, please explain why.

## **5 SHIPMENT PROJECTIONS AND MARKET SHARES**

An amended energy conservation standard can change overall shipments by altering product attributes, marketing approaches, product availability, and price. The industry revenue calculations are based on the shipment projections developed by DOE's shipments model. The shipments model includes forecasts for the base case shipments (i.e., total industry shipments absent amended energy conservation standards) and the standards case shipments (i.e., total industry shipments with amended energy conservation standards).

5.1 Please compare DOE's projections of annual industry-wide shipments for electric, gas-fired, and oil-fired storage-type residential water heaters with your company's projections of industry-wide shipments.

**Table 5-1 Annual Industry-Wide Shipment Projections for Electric Storage-Type Residential Water Heaters Absent Amended Energy Conservation Standards**

	2007 Total Industry- Wide Shipments	2008 Total Industry- Wide Shipments	Projected Total Industry-Wide Shipments in 2015*	Projected Total Industry-Wide Shipments in 2025	Projected Total Industry-Wide Shipments in 2035
DOE's Estimate for Total Industry Shipments (Millions)**	4.470	4.189	5.224	5.459	6.176
Manufacturer Feedback					

\* 2015 is estimated effective date of amended energy conservation standards for water heaters.

\*\* For gas-fired and electric water heaters 2007 data was provided by AHRI (March 3, 2008) and 2008 data was provided by AHRI (March 17, 2009). Projections were updated using: (1) AEO2009 New Housing Forecast; (2) AHRI 2008 Data; and (3) AHS 2007 Historical Market Shares.

**Table 5-2 Annual Industry-Wide Shipment Projections for Gas-Fired Storage-Type Residential Water Heaters Absent Amended Energy Conservation Standards**

	2007 Total Industry-Wide Shipments	2008 Total Industry-Wide Shipments	Projected Total Industry-Wide Shipments in 2015*	Projected Total Industry-Wide Shipments in 2025	Projected Total Industry-Wide Shipments in 2035
DOE's Estimate for Total Industry Shipments (Millions)**	4.384	4.001	4.391	3.966	4.474
Manufacturer Feedback					

\* 2015 is estimated effective date of amended energy conservation standards for water heaters.

\*\* For gas-fired and electric water heaters 2007 data was provided by AHRI (March 3, 2008) and 2008 data was provided by AHRI (March 17, 2009). Projections were updated using: (1) AEO2009 New Housing Forecast; (2) AHRI 2008 Data; and (3) AHS 2007 Historical Market Shares.

**Table 5-3 Annual Industry-Wide Shipment Projections for Oil-Fired Storage-Type Residential Water Heaters Absent Amended Energy Conservation Standards**

	2007 Total Industry-Wide Shipments	2008 Total Industry-Wide Shipments	Projected Total Industry-Wide Shipments in 2015*	Projected Total Industry-Wide Shipments in 2025	Projected Total Industry-Wide Shipments in 2035
DOE's Estimate for Total Industry Shipments (Millions)**	0.036	0.038	0.042	0.047	0.053
Manufacturer Feedback					

\* 2015 is estimated effective date of amended energy conservation standards for water heaters.

\*\* For oil-fired water heaters 2007 value is from Oil Heating Journal and 2008 value is modeled.

5.2 Are the 2007 and 2008 industry wide-shipments shown in Table 5-1 through Table 18-3 consistent with historic trends? Do you expect total shipment levels to return to their previous levels (i.e., those levels prior to 2007)?

5.3 DOE's shipments analysis estimates industry-wide shipments in 2015 would continue to increase even as amended energy conservation standards become effective due to new housing starts and increases in replacements, and voluntary programs such as ENERGY STAR. Could you provide any qualitative information on expected changes in total industry shipments shown in Table 5-1 through Table 18-3?

## 6 PRODUCT MIX

Product mix describes the distribution of current shipments by efficiency level. Changes in the product mix due to amended energy conservation standards can have a large impact on industry revenues. Having an accurate estimate of the current product mix allows DOE to better estimate how revenues might change due to amended energy conservation standards.

6.1 Does your company offer multiple product lines at different efficiency levels? Could you provide a description of your company's product lines and their respective efficiency levels?

6.2 Table 6-1 through Table 19-3 show DOE's estimate for the current mix of shipments by efficiency today and in 2015, the anticipated effective date of amended energy conservation standards. Could you provide feedback on DOE's estimates based on your knowledge of the industry?

**Table 6-1 Percentage of Industry-Wide Shipments by Efficiency Level for Electric Storage-Type Residential Water Heaters Today and in 2015**

Percentage of Total Shipments at Each Efficiency	Baseline Level (EF = 0.90)	EL 1 (EF = 0.91)	EL 2 (EF = 0.92)	EL 3 (EF = 0.93)	EL 4 (EF = 0.94)	EL 5 (EF = 0.95)	EL 6 (EF = 2.0)	EL 7 (EF = 2.2)
DOE's Estimate (2008)	38.2%	24.4%	7.1%	19.6%	4.8%	6.0%	0.0%	0.0%
Manufacturer Feedback								
DOE's Estimate (2015)	36.3%	23.2%	6.7%	18.6%	4.6%	5.7%	5.0%	0.0%
Manufacturer Feedback								

**Table 6-2 Percentage of Industry-Wide Shipments by Efficiency Level for Gas-Fired Storage-Type Residential Water Heaters Today and in 2015**

Percentage of Total Shipments at Each Efficiency	Baseline Level (EF = 0.59)	EL 1 (EF = 0.62)	EL 2 (EF = 0.63)	EL 3 (EF = 0.64)	EL 4 (EF = 0.65)	EL 5 (EF = 0.67)	EL 6 (EF = 0.80)
DOE's Estimate (2008)	86.9%	7.8%	2.4%	1.3%	1.5%	0.2%	0.0%
Manufacturer Feedback							
DOE's Estimate (2015)	81.6%	7.3%	2.2%	1.2%	1.4%	5.3%	1.0%
Manufacturer Feedback							

**Table 6-3 Percentage of Industry-Wide Shipments by Efficiency Level for Oil-Fired Storage-Type Residential Water Heaters Today and in 2015**

Percentage of Total Shipments at each Efficiency	Baseline Level (EF = 0.53)	EL 1 (EF = 0.54)	EL 2 (EF = 0.56)	EL 3 (EF = 0.58)	EL 4 (EF = 0.60)	EL 5 (EF = 0.62)	EL 6 (EF = 0.66)	EL 7 (EF = 0.68)
DOE's Estimate (2008)	22.2%	0.0%	0.0%	0.0%	11.1%	16.7%	25.0%	25.0%
Manufacturer Feedback								
DOE's Estimate (2015)	22.2%	0.0%	0.0%	0.0%	11.1%	16.7%	25.0%	25.0%
Manufacturer Feedback								

6.3 Do you expect the product mix to change over time? If so, please explain why.

6.4 An amended energy conservation standard affects the product mix by eliminating the sale of products below the minimum efficiency level. DOE assumes that all products that fall below the standard would roll-up to the efficiency level set by an amended energy conservation standard. DOE assumes the distribution of efficiencies above the efficiency level set by the energy conservation standard will not change. In other words, those customers already purchasing more-efficient products will continue to do so irrespective of amended energy conservation standards. How do you think amended energy conservation standards will impact the sales of more efficient products? For example, would customers continue to buy products that exceed the energy conservation standard level? Would your response change at higher efficiency levels?

## 7 FINANCIAL PARAMETERS

Navigant Consulting, Inc. (NCI) has developed a “strawman” model of the electric, gas-fired, and oil-fired storage-type residential water heater industry financial performance called the Government Regulatory Impact Model (GRIM) using publicly available data. This section attempts to understand how your company’s financial situation differs from our industry aggregate picture.

7.1 Please compare your financial parameters to the GRIM parameters tabulated below.

**Table 7-1 Financial Parameters for Storage-Type Residential Water Heater Manufacturers**

GRIM Input	Definition	Industry Estimated Value	Your Actual (If Significantly Different from DOE's Estimate)
Income Tax Rate	Corporate effective income tax paid (percentage of earnings before taxes, EBT)	27.5%	
Discount Rate	Weighted average cost of capital (inflation-adjusted weighted average of corporate cost of debt and return on equity)	8.5%	
Working Capital	Current assets less current liabilities (percentage of revenues)	11.4%	
SG&A	Selling, general, and administrative expenses (percentage of revenues)	20.9%	
R&D	Research and development expenses (percentage of revenues)	1.5%	
Depreciation	Amortization of fixed assets (percentage of revenues)	2.2%	
Capital Expenditures	Outlay of cash to acquire or improve capital assets (percentage of revenues, not including acquisition or sale of business units)	2.2%	
Cost of Goods Sold	Includes material, labor, overhead, and depreciation (percentage of revenues)	71.3%	

7.2 If your company manufactures multiple product classes of storage-type residential water heaters, do any of the financial parameters in Table 7-1 change based on fuel-type? Please describe any differences.

7.3 How would you expect an amended energy conservation standard to impact any of the financial parameters for the industry?



## 8 CONVERSION COSTS

Amended energy conservation standards may cause your company to incur capital and product conversion costs to redesign existing products and make changes to existing production lines to be compliant with the amended energy conservation standard. Capital conversion costs are one-time investments in plant, property, and equipment (PPE) necessitated by an amended energy conservation standard. These may be incremental changes to existing PPE or the replacement of existing PPE. Replacing existing PPE could strand existing assets before the end of their useful lives. In addition to capital conversion costs, product conversion costs are costs related research, product development, testing, marketing and other costs for redesigning products necessitated by an amended energy conservation standard.

8.1 What level of conversion costs do you anticipate incurring under the different efficiency levels DOE is considering? Refer to the tables below to provide your company's estimates. Please provide additional qualitative information to help DOE understand the types and nature of your investments.

**Table 8-1 Electric Storage-Type Residential Water Heater Conversion Costs**

Efficiency Level (Energy Factor)	Electric Storage-Type Residential Water Heaters		
	Capital Conversion Costs (2009\$)	Product Conversion Costs (2009\$)	Stranded Assets (2009\$)
Baseline (EF = 0.90)			
EL 1 (EF = 0.91)			
EL 2 (EF = 0.92)			
EL 3 (EF = 0.93)			
EL 4 (EF = 0.94)			
EL 5 (EF = 0.95)			
EL 6 (EF = 2.0)			
EL 7 (EF = 2.2)			

**Table 8-2 Gas-Fired Storage-Type Residential Water Heater Conversion Costs**

Efficiency Level (Energy Factor)	Gas-Fired Storage-Type Residential Water Heaters		
	Capital Conversion Costs (2009\$)	Product Conversion Costs (2009\$)	Stranded Assets (2009\$)
Baseline (EF = 0.59)			
EL 1 (EF = 0.62)			
EL 2 (EF = 0.63)			
EL 3 (EF = 0.64)			
EL 4 (EF = 0.65)			
EL 5 (EF = 0.67)			
EL 6 (EF = 0.80)			

**Table 8-3 Oil-Fired Storage-Type Residential Water Heater Conversion Costs**

Efficiency Level (Energy Factor)	Gas-Fired Storage-Type Residential Water Heater		
	Capital Conversion Costs (2009\$)	Product Conversion Costs (2009\$)	Stranded Assets (2009\$)
Baseline (EF = 0.53)			
EL 1 (EF = 0.54)			
EL 2 (EF = 0.56)			
EL 3 (EF = 0.58)			
EL 4 (EF = 0.60)			
EL 5 (EF = 0.62)			
EL 6 (EF = 0.66)			
EL 7 (EF = 0.68)			

## 9 CUMULATIVE REGULATORY BURDEN

Cumulative regulatory burden refers to the burden that industry faces from overlapping effects of new or revised DOE standards, voluntary standards, and/or other regulatory actions affecting the same product or industry.

9.1 Are there other recent or impending regulations that electric, gas-fired, and oil-fired storage-type residential water heater manufacturers face (from DOE or otherwise)? If so, could you identify the regulation and the corresponding possible effective dates for those regulations? Below is a list of regulations that could possibly affect manufacturers of electric, gas-fired, and oil-fired storage-type residential water heaters. Please provide any comments on the listed regulations in addition to other regulations.

**Table 9-1 Other Regulations Identified by DOE**

Regulation	Estimated or Actual Effective Date(s)	Comments
DOE's Amended Energy Conservation Standards for Other Products		
International Energy-Efficiency Standards		
State Emission Requirements and Other State Regulations		
South Coast Air Quality Management District (SCAQMD) Ultra-Low NOx Requirements		
Uniform Plumbing, Building, and Safety Codes		

9.2 What level of expense are you expecting to incur as a result of these regulations?

9.3 Under what circumstances would you be able to coordinate any expenditures related to these other regulations with an amended energy conservation standard, thereby lessening the cumulative burden?

## 10 DIRECT EMPLOYMENT IMPACT ASSESSMENT

The impact of amended energy conservation standards on employment is an important consideration in the rulemaking process. This section of the interview guide seeks to explore current trends in electric, gas-fired, and oil-fired storage-type residential water heater production employment and solicit manufacturer views on how domestic employment patterns might be affected by amended energy conservation standards.

10.1 Would your domestic employment levels be expected to change significantly under amended energy conservation standards? If so, please explain how they would change if higher efficiency levels are required.

10.2 Would the workforce skills necessary under amended energy conservation standards require extensive retraining or replacement of employees at your manufacturing facilities?

10.3 Would amended energy conservation standards require extensive retraining of your service/field technicians? If so, could you expand on how your service infrastructure would be impacted in general as a result of amended energy conservation standards?

## **11 EXPORTS / FOREIGN COMPETITION / OUTSOURCING**

Disparity between domestic and foreign energy conservation standards could impact exports or imports. Labor content and material changes, resulting from amended energy conservation standards, may impact sourcing decisions.

11.1 What percentage of your company's electric, gas-fired, and oil-fired storage-type residential water heater sales is domestic? Absent amended energy conservation standards, are production facilities being relocated to foreign countries? Would amended energy conservation standards impact your domestic vs. foreign manufacturing decision?

11.2 If applicable, to what foreign countries or regions do you export your products? What percentage of sales can be attributed to each?

11.3 Would an amended energy conservation standard be expected to affect your export sales? What would the resulting impact be, if any, on your manufacturing operations and profitability?

11.4 Are your foreign exports affected by amended energy conservation standards in other countries?

11.5 What percentage of the U.S. market for electric, gas-fired, and oil-fired storage-type residential water heaters is imported? Would amended energy conservation standards have an impact on foreign competition?

11.6 What is your outlook for electric, gas-fired, and oil-fired storage-type residential water heater exports?

## **12 CONSOLIDATION**

Amended energy conservation standards can alter the competitive dynamics of the market. This can include prompting companies to enter or exit the market, or to merge. DOE and the Department of Justice are both interested in any potential reduction in competition that would result from an amended energy conservation standard.

12.1 Please comment on industry consolidation and related trends over the last 5 years.

12.2 In the absence of amended energy conservation standards, do you expect any further industry consolidation? Please describe your expectations.

12.3 How would amended energy conservation standards affect your ability to compete?

## **13 IMPACTS ON SMALL BUSINESS**

13.1 The Small Business Association (SBA) denotes a small business in the electric, gas-fired, and oil-fired storage-type residential water heater industry as having less than 500 employees.<sup>2</sup> By this definition, is your company considered a small business?

13.2 Are there any reasons that a small business might be at a disadvantage relative to a larger business under amended energy conservation standards? Please consider such factors as technical expertise, access to capital, bulk purchasing power for materials/components, engineering resources, and any other relevant issues.

13.3 Are there any niche manufacturers, small businesses, and/or component manufacturers for which the adoption of amended energy conservation standards would have a severe impact? If so, would manufacturers of these products have different incremental impacts from implemented amended energy conservation standards than from the rest of the industry?

## **14 ULTRA-LOW NOX WATER HEATERS**

As part of the rulemaking analyses, DOE is reviewing gas-fired, storage-type water heaters that are manufactured and shipped to locations where ultra-low nitrogen oxide (NO<sub>x</sub>) emissions requirements are in place, such as the South Coast Air Quality Management District (SCAQMD) of California. DOE has identified markets in California and Texas where ultra-low NO<sub>x</sub> emissions requirements exist. For example, Rule 1121 (Control of Nitrogen Oxides from Residential Type, Natural Gas-fired Water Heaters) limits NO<sub>x</sub> emissions to 10 nanograms per Joule (ng/J) within the SCAQMD. Because DOE is aware that manufacturers typically employ different burner technologies in order to comply with these emissions requirements, DOE would like to better understand how NO<sub>x</sub> requirements change gas-fired residential water heater manufacturing.

14.1 What States or regions currently have ultra-low NO<sub>x</sub> emissions requirements? What are those requirements?

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<sup>2</sup> DOE uses the small business size standards published on August 22, 2008, as amended, by the SBA to determine whether a company is a small business. To be categorized as a small business, a water heater manufacturer and its affiliates may employ a maximum of 500 employees. The 500 employee threshold includes all employees in a business's parent company and any other subsidiaries.

14.2 What percentage of your products are shipped to regions with ultra-low NOx requirements? Do you expect those percentages to change over time?

14.3 Are you aware of any new emissions requirements being considered by State or regional governments?

14.4 What States or regions do you anticipate having emissions requirements in the future and what is the timing of any future requirements?

DOE identified ultra-low NOx gas-fired storage water heaters on the market with rated storage volumes between 28 and 65 gallons. These products range in energy efficiency from DOE's baseline efficiency levels (0.59 EF for 40 gallon models) to 0.62 EF (for models with rated storage volumes between 28 and 50 gallons). DOE noted that these products typically include both pilot and electronic ignition, ultra-low NOx burner manifolds, and atmospheric venting configurations. DOE also noted that manufacturers typically improve energy efficiency by increasing the amount of insulation around the storage tank at the baseline efficiency level.

14.5 Does your company plan on expanding current ultra-low NOx offerings? If so, what efficiency levels and rated storage volumes will you offer?

14.6 How would the strategies used by manufacturers to increase the efficiency of a conventional gas-fired water heater differ from the strategies used to increase an ultra-low NOx water heater? Could you please explain any differences?

14.7 If manufacturers use different strategies to increase the efficiency of an ultra-low NOx water heater, how would the incremental cost between efficiency levels change?

14.8 Do you currently have an ultra-low NOx prototype that uses power vent technology to improve energy efficiency? At what efficiency level would you incorporate power vent technologies to increase the efficiency of an ultra-low NOx water heater? For comparison, a

conventional gas-fired water heater with a 40 gallon rated storage volume includes a power vent at 0.64 EF. Can a power vent be paired with a standard burner manifold instead of the ultra-low NOx burner to achieve ultra-low NOx emission levels?

14.9 Would designs to meet flammable vapor ignition requirements impact the design of models that meet ultra-low NOx requirements, both with and without power venting?

14.10 Please explain any barriers to improving energy efficiency for ultra-low NOx gas-fired storage water heaters.

## **15 UNIT SHIPPING METHODS AND ASSOCIATED COSTS**

An amended energy conservation standard can change overall shipments by altering product attributes, product size, amount of shipments, and price. Having an accurate estimate of the shipping costs for the industry allows DOE to better examine impacts on profitability and employment due to amended energy conservation standards. DOE has based their shipment costs off of average industry cost per trailer and the number of units per trailer. In the analysis, DOE assumed standard pallets were used, the trailer size had dimensions of 10' by 8' by 53', and total shipping cost per trailer was \$3,000.

15.1 What is the average size and cost of the trailer used to ship residential storage-type water heaters?

15.2 When packing and loading water heaters onto trailers, what methods are applied? For example, are pallets, crates, and forklifts used? Please specify the type of crate used, dimensions, and number of water heaters per crate, if applicable.

15.3 Table 15-1 through Table 15-3 provide DOE's estimates of the shipping costs for storage-type residential water heaters at each efficiency level being considered. Could you please provide any comments on the estimated values?



**Table 15-1. Estimated Shipping Costs for Electric Storage-Type Residential Water Heaters (50 Gallons Rated Storage Volume)**

Efficiency Levels (Energy Factor)	Outer Packaging Dimensions per Water Heater - h x w x l (in.)		Number of Water Heaters per Trailer		Unit Shipping Cost	
	DOE's Estimate	Manufacturer Feedback	DOE's Estimate	Manufacturer Feedback	DOE's Estimate (2008\$)	Manufacturer Feedback
Baseline (EF = 0.90)	52 x 25 x 22		180		\$17	
EL 1 (EF = 0.91)	52 x 26 x 23		180		\$17	
EL 2 (EF = 0.92)	53 x 27 x 24		180		\$17	
EL 3 (EF = 0.93)	53 x 27 x 24		180		\$17	
EL 4 (EF = 0.94)	53 x 28 x 25		120		\$25	
EL 5 (EF = 0.95)	54 x 30 x 27		120		\$25	
EL 6 (EF = 2.0)	67 x 26 x 23		90		\$33	
EL 7 (EF = 2.2)	67 x 26 x 23		90		\$33	

**Table 15-2. Estimated Shipping Costs for Gas-Fired Storage-Type Residential Water Heaters (40 Gallons Rated Storage Volume)**

Efficiency Levels (Energy Factor)	Outer Packaging Dimensions per Water Heater - h x w x l (in.)		Number of Water Heaters per Trailer		Unit Shipping Cost	
	DOE's Estimate	Manufacturer Feedback	DOE's Estimate	Manufacturer Feedback	DOE's Estimate (2008\$)	Manufacturer Feedback
Baseline (EF = 0.59)	54 x 23 x 24		180		\$17	
EL 1 (EF = 0.62)	54.5 x 24 x 25		120		\$25	
EL 2 (EF = 0.63)	55 x 25 x 26		120		\$25	
EL 3 (EF = 0.64)	69.5 x 23.5 x 24.5		60		\$50	
EL 4 (EF = 0.65)	70 x 24 x 25		60		\$50	
EL 5 (EF = 0.67)	70.6 x 25 x 26		60		\$50	
EL 6 (EF = 0.80)	73.3 x 27.5 x 32		60		\$50	

**Table 15-3. Estimated Shipping Costs for Oil-Fired Storage-Type Residential Water Heaters (30 Gallons Rated Storage Volume)**

Efficiency Levels (Energy Factor)	Outer Packaging Dimensions per Water Heater - h x w x l (in.)		Number of Water Heaters per Trailer		Unit Shipping Cost	
	DOE Estimate	Manufacturer Feedback	DOE Estimate	Manufacturer Feedback	DOE Estimate (2008\$)	Manufacturer Feedback
Baseline (EF = 0.53)	53.5 x 20.5 x 21.5		180		\$17	
EL 1 (EF = 0.54)	54 x 21.5 x 22.5		180		\$17	
EL 2 (EF = 0.56)	55.5 x 22.5 x 23.5		180		\$17	
EL 3 (EF = 0.58)	56 x 23.5 x 24.5		120		\$25	
EL 4 (EF = 0.60)	54.5 x 22.5 x 23.5		180		\$17	
EL 5 (EF = 0.62)	55 x 23.5 x 24.5		120		\$25	
EL 6 (EF = 0.66)	53.5x20.5 x 21.5		180		\$17	
EL 7 (EF = 0.68)	53.5x20.5 x 21.5		180		\$17	

## 16 ALTERNATIVE ENERGY-EFFICIENCY EQUATIONS FOR STORAGE-TYPE WATER HEATERS

In response to a request from the Air Conditioning, Heating, and Refrigeration Institute (AHRI) and several manufacturers, DOE is considering revisions to the energy-efficiency equations that define the existing Federal energy conservation standards for gas-fired and electric storage water heaters. The energy-efficiency equations allow DOE to expand the analysis on the representative rated storage volume to the full range of storage volumes covered under the existing Federal energy conservation standard. In the preliminary analysis, DOE determined that the current Federal energy-efficiency equations may not represent the current gas-fired and electric storage water heater markets. Additionally, amended energy conservation standards may eliminate certain rated storage volume ranges from the market or require manufacturers to use different technologies for different rated storage volume ranges (e.g., with the current slopes, low volume models may require heat pump or condensing technologies to meet an amended standard).

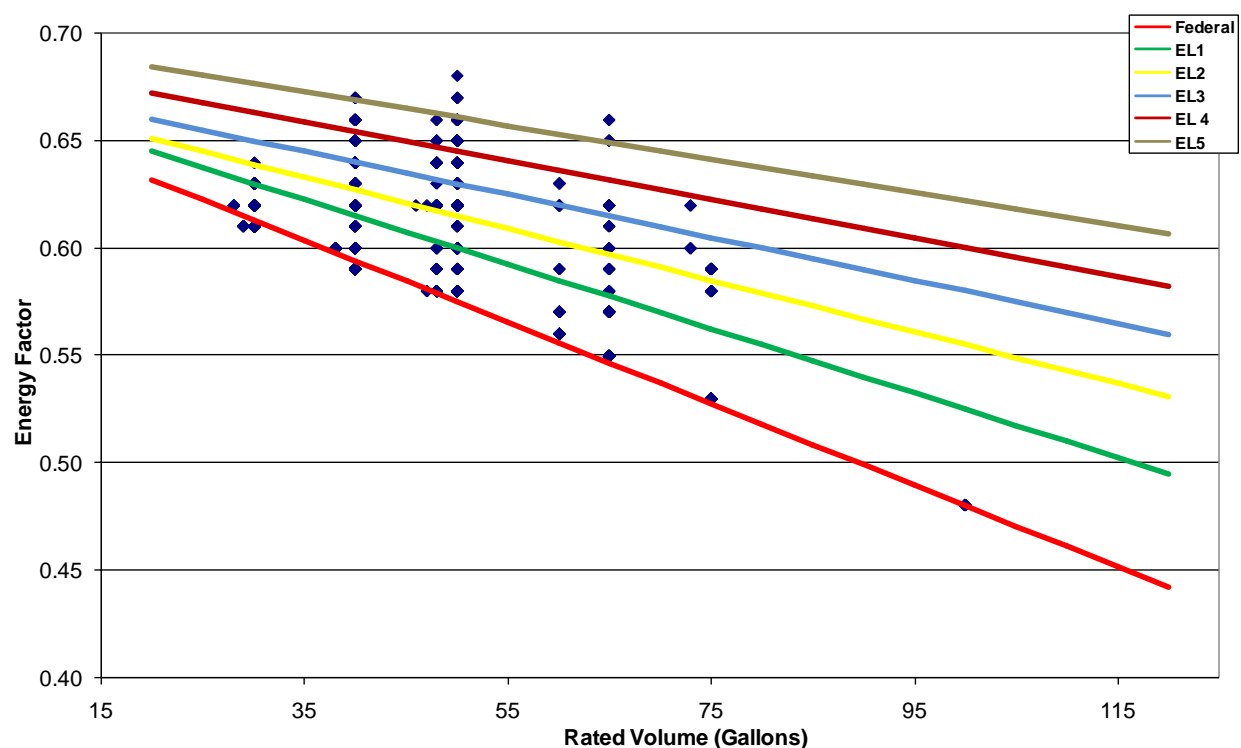
For the existing Federal energy conservation standards, the slope and the intercept of each energy-efficiency equation are constant for each product class. Table 16-1 shows the energy-efficiency equations of the existing Federal energy conservation standards for gas-fired and electric storage water heaters.

**Table 16-1. Existing Federal Energy Conservation Standards for Residential Gas-Fired and Electric Storage Water Heaters**

Residential Water Heater Class	Minimum Energy Factor (EF)
Gas-Fired Storage-Type	$0.67 - (0.0019 \times \text{Rated Storage Volume in Gallons})$
Electric Storage-Type	$0.97 - (0.00132 \times \text{Rated Storage Volume in Gallons})$

DOE developed alternative energy-efficiency equations by both analyzing market data and

through testing of water heaters selected from a variety of manufacturers covering a range of efficiency levels and rated storage volumes. The alternative energy-efficiency equations DOE developed for gas-fired storage water heaters and the gas-fired storage water heaters currently available to the market are presented in Figure 16-1. The horizontal axis represents the rated storage volume and the vertical axis represents the energy factor. The points correspond to the models that DOE identified that are currently available to the market, and the efficiency levels are shown as lines spanning the rated volume range, which is 20 to 100 gallons for gas-fired storage water heaters. Please note that the max-tech efficiency level (i.e., condensing technology) is not shown in this figure. The max-tech efficiency level corresponds to 0.80 EF at 40 gallons. DOE proposes a flat line to represent the max-tech efficiency level, where the energy factor would be 0.80 EF for the entire 20 to 100 gallon rated volume range.



**Figure 16-1. Alternative Energy-Efficiency Equations for Gas-Fired Storage Water Heaters (max-tech not shown)**

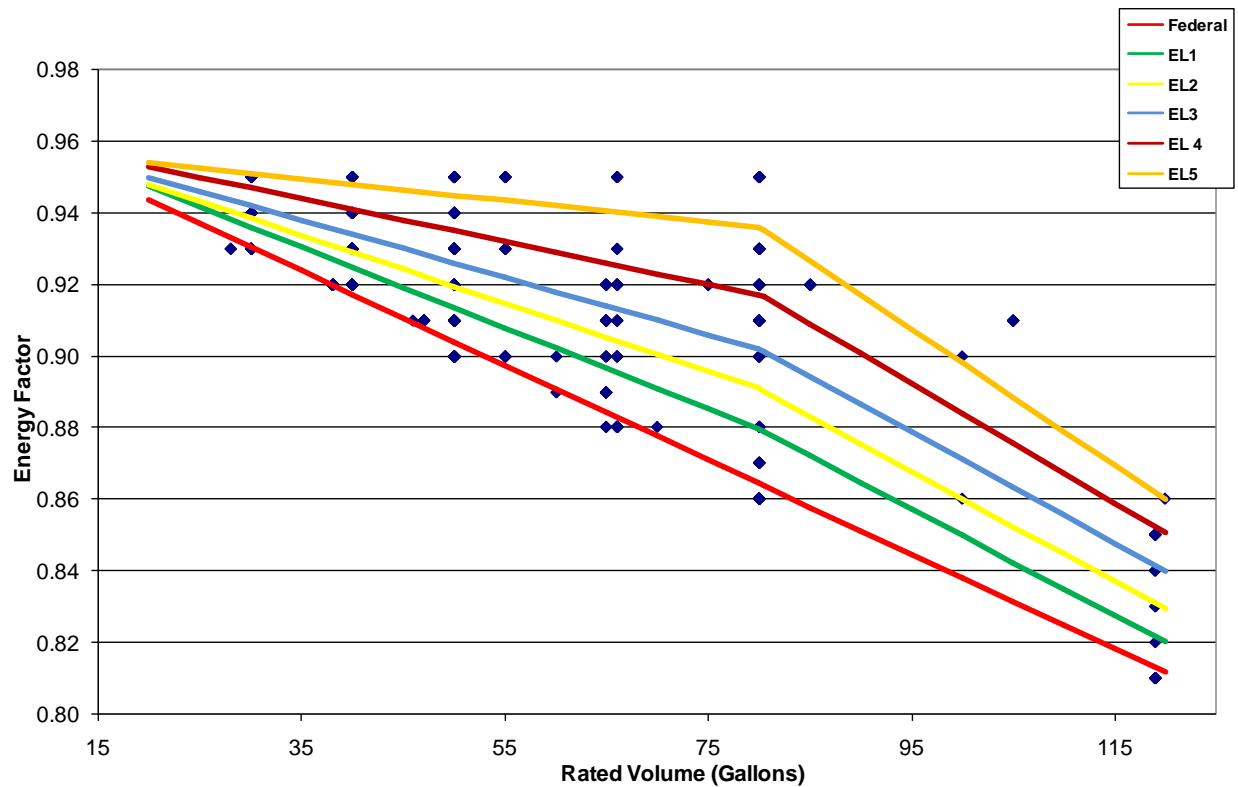
**Table 16-2. Alternative Energy-Efficiency Equations for Gas-Fired Storage Water Heaters**

<b>Efficiency Level</b>	<b>20 to 100 Gallons</b>
Baseline Energy-Efficiency Equation	$EF = -0.00190(V_R) + 0.670$
EL 1 Energy-Efficiency Equation	$EF = -0.00150(V_R) + 0.675$
EL 2 Energy-Efficiency Equation	$EF = -0.00120(V_R) + 0.675$
EL 3 Energy-Efficiency Equation	$EF = -0.00100(V_R) + 0.680$
EL 4 Energy-Efficiency Equation	$EF = -0.00090(V_R) + 0.690$
EL 5 Energy-Efficiency Equation	$EF = -0.00078(V_R) + 0.700$
EL 6 Energy-Efficiency Equation	$EF = 0.80$

16.1 Please provide any qualitative and quantitative feedback on the alternative energy-efficiency equations for gas-fired storage-type water heaters.

Similarly, DOE developed alternative energy-efficiency equations for electric storage water heaters. The alternative energy-efficiency equations for electric storage water heaters and the electric storage water heaters currently available to the market are shown in Figure 16-2. The efficiency levels that DOE is considering span the rated volume range, which is 20 to 120 gallons for electric storage water heaters. Please note that efficiency level 6 and the max-tech efficiency level (i.e., those efficiency levels utilizing heat pump technology) are not shown in this figure. Efficiency level 6 corresponds to a 2.0 EF at 50 gallons, and the max-tech efficiency level corresponds to a 2.2 EF at 50 gallons. Similarly, to the gas-fired storage water heater max-tech efficiency level, DOE proposes a flat line to represent efficiency level 6 and the max-tech for electric storage water heaters, where the energy factor would be 2.0 and 2.2, respectively, for the entire 20 to 120 gallon rated volume range.

DOE proposes a two-slope approach for electric storage water heaters. After reviewing market data and conducting testing of various models, DOE determined that the relationship between energy factor and rated volume is different for electric storage water heaters with small and large rated volumes. Based on available data, DOE determined that the relationship changes at 80 gallons, as shown in Figure 16-2.



**Figure 16-2. Alternative Energy-Efficiency Equations for Electric Storage Water Heaters**

**Table 16-3. Alternative Energy-Efficiency Equations for Gas-Fired Storage Water Heaters**

Efficiency Level	20 to 80 Gallons	Over 80 and up to 120 Gallons
Baseline Energy-Efficiency Equation	$EF = -0.00190(V_R) + 0.670$	
EL 1 Energy-Efficiency Equation	$EF = -0.00150(V_R) + 0.675$	$EF = -0.00149(V_R) + 0.999$
EL 2 Energy-Efficiency Equation	$EF = -0.00120(V_R) + 0.675$	$EF = -0.00153(V_R) + 1.013$
EL 3 Energy-Efficiency Equation	$EF = -0.00100(V_R) + 0.680$	$EF = -0.00155(V_R) + 1.026$
EL 4 Energy-Efficiency Equation	$EF = -0.00090(V_R) + 0.690$	$EF = -0.00168(V_R) + 1.051$
EL 5 Energy-Efficiency Equation	$EF = -0.00078(V_R) + 0.700$	$EF = -0.00190(V_R) + 1.088$
EL 6 Energy-Efficiency Equation	$EF = 2.0$	
EL 7 Energy-Efficiency Equation	$EF = 2.2$	

16.2 Please provide any qualitative and quantitative feedback on the alternative energy-efficiency equations for electric storage-type water heaters.

16.3 DOE reviewed the 2009 AHRI directory and manufacturers' literature to determine the

maximum efficiency levels for various rated storage volumes currently available to the market. Do the maximum efficiency levels offered on the market identified correspond to the maximum achievement in energy efficiency that is possible for electric storage water heaters at these rated volume sizes, using conventional technologies (i.e., insulation improvements)?

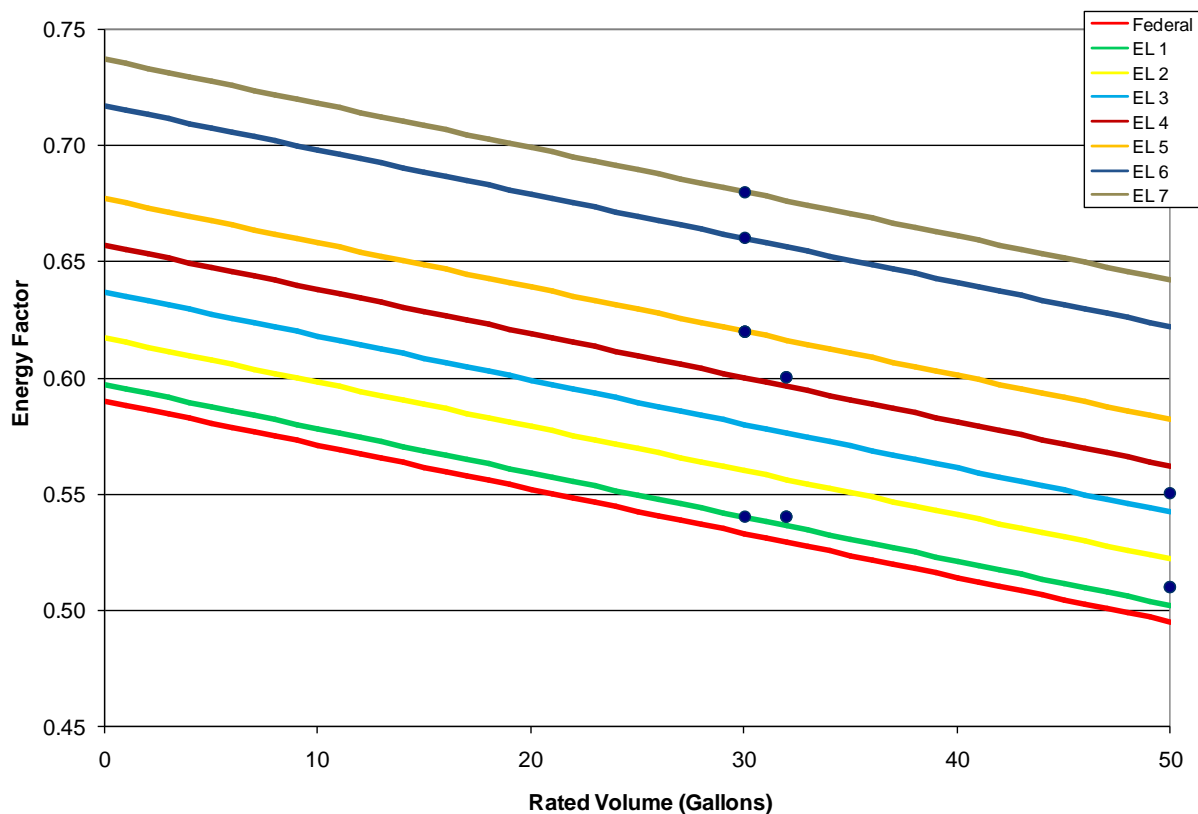
**Table 16-4. Energy-Efficiency Levels at various Rated Storage Volumes for Electric Storage Water Heaters**

<b>Rated Storage Volume</b>	<b>Maximum Energy Factor Available to the Market</b>	<b>Maximum Achievable Energy Factor (Manufacturer Feedback)</b>
30 Gallons	0.95 EF	
40 Gallons	0.95 EF	
50 Gallons	0.95 EF	
66 Gallons	0.95 EF	
80 Gallons	0.95 EF	
100 Gallons	0.91 EF	
120 Gallons	0.86 EF	

16.4 Are the slopes appropriate for each efficiency level?

16.5 Do you agree with a two-slope approach for electric storage water heaters? Should this change of slope occur at 80 gallons?

DOE did not develop alternative energy-efficiency equations for oil-fired storage water heaters. Figure 16-3 shows the oil-fired storage water heaters currently available to the market and the energy-efficiency equations DOE is considering for the rulemaking analysis.



**Figure 16-3 Energy-Efficiency Equations for Oil-Fired Storage Water Heaters**

16.6 Is the slope of the current Federal energy-efficiency equation for oil-fired storage water heaters representative of the current market?

16.7 Should DOE consider an alternative energy-efficiency equation for oil-fired storage water heaters?

16.8 Currently, the slope for the oil-fired storage water heaters is the same as the slope for the gas-fired storage water heaters. If DOE is revising the slope for gas-fired storage water heaters as described above, should DOE consider similarly revising the oil-fired storage water heater slope? Please provide any quantitative data or qualitative reasons behind your preference.

**12A.2 INSTANTANEOUS GAS-FIRED WATER HEATERS MANUFACTURER  
IMPACT ANALYSIS INTERVIEW GUIDE**

April 6, 2009



As part of the rulemaking process for amended energy conservation standards for instantaneous gas-fired water heaters, the Department of Energy (DOE) conducts the manufacturer impact analysis (MIA). In this analysis, DOE uses publicly available information and information provided by manufacturers during interviews to assess possible impacts due to amended energy conservation standards on manufacturers. DOE is currently considering 8 efficiency levels (EL) for instantaneous gas-fired water heaters. DOE analyzed one representative input capacity for instantaneous gas-fired water heaters of 199,000 Btu/h.

### **Efficiency Levels Under Consideration for Instantaneous Gas-Fired Water Heaters**

Product Class (representative input capacity)	Efficiency Metric	Baseline Efficiency Level	EL 1	EL 2	EL 3	EL 4	EL 5	EL 6	EL 7	EL 8
Instantaneous Gas-Fired Water Heaters (199 kBtu/h)	Energy Factor (EF)	0.62	0.69	0.78	0.80	0.82	0.84	0.85	0.92	0.95

## **1 KEY ISSUES**

1.4 In general, what are the key issues for your company regarding amended energy conservation standards for instantaneous gas-fired water heaters and this rulemaking?

1.5 For the issues identified, how significant are they at each listed efficiency level?

1.6 How can we most effectively incorporate these issues in the MIA?

## **2 COMPANY OVERVIEW AND ORGANIZATIONAL CHARACTERISTICS**

DOE is interested in understanding manufacturer impacts at the plant or profit center level directly pertinent to instantaneous gas-fired water heater production. However, the context within which the plant operates and the details of plant production and costs are not readily available from the published literature. Therefore, DOE invites you to provide these details confidentially in your own words to the extent possible and practical. Understanding the organizational setting around the instantaneous gas-fired water heater industry profit center will help DOE understand the probable future of the instantaneous gas-fired water heater manufacturing activity with and without amended energy conservation standards.

2.1 Do you have a parent company, and/or any subsidiaries relevant to the instantaneous gas-fired water heater industry?

2.2 Do you manufacture any products other than instantaneous gas-fired water heaters? If so, what other products do you manufacture?

2.3 What percentage of your total manufacturing corresponds to instantaneous gas-fired water heaters?

2.4 Where are your production facilities located, and what type of product is manufactured at each location? Could you provide figures for your company's manufacturing at each location by efficiency?

2.5 At your manufacturing facilities, would potential instantaneous gas-fired water heater redesigns be difficult to implement? If so, would your company modify the existing facility or develop a new facility?

2.6 What are your employment levels at each of these facilities?

2.7 What are your product lines, niches, and relative strengths in the instantaneous gas-fired water heater market?

2.8 What is your company's approximate market share of the instantaneous gas-fired water heater industry?

2.9 Would you expect your market share to change once amended energy conservation standards become effective?

### 3 MANUFACTURER PRODUCTION COSTS AND SELLING PRICES

DOE estimated the manufacturer production costs of instantaneous gas-fired water heaters. DOE defines manufacturer production cost as all direct costs associated with manufacturing a product. It includes direct labor, direct materials, and overhead (which includes depreciation costs). The breakdown of manufacturer production cost has implications for the quantitative impacts on instantaneous gas-fired water heater manufacturers. The per unit production costs are necessary for DOE to estimate labor expenditures and other cash flow calculations.

Manufacturer selling price is the average cost manufacturers charge their first consumers, but does not include costs along distribution channels. The manufacturer selling price includes a per unit research and development cost; selling, general, and administrative expense; shipping cost; and profit. For the instantaneous gas-fired MIA, the manufacturer markup is a multiplier applied to manufacturer production cost to cover the per unit research and development, selling, general, and administrative expense, shipping costs, and profit.

DOE estimated an industry-wide baseline markup of 1.45 for instantaneous gas-fired water heaters. DOE asks a series of questions about the manufacturer markup associated with premium products at higher efficiencies in Section 4. As shown in Equation 3-1 below, the manufacturer production cost multiplied by the manufacturer markup would cover all costs in the manufacturer selling price of baseline products.

#### Equation 3-1. Calculation of Manufacturer Selling Price

Manufacturer Production Cost  $\times$  Manufacturer Markup = Manufacturer Selling Price

3.1 Is there a significant difference between the baseline markups DOE calculated and your company's baseline markups for instantaneous gas-fired water heaters?

3.2 Table 3-1 provides DOE's estimates of the manufacturer production costs and manufacturer selling prices for instantaneous gas-fired water heaters at each efficiency level being considered. Could you please provide any comments on the estimated values?

**Table 3-1 Estimated Manufacturer Production Costs and Manufacturer Selling Prices for Instantaneous Gas-Fired Water Heaters**

Efficiency Level (Energy Factor)	DOE's Manufacturer Production Cost Estimates* (2008\$)	DOE's Manufacturer Selling Price Estimates (2008\$)	Manufacturer Comments or Revised Estimates
Baseline Level (EF = 0.62)	\$231	\$335	
EL 1 (EF = 0.69)	\$242	\$350	
EL 2 (EF = 0.78)	\$278	\$403	
EL 3 (EF = 0.80)	\$353	\$511	
EL 4 (EF = 0.82)	\$371	\$538	
EL 5 (EF = 0.84)	\$390**	\$565**	
EL 6 (EF = 0.85)	\$399**	\$578**	
EL 7 (EF = 0.92)	\$661	\$959	
EL 8 (EF = 0.95)	TBD	TBD	

\* DOE's manufacturer production cost estimates were developed using a five-year average of raw material prices (i.e., spanning 2003 to 2007, shown in 2008\$).

\*\* DOE plans to revise the MPC of EL 5 and EL 6 to reflect a design associated with near-condensing operation.

3.3 Please compare your manufacturer production cost percentages<sup>3</sup> to the estimates tabulated below. The manufacturer production cost breakdown is used to calculate the total cost of goods sold (COGS) for the industry. Having an accurate estimate of the production costs for the industry allows DOE to better examine impacts on profitability and employment due to amended energy conservation standards. Are the different percentages of each cost representative of your company or the instantaneous gas-fired residential water heater industry? Please explain any differences.

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<sup>3</sup>The manufacturer production cost percentages shown in Table 3-2 are the values that make up COGS. These are percentages of total COGS.

**Table 3-2 Breakdown of Manufacturer Production Costs for Baseline Instantaneous Gas-Fired Water Heater Residential Water Heaters**

Components of Manufacturer Production Costs	Estimated Percentage of Manufacturer Production Cost	Your Actual (if different from our estimate)
Materials	64.2%	
Labor	23.4%	
Overhead	9.2%	
Depreciation	3.2%	

#### **4 MARKUPS AND PROFITABILITY**

One of the primary objectives of the MIA is to assess the impact of efficiency levels on industry profitability. In this section, DOE would like to understand the current markup structure of the industry and how setting an energy conservation standard would impact your company's markup structure and profitability. As discussed in Section 3, the manufacturer markup is a multiplier applied to manufacturer production cost to cover per unit research and development, selling, general, and administrative expenses, shipping costs, and profit. The manufacturer production cost multiplied by the manufacturer markup along with shipping costs would cover all costs involved in manufacturing the product.

4.1 Do profit levels currently vary by efficiency level? Please explain why or why not.

4.2 Do profit levels vary by input capacity?

4.3 DOE would like to understand how the baseline manufacturer markup changes at higher efficiency levels. Could you provide your company's markup for any products that meet the efficiency levels shown below?

**Table 4-1 Manufacturer Markups for Instantaneous Gas-fired Water Heaters**

	Instantaneous Gas-Fired Water Heaters (199 kBtu/h Input Capacity)
Efficiency Level (Energy Factor)	Estimated Manufacturer Markup
Baseline Level (EF = 0.62)	
EL 1 (EF = 0.69)	
EL 2 (EF = 0.78)	
EL 3 (EF = 0.80)	
EL 4 (EF = 0.82)	
EL 5 (EF = 0.84)	
EL 6 (EF = 0.85)	
EL 7 (EF = 0.92)	
EL 8 (EF = 0.95)	

4.4 Would you expect changes in your estimated profitability following an amended energy conservation standard? If so, please explain why.

## **5 SHIPMENT PROJECTIONS AND MARKET SHARES**

An amended energy conservation standard can change overall shipments by altering product attributes, marketing approaches, product availability, and price. The industry revenue calculations are based on the shipment projections developed by DOE's shipments model. The shipments model includes forecasts for the base case shipments (i.e., total industry shipments absent amended energy conservation standards) and the standards case shipments (i.e., total industry shipments with amended energy conservation standards).

5.1 Please compare DOE's projections of annual industry-wide shipments for instantaneous gas-fired water heaters with your company's projections of industry-wide shipments.

**Table 5-1 Annual Industry-Wide Shipment Projections for Instantaneous Gas-fired Water Heaters Absent Amended Energy Conservation Standards**

	2007 Total Industry- Wide Shipments	2008 Total Industry- Wide Shipments	Projected Total Industry-Wide Shipments in 2015*	Projected Total Industry-Wide Shipments in 2025	Projected Total Industry-Wide Shipments in 2035
DOE's Estimate for Total Industry Shipments (Millions)**	0.322	0.533	1.657	1.504	1.697
Manufacturer Feedback					

\* 2015 is estimated effective date of amended energy conservation standards for water heaters

\*\*2007 Data was provided by AHRI (March 3, 2008) and 2008 value is modeled (AHRI plans to submit 2008 shipment data)

5.2 Are the 2007 and 2008 industry wide-shipments shown in Table 5-1 consistent with historic trends? Do you expect total shipment levels to return to their previous levels (i.e., those levels prior to 2007)?

5.3 DOE's shipments analysis estimated industry-wide shipments in 2015 would continue to increase even as amended energy conservation standards become effective due to increased demand for instantaneous water heaters and voluntary programs. Could you provide any qualitative information on expected changes in total industry shipments shown in Table 5-1?

## 6 PRODUCT MIX

Product mix describes the distribution of current shipments by efficiency level. Changes in the product mix due to amended energy conservation standards can have a large impact on industry revenues. Having an accurate estimate of the current product mix allows DOE to better estimate how revenues might change due to amended energy conservation standards.

6.1 Does your company offer multiple product lines at different efficiency levels? Could you provide a description of your company's product lines and their respective efficiency levels?

6.2 Table 6-1 shows DOE's estimate for the current mix of shipments by efficiency today and in 2015, the anticipated effective date of amended energy conservation standards. Could you provide feedback on DOE's estimates based on your knowledge of the industry?

**Table 6-1 Percentage of Industry-Wide Shipments by Efficiency Level for Instantaneous Gas-fired Water Heaters Today and in 2015**

Percentage of Total Shipments at each Efficiency	Baseline Level (EF = 0.62)	EL 1 (EF = 0.69)	EL 2 (EF = 0.78)	EL 3 (EF = 0.80)	EL 4 (EF = 0.82)	EL 5 (EF = 0.84)	EL 6 (EF = 0.85)	EL 7 (EF = 0.92)	EL 8 (EF = 0.95)
DOE's Estimate (2008)	0.0%	0.0%	0.6%	13.1%	57.0%	14.6%	11.7%	2.9%	0.0%
Manufacturer Feedback									
DOE's Estimate (2015)	0.0%	0.0%	0.6%	12.8%	55.8%	14.3%	11.4%	4.0%	1.0%
Manufacturer Feedback									

6.3 Is the projected distribution of efficiencies representative of the instantaneous gas-fired water heater shipments? Do you expect the product mix to change over time? If so, please explain why.

6.4 An amended energy conservation standard affects the product mix by eliminating the sale of products below the minimum efficiency level. DOE assumes that all products that fall below the standard would roll-up to the efficiency level set by an amended energy conservation standard. DOE assumes the distribution of efficiencies above the efficiency level set by the energy conservation standard will not change. In other words, those customers already purchasing more-efficient products will continue to do so irrespective of amended energy conservation standards. How do you think amended energy conservation standards will impact the sales of more efficient products? For example, would customers continue to buy products that exceed the energy conservation standard level? Would your response change at higher efficiency levels?

## 7 FINANCIAL PARAMETERS

Navigant Consulting, Inc. (NCI) has developed a “strawman” model of the instantaneous gas-fired water heaters industry financial performance called the Government Regulatory Impact Model (GRIM) using publicly available data. This section attempts to understand how your company’s financial situation differs from our industry aggregate picture.



7.1 Please compare your financial parameters to the GRIM parameters tabulated below.

**Table 7-1 Financial Parameters for Instantaneous Gas-Fired Water Heaters Manufacturers**

GRIM Input	Definition	Industry Estimated Value	Your Actual (if significantly different from our estimate)
Income Tax Rate	Corporate effective income tax paid (percentage of earnings before taxes, EBT)	27.5%	
Discount Rate	Weighted average cost of capital (inflation-adjusted weighted average of corporate cost of debt and return on equity)	8.5%	
Working Capital	Current assets less current liabilities (percentage of revenues)	11.4%	
SG&A	Selling, general, and administrative expenses (percentage of revenues)	20.9%	
R&D	Research and development expenses (percentage of revenues)	1.5%	
Depreciation	Amortization of fixed assets (percentage of revenues)	2.2%	
Capital Expenditures	Outlay of cash to acquire or improve capital assets (percentage of revenues, not including acquisition or sale of business units)	2.2%	
Cost of Goods Sold	Includes material, labor, overhead, and depreciation (percentage of revenues)	71.3%	

7.2 How would you expect an amended energy conservation standard to impact any of the financial parameters for the industry?

## 8 CONVERSION COSTS

Amended energy conservation standards may cause your company to incur capital and product conversion costs to redesign existing products and make changes to existing production lines to be compliant with the amended energy conservation standard. Capital conversion costs are one-time investments in plant, property, and equipment (PPE) necessitated by an amended energy conservation standard. These may be incremental changes to existing PPE or the replacement of existing PPE. Replacing existing PPE could strand existing assets before the end of their useful lives. In addition to capital conversion costs, product conversion costs are costs related to research, product development, testing, marketing and other costs for redesigning products necessitated by an amended energy conservation standard.

8.1 What level of conversion costs do you anticipate incurring under the different efficiency levels DOE is considering? Refer to the tables below to provide your company's estimates. Please provide additional qualitative information to help DOE understand the types and nature of your investments.

**Table 8-1 Instantaneous Gas-Fired Water Heaters Conversion Costs**

Efficiency Level (Energy Factor)	Instantaneous Gas-Fired Water Heaters		
	Capital Conversion Costs (2009\$)	Product Conversion Costs (2009\$)	Stranded Assets (2009\$)
Baseline Level (EF = 0.62)			
EL 1 (EF = 0.69)			
EL 2 (EF = 0.78)			
EL 3 (EF = 0.80)			
EL 4 (EF = 0.82)			
EL 5 (EF = 0.84)			
EL 6 (EF = 0.85)			
EL 7 (EF = 0.92)			
EL 8 (EF = 0.95)			

## 9 CUMULATIVE REGULATORY BURDEN

Cumulative regulatory burden refers to the burden that industry faces from overlapping effects of new or revised DOE standards, voluntary standards, and/or other regulatory actions affecting the same product or industry.

9.1 Are there other recent or impending regulations that instantaneous gas-fired water heater manufacturers face (from DOE or otherwise)? If so, could you identify the regulation and the corresponding possible effective dates for those regulations? Below is a list of regulations and estimated effective dates that could possibly affect manufacturers of instantaneous gas-fired water heater. Please provide any comments on the listed regulations in addition to other

regulations.

**Table 9-1 Other Regulations Identified by DOE**

Regulation	Estimated or Actual Effective Date(s)	Comments
DOE's Amended Energy Conservation Standards for Other Products		
International Energy-Efficiency Standards		
State Emission Requirements and Other State Regulations		
South Coast Air Quality Management District (SCAQMD) Ultra-Low NOx Requirements		
Uniform Plumbing, Building, and Safety Codes		

9.2 What level of expense are you expecting to incur as a result of these regulations?

9.3 Under what circumstances would you be able to coordinate any expenditures related to these other regulations with an amended energy conservation standard, thereby lessening the cumulative burden?

## **10 DIRECT EMPLOYMENT IMPACT ASSESSMENT**

The impact of amended energy conservation standards on employment is an important consideration in the rulemaking process. This section of the interview guide seeks to explore current trends in instantaneous gas-fired water heater production employment and solicit manufacturer views on how domestic employment patterns might be affected by amended energy conservation standards.

10.1 Would your domestic employment levels be expected to change significantly under amended energy conservation standards? If so, please explain how they would change if higher efficiency levels are required.

10.2 Would the workforce skills necessary under amended energy conservation standards require extensive retraining or replacement of employees at your manufacturing facilities?

10.3 Would amended energy conservation standards require extensive retraining of your service/field technicians? If so, could you expand on how your service infrastructure would be impacted in general as a result of amended energy conservation standards?

## **11 EXPORTS / FOREIGN COMPETITION / OUTSOURCING**

Disparity between domestic and foreign energy conservation standards could impact exports or imports. Labor content and material changes, resulting from amended energy conservation standards, may impact sourcing decisions.

11.1 What percentage of your company's instantaneous gas-fired water heater sales is domestic? Absent amended energy conservation standards, are production facilities being relocated to foreign countries? Would amended energy conservation standards impact your domestic vs. foreign manufacturing decision?

11.2 If applicable, to what foreign countries or regions do you export your products? What percentage of sales can be attributed to each?

11.3 Would an amended energy conservation standard be expected to affect your export sales? What would the resulting impact be, if any, on your manufacturing operations and profitability?

11.4 Are your foreign exports affected by amended energy conservation standards in other countries?

11.5 What percentage of the U.S. market for instantaneous gas-fired water heater has been captured by foreign competition? Would amended energy conservation standards have an impact on foreign competition?

11.6 What is your outlook for the future operation of your company and the instantaneous gas-fired water heater industry with regard to exports?

## **12 CONSOLIDATION**

Amended energy conservation standards can alter the competitive dynamics of the market. This can include prompting companies to enter or exit the market, or to merge. DOE and the Department of Justice are both interested in any potential reduction in competition that would result from an amended energy conservation standard.

12.1 Please comment on industry consolidation and related trends over the last 5 years.

12.2 In the absence of amended energy conservation standards, do you expect any further industry consolidation? Please describe your expectations.

12.3 How would amended energy conservation standards affect your ability to compete?

## **13 IMPACTS ON SMALL BUSINESS**

13.1 The Small Business Association (SBA) denotes a small business in the instantaneous gas-fired water heater industry as having less than 500 employees<sup>2</sup>. By this definition, is your company considered a small business?

13.2 Are there any reasons that a small business might be at a disadvantage relative to a larger business under amended energy conservation standards? Please consider such factors as technical expertise, access to capital, bulk purchasing power for materials/components, engineering resources, and any other relevant issues.

13.3 Are there any niche manufacturers, small businesses, and/or component manufacturers for which the adoption of amended energy conservation standards would have a severe impact? If so, would manufacturers of these products have different incremental impacts from

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<sup>2</sup> DOE uses the small business size standards published on August 22, 2008, as amended, by the Small Business Administration (SBA) to determine whether a company is a small business. To be categorized as a small business, a water heater manufacturer and its affiliates may employ a maximum of 500 employees. The 500 employee threshold includes all employees in a business's parent company and any other subsidiaries.

implemented amended energy conservation standards than from the rest of the industry?

## **12A.3 DIRECT HEATING EQUIPMENT MANUFACTURER IMPACT ANALYSIS GUIDE**

April 6, 2009

12A-46

As part of the rulemaking process for amended energy conservation standards for direct heating equipment, the Department of Energy (DOE) conducts the manufacturer impact analysis (MIA). In this analysis, DOE uses publicly available information and information provided by manufacturers during interviews to assess possible impacts on manufacturers due to amended energy conservation standards. DOE is currently considering 4 efficiency levels (ELs) for gas wall fan-type units and gas wall gravity-type units, 1 EL for gas floor-type units, and 5 ELs for gas room-type units. In responding to this questionnaire, please refer to the efficiency levels in the table below. DOE analyzed one representative input capacity range for each product class, including over 42,000 Btu/H for gas fan-type units, 27,000 – 46,000 Btu/H for gas wall gravity-type units, over 37,000 Btu/H for gas floor-type units, and 27,000 – 46,000 for gas room-type units.

#### **Efficiency Levels under Consideration for Direct Heating Equipment**

Product Class (Representative Input Capacity)	Efficiency Metric	Baseline Efficiency Level	EL 1	EL 2	EL 3	EL 4	EL 5
Gas Wall Fan-Type Units with Input Capacity Over 42,000 Btu/h	Annual Fuel Utilization Efficiency (AFUE)	74	75	76	77	80	
Gas Wall Gravity-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h	Annual Fuel Utilization Efficiency (AFUE)	64	66	68	71	72	
Gas Floor-Type Units with Input Capacity Over 37,000 Btu/h	Annual Fuel Utilization Efficiency (AFUE)	57	58				
Gas Room-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h	Annual Fuel Utilization Efficiency (AFUE)	64	65	66	67	68	83

## **14 KEY ISSUES**

- 1.7 In general, what are the key issues for your company regarding amended energy conservation standards for direct heating equipment and this rulemaking?
- 1.8 For the issues identified, how significant are they at each listed efficiency level?
- 1.9 How can we most effectively incorporate these issues in the MIA?



## **15 COMPANY OVERVIEW AND ORGANIZATIONAL CHARACTERISTICS**

DOE is interested in understanding manufacturer impacts at the plant or profit center level directly pertinent to direct heating equipment production. However, the context within which the plant operates and the details of plant production and costs are not readily available from the published literature. Therefore, DOE invites you to provide these details confidentially in your own words to the extent possible and practical. Understanding the organizational setting around the direct heating equipment industry profit center will help DOE understand the probable future of the manufacturing activity with and without amended energy conservation standards.

15.1 Do you have a parent company, and/or any subsidiaries relevant to the direct heating equipment industry?

15.2 Do you manufacture any products other than direct heating equipment? If so, what other products do you manufacture?

15.3 What percentage of your total manufacturing corresponds to gas wall fan-type units, gas wall gravity-type units, gas floor-type units, and gas room-type units?

15.4 Where are your production facilities located, and what type of product is manufactured at each location? Could you provide figures for your company's manufacturing at each location by product type (i.e., gas wall fan-type units, gas wall gravity-type units, gas floor-type units, and gas room-type units), input capacity, and efficiency?

15.5 At your manufacturing facilities, would potential direct heating equipment redesigns be difficult to implement? If so, would your company modify the existing facility or develop a new facility?

15.6 What are your employment levels at each of these facilities?

15.7 What are your product lines, niches, and relative strengths in the direct heating equipment market?

15.8 What is your company's approximate market share for gas wall fan-type units, gas wall gravity-type units, gas floor-type units, and gas room-type units?

15.9 Would you expect your market share to change once amended energy conservation standards become effective?

## **16 MANUFACTURER PRODUCTION COSTS AND SELLING PRICES**

DOE estimated the manufacturer production costs of four-types of direct heating equipment. DOE defines manufacturer production cost as all direct costs associated with manufacturing a product. It includes direct labor, direct materials, and overhead (which includes depreciation costs). The breakdown of manufacturer production cost has implications for the quantitative impacts on direct heating equipment manufacturers. The per unit production costs are necessary for DOE to estimate labor expenditures and other cash flow calculations.

Manufacturer selling price is the average cost manufacturers charge their first consumers, but does not include costs along distribution channels. The manufacturer selling price includes a per unit research and development cost; selling, general, and administrative expense; shipping cost; and profit. The manufacturer markup is a multiplier applied to manufacturer production cost to cover the per unit research and development, selling, general, and administrative expense, shipping, and profit.

For its preliminary analysis, DOE estimated an industry-wide markup of 1.38 for direct heating equipment at baseline efficiency levels. DOE asks a series of questions about markups at higher efficiencies in section **4**. As shown in Equation 3-1 below, the manufacturer production cost multiplied by the manufacturer markup would cover all costs in the manufacturer selling price of baseline products.

### **Equation 16-1. Calculation of Manufacturer Selling Price**

$$\text{Manufacturer Production Cost} \times \text{Manufacturer Markup} = \text{Manufacturer Selling Price}$$

16.1 Is there a significant difference between the 1.38 baseline markup DOE calculated and your company's baseline markup?

16.2 Table 3-1 through Table 16-4 provide DOE's estimates of the manufacturer production costs and manufacturer selling prices for direct heating equipment at the representative input capacity and each efficiency level being considered. Could you please provide any comments on the estimated values?

**Table 16-1 Estimated Manufacturer Production Costs and Manufacturer Selling Prices for Gas Wall Fan-Type Units with Input Capacity Over 42,000 Btu/h**

Efficiency Level (Annual Fuel Utilization Efficiency)	DOE's Manufacturer Production Cost Estimates* (2008\$)	DOE's Manufacturer Selling Price Estimates (2008\$)	Manufacturer Comments or Revised Estimates
Baseline Level (AFUE = 74)	\$358	\$494	
EL 1 (AFUE = 75)	\$374	\$516	
EL 2 (AFUE = 76)	\$388	\$535	
EL 3 (AFUE = 77)	\$408	\$563	
EL 4 (AFUE = 80)	\$466	\$643	

\* DOE's manufacturer production cost estimates were developed using a five-year average of raw material prices spanning 2004 to 2008.

**Table 16-2 Estimated Manufacturer Production Costs and Manufacturer Selling Prices for Gas Wall Gravity-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h**

Efficiency Level (Annual Fuel Utilization Efficiency)	DOE's Manufacturer Production Cost Estimates* (2008\$)	DOE's Manufacturer Selling Price Estimates (2008\$)	Manufacturer Comments or Revised Estimates
Baseline Level (AFUE = 64)	\$199	\$275	
EL 1 (AFUE = 66)	\$226	\$312	
EL 2 (AFUE = 68)	\$250	\$345	
EL 3 (AFUE = 71)	\$289	\$399	
EL 4 (AFUE = 72)	\$299	\$413	

\* DOE's manufacturer production cost estimates were developed using a five-year average of raw material prices spanning 2004 to 2008.

**Table 16-3 Estimated Manufacturer Production Costs and Manufacturer Selling Prices for Gas Floor-Type Units with Input Capacity Over 37,000 Btu/h**

Efficiency Level (Annual Fuel Utilization Efficiency)	DOE's Manufacturer Production Cost Estimates* (2008\$)	DOE's Manufacturer Selling Price Estimates (2008\$)	Manufacturer Comments or Revised Estimates
Baseline Level (AFUE = 57)	\$353	\$487	
EL 1 (AFUE = 58)	\$377	\$520	

\* DOE's manufacturer production cost estimates were developed using a five-year average of raw material prices spanning 2004 to 2008.

**Table 16-4 Estimated Manufacturer Production Costs and Manufacturer Selling Prices for Gas Room-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h**

Efficiency Level (Annual Fuel Utilization Efficiency)	DOE's Manufacturer Production Cost Estimates* (2008\$)	DOE's Manufacturer Selling Price Estimates (2008\$)	Manufacturer Comments or Revised Estimates
Baseline Level (AFUE = 64)	\$226	\$312	
EL 1 (AFUE = 65)	\$241	\$333	
EL 2 (AFUE = 66)	\$257	\$355	
EL 3 (AFUE = 67)	\$269	\$371	
EL 4 (AFUE = 68)	\$279	\$358	
EL 5 (AFUE = 83)	\$382	\$527	

\* DOE's manufacturer production cost estimates were developed using a five-year average of raw material prices spanning 2004 to 2008.

16.3 Please compare your manufacturer production cost percentages<sup>4</sup> to the estimates tabulated below. The manufacturer production cost breakdown is used to calculate the total cost of goods sold (COGS) for the industry. Having an accurate estimate of the production costs for the industry allows DOE to better examine impacts on profitability and employment due to amended energy conservation standards. Are the different percentages of each cost representative of your company or the direct heating equipment industry? Please explain any differences.

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<sup>4</sup> The manufacture production cost percentages shown in Table 16-5 through Table 16-8 are the values that make up COGS. These are percentages of total COGS.

**Table 16-5 Breakdown of Manufacturer Production Costs for Baseline Gas Wall Fan-Type Units with Input Capacity Over 42,000 Btu/h**

Components of Manufacturer Production Cost	DOE's Estimated Percentage of Manufacturer Production Cost	Manufacturer Feedback
Materials	48.8%	
Labor	24.1%	
Overhead	11.4%	
Depreciation	15.6%	

**Table 16-6 Breakdown of Manufacturer Production Costs for Baseline Gas Wall Gravity-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h**

Components of Manufacturer Production Cost	DOE's Estimated Percentage of Manufacturer Production Cost	Manufacturer Feedback
Materials	52.1%	
Labor	17.3%	
Overhead	12.0%	
Depreciation	18.5%	

**Table 16-7 Breakdown of Manufacturer Production Costs for Baseline Gas Floor-Type Units with Input Capacity Over 37,000 Btu/h**

Components of Manufacturer Production Cost	DOE's Estimated Percentage of Manufacturer Production Cost	Manufacturer Feedback
Materials	48.1%	
Labor	28.9%	
Overhead	9.9%	
Depreciation	13.0%	

**Table 16-8 Breakdown of Manufacturer Production Costs for Baseline Gas Room-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h**

Components of Manufacturer Production Cost	DOE's Estimated Percentage of Manufacturer Production Cost	Manufacturer Feedback
Materials	48.7%	
Labor	19.3%	
Overhead	13.1%	
Depreciation	18.8%	

## 17 MARKUPS AND PROFITABILITY

One of the primary objectives of the MIA is to assess the impact of amended energy conservation standards on industry profitability. In this section, DOE would like to understand the current markup structure of the industry and how setting an amended energy conservation standard would impact your company's markup structure and profitability. As discussed in Section 3, the manufacturer markup is a multiplier applied to manufacturer production cost to cover per unit research and development, selling, general, and administrative expenses, shipping costs, and profit.

17.1 Do profit levels currently vary by product class? Do profit levels vary by efficiency level? Please explain why or why not.

17.2 Within each product class, do profit levels vary by input capacity?

17.3 DOE would like to understand how the baseline manufacturer markup changes at higher efficiency levels. Could you provide your company's markup for any products that meet the efficiency levels shown below?

**Table 17-1 Manufacturer Markups for Gas Wall Fan-Type Units with Input Capacity Over 42,000 Btu/h**

Gas Wall Fan-Type Units with Input Capacity Over 42,000 Btu/h	
Efficiency Level (Annual Fuel Utilization Efficiency)	Estimated Manufacturer Markup
Baseline (AFUE = 74)	
EL 1 (AFUE = 75)	
EL 2 (AFUE = 76)	
EL 3 (AFUE = 77)	
EL 4 (AFUE = 80)	

**Table 17-2 Manufacturer Markups for Gas Wall Gravity-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h**

	Gas Wall Gravity-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h
Efficiency Level (Annual Fuel Utilization Efficiency)	Estimated Manufacturer Markup
Baseline (AFUE = 64)	
EL 1 (AFUE = 66)	
EL 2 (AFUE = 68)	
EL 3 (AFUE = 71)	
EL 4 (AFUE = 72)	

**Table 17-3 Manufacturer Markups for Gas Floor-Type Units with Input Capacity Over 37,000 Btu/h**

	Gas Floor-Type Units with Input Capacity Over 37,000 Btu/h)
Efficiency Level (Annual Fuel Utilization Efficiency)	Estimated Manufacturer Markup
Baseline (AFUE = 57)	
EL 1 (AFUE = 58)	

**Table 17-4 Manufacturer Markups for Gas Room-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h**

	Gas Room-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h
Efficiency Level (Annual Fuel Utilization Efficiency)	Estimated Manufacturer Markup
Baseline (AFUE = 64)	
EL 1 (AFUE = 65)	
EL 2 (AFUE = 66)	
EL 3 (AFUE = 67)	
EL 4 (AFUE = 68)	
EL 5 (AFUE = 83)	

17.4 Would you expect changes in your estimated profitability following an amended energy conservation standard? If so, please explain why.

## 18 SHIPMENT PROJECTIONS AND MARKET SHARES

An amended energy conservation standard can change overall shipments by altering product attributes, marketing approaches, product availability, and price. The industry revenue calculations are based on the shipment projections developed by DOE's shipments model. The shipments model includes forecasts for the base case shipments (i.e., total industry shipments

absent amended energy conservation standards) and the standards case shipments (i.e., total industry shipments with amended energy conservation standards).

18.1 Please compare DOE's projections of annual industry-wide shipments for direct heating equipment with your company's projections of industry-wide shipments.

**Table 18-1 Annual Industry-Wide Shipment Projections for Gas Wall Fan-Type Units with Input Capacity Over 42,000 Btu/h Absent Amended Energy Conservation Standards**

	2007 Total Industry- Wide Shipments	2008 Total Industry- Wide Shipments	Projected Total Industry-Wide Shipments in 2013*	Projected Total Industry-Wide Shipments in 2023	Projected Total Industry-Wide Shipments in 2033
DOE's Estimate for Total Industry Shipments (Millions)**	0.037	0.040	0.050	0.071	0.092
Manufacturer Feedback					

\* 2013 is estimated effective date of amended energy conservation standards for direct heating equipment.

\*\* For gas wall fan-type units, 2007 and 2008 values are based on data provided by AHRI (March and May 2008)

**Table 18-2 Annual Industry-Wide Shipment Projections for Gas Wall Gravity-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h Absent Amended Energy Conservation Standards**

	2007 Total Industry-Wide Shipments	2008 Total Industry-Wide Shipments	Projected Total Industry-Wide Shipments in 2013*	Projected Total Industry-Wide Shipments in 2023	Projected Total Industry-Wide Shipments in 2033
DOE's Estimate for Total Industry Shipments (Millions)**	0.108	0.106	0.096	0.074	0.053
Manufacturer Feedback					

\* 2013 is estimated effective date of amended energy conservation standards for direct heating equipment.

\*\* For gas gravity fan-type units, 2007 and 2008 values are based on data provided by AHRI (March and May 2008).



**Table 18-3 Annual Industry-Wide Shipment Projections for Gas Floor-Type Units with Input Capacity Over 37,000 Btu/h Absent Amended Energy Conservation Standards**

	2007 Total Industry-Wide Shipments	2008 Total Industry-Wide Shipments	Projected Total Industry-Wide Shipments in 2013*	Projected Total Industry-Wide Shipments in 2023	Projected Total Industry-Wide Shipments in 2033
DOE's Estimate for Total Industry Shipments (Millions)**	0.003	0.003	0.002	0.001	0.000
Manufacturer Feedback					

\* 2013 is estimated effective date of amended energy conservation standards for direct heating equipment.

\*\* For gas floor-type units 2007 Data provided by AHRI (March 3, 2008). 2008 values are based on DOE projections.

**Table 18-4 Annual Industry-Wide Shipment Projections for Gas Room-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h Absent Amended Energy Conservation Standards**

	2007 Total Industry-Wide Shipments	2008 Total Industry-Wide Shipments	Projected Total Industry-Wide Shipments in 2013*	Projected Total Industry-Wide Shipments in 2023	Projected Total Industry-Wide Shipments in 2033
DOE's Estimate for Total Industry Shipments (Millions)**	0.021	0.021	0.021	0.021	0.021
Manufacturer Feedback					

\* 2013 is estimated effective date of amended energy conservation standards for direct heating equipment.

\*\* For gas room-type units 2007 and 2008 values are based on data provided by AHRI (March and May 2008)

18.2 Are the 2007 and 2008 industry wide-shipments shown in Table 5-1 through Table 18-4 consistent with historic trends? Do you expect total shipment levels to return to their previous levels (i.e., those levels prior to 2007)?

18.3 DOE's shipments analysis estimates industry-wide shipments in 2015 would remain at their current levels irrespective of higher standard levels (i.e., industry-wide shipments remain constant regardless of the standard level set by DOE). Could you provide any qualitative information on expected changes in total industry shipments shown in Table 5-1 through Table 18-4?

## 19 PRODUCT MIX

Product mix describes the distribution of current shipments by efficiency level. Changes in the product mix due to amended energy conservation standards can have a large impact on industry revenues. Having an accurate estimate of the current product mix allows DOE to better estimate how revenues might change due to amended energy conservation standards.

19.1 Does your company offer multiple product lines at different efficiency levels? Could you provide a description of your company's product lines and their respective efficiency levels?

19.2 Table 6-1 through Table 19-4 show DOE's estimate for the current mix of shipments by efficiency today and in 2013, the anticipated effective date of amended energy conservation standards. Could you provide feedback on DOE's estimates based on your knowledge of the industry?

**Table 19-1 Percentage of Industry-Wide Shipments by Efficiency Level for Gas Wall Fan-Type Units with Input Capacity Over 42,000 Btu/h Today and in 2013**

Percentage of Total Shipments at Each Efficiency	Baseline (AFUE = 74)	EL 1 (AFUE = 75)	EL 2 (AFUE = 76)	EL 3 (AFUE = 77)	EL 4 (AFUE = 80)
DOE's Estimate (2008)	48%	12%	19%	19%	2%
Manufacturer Feedback					
DOE's Estimate (2013)	48%	12%	19%	19%	2%
Manufacturer Feedback					

**Table 19-2 Percentage of Industry-Wide Shipments by Efficiency Level for Gas Wall Gravity-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h Today and in 2013**

Percentage of Total Shipments at Each Efficiency	Baseline (AFUE = 64)	EL 1 (AFUE = 66)	EL 2 (AFUE = 68)	EL 3 (AFUE = 71)	EL 4 (AFUE = 72)
DOE's Estimate (2008)	45%	20%	35%	0%	0%
Manufacturer Feedback					
DOE's Estimate (2013)	45%	20%	35%	0%	0%
Manufacturer Feedback					

**Table 19-3 Percentage of Industry-Wide Shipments by Efficiency Level for Gas Floor-Type Units with Input Capacity Over 37,000 Btu/h Today and in 2013**

Percentage of Total Shipments at each Efficiency	Baseline (AFUE = 57)	EL 1 (AFUE = 58)
DOE's Estimate (2008)	22%	78%
Manufacturer Feedback		
DOE's Estimate (2013)	22%	78%
Manufacturer Feedback		

**Table 19-4 Percentage of Industry-Wide Shipments by Efficiency Level for Gas Room-Type Units with Input Capacity Between 27,000 Btu/h and 46,000 Btu/h Absent Amended Energy Conservation Standards Today and in 2013**

Percentage of Total Shipments at Each Efficiency	Baseline (AFUE = 64)	EL 1 (AFUE = 65)	EL 2 (AFUE = 66)	EL 3 (AFUE = 67)	EL 4 (AFUE = 68)	EL 5 (AFUE = 83)
DOE's Estimate (2008)	20%	40%	40%	0%	0%	0%
Manufacturer Feedback						
DOE's Estimate (2013)	20%	40%	40%	0%	0%	0%
Manufacturer Feedback						

19.3 Are the projected distributions of efficiencies representative of direct heating equipment shipments by product class? Do you expect the product mix to change over time? If so, please explain why.

19.4 An amended energy conservation standard affects the product mix by eliminating the sale of products below the minimum efficiency level. DOE assumes that all products that fall below the standard would roll-up to the efficiency level set by an amended energy conservation standard. DOE assumes the distribution of efficiencies above the efficiency level set by the energy conservation standard will not change. In other words, those customers already purchasing more-efficient products will continue to do so irrespective of amended energy conservation standards. How do you think amended energy conservation standards will impact the sales of more efficient products? For example, would customers continue to buy products that exceed the energy conservation standard level? Would your response change at higher efficiency levels?

## **20 FINANCIAL PARAMETERS**

Navigant Consulting, Inc. (NCI) has developed a “strawman” model of the direct heating equipment industry financial performance called the Government Regulatory Impact Model (GRIM) using publicly available data. This section attempts to understand how your company’s financial situation differs from our industry aggregate picture.

20.1 Please compare your financial parameters to the GRIM parameters tabulated below.

**Table 20-1 Financial Parameters for Direct Heating Equipment Manufacturers**

GRIM Input	Definition	Industry Estimated Value	Your Actual (If Significantly Different from DOE's Estimate)
Income Tax Rate	Corporate effective income tax paid (percentage of earnings before taxes, EBT)	27.5%	
Discount Rate	Weighted average cost of capital (inflation-adjusted weighted average of corporate cost of debt and return on equity)	8.5%	
Working Capital	Current assets less current liabilities (percentage of revenues)	11.4%	
SG&A	Selling, general, and administrative expenses (percentage of revenues)	20.9%	
R&D	Research and development expenses (percentage of revenues)	1.5%	
Depreciation	Amortization of fixed assets (percentage of revenues)	2.2%	
Capital Expenditures	Outlay of cash to acquire or improve capital assets (percentage of revenues, not including acquisition or sale of business units)	2.2%	
Cost of Goods Sold	Includes material, labor, overhead, and depreciation (percentage of revenues)	71.3%	

20.2 How would you expect an amended energy conservation standard to impact any of the financial parameters for the industry?

## 21 CONVERSION COSTS

Amended energy conservation standards may cause your company to incur capital and product conversion costs to redesign existing products and make changes to existing production lines to be compliant with the amended energy conservation standard. Capital conversion costs are one-time investments in plant, property, and equipment (PPE) necessitated by an amended energy conservation standard. These may be incremental changes to existing PPE or the replacement of existing PPE. Replacing existing PPE could strand existing assets before the end of their useful lives. In addition to capital conversion costs, product conversion costs are costs related research,

product development, testing, marketing and other costs for redesigning products necessitated by an amended energy conservation standard.

21.1 What level of conversion costs do you anticipate incurring under the different efficiency levels DOE is considering? Refer to the tables below to provide your company's estimates. Please provide additional qualitative information to help DOE understand the types and nature of your investments.

**Table 21-1 Gas Wall Fan-Type Units Conversion Costs**

Efficiency Level (Annual Fuel Utilization Efficiency)	Gas Wall Fan-Type Units		
	Capital Conversion Costs (2009\$)	Product Conversion Costs (2009\$)	Stranded Assets (2009\$)
Baseline (AFUE = 74)			
EL 1 (AFUE = 75)			
EL 2 (AFUE = 76)			
EL 3 (AFUE = 77)			
EL 4 (AFUE = 80)			

**Table 21-2 Gas Wall Gravity-Type Units Conversion Costs**

Efficiency Level (Annual Fuel Utilization Efficiency)	Gas Wall Gravity-Type Units		
	Capital Conversion Costs (2009\$)	Product Conversion Costs (2009\$)	Stranded Assets (2009\$)
Baseline (AFUE = 64)			
EL 1 (AFUE = 66)			
EL 2 (AFUE = 68)			
EL 3 (AFUE = 71)			
EL 4 (AFUE = 72)			

**Table 21-3 Gas Floor-Type Units Conversion Costs**

Efficiency Level (Annual Fuel Utilization Efficiency)	Gas Floor-Type Units		
	Capital Conversion Costs (2009\$)	Product Conversion Costs (2009\$)	Stranded Assets (2009\$)
Baseline (AFUE = 57)			
EL 1 (AFUE = 58)			

**Table 21-4 Gas Room-Type Units with Input Capacity Conversion Costs**

Efficiency Level (Annual Fuel Utilization Efficiency)	Gas Room-Type Units		
	Capital Conversion Costs (2009\$)	Product Conversion Costs (2009\$)	Stranded Assets (2009\$)
Baseline (AFUE = 64)			
EL 1 (AFUE = 65)			
EL 2 (AFUE = 66)			
EL 3 (AFUE = 67)			
EL 4 (AFUE = 68)			
EL 5 (AFUE = 83)			

## 22 CUMULATIVE REGULATORY BURDEN

Cumulative regulatory burden refers to the burden that industry faces from overlapping effects of new or revised DOE standards, voluntary standards, and/or other regulatory actions affecting the same product or industry.

22.1 Are there other recent or impending regulations that direct heating equipment manufacturers face (from DOE or otherwise)? If so, could you identify the regulation and the corresponding possible effective dates for those regulations? Below is a list of regulations that could possibly affect manufacturers of direct heating equipment. Please provide any comments on the listed regulations in addition to other regulations.

**Table 22-1 Other Regulations Identified by DOE**

Regulation	Possible Effective Date(s)	Comments
DOE's Amended Energy Conservation Standards for Other Products		
International Energy Efficiency Standards		
State Emission Requirements and Other State Regulations		
Uniform Plumbing, Building, and Safety Codes		

22.2 What level of expense are you expecting to incur as a result of these regulations?

22.3 Under what circumstances would you be able to coordinate any expenditures related to these other regulations with an amended energy conservation standard, thereby lessening the cumulative burden?

## **23 DIRECT EMPLOYMENT IMPACT ASSESSMENT**

The impact of amended energy conservation standards on employment is an important consideration in the rulemaking process. This section of the interview guide seeks to explore current trends in direct heating equipment production employment and solicit manufacturer views on how domestic employment patterns might be affected by amended energy conservation standards.

23.1 Would your domestic employment levels be expected to change significantly under amended energy conservation standards? If so, please explain how they would change if higher efficiency levels are required.

23.2 Would the workforce skills necessary under amended energy conservation standards require extensive retraining or replacement of employees at your manufacturing facilities?

23.3 Would amended energy conservation standards require extensive retraining of your service/field technicians? If so, could you expand on how your service infrastructure would be impacted in general as a result of amended energy conservation standards?



## **24 EXPORTS / FOREIGN COMPETITION / OUTSOURCING**

Disparity between domestic and foreign energy conservation standards could impact exports or imports. Labor content and material changes, resulting from amended energy conservation standards, may impact sourcing decisions.

24.1 What percentage of your company's direct heating equipment sales is domestic? Absent amended energy conservation standards, are production facilities being relocated to foreign countries? Would amended energy conservation standards impact your domestic vs. foreign manufacturing decision?

24.2 If applicable, to what foreign countries or regions do you export your products? What percentage of sales can be attributed to each?

24.3 Would an amended energy conservation standard be expected to affect your export sales? What would the resulting impact be, if any, on your manufacturing operations and profitability?

24.4 Are your foreign exports affected by amended energy conservation standards in other countries?

24.5 What percentage of the U.S. market for direct heating equipment is imported? Would amended energy conservation standards have an impact on foreign competition?

24.6 What is your outlook for direct heating equipment exports?

## **25 CONSOLIDATION**

Amended energy conservation standards can alter the competitive dynamics of the market. This can include prompting companies to enter or exit the market, or to merge. DOE and the Department of Justice are both interested in any potential reduction in competition that would result from an amended energy conservation standard.

25.1 Please comment on industry consolidation and related trends over the last 5 years.

25.2 In the absence of amended energy conservation standards, do you expect any further industry consolidation? Please describe your expectations.

25.3 How would amended energy conservation standards affect your ability to compete?

## **26 IMPACTS ON SMALL BUSINESS**

26.1 The Small Business Association (SBA) denotes a small business in the direct heating equipment industry as having less than 500 employees<sup>5</sup>. By this definition, is your company considered a small business?

26.2 Are there any reasons that a small business might be at a disadvantage relative to a larger business under amended energy conservation standards? Please consider such factors as technical expertise, access to capital, bulk purchasing power for materials/components, engineering resources, and any other relevant issues.

26.3 Are there any niche manufacturers, small businesses, and/or component manufacturers for which the adoption of amended energy conservation standards would have a severe impact? If so, would manufacturers of these products have different incremental impacts from implemented amended energy conservation standards than from the rest of the industry?

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<sup>5</sup> DOE uses the small business size standards published on August 22, 2008, as amended, by the Small Business Administration (SBA) to determine whether a company is a small business. To be categorized as a small business, a direct heating equipment manufacturer and its affiliates may employ a maximum of 500 employees. The 500 employee threshold includes all employees in a business's parent company and any other subsidiaries.

## **12A.4 RESIDENTIAL HEARTH PRODUCTS MANUFACTURER IMPACT ANALYSIS GUIDE**

April 6, 2009

12A-66

As part of the rulemaking process for amended energy conservation standards for residential hearth products, the Department of Energy (DOE) conducts the manufacturer impact analysis (MIA). In this analysis, DOE uses publicly available information and information provided by manufacturers during interviews to assess possible impacts on manufacturers due to amended energy conservation standards. DOE is currently considering 8 efficiency levels (EL) for hearth products. In responding to this questionnaire, please refer to the efficiency levels in the table below. DOE analyzed one representative rated input capacity range for residential hearth products and extrapolated the results to other rated input capacity ranges.

**Efficiency Levels under Consideration for Residential Hearth Products**

Product Class (Representative Input Capacity Range)	Efficiency Metric	Baseline Efficiency Level	EL 1	EL 2	EL 3	EL 4	EL 5	EL 6	EL 7	EL 8
Residential Hearth Products (Between 27,000 and 46,000 Btu/h)	Annual Fuel Utilization Efficiency (AFUE)	64%	65%	66%	67%	68%	70%	72%	77%	93%

## **1 KEY ISSUES**

1.10 In general, what are the key issues for your company regarding amended energy conservation standards for residential hearth products and this rulemaking?

1.11 For the issues identified, how significant are they at each listed efficiency level?

1.12 How can we most effectively incorporate these issues in the MIA?

## **2 COMPANY OVERVIEW AND ORGANIZATIONAL CHARACTERISTICS**

DOE is interested in understanding manufacturer impacts at the plant or profit center level directly pertinent to residential hearth products production. However, the context within which the plant operates and the details of plant production and costs are not readily available from the published literature. Therefore, DOE invites you to provide these details confidentially in your own words to the extent possible and practical. Understanding the organizational setting around the residential hearth products industry profit center will help DOE understand the probable future of the manufacturing activity with and without amended energy conservation standards.

2.1 Do you have a parent company, and/or any subsidiaries relevant to the residential products industry?

2.2 Do you manufacture any products other than residential hearth products? If so, what other products do you manufacture?

2.3 What percentage of your total manufacturing corresponds to residential hearth products?

2.4 Where are your production facilities located, and what type of product is manufactured at each location? Could you provide figures for your company's manufacturing at each location by product type (residential hearth products or other) and efficiency?

2.5 At your manufacturing facilities, would potential residential hearth product redesigns be difficult to implement? If so, would your company modify the existing facility or develop a new facility?

2.6 What are your employment levels at each of these facilities?

2.7 What are your product lines, niches, and relative strengths in the residential hearth products market?

2.8 What is your company's approximate market share in the residential hearth products industry?

2.9 Would you expect your market share to change once amended energy conservation standards become effective?

### **3 MANUFACTURER PRODUCTION COSTS AND SELLING PRICES**

DOE estimated the manufacturer production costs of residential hearth products. DOE defines manufacturer production cost as all direct costs associated with manufacturing a product. It includes direct labor, direct materials, and overhead (which includes depreciation costs). The breakdown of manufacturer production cost has implications for the quantitative impacts on residential hearth products manufacturers. The per unit production costs are necessary for DOE to estimate labor expenditures and other cash flow calculations.

Manufacturer selling price is the average cost manufacturers charge their first consumers, but does not include costs along distribution channels. The manufacturer selling price includes a per unit research and development cost; selling, general, and administrative expense; shipping cost; and profit. The manufacturer markup is a multiplier applied to manufacturer production cost to cover the per unit research and development; selling, general, and administrative expense; shipping; and profit.

DOE estimated an industry-wide markup of 1.38 for residential hearth products at baseline efficiency levels. DOE asks a series of questions about markups at higher efficiencies in section 4. As shown in Equation 3-1 below, the manufacturer production cost multiplied by the manufacturer markup would cover all costs in the manufacturer selling price of baseline products.

#### **Equation 3-1. Calculation of Manufacturer Selling Price**

**Manufacturer Production Cost × Manufacturer Markup = Manufacturer Selling Price**

3.1 Is there a significant difference between the 1.38 baseline markup DOE calculated and your company's baseline markup for residential hearth products?

3.2 Table 3-1 provides DOE's estimates of the manufacturer production costs and manufacturer selling prices for residential hearth products at the representative rated input capacity range and each efficiency level being considered. Could you please provide any comments on the estimated values?

**Table 3-1 Estimated Manufacturer Production Costs and Manufacturer Selling Prices for Residential Hearth Products (Representative Input Capacity Range: Between 27,000 and 46,000 Btu/h)**

Efficiency Level (AFUE)	DOE's Manufacturer Production Cost Estimates* (2008\$)	DOE's Manufacturer Selling Price Estimates (2008\$)	Manufacturer Comments or Revised Estimates
Baseline Level (AFUE = 64)	TBD		
EL 1 (AFUE = 65)	TBD		
EL 2 (AFUE = 66)	TBD		
EL 3 (AFUE = 67)	TBD		
EL 4 (AFUE = 68)	TBD		
EL 5 (AFUE = 70)	TBD		
EL 6 (AFUE = 72)	TBD		
EL 7 (AFUE = 77)	TBD		
EL 8 (AFUE = 93)	TBD		

\* DOE's manufacturer production cost estimates were developed using a five-year average of raw material prices spanning 2004 to 2008.

3.3 Please compare your manufacturer production cost percentages<sup>6</sup> to the estimates tabulated below. The manufacturer production cost breakdown is used to calculate the total cost of goods sold (COGS) for the industry. Having an accurate estimate of the production costs for the industry allows DOE to better examine impacts on profitability and employment due to amended energy conservation standards. Are the different percentages of each cost representative of your company or the residential hearth products industry? Please explain any differences.

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<sup>6</sup> The manufacturer production cost percentages shown in Table 3-2 are the values that make up COGS. These are percentages of total COGS.

**Table 3-2 Breakdown of Manufacturer Production Costs for Residential Hearth Products**

Components of Manufacturer Production Costs	DOE's Estimated Percentage of Manufacturer Production Cost	Manufacturer Feedback
Materials	TBD	
Labor	TBD	
Overhead	TBD	
Depreciation	TBD	

#### **4 MARKUPS AND PROFITABILITY**

One of the primary objectives of the MIA is to assess the impact of amended energy conservation standards on industry profitability. In this section, DOE would like to understand the current markup structure of the industry and how setting an amended energy conservation standard would impact your company's markup structure and profitability. As discussed in Section 3, the manufacturer markup is a multiplier applied to manufacturer production cost to cover per unit research and development, selling, general, and administrative expenses, shipping, and profit. The manufacturer production cost multiplied by the manufacturer markup would cover all costs involved in manufacturing the product.

4.1 Do profit levels currently vary by input capacity or other characteristic? Do profit levels vary by efficiency level? Please explain why or why not.

4.2 DOE would like to understand how the baseline manufacturer markup changes at higher efficiency levels. Could you provide your company's markup for any products that meet the efficiency levels shown below?



**Table 4-1 Residential Hearth Products (Representative Input Capacity Range: Between 27,000 and 46,000 Btu/h) Manufacturer Markups**

	Hearth Units (Between 27,000 and 46,000 Btu/h)
Efficiency Level (Energy Factor)	Estimated Manufacturer Markup
Baseline Level (AFUE = 64)	
EL 1 (AFUE = 65)	
EL 2 (AFUE = 66)	
EL 3 (AFUE = 67)	
EL 4 (AFUE = 68)	
EL 5 (AFUE = 70)	
EL 6 (AFUE = 72)	
EL 7 (AFUE = 77)	
EL 8 (AFUE = 93)	

4.3 Would you expect changes in your estimated profitability following an amended energy conservation standard? If so, please explain why.

## 5 SHIPMENT PROJECTIONS AND MARKET SHARES

An amended energy conservation standard can change overall shipments by altering product attributes, marketing approaches, product availability, and price. The industry revenue calculations are based on the shipment projections developed by DOE's shipments model. The shipments model includes forecasts for the base case shipments (i.e., total industry shipments absent amended energy conservation standards) and the standards case shipments (i.e., total industry shipments with amended energy conservation standards).

5.1 Please compare DOE's projections of annual industry-wide shipments for residential hearth products with your company's projections of industry-wide shipments.

**Table 5-1 Annual Industry-Wide Shipment Projections for Residential Hearth Products Absent Amended Energy Conservation Standards**

	2007 Total Industry- Wide Shipments	2008 Total Industry- Wide Shipments	Projected Total Industry-Wide Shipments in 2013*	Projected Total Industry-Wide Shipments in 2023	Projected Total Industry-Wide Shipments in 2033
DOE's Estimate for Total Industry Shipments (Millions)**	0.240	0.240	0.240	0.240	0.240
Manufacturer Feedback					

\* 2013 is estimated effective date of amended energy conservation standards for hearth products.

\*\* For hearth products, data was based on an average of shipments data provided by AHRI for 2001 to 2004 for fireplaces and other vented gas heaters.

5.2 Are the 2007 and 2008 industry wide-shipments shown in Table 5-1 consistent with historic trends? Do you expect total shipment levels to return to their previous levels (i.e., those levels prior to 2007)?

5.3 DOE's shipments analysis estimates industry-wide shipments in 2013 would continue to remain the same. Could you provide any qualitative information on expected changes in total industry shipments shown in Table 5-1?

## 6 PRODUCT MIX

Product mix describes the distribution of current shipments by efficiency level. Changes in the product mix due to amended energy conservation standards can have a large impact on industry revenues. Having an accurate estimate of the current product mix allows DOE to better estimate how revenues might change due to amended energy conservation standards.

6.1 Does your company offer multiple product lines at different efficiency levels? Could you provide a description of your company's product lines and their respective efficiency levels?

6.2 Table 6-1 shows DOE's estimate for the current mix of shipments by efficiency today and in 2013, the anticipated effective date of amended energy conservation standards. Could you provide feedback on DOE's estimates based on your knowledge of the industry?

**Table 6-1 Percentage of Industry-Wide Shipments by Efficiency Level for Residential Hearth Products Today and in 2013**

Percentage of Total Shipments at each Efficiency	Baseline Level (AFUE = 64)	EL 1 (AFUE = 65)	EL 2 (AFUE = 66)	EL 3 (AFUE = 67)	EL 4 (AFUE = 68)	EL 5 (AFUE = 70)	EL 6 (AFUE = 72)	EL 7 (AFUE = 77)	EL 8 (AFUE = 93)
DOE's Estimate (2008)	21%	19%	8%	19%	8%	8%	8%	8%	1%
Manufacturer Feedback									
DOE's Estimate (2013)	21%	19%	8%	19%	8%	8%	8%	8%	1%
Manufacturer Feedback									

6.3 Do you expect the product mix to change over time? If so, please explain why.

6.4 An amended energy conservation standard affects the product mix by eliminating the sale of products below the minimum efficiency level. DOE assumes that all products that fall below the standard would roll-up to the efficiency level set by an amended energy conservation standard. DOE assumes the distribution of efficiencies above the efficiency level set by the energy conservation standard will not change. In other words, those customers already purchasing more-efficient products will continue to do so irrespective of amended energy conservation standards. How do you think amended energy conservation standards will impact the sales of more efficient products? For example, would customers continue to buy products that exceed the energy conservation standard level? Would your response change at higher efficiency levels?

## 7 FINANCIAL PARAMETERS

Navigant Consulting, Inc. (NCI) has developed a “strawman” model of the residential hearth products industry financial performance called the Government Regulatory Impact Model (GRIM) using publicly available data. This section attempts to understand how your company’s financial situation differs from our industry aggregate picture.

7.1 Please compare your financial parameters to the GRIM parameters tabulated below.

**Table 7-1 Financial Parameters for Residential Hearth Products Manufacturers**

GRIM Input	Definition	Industry Estimated Value	Your Actual (If Significantly Different from DOE's Estimate)
Income Tax Rate	Corporate effective income tax paid (percentage of earnings before taxes, EBT)	27.5%	
Discount Rate	Weighted average cost of capital (inflation-adjusted weighted average of corporate cost of debt and return on equity)	8.5%	
Working Capital	Current assets less current liabilities (percentage of revenues)	11.4%	
SG&A	Selling, general, and administrative expenses (percentage of revenues)	20.9%	
R&D	Research and development expenses (percentage of revenues)	1.5%	
Depreciation	Amortization of fixed assets (percentage of revenues)	2.2%	
Capital Expenditures	Outlay of cash to acquire or improve capital assets (percentage of revenues, not including acquisition or sale of business units)	2.2%	
Cost of Goods Sold	Includes material, labor, overhead, and depreciation (percentage of revenues)	71.3%	

7.2 How would you expect an amended energy conservation standard to impact any of the financial parameters for the industry?

## 8 CONVERSION COSTS

Amended energy conservation standards may cause your company to incur capital and product conversion costs to redesign existing products and make changes to existing production lines to be compliant with the amended energy conservation standard. Capital conversion costs are one-time investments in plant, property, and equipment (PPE) necessitated by an amended energy conservation standard. These may be incremental changes to existing PPE or the replacement of existing PPE. Replacing existing PPE could strand existing assets before the end of their useful lives. In addition to capital conversion costs, product conversion costs are costs related research, product development, testing, marketing and other costs for redesigning products necessitated by an amended energy conservation standard.

8.1 What level of conversion costs do you anticipate incurring under the different efficiency levels DOE is considering? Refer to the tables below to provide your company's estimates. Please provide additional qualitative information to help DOE understand the types and nature of your investments.

**Table 8-1 Residential Hearth Products Conversion Costs**

Efficiency Level (AFUE)	Hearth Units		
	Capital Conversion Costs (2009\$)	Product Conversion Costs (2009\$)	Stranded Assets (2009\$)
Baseline (AFUE = 64)			
EL 1 (AFUE = 65)			
EL 2 (AFUE = 66)			
EL 3 (AFUE = 67)			
EL 4 (AFUE = 68)			
EL 5 (AFUE = 70)			
EL 6 (AFUE = 72)			
EL 7 (AFUE = 77)			
EL 8 (AFUE = 93)			

## 9 CUMULATIVE REGULATORY BURDEN

Cumulative regulatory burden refers to the burden that industry faces from overlapping effects of new or revised DOE standards, voluntary standards, and/or other regulatory actions affecting the same product or industry.

9.1 Are there other recent or impending regulations that hearth product manufacturers face (from DOE or otherwise)? If so, could you identify the regulation and the corresponding possible effective dates for those regulations? Below is a list of regulations that could possibly affect manufacturers of residential hearth products. Please provide any comments on the listed regulations in addition to other regulations.

**Table 9-1 Other Regulations Identified by DOE**

Regulation	Possible Effective Date(s)	Comments
DOE's Amended Energy Conservation Standards for Other Products		
International Energy-Efficiency Standards		
State Emission Requirements and Other State Regulations		
Uniform Plumbing, Building, and Safety Codes		

9.2 What level of expense are you expecting to incur as a result of these regulations?

9.3 Under what circumstances would you be able to coordinate any expenditures related to these other regulations with an amended energy conservation standard, thereby lessening the cumulative burden?

## **10 DIRECT EMPLOYMENT IMPACT ASSESSMENT**

The impact of amended energy conservation standards on employment is an important consideration in the rulemaking process. This section of the interview guide seeks to explore current trends in residential hearth products production employment and solicit manufacturer views on how domestic employment patterns might be affected by amended energy conservation standards.

10.1 Would your domestic employment levels be expected to change significantly under amended energy conservation standards? If so, please explain how they would change if higher efficiency levels are required.

10.2 Would the workforce skills necessary under amended energy conservation standards require extensive retraining or replacement of employees at your manufacturing facilities?

10.3 Would amended energy conservation standards require extensive retraining of your service/field technicians? If so, could you expand on how your service infrastructure would be impacted in general as a result of amended energy conservation standards?

## **11 EXPORTS / FOREIGN COMPETITION / OUTSOURCING**

Disparity between domestic and foreign energy conservation standards could impact exports or imports. Labor content and material changes, resulting from amended energy conservation standards, may impact sourcing decisions.

11.1 What percentage of your company's residential hearth product sales is domestic? Absent amended energy conservation standards, are production facilities being relocated to foreign countries? Would amended energy conservation standards impact your domestic vs. foreign manufacturing decision?

11.2 If applicable, to what foreign countries or regions do you export your products? What percentage of sales can be attributed to each?

11.3 Would an amended energy conservation standard be expected to affect your export sales? What would the resulting impact be, if any, on your manufacturing operations and profitability?

11.4 Are your foreign exports affected by amended energy conservation standards in other countries?

11.5 What percentage of the U.S. market for residential hearth products is imported? Would amended energy conservation standards have an impact on foreign competition?

11.6 What is your outlook for residential hearth products exports?

## **12 CONSOLIDATION**

Amended energy conservation standards can alter the competitive dynamics of the market. This can include prompting companies to enter or exit the market, or to merge. DOE and the Department of Justice are both interested in any potential reduction in competition that would

result from an amended energy conservation standard.

12.1 Please comment on industry consolidation and related trends over the last 5 years.

12.2 In the absence of amended energy conservation standards, do you expect any further industry consolidation? Please describe your expectations.

12.3 How would amended energy conservation standards affect your ability to compete?

### **13 IMPACTS ON SMALL BUSINESS**

13.1 The Small Business Association (SBA) denotes a small business in the residential hearth products industry as having less than 500 employees<sup>7</sup>. By this definition, is your company considered a small business?

13.2 Are there any reasons that a small business might be at a disadvantage relative to a larger business under amended energy conservation standards? Please consider such factors as technical expertise, access to capital, bulk purchasing power for materials/components, engineering resources, and any other relevant issues.

13.3 Are there any niche manufacturers, small businesses, and/or component manufacturers for which the adoption of amended energy conservation standards would have a severe impact? If so, would manufacturers of these products have different incremental impacts from implemented amended energy conservation standards than from the rest of the industry?

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<sup>7</sup> DOE uses the small business size standards published on August 22, 2008, as amended, by the Small Business Administration (SBA) to determine whether a company is a small business. To be categorized as a small business, a hearth products manufacturer and its affiliates may employ a maximum of 500 employees. The 500 employee threshold includes all employees in a business's parent company and any other subsidiaries.



## **12A.5 GAS-FIRED POOL HEATERS MANUFACTURER IMPACT ANALYSIS INTERVIEW GUIDE**

April 6, 2009

12A-80

As part of the rulemaking process for amended energy conservation standards for gas-fired residential pool heaters, the Department of Energy (DOE) conducts the manufacturer impact analysis (MIA). In this analysis, DOE uses publicly available information and information provided by manufacturers during interviews to assess possible impacts on manufacturers due to amended energy conservation standards. DOE is currently considering 8 efficiency levels (EL) for gas-fired residential pool heaters. In responding to this questionnaire, please refer to the efficiency levels in the table below. DOE analyzed one representative input capacity of 250,000 British thermal units per hour (Btu/h) for gas-fired residential pool heaters.

### **Efficiency Levels Under Consideration for Gas-fired Residential Pool Heaters**

Product Class (Representative Input Capacity)	Efficiency Metric	Baseline Efficiency Level	EL1**	EL2**	EL3**	EL4*	EL5*	EL6*	EL7*	EL8*
Gas-Fired Residential Pool Heaters (250,000 Btu/h)	Thermal Efficiency (%)	78%	79%	81%	82%	83%	84%	86%	90%	95%

\* Models having electronic ignition only.

\*\* Models having standing pilot or electronic ignition.

## **1 KEY ISSUES**

1.13 In general, what are the key issues for your company regarding amended energy conservation standards for gas-fired residential pool heaters and this rulemaking?

1.14 For the issues identified, how significant are they at each listed efficiency level?

1.15 How can we most effectively incorporate these issues in the MIA?

## **2 COMPANY OVERVIEW AND ORGANIZATIONAL CHARACTERISTICS**

DOE is interested in understanding manufacturer impacts at the plant or profit center level directly pertinent to gas-fired residential pool heaters production. However, the context within which the plant operates and the details of plant production and costs are not readily available from the published literature. Therefore, DOE invites you to provide these details confidentially in your own words to the extent possible and practical. Understanding the organizational setting around the residential pool heater industry profit center will help DOE understand the probable future of the manufacturing activity with and without amended energy conservation standards.

2.1 Do you have a parent company, and/or any subsidiaries relevant to the residential pool heater industry?

2.2 Do you manufacture any products other than residential pool heaters? If so, what other products do you manufacture?

2.3 What percentage of your total manufacturing corresponds to gas-fired residential pool heaters?

2.4 Where are your production facilities located, and what type of product is manufactured at each location? Could you provide figures for your company's manufacturing at each location by efficiency level?

2.5 At your manufacturing facilities, would potential residential pool heater redesigns be difficult to implement? If so, would your company modify the existing facility or develop a new facility?

2.6 What are your employment levels at each of these facilities?

2.7 What are your product lines, niches, and relative strengths in the residential pool heater market?

2.8 What is your company's approximate market share in the gas-fired residential pool heater industry?

2.9 Would you expect your market share to change once amended energy conservation standards become effective?

### 3 MANUFACTURER PRODUCTION COSTS AND SELLING PRICES

DOE estimated the manufacturer production costs of gas-fired residential pool heaters at one input capacity. DOE defines manufacturer production cost as all direct costs associated with manufacturing a product. It includes direct labor, direct materials, and overhead (which includes depreciation costs). The breakdown of manufacturer production cost has implications for the quantitative impacts on gas-fired residential pool heater manufacturers. The per unit production costs are necessary for DOE to estimate labor expenditures and other cash flow calculations.

Manufacturer selling price is the average cost manufacturers charge their first consumers, but does not include costs along distribution channels. The manufacturer selling price includes a per unit research and development cost; selling, general, and administrative expense; shipping cost; and profit. For residential pool heater MIA, the manufacturer markup is a multiplier applied to manufacturer production cost to cover the per unit research and development, selling, general, and administrative expense, shipping costs, and profit.

DOE estimated an industry-wide markup of 1.38 for residential pool heaters at baseline efficiency levels. DOE asks a series of questions about the manufacturer markups associated with premium products at higher efficiencies in Section 4. As shown in Equation 3-1 below, the manufacturer production cost multiplied by the manufacturer markup would cover all costs in the manufacturer selling price of baseline products.

#### Equation 3-1. Calculation of Manufacturer Selling Price

$$\text{Manufacturer Production Cost} \times \text{Manufacturer Markup} = \text{Manufacturer Selling Price}$$

3.1 Is there a significant difference between the baseline markup DOE calculated and your company's baseline markup for gas-fired residential pool heaters?

3.2 Table 3-1 provides DOE's estimates of the manufacturer production costs and manufacturer selling prices for gas-fired residential pool heaters at the representative input capacity and each efficiency level being considered. Could you please provide any comments on the estimated values?

**Table 3-1 Estimated Manufacturer Production Costs and Manufacturer Selling Prices for Gas fired Residential Pool Heaters Utilizing Electronic Ignition (250,000 Btu/h Input Capacity)**

Efficiency Level (Thermal Efficiency (%))	DOE's Manufacturer Production Cost Estimates* (2008\$)	DOE's Manufacturer Selling Price Estimates (2008\$)	Manufacturer Comments or Revised Estimates
Baseline Level (78%)	\$520	\$718	
EL 1 (79%)	\$530	\$731	
EL 2 (81%)	\$544	\$751	
EL 3 (82%)	\$575	\$794	
EL 4 (83%)	\$646	\$891	
EL 5 (84%)	\$662	\$914	
EL 6 (86%)	\$862	\$1,190	
EL 7 (90%)	\$906	\$1,250	
EL 8 (95%)	\$965	\$1,332	

\* DOE's manufacturer production cost estimates were developed using a five-year average of raw material prices spanning 2004 to 2008.

3.3 Please compare your manufacturer production cost percentages<sup>8</sup> to the estimates tabulated below. The manufacturer production cost breakdown is used to calculate the total cost of goods sold (COGS) for the industry. Having an accurate estimate of the production costs for the industry allows DOE to better examine impacts on profitability and employment due to amended energy conservation standards. Are the different percentages of each cost representative of your company or the residential pool heater industry? Please explain any differences.

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<sup>8</sup> The manufacturer production cost percentages shown in Table 3-2 are the values that make up COGS. These are percentages of total COGS.

**Table 3-2 Breakdown of Manufacturer Production Costs for Baseline Gas-fired Residential Pool Heaters (250,000 Btu/h Input Capacity)**

Components of Manufacturer Production Costs	DOE's Estimated Percentage of Manufacturer Production Cost	Manufacturer Feedback
Materials	60.6%	
Labor	16.7%	
Overhead	11.7%	
Depreciation	11.0%	

#### **4 MARKUPS AND PROFITABILITY**

One of the primary objectives of the MIA is to assess the impact of amended energy conservation standards on industry profitability. In this section, DOE would like to understand the current markup structure of the industry and how setting an amended energy conservation standard would impact your company's markup structure and profitability. As discussed in Section 3, the manufacturer markup is a multiplier applied to manufacturer production cost to cover per unit research and development, selling, general, and administrative expenses, shipping costs, and profit. The manufacturer production cost multiplied by the manufacturer markup would cover all costs involved in manufacturing the product.

4.1 Do profit levels currently vary by efficiency level? Please explain why or why not.

4.2 Do profit levels vary by input capacities, and ignition type?

4.3 DOE would like to understand how the baseline manufacturer markup changes at higher efficiency levels. Could you provide your company's markup for any products that meet the efficiency levels shown below?

**Table 4-1 Gas-fired Residential Pool Heaters (250,000 Btu/h Input Capacity)  
Manufacturer Markup Changes Due to Amended Energy Conservation Standards**

	Gas-fired Residential Pool Heaters (250,000 Btu/h Input Capacity)
Efficiency Level (Thermal Efficiency)	Estimated Manufacturer Markup
Baseline (78%)	
EL 1 (79%)	
EL 2 (81%)	
EL 3 (82%)	
EL 4 (83%)	
EL 5 (84%)	
EL 6 (86%)	
EL 7 (90%)	
EL 8 (95%)	

4.4 Would you expect changes in your estimated profitability following an amended energy conservation standard? If so, please explain why.

## **5 SHIPMENT PROJECTIONS AND MARKET SHARES**

An amended energy conservation standard can change overall shipments by altering product attributes, marketing approaches, product availability, and price. The industry revenue calculations are based on the shipment projections developed by DOE's shipments model. The shipments model includes forecasts for the base case shipments (i.e., total industry shipments absent amended energy conservation standards) and the standards case shipments (i.e., total industry shipments with amended energy conservation standards).

5.1 Please compare DOE's projections of annual industry-wide shipments for gas-fired residential pool heaters with your company's projections of industry-wide shipments.

**Table 5-1 Annual Industry-Wide Shipment Projections for Gas-fired Residential Pool Heaters absent Amended Energy Conservation Standards**

	2007 Total Industry- Wide Shipments	2008 Total Industry- Wide Shipments	Projected Total Industry-Wide Shipments in 2013*	Projected Total Industry-Wide Shipments in 2023	Projected Total Industry-Wide Shipments in 2033
DOE's Estimate for Total Industry Shipments (Millions)**	0.242	0.225	0.286	0.316	0.345
Manufacturer Feedback					

\* 2013 is estimated effective date of amended energy conservation standards for pool heaters.

\*\* For pool heaters, 2007 and 2008 data are estimates from DOE's shipment model (updated March 2009).

Projections are updated using (1) AEO2009 New Housing Forecast; (2) New Swimming Pool Shipment Data; (3) historical RECS Data; and (4) Accounted for a fraction for households that do not replace failed pool heaters..

5.2 Are the 2007 and 2008 industry wide-shipments shown in Table 5-1 consistent with historic trends? Do you expect total shipment levels to return to their previous levels (i.e., those levels prior to 2007)?

5.3 DOE's shipments analysis estimates industry-wide shipments in 2013 would continue to increase even as amended energy conservation standards become effective due to new housing starts. Could you provide any qualitative information on expected changes in total industry shipments if DOE set the amended energy conservation standard at the efficiency levels shown in Table 5-1?

## 6 PRODUCT MIX

Product mix describes the distribution of current shipments by efficiency level. Changes in the product mix due to amended energy conservation standards can have a large impact on industry revenues. Having an accurate estimate of the current product mix allows DOE to better estimate how revenues might change due to amended energy conservation standards.

6.1 Does your company offer multiple product lines at different efficiency levels? Could you provide a description of your company's product lines and their respective efficiency levels?

6.2 Table 6-1 show DOE's estimate for the current mix of shipments by efficiency today and



in 2013, the anticipated effective date of amended energy conservation standards. Could you provide feedback on DOE's estimates based on your knowledge of the industry?

**Table 6-1 Percentage of Industry-Wide Shipments by Efficiency Level for Gas-fired Residential Pool Heaters Today and in 2013**

Percentage of Total Shipments at each Efficiency	Baseline Level (78%)	EL 1 (79%)	EL 2 (81%)	EL 3 (82%)	EL 4 (83%)	EL 5 (84%)	EL 6 (86%)	EL 7 (90%)	EL 8 (95%)
DOE's Estimate (2008)	1%	12%	21%	33%	14%	12%	6%	0%	1%
Manufacturer Feedback									
DOE's Estimate (2013)	1%	12%	21%	33%	14%	12%	6%	0%	1%
Manufacturer Feedback									

6.3 Do you expect the product mix to change over time? If so, please explain why.

6.4 An amended energy conservation standard affects the product mix by eliminating the sale of products below the minimum efficiency level. DOE assumes that all products that fall below the standard would roll-up to the efficiency level set by an amended energy conservation standard. DOE assumes the distribution of efficiencies above the efficiency level set by the energy conservation standard will not change. In other words, those customers already purchasing more-efficient products will continue to do so irrespective of amended energy conservation standards. How do you think amended energy conservation standards will impact the sales of more efficient products? For example, would customers continue to buy products that exceed the energy conservation standard level? Would your response change at higher efficiency levels?

## 7 FINANCIAL PARAMETERS

Navigant Consulting, Inc. (NCI) has developed a "strawman" model of the gas-fired residential pool heater industry financial performance called the Government Regulatory Impact Model (GRIM) using publicly available data. This section attempts to understand how your company's financial situation differs from our industry aggregate picture.

7.1 Please compare your financial parameters to the GRIM parameters tabulated below.

**Table 7-1 Financial Parameters for Residential Pool Heater Manufacturers**

GRIM Input	Definition	Industry Estimated Value	Your Actual (If Significantly Different from DOE's Estimate)
Income Tax Rate	Corporate effective income tax paid (percentage of earnings before taxes, EBT)	27.5%	
Discount Rate	Weighted average cost of capital (inflation-adjusted weighted average of corporate cost of debt and return on equity)	8.5%	
Working Capital	Current assets less current liabilities (percentage of revenues)	11.4%	
SG&A	Selling, general, and administrative expenses (percentage of revenues)	20.9%	
R&D	Research and development expenses (percentage of revenues)	1.5%	
Depreciation	Amortization of fixed assets (percentage of revenues)	2.2%	
Capital Expenditures	Outlay of cash to acquire or improve capital assets (percentage of revenues, not including acquisition or sale of business units)	2.2%	
Cost of Goods Sold	Includes material, labor, overhead, and depreciation (percentage of revenues)	71.3%	

7.2 How would you expect an amended energy conservation standard to impact any of the financial parameters for the industry?

## 8 CONVERSION COSTS

Amended energy conservation standards may cause your company to incur capital and product conversion costs to redesign existing products and make changes to existing production lines to be compliant with the amended energy conservation standard. Capital conversion costs are one-time investments in plant, property, and equipment (PPE) necessitated by an amended energy conservation standard. These may be incremental changes to existing PPE or the replacement of existing PPE. Replacing existing PPE could strand existing assets before the end of their useful lives. In addition to capital conversion costs, product conversion costs are costs related research,

product development, testing, marketing and other costs for redesigning products necessitated by an amended energy conservation standard.

8.1 What level of conversion costs do you anticipate incurring under the different efficiency levels DOE is considering? Refer to the tables below to provide your company's estimates. Please provide additional qualitative information to help DOE understand the types and nature of your investments.

**Table 8-1 Gas-fired Residential Pool Heater Conversion Costs**

Efficiency Level (Thermal Efficiency)	Gas-fired Residential Pool Heater		
	Capital Conversion Costs (2009\$)	Product Conversion Costs (2009\$)	Stranded Assets (2009\$)
Baseline (78%)			
EL 1 (79%)			
EL 2 (81%)			
EL 3 (82%)			
EL 4 (83%)			
EL 5 (84%)			
EL 6 (86%)			
EL 7 (90%)			
EL 8 (95%)			

## 9 CUMULATIVE REGULATORY BURDEN

Cumulative regulatory burden refers to the burden that industry faces from overlapping effects of new or revised DOE standards, voluntary standards, and/or other regulatory actions affecting the same product or industry.

9.1 Are there other recent or impending regulations that gas-fired residential pool heater manufacturers face (from DOE or otherwise)? If so, could you identify the regulation and the corresponding possible effective dates for those regulations? Below is a list of regulations that could possibly affect manufacturers of gas-fired residential pool heaters. Please provide any comments on the listed regulations in addition to other regulations.

**Table 9-1 Other Regulations Identified by DOE**

Regulation	Possible Effective Date(s)	Comments
DOE's Amended Energy Conservation Standards for Other Products		
International Energy Efficiency Standards		
State Emission Requirements and Other State Regulations		
Uniform Plumbing, Building, and Safety Codes		
South Coast Air Quality Management District (SCAQMD) Ultra-Low NOx Requirements		

9.2 What level of expense are you expecting to incur as a result of these regulations?

9.3 Under what circumstances would you be able to coordinate any expenditures related to these other regulations with an amended energy conservation standard, thereby lessening the cumulative burden?

## **10 DIRECT EMPLOYMENT IMPACT ASSESSMENT**

The impact of amended energy conservation standards on employment is an important consideration in the rulemaking process. This section of the interview guide seeks to explore current trends in residential pool heater production employment and solicit manufacturer views on how domestic employment patterns might be affected by amended energy conservation standards.

10.1 Would your domestic employment levels be expected to change significantly under amended energy conservation standards? If so, please explain how they would change if higher efficiency levels are required.

10.2 Would the workforce skills necessary under amended energy conservation standards require extensive retraining or replacement of employees at your manufacturing facilities?

10.3 Would amended energy conservation standards require extensive retraining of your service/field technicians? If so, could you expand on how your service infrastructure would be impacted in general as a result of amended energy conservation standards?

## **11 EXPORTS / FOREIGN COMPETITION / OUTSOURCING**

Disparity between domestic and foreign energy conservation standards could impact exports or imports. Labor content and material changes, resulting from amended energy conservation standards, may impact sourcing decisions.

11.1 What percentage of your company's gas-fired residential pool heater sales is domestic? Absent amended energy conservation standards, are production facilities being relocated to foreign countries? Would amended energy conservation standards impact your domestic vs. foreign manufacturing decision?

11.2 If applicable, to what foreign countries or regions do you export your products? What percentage of sales can be attributed to each?

11.3 Would an amended energy conservation standard be expected to affect your export sales? What would the resulting impact be, if any, on your manufacturing operations and profitability?

11.4 Are your foreign exports affected by amended energy conservation standards in other countries?

11.5 What percentage of the U.S. market for gas-fired residential pool heaters is imported? Would amended energy conservation standards have an impact on foreign competition?

11.6 What is your outlook for gas-fired residential pool heater exports?

## **12 CONSOLIDATION**

Amended energy conservation standards can alter the competitive dynamics of the market. This can include prompting companies to enter or exit the market, or to merge. DOE and the Department of Justice are both interested in any potential reduction in competition that would result from an amended energy conservation standard.

12.1 Please comment on industry consolidation and related trends over the last 5 years.

12.2 In the absence of amended energy conservation standards, do you expect any further industry consolidation? Please describe your expectations.

12.3 How would amended energy conservation standards affect your ability to compete?

## **13 IMPACTS ON SMALL BUSINESS**

13.1 The Small Business Association (SBA) denotes a small business in the gas-fired residential pool heater industry as having less than 500 employees<sup>9</sup>. By this definition, is your company considered a small business?

13.2 Are there any reasons that a small business might be at a disadvantage relative to a larger business under amended energy conservation standards? Please consider such factors as technical expertise, access to capital, bulk purchasing power for materials/components, engineering resources, and any other relevant issues.

13.3 Are there any niche manufacturers, small businesses, and/or component manufacturers for which the adoption of amended energy conservation standards would have a severe impact? If so, would manufacturers of these products have different incremental impacts from implemented amended energy conservation standards than from the rest of the industry?

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<sup>9</sup> DOE uses the small business size standards published on August 22, 2008, as amended, by the Small Business Administration (SBA) to determine whether a company is a small business. To be categorized as a small business, a residential pool heater manufacturer and its affiliates may employ a maximum of 500 employees. The 500 employee threshold includes all employees in a business's parent company and any other subsidiaries.

## 12A.6 GOVERNMENT REGULATORY IMPACT MODEL (GRIM) OVERVIEW

### 12A.6.1 INTRODUCTION AND PURPOSE

The purpose of the Government Regulatory Impact Model (GRIM) is to help quantify the impacts of energy conservation standards and other regulations on manufacturers. The basic mode of analysis is to estimate the change in value of the industry or manufacturers(s) following a regulation or a series of regulations. The model structure also allows an analysis of multiple products with regulations taking effect over a period of time, and of multiple regulations on the same products.

Industry net present value is defined, for the purpose of this analysis, as the discounted sum of industry free cash flows plus a discounted terminal value. The model calculates the actual cash flows by year and then determines the present value of those cash flows both without an energy conservation standard (*i.e.*, the base case) and under different trial standard levels (TSLs) (*i.e.*, the standards case).

Output from the model consists of summary financial metrics, graphs of major variables, and, when appropriate, access to the complete cash flow calculation.

### 12A.6.2 MODEL DESCRIPTION

The basic structure of the GRIM is a standard annual cash flow analysis that uses manufacturer selling prices, manufacturing costs, a shipments forecast, and financial parameters as inputs and accepts a set of regulatory conditions as changes in costs and investments. The cash flow analysis is separated into two major blocks: income and cash flow. The income calculation determines net operating profit after taxes. The cash flow calculation converts net operating profit after taxes into an annual cash flow by including investment and non-cash items. Below are definitions of listed items on the printout of the output sheet (see Section 12A.6.3).

- (1) **Unit Sales:** Total annual shipments for the industry were obtained from the National Impact Analysis Spreadsheet;
- (2) **Revenues:** Annual revenues - computed by multiplying products' unit prices at each efficiency level by the appropriate manufacturer markup;
- (3) **Labor:** The portion of cost of goods sold (COGS) that includes direct labor, commissions, dismissal pay, bonuses, vacation, sick leave, social security contributions, fringe, and assembly labor up-time;
- (4) **Material:** The portion of COGS that includes materials;

- (5) **Overhead:** The portion of COGS that includes indirect labor, indirect material, energy use, maintenance, depreciation, property taxes, and insurance related to assets. While included in overhead, the depreciation is shown as a separate line item;
- (6) **Depreciation:** The portion of overhead that includes an allowance for the total amount of fixed assets used to produce that one unit. Annual depreciation computed as a percentage of **COGS**. While included in overhead, the depreciation is shown as a separate line item;
- (7) **Stranded Assets:** In the year the standard becomes effective, a one time write-off of stranded assets is accounted for;
- (8) **Standard SG&A:** Selling, general, and administrative costs are computed as a percentage of **Revenues (2)**;
- (9) **R&D:** GRIM separately accounts for ordinary research and development (R&D) as a percentage of **Revenues (2)**;
- (10) **Product Conversion Costs:** Product conversion costs are one-time investments in research, development, testing, marketing, and other costs focused on making products designs comply with the new energy conservation standard. The GRIM allocates these costs over the period between the standard's announcement and compliance dates;
- (11) **Earnings Before Interest and Taxes (EBIT):** Includes profits before deductions for interest paid and taxes;
- (12) **EBIT as a Percentage of Sales (EBIT/Revenues):** GRIM calculates EBIT as a percentage of sales to compare with the industry's average reported in financial statements;
- (13) **Taxes:** Taxes on **EBIT (11)** are calculated by multiplying the tax rate contained in Major Assumptions by **EBIT (11)**.
- (14) **Net Operating Profits After Taxes (NOPAT):** Computed by subtracting **Cost of Goods Sold ((3) to (6))**, **SG&A (8)**, **R&D (9)**, **Product Conversion Costs (10)**, and **Taxes (13)** from **Revenues (2)**.
- (15) **NOPAT repeated:** NOPAT is repeated in the Statement of Cash Flows;
- (16) **Depreciation repeated:** Depreciation and Stranded Assets are added back in the Statement of Cash Flows because they are non-cash expenses;
- (17) **Change in Working Capital:** Change in cash tied up in accounts receivable, inventory, and other cash investments necessary to support operations is calculated by multiplying working capital (as a percentage of revenues) by the change in annual revenues.



- (18) **Cash Flow From Operations:** Calculated by taking *NOPAT (15)*, adding back non-cash items such as a *Depreciation (16)*, and subtracting the *Change in Working Capital (17)*;
- (19) **Ordinary Capital Expenditures:** Ordinary investments in property, plant, and equipment to maintain and replace existing production assets, computed as a percentage of *Revenues (2)*;
- (20) **Capital Conversion Costs:** Capital conversion costs are one-time investments in property, plant, and equipment to adapt or change existing production facilities so that new product designs can be fabricated and assembled under the new regulation; The GRIM allocates these costs over the period between the standard's announcement and compliance dates;
- (21) **Capital Investment:** Total investments in property, plant, and equipment are computed by adding *Ordinary Capital Expenditures (19)* and *Capital Conversion Costs (20)*;
- (22) **Free Cash Flow:** Annual cash flow from operations and investments; computed by subtracting *Capital Investment (21)* from *Cash Flow from Operations (18)*;
- (23) **Terminal Value:** Estimate of the continuing value of the industry after the analysis period. Computed by growing the Free Cash Flow at the beginning of 2045 at a constant rate in perpetuity;
- (24) **Present Value Factor:** Factor used to calculate an estimate of the present value of an amount to be received in the future;
- (25) **Discounted Cash Flow:** *Free Cash Flows (22)* multiplied by the *Present Value Factor (24)*. For the end of 2044, the discounted cash flow includes the discounted *Terminal Value (23)*; and
- (26) **Industry Value thru the end of 2044:** The sum of *Discounted Cash Flows (25)*.

## 12A.6.3 DETAILED CASH FLOW EXAMPLE

### Standards Case Income and Cash Flow Statements

This tab computes key parameters from an income statement based on unit sales, revenues and COGS, and initial financial inputs (parameters as a % of revenue). It also computes an NPV based on a discounted cash flow model.

			Base Year							Standard Year					
Income and Cash Flow Statement (Standards Case)			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
GS and ES Income Statement															
Unit Sales			8,855	8,190	8,794	8,389	8,847	9,003	9,132	9,299	9,369	9,448	9,468	9,462	9,444
Revenues			\$ 2,189.33	\$ 2,051.38	\$ 2,244.33	\$ 2,157.56	\$ 2,308.32	\$ 2,378.31	\$ 2,445.61	\$ 2,530.38	\$ 2,533.84	\$ 2,565.19	\$ 2,544.20	\$ 2,510.57	\$ 2,571.56
Cost of Sales															
Labor			\$ 179.17	\$ 168.11	\$ 183.57	\$ 177.33	\$ 189.88	\$ 196.05	\$ 201.89	\$ 208.86	\$ 214.82	\$ 219.57	\$ 224.55	\$ 229.47	\$ 234.98
Material			\$ 1,173.97	\$ 1,100.67	\$ 1,206.15	\$ 1,159.19	\$ 1,241.26	\$ 1,279.57	\$ 1,316.74	\$ 1,363.91	\$ 1,381.41	\$ 1,429.90	\$ 1,398.80	\$ 1,340.18	\$ 1,378.46
Overhead			\$ 97.90	\$ 91.51	\$ 99.66	\$ 95.72	\$ 102.09	\$ 104.92	\$ 107.57	\$ 110.90	\$ 114.30	\$ 117.36	\$ 119.48	\$ 121.19	\$ 122.72
Depreciation			\$ 44.33	\$ 41.55	\$ 45.50	\$ 43.73	\$ 46.80	\$ 48.23	\$ 49.62	\$ 51.37	\$ 51.77	\$ 52.23	\$ 52.99	\$ 53.47	\$ 54.83
Shipping			\$ 192.11	\$ 179.63	\$ 195.07	\$ 188.06	\$ 200.53	\$ 206.29	\$ 211.58	\$ 217.85	\$ 224.39	\$ 230.93	\$ 237.64	\$ 244.57	\$ 251.11
GS Stranded Assets			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
ES Stranded Assets			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 30.34	\$ -	\$ -	\$ -	\$ -
Selling, General and Administrative															
Standard SG&A			\$ 350.29	\$ 328.22	\$ 359.09	\$ 345.21	\$ 369.33	\$ 380.53	\$ 391.30	\$ 404.86	\$ 410.61	\$ 428.43	\$ 437.07	\$ 448.69	\$ 461.45
R&D			\$ 32.53	\$ 30.48	\$ 33.35	\$ 32.06	\$ 34.30	\$ 35.34	\$ 36.34	\$ 37.60	\$ 38.07	\$ 39.73	\$ 40.90	\$ 41.89	\$ 42.79
GS Product Conversion Costs			\$ -	\$ -	\$ -	\$ -	\$ 0.11	\$ 0.92	\$ 1.95	\$ 2.43	\$ 0.11	\$ -	\$ -	\$ -	\$ -
ES Product Conversion Costs			\$ -	\$ -	\$ -	\$ -	\$ 0.98	\$ 8.36	\$ 17.71	\$ 22.14	\$ 1.00	\$ -	\$ -	\$ -	\$ -
Earnings Before Interest and Taxes (EBIT)			\$ 119.02	\$ 111.21	\$ 121.93	\$ 116.26	\$ 123.04	\$ 118.09	\$ 110.91	\$ 110.45	\$ 108.00	\$ 142.0397	\$ 143.78	\$ 145.11	\$ 146.22
EBIT Revenues			5.4%	5.4%	5.4%	5.4%	5.3%	5.0%	4.5%	4.4%	2.1%	2.6%	2.6%	2.6%	2.6%
Taxes			\$ 46.26	\$ 43.22	\$ 47.39	\$ 45.18	\$ 47.82	\$ 45.90	\$ 43.11	\$ 42.93	\$ 41.97	\$ 55.20	\$ 55.88	\$ 56.40	\$ 56.83
Net Operating Profit after Taxes (NOPAT)			\$ 72.76	\$ 67.99	\$ 74.54	\$ 71.07	\$ 75.22	\$ 72.19	\$ 67.81	\$ 67.52	\$ 66.02	\$ 86.84	\$ 87.90	\$ 88.71	\$ 89.39
GS and ES Cash Flow Statement															
NOPAT			\$ 72.76	\$ 67.99	\$ 74.54	\$ 71.07	\$ 75.22	\$ 72.19	\$ 67.81	\$ 67.52	\$ 66.02	\$ 86.84	\$ 87.90	\$ 88.71	\$ 89.39
Depreciation			\$ 44.33	\$ 41.55	\$ 45.50	\$ 43.73	\$ 46.80	\$ 48.23	\$ 49.62	\$ 51.37	\$ 51.77	\$ 52.23	\$ 52.99	\$ 53.47	\$ 54.83
Change in Working Capital			\$ 237.08	\$ 14.94	\$ (20.89)	\$ 9.40	\$ (16.33)	\$ (7.58)	\$ (7.29)	\$ (9.18)	\$ (294.92)	\$ (12.06)	\$ (8.56)	\$ (7.19)	\$ (6.60)
Cash Flows from Operations			\$ 354.17	\$ 124.47	\$ 99.15	\$ 124.20	\$ 105.70	\$ 112.85	\$ 110.13	\$ 109.71	\$ (83.78)	\$ 192.01	\$ 198.33	\$ 201.99	\$ 204.62
Ordinary Capital Expenditures			\$ (54.73)	\$ (51.28)	\$ (56.11)	\$ (53.94)	\$ (57.71)	\$ (59.46)	\$ (61.14)	\$ (63.26)	\$ (131.35)	\$ (134.13)	\$ (136.10)	\$ (137.76)	\$ (139.29)
GS Capital Conversion Costs			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
ES Capital Conversion Costs			\$ -	\$ -	\$ -	\$ -	\$ (1.39)	\$ (11.78)	\$ (24.95)	\$ (31.19)	\$ -	\$ -	\$ -	\$ -	\$ -
Capital Investments			\$ (54.73)	\$ (51.28)	\$ (56.11)	\$ (53.94)	\$ (59.09)	\$ (71.24)	\$ (86.09)	\$ (94.45)	\$ (131.35)	\$ (134.13)	\$ (136.10)	\$ (137.76)	\$ (139.29)
Free Cash Flow			\$ 299.44	\$ 73.19	\$ 43.04	\$ 70.26	\$ 46.60	\$ 41.61	\$ 24.04	\$ 15.26	\$ (215.12)	\$ 57.88	\$ 62.22	\$ 64.23	\$ 65.33
Terminal Value			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Present Value Factor			0.00	0.00	0.00	1.00	0.92	0.84	0.78	0.71	0.65	0.60	0.55	0.51	0.47
Discounted Cash Flow			\$ -	\$ -	\$ -	\$ 70.26	\$ 42.81	\$ 35.11	\$ 18.64	\$ 10.87	\$ (140.75)	\$ 34.79	\$ 34.36	\$ 32.58	\$ 30.44
Industry Value thru	2044	\$ 570.21													