CHAPTER 6. MARKUPS TO DETERMINE PRODUCT PRICE

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CHAPTER 6. MARKUPS TO DETERMINE PRODUCT PRICE

6.1 INTRODUCTION

To carry out the engineering and life-cycle cost (LCC) analyses, DOE needed to determine the price to the consumer of a baseline product and the price of more efficient units. By applying a multiplier called a "markup" to the manufacturer product costs estimated in the engineering analysis, DOE estimated the consumer price for baseline models and more efficient products.

6.1.1 Distribution Channels

The appropriate markups for determining the consumer product price depend on the type of distribution channel through which products move from manufacturers to purchasers. At each point in the distribution channel, companies mark up the price of the product to cover their business costs and profit margin.

For water heaters, the distribution channel differs for replacement and new home applications. For replacement applications, manufacturers sell to either plumbing distributors or large retail outlets (typically large home-supply stores).[a] Two possible paths follow: (1) a retail outlet sells a water heater to the customer, who either hires someone to install it or self-installs it;[b] or (2) a plumbing distributor sells a water heater to a contractor, who then sells it to a consumer and installs it. For storage-type water heaters, estimates of water heater distribution channels from DOE's 2001 water heater technical support document (TSD)[1] indicate that the retail channel accounted for 60 percent of all replacement applications. While this share is likely higher today, DOE used this value since no more recent data was available. For instantaneous water heaters, DOE relied on available information, which suggests that most sales go through plumbing distributors and contractors rather than retail outlets.

In most new home applications, the water heater is part of the overall plumbing package installed by a plumbing contractor or, in the case of large building companies, by its own master plumber and crew. A plumbing contractor usually purchases the water heater from a plumbing distributor, and in this case DOE believes it is appropriate to include a contractor markup. According to the 2002 U.S. Economic Census (Construction Industry Series),[2, 3] builders with annual revenue of more than $10 million accounted for half of the value of new residential single-family construction. DOE believes that these builders are large enough to have a master plumber and not hire a contractor, and assigned half of water heater shipments to new construction to this channel (New Homes A in the figure below).

[a] Manufacturer representatives facilitate sales from manufacturers to both distributors and retailers, but they work on commission and thus DOE does not include them for purposes of estimating markups.

[b] In some cases (e.g., Sears), the retail outlet provides installation as part of a package. In others, the retail outlet links the customer to a contractor for installation. Self-installation is likely more common for electric than for gas water heaters due to the greater complexity of replacing a gas unit.

Based on the above description, DOE defined four distribution channels for the purposes of estimating markups for water heaters, as shown in Figure 6.1.1.

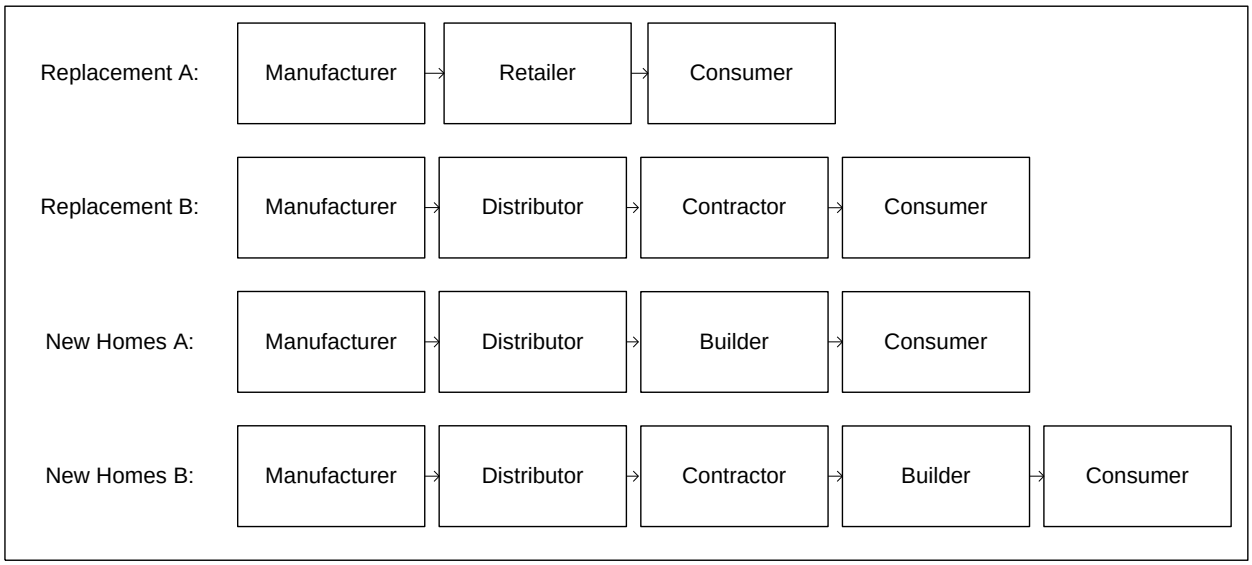

Figure 6.1.1 Distribution Channels for Residential Water Heaters

For direct heating equipment, consumer purchases and installations do not play a significant role in the established distribution channels. To determine distribution channels for direct heating equipment, DOE used the approach outlined in the Residential Furnace 2007 TSD.[4] For replacement applications, most sales go through distributors to contractors, and then to consumers. In new home applications, most sales go through distributors to contractors hired by the builder. Thus, DOE defined two distribution channels for the purposes of estimating markups for direct heating equipment, as shown in Figure 6.1.2.

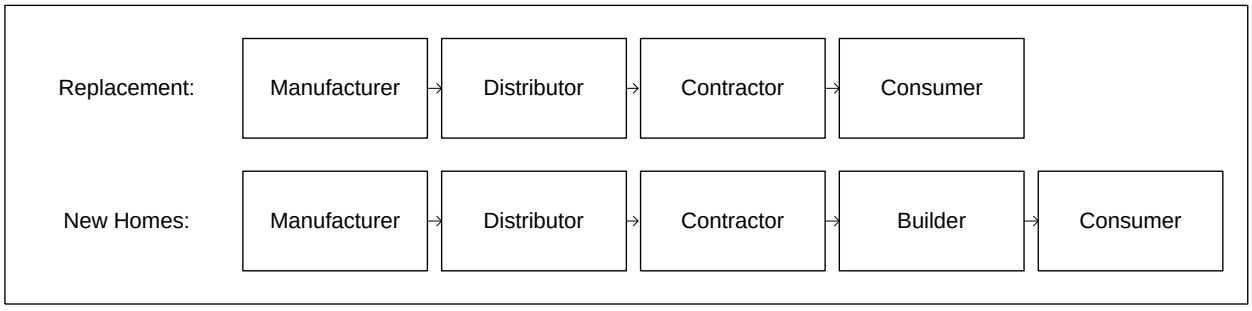

Figure 6.1.2 Distribution Channels for Direct Heating Equipment

To determine distribution channels for pool heaters, DOE used information from a consultant report.[5] For replacement applications, most sales go through distributors or retailers to pool service companies. In most new home applications, the pool builder purchases the product from a distributor or wholesaler, and there is no contractor involved. Thus, DOE defined two distribution channels for the purposes of estimating markups for pool heaters, as shown in Figure 6.1.3.

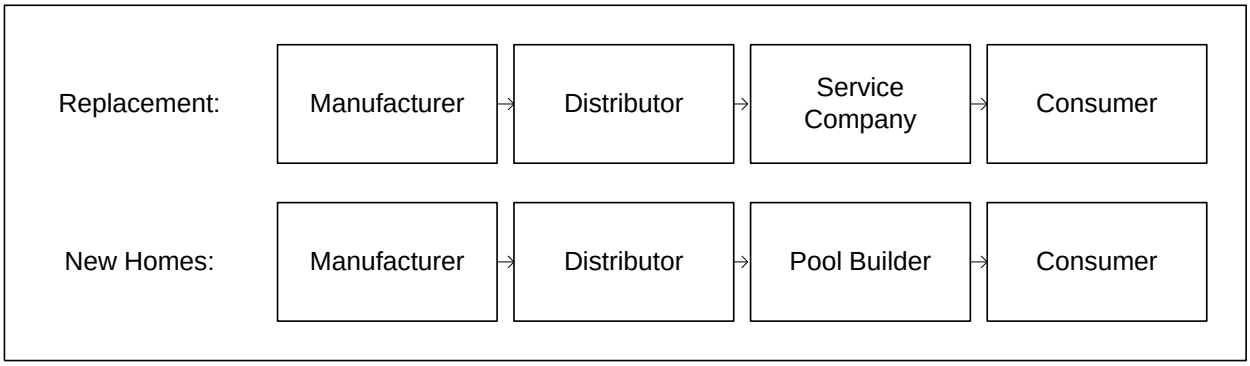

Figure 6.1.3 Distribution Channels for Pool Heaters

6.1.2 Markup Calculation Procedure

Companies mark up the price of product to cover their business costs and profit margin. In financial statements, gross margin is the difference between the company revenue and the company cost of sales or cost of goods sold (*CGS*). Inputs for calculating the gross margin are all corporate costs—including overhead costs (sales, general, and administration); research and development (R&D) and interest expenses; depreciation, and taxes—and profits. In order for sales of a product to contribute positively to company cash flow, the product's markup must be greater than the corporate gross margin. Individual products may command a lower or higher markup, depending on their perceived added value and the competition they face from similar products in the market.

In developing markups for the different actors in the distribution chains, DOE obtained data about the revenue, *CGS*, and expenses of firms that produce and sell the products of interest. DOE's approach categorizes the expenses into two categories: labor-scaling costs (*LSC*), which are fixed labor and occupancy expenses that increase in proportion to the amount of labor required to produce or sell the product, and non-labor-scaling costs (*NLSC*), which are variable operating costs that do not scale with labor and vary in proportion to *CGS*. Together, *LSC* and *NLSC* represent the gross margin.

6.1.2.1 Approach for Manufacturer Markup

DOE uses manufacturer markups to transform a manufacturer's product costs into a manufacturer sales price. Using the *CGS* and gross margin, the manufacturer markup can be calculated as follows:

$$MU_{MFG} = \frac{CGS_{MFG} + GM_{MFG}}{CGS_{MFG}}$$

Where:

MU_{MFG} = Manufacturer markup,
CGS_{MFG} = Manufacturer cost of goods sold, and
GM_{MFG} = Manufacturer gross margin.

6.1.2.2 Approach for Retailer and Distributor Markups

DOE based the retailer and distributor markups on financial data from the U.S. Census Business Expenses Survey.[6] DOE organized the data into income statements that break down cost components incurred by firms that sell the products.[c] The key assumptions that DOE made to estimate the retailer and distributor markups using these financial data were:

1. The income statements faithfully represent the various average costs incurred by firms selling home appliances.

2. These costs can be divided into two categories:
   a. Costs that vary in proportion to the manufacturer sales price (variable costs); and
   b. Costs that do not vary with the manufacturer sales price (fixed costs).

3. Retailer and distributor sales prices vary in proportion to retailer and distributor costs that are included in the income statements.

In support of the first assumption, the income statements itemize firm costs into a number of expense categories, including *CGS*, operating labor and occupancy costs, and other operating costs and profit. Although retailers and distributors tend to handle multiple commodity lines, the data provide the most accurate available indication of home appliance expenses.

Information obtained from the trade literature pertaining to the heating, ventilation, and air-conditioning (HVAC) contracting industry tends to support the second assumption. This information indicates that retailer and distributor markups should vary according to the quantity of labor and materials used to sell or distribute the product, with markups on labor tending to be much larger than markups on materials.[7] This information also describes markups as varying much more in relation to sales volume than in relation to other factors, including appliance energy efficiency. This last finding strongly suggests that labor inputs vary more with sales volume than with appliance cost or energy efficiency. In the discussion that follows, DOE uses a division of costs between those that do not scale with the manufacturer sales price (fixed costs—labor and occupancy expenses referred to above as *LSC*), and those that do (variable costs—operating expenses and profit referred to above as *NLSC*).

In support of the third assumption, the retailer and distributor industries are relatively competitive, and consumer demand for residential home appliances is relatively inelastic, i.e. the demand is not expected to decrease significantly with a relatively small increase in price. The large number of household appliance stores and merchant wholesalers of service equipment (i.e., distributors of products including heating products) listed by the U.S. Census Bureau in its *Statistics of U.S. Businesses* indicates the competitive nature of the market.[8] For example, there are more than 10,000 household appliance store establishments and over 5,000 merchant

[c] The retailers and distributors to whom these financial data refer handle multiple commodity lines.

wholesaler establishments of service equipment in the U.S.[d] Following standard economic theory, competitive firms facing inelastic demand either set prices in line with costs or quickly go out of business.[9]

Using the above assumptions, DOE developed baseline and incremental markups for retailers and distributors. DOE used the baseline markups, which cover all of a retailer's or distributor's costs (both *LSC* and *NLSC*), to determine the sales price of baseline models. The baseline markup relates the manufacturer sales price to the retailer or distributor sales price. DOE calculated the baseline markup for retailers and distributors using the following equation:

$$MU_{BASE} = \frac{CGS_{RTL/DIST} + GM_{RTL/DIST}}{CGS_{RTL/DIST}} = \frac{CGS_{RTL/DIST} + (LSC_{RTL/DIST} + NLSC_{RTL/DIST})}{CGS_{RTL/DIST}}$$

Where:

MU_{BASE} = Baseline retailer or distributor markup,
$CGS_{RTL/DIST}$ = Retailer or distributor cost of goods sold,
$GM_{RTL/DIST}$ = Retailer or distributor gross margin,
$LSC_{RTL/DIST}$ = Retailer or distributor labor-scaling costs, and
$NLSC_{RTL/DIST}$ = Retailer or distributor non-labor-scaling costs.

Incremental markups are coefficients that relate the change in the manufacturer sales price of higher energy efficient models to the change in the retailer or distributor sales price. Incremental markups cover only those costs that scale with a change in the manufacturer's sales price (*NLSC*). DOE considers higher energy efficient models to be products that meet the requirements of new energy conservation standards. It calculated the incremental markup (MU_{INCR}) for retailers and distributors using the following equation:

$$MU_{INCR} = \frac{CGS_{RTL/DIST} + NLSC_{RTL/DIST}}{CGS_{RTL/DIST}}$$

Where:

MU_{INCR} = Incremental retailer or distributor markup,
$CGS_{RTL/DIST}$ = Retailer or distributor cost of goods sold, and
$NLSC_{RTL/DIST}$ = Retailer or distributor non-labor-scaling costs.

6.1.2.3 Approach for Contractor Markup

The type of financial data used for estimating markups for retailers and distributors is not available for contractors. To estimate contractor markups for direct heating equipment and pool heaters, DOE used cost data from a financial analysis of the HVAC industry conducted by the

[d] DOE determined the number of establishments for household appliance stores based on the following North American Industry Classification System (NAICS) code and description: 443111, *Household Appliance Stores*.

Air-Conditioning Contractors of America (ACCA).[10] ACCA reports gross margin as a percent of sales, so the baseline markup can be estimated using the following equation:

$$MU_{BASE} = \frac{1}{1 - GM_{CTR}}$$

Where:

MU_{BASE} = Baseline contractor markup and
GM_{CTR} = Contractor gross margin.

The data from the HVAC industry may not be appropriate for plumbing contractors. Therefore, DOE estimated contractor markup for water heaters using the value given in RS Means[11] for contractor markup on mechanical equipment.

Neither of the above data sources provides sufficient detail to allow estimation of incremental markups, so DOE used the baseline markup for the incremental markup as well.

6.1.2.4 Approach for Builder Markup

To develop a builder markup, DOE collected data on new single-family housing construction (NAICS 236116) from the 2002 Economic Census Geographic Area Series Construction.[12] The census data include the number of establishments, payroll, value of construction, cost of materials, and cost of subcontracted work for each state. DOE calculated the baseline markup for builders using the following equation:

$$MU_{BASE} = \frac{V_{CONSTRUCT}}{Pay + MatCost + SubCost}$$

Where:

MU_{BASE} = Baseline builder markup,
$V_{CONSTRUCT}$ = Value of construction,
Pay = Payroll,
$MatCost$ = Cost of materials, and
$SubCost$ = Cost of subcontracted work.

DOE estimated the incremental builder markup using regression analysis. It calculated per firm revenue, cost of goods sold, and payroll from the data provided in the 2002 Economic Census Geographic Area Series Construction.[12] A regression of per firm revenue on per firm cost of goods sold and payroll estimates the coefficients for the equation:

$$R_i = \alpha CGS_i + \beta Pay_i$$

Where:

R_i = Revenue of firm i,

CGS_i = Cost of good sold of firm i, and

Pay_i = Payroll of firm i.

The coefficient α is an estimate of the incremental builder markup.

6.1.2.5 Overall Markups

The overall markup for each distribution channel is the product of the appropriate markups, as well as sales tax in the case of replacement applications.

DOE used the overall baseline markup to estimate the consumer product price of baseline models, given the manufacturer cost of the baseline models. As stated above, DOE considers baseline models to be product sold under existing market conditions (i.e., without new energy conservation standards). The following equation shows how DOE used the overall baseline markup to determine the product price for baseline models.

$$CPP_{BASE} = COST_{MFG} \times \left(MU_{MFG} \times MU_{BASE} \times Tax_{SALES}\right) = COST_{MFG} \times MU_{OVERALL\_BASE}$$

Where:

CPP_{BASE} = Consumer product price for baseline models,
$COST_{MFG}$ = Manufacturer cost for baseline models,
MU_{MFG} = Manufacturer markup,
MU_{BASE} = Baseline replacement or new home channel markup,
Tax_{SALES} = Sales tax (replacement applications only), and
$MU_{OVERALL\_BASE}$ = Baseline overall markup.

Similarly, DOE used the overall incremental markup to estimate changes in the consumer product price, given changes in the manufacturer cost above the baseline model cost resulting from an energy conservation standard to raise product energy efficiency. The total consumer product price for higher energy efficient models is composed of two components: the consumer product price of the baseline model and the change in consumer product price associated with the increase in manufacturer cost to meet the new energy conservation standard. The following equation shows how DOE used the overall incremental markup to determine the consumer product price for higher energy efficient models (i.e., models meeting new energy conservation standards).

$$\begin{aligned} CPP_{STD} &= COST_{MFG} \times MU_{OVERALL\_BASE} + \Delta COST_{MFG} \times \left(MU_{MFG} \times MU_{INCR} \times Tax_{SALES}\right) \\ &= CPP_{BASE} + \Delta COST_{MFG} \times MU_{OVERALL\_INCR} \end{aligned}$$

Where:

CPP_{STD} =	Consumer product price for models meeting new energy conservation standards,
CPP_{BASE} =	Consumer product price for baseline models,
$COST_{MFG}$ =	Manufacturer cost for baseline models,
$\Delta COST_{MFG}$ =	Change in manufacturer cost for higher energy efficient models,
MU_{MFG} =	Manufacturer markup,
MU_{INCR} =	Incremental replacement or new home channel markup,
Tax_{SALES} =	Sales tax (replacement applications only),
$MU_{OVERALL\_BASE}$ =	Baseline overall markup (product of manufacturer markup, baseline replacement or new home channel markup, and sales tax), and
$MU_{OVERALL\_INCR}$ =	Incremental overall markup.

6.2 MANUFACTURER MARKUP

DOE determined that the manufacturer markups for all product. Details are provided in chapter 5, Engineering Analysis.

6.3 RETAILER MARKUP

DOE used financial data from the U.S. Census 1997 Business Expenses Survey (BES), in the "Electronics and Appliance Stores" category, to calculate markups used by retailers of the three heating products.[6]

Table 6.3.1 shows the BES data that DOE used and the retail markups for these appliances that DOE estimated following the procedures described above in section 6.1.2.2. More detailed information regarding these values can be found in appendix 6-A, Detailed Data for Product Markups. DOE estimates the baseline retail markup to be 1.45 and the incremental retail markup to be 1.15.

Table 6.3.1 Data Used to Calculate Retailer Markup

Item	**Million 1997$**
Sales (revenue)	10,343
Cost of Goods Sold (CGS)	7,151
Gross Margin (GM)	3,192
Non-Labor Scaling Costs	1,068
Baseline Markup	**1.45**
Incremental Markup	**1.15**

Source: 1997 Economic Census, Business Expenses Survey.[6]

6.4 DISTRIBUTOR MARKUP

DOE used financial data from the BES for two categories to calculate markups used by distributors of water heaters and direct heating equipment.[6] The category "Electrical Goods Merchant Wholesalers" includes electric water heaters, and the category "Hardware, and Plumbing and Heating Equipment and Supplies Merchant Wholesalers" includes non-electric

water heaters and direct heating equipment. Pool heater distributors are not explicitly categorized in the BES, but for this analysis are assigned to the "Hardware, and Plumbing and Heating Equipment and Supplies Merchant Wholesalers" category. The markups for these categories were calculated as described in section 6.1.2.2.

Table 6.4.1 shows the data from the BES and the distributor markups DOE estimated using the procedures described above in section 6.1.2.2. More detailed information regarding these values can be found in appendix 6-A, Detailed Data for Product Price Markups. DOE estimates the electric water heater distributor baseline markup to be 1.28 and incremental markup to be 1.10. For non-electric water heaters, pool heaters, and direct heating equipment, the baseline distributor markup is estimated to be 1.35 and the incremental markup is estimated to be 1.11. The markup is lower for electric water heaters because their distributors are grouped with electrical goods wholesalers.

Table 6.4.1 Data Used to Calculate Distributor Markup

	Electrical Goods Merchant Wholesalers	Hardware, and Plumbing and Heating Equipment and Supplies Merchant Wholesalers
Item	**Million 1997$**	**Million 1997$**
Sales (revenue)	205,688	74,080
Cost of Goods Sold (CGS)	160,435	54,835
Gross Margin (GM)	45,253	19,245
Non-Labor Scaling Costs	15,784	6,190
Baseline Markup	**1.28**	**1.35**
Incremental Markup	**1.10**	**1.11**

Source: 1997 Economic Census, Business Expenses Survey.[6]

6.5 CONTRACTOR MARKUP

DOE used gross margin data reported in the Air Conditioner Contractors of America (ACCA) 2005 Financial Analysis for the HVACR Contracting Industry[10] to calculate the baseline markup for contractors that install direct heating equipment and pool heaters. ACCA reports that for residential and light commercial contractors, gross margin is 24 percent of sales. Using the procedure described in 6.1.2.3, DOE estimates the contractor markup for direct heating equipment to be 1.32. For the contractor markup for water heaters and pool heaters, the value from RS Means is 1.10.[e11]

[e] The information gathered by DOE suggests that contractors place little markup on the water heater in replacement applications. The plumbing contractor prices his total installation; he generally "line items" the water heater as one item in the total price along with delivery (trip charge), installation parts, permit (in some cases), second story (or attic, basement, etc.) adder, labor, old heater haul away, and other various charges. Thus, he may list a competitive price for the water heater (with little if any markup) but build in more profit into other items.

Neither of the above data sources provides sufficient detail to allow estimation of baseline and incremental markups, so DOE used one and the same markup for each markup.

6.6 BUILDER MARKUP

To estimate a markup for homebuilders, DOE collected data on new single-family housing construction from the 2002 Economic Census Geographic Area Series for Construction.[12] For 42 states, the Census reports the number of construction firms, payroll, value of construction, cost of materials, and cost of subcontracted work. Using the approach described in section 6.1.2.4, DOE used this data to estimate a baseline builder markup in each state.[f] Appendix 6-A, Detailed Data for Product Price Markups, shows the state baseline markups, which average 1.31. DOE used this national-average markup.

To estimate an incremental markup for homebuilders, DOE used data from the 2002 Economic Census Geographic Area Series Construction[12] to calculate average per firm value of construction, CGS, and payroll for each state, shown in appendix 6-A, Detailed Data for Product Price Markups. A regression analysis of per firm value of construction on per firm CGS and per firm payroll produced an estimate of the incremental builder markup of 1.26.[g]

6.7 SALES TAX

The sales tax represents state and local sales taxes that are applied to the consumer product price in replacement applications. The sales tax is a multiplicative factor that increases the consumer product price.

DOE derived state and local taxes from data provided by the Sales Tax Clearinghouse.[13] These data represent weighted averages that include county and city rates. DOE then derived population-weighted average tax values for each Census division and large state, as shown in Table 6.7.1 below.

[f] Only 42 states are included in this analysis because necessary data was withheld for the other 8 states.

[g] R-square: 0.97, standard error on incremental markup: 0.056. This regression assumes a non-zero intercept.

Table 6.7.1 Average Sales Tax Rates by Census Division and Large State

Census Division/State	Tax Rate (2010)
New England	6.11%
Mid Atlantic	6.62%
East North Central	6.94%
West North Central	6.86%
South Atlantic	6.58%
East South Central	7.90%
West South Central	8.42%
Mountain	6.80%
Pacific	7.51%
New York	8.45%
California	9.15%
Texas	8.05%
Florida	6.70%

DOE then derived U.S. weighted-average tax values for each of the three major heating products, shown below in Table 6.7.2. For water heaters, which have close to 100 percent saturation in each of the divisions and large states, DOE used population weights for each division/state. For direct heating equipment and pool heaters, DOE based the weighting on the product's saturation within each division and large state. It determined the saturations from the DOE Energy Information Administration (EIA)'s 2005 Residential Energy Consumption Survey.[14]

Table 6.7.2 Weighted-Average Sales Tax Rates by Product

Product	Tax Rate
Gas Storage Water Heaters	7.5%
Electric Storage Water Heaters	7.1%
Oil Storage Water Heaters	7.0%
Instantaneous Water Heaters	7.5%
Pool Heaters	7.5%
Direct Heating Equipment	7.3%

6.8 SUMMARY OF MARKUPS

Tables 6.8.1 through 6.8.4 summarize the markups at each stage in the distribution channel (including sales tax where appropriate) and the overall baseline and incremental markups for replacement and new construction applications for the three heating products.

Table 6.8.1 Markups for Water Heaters, Replacement Applications

	Gas Storage		Oil Storage		Gas Instantaneous		Electric Storage	
	Base.	Incr.	Base.	Incr.	Base.	Incr.	Base.	Incr.
Manufacturer	1.31		1.30		1.45		1.28	
Retailer	1.45	1.15	1.45	1.15	1.45	1.15	1.45	1.15
Distributor	1.35	1.11	1.35	1.11	1.28	1.10	1.35	1.11
Contractor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Sales Tax	1.075		1.070		1.075		1.071	
Overall*								
Repl A	2.04	1.62	2.02	1.60	2.26	1.79	1.99	1.58
Repl B	2.09	1.72	2.07	1.70	2.19	1.89	2.04	1.67
Wtd Avg Repl	2.06	1.66	2.04	1.64	2.20	1.88	2.01	1.62

* The overall markup is the average of the total markups for distribution channels A and B, weighted by the estimated shares of each channel in total replacement installations. As described in section 6.1, the estimated share of Channel A is 60 percent for storage water heaters and 10 percent for instantaneous water heaters.

Table 6.8.2 Markups for Water Heaters, New Home Applications

	Gas Storage		Oil Storage		Gas Instantaneous		Electric Storage	
	Base.	Incr.	Base.	Incr.	Base.	Incr.	Base.	Incr.
Manufacturer	1.31		1.30		1.45		1.28	
Distributor	1.35	1.11	1.35	1.11	1.28	1.10	1.35	1.11
Contractor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Builder	1.31	1.26	1.31	1.26	1.31	1.26	1.31	1.26
Overall*								
New A	2.32	1.83	2.30	1.82	2.43	2.01	2.26	1.79
New B	2.55	2.02	2.53	2.00	2.67	2.21	2.49	1.97
Wtd Avg New	2.43	1.92	2.41	1.91	2.55	2.11	2.38	1.88

* The overall markup is the average of the total markups for distribution channels A and B, weighted by the estimated shares of each channel in total new home installations. As described in section 6.1, the estimated shares of Channel A and B are each 50 percent

Table 6.8.3 Markups for Direct Heating Equipment and Pool Heaters, Replacement Applications

	Direct Heating Equipment		Pool Heaters	
	Baseline	Incremental	Baseline	Incremental
Manufacturer	1.35		1.30	
Distributor	1.35	1.11	1.35	1.11
Contractor	1.32	1.32	1.10	1.10
Sales Tax	1.073		1.075	
Overall	2.58	2.12	2.08	1.71

Table 6.8.4 Markups for Direct Heating Equipment and Pool Heaters, New Home Applications

	Direct Heating Equipment		Pool Heaters*	
	Baseline	Incremental	Baseline	Incremental
Manufacturer	1.35		1.30	
Distributor	1.35	1.11	1.35	1.11
Contractor	1.32	1.32	--	--
Builder	1.31	1.26	1.31**	1.26**
Overall	3.15	2.49	2.30	1.82

*In the case of new homes, the pool builder purchases the product directly from a distributor or wholesaler without contractor involvement.
**It is assumed that pool builders have the same markup as home builders.

6.8.2 Accuracy of Estimated Markups for Water Heaters[h]

DOE assembled a data base with retail Internet prices for a large number of water heater models at baseline efficiency. For each model, DOE divided the retail price by the manufacturer cost for different rated volume water heater (estimated as described in chapter 5) to derive an implicit markup. This markup would include the manufacturer markup and the retail markup. To be comparable with the overall markups shown in Table 6.8.1, DOE added a national population-weighted average sales tax. See appendix 6-A, Detailed Data for Product Markups, for the derivation of the implicit markups.

The implicit water heater markups are very similar to the overall markups calculated for the retail distribution channel ("Channel Repl A") for electric and oil-fired storage water heaters, and are about 10 percent higher for gas storage water heaters and gas instantaneous water heaters (Table 6.8.5). Exact agreement should not be expected, since the retail channel markups in Table 6.8.1 refer mainly to physical stores, and prices given on the Internet may not reflect in-store promotions. In addition, actual manufacturing costs may be different from the costs used to calculate the implicit markups.

[h] This analysis was performed during the Preliminary Analysis phase of this Rulemaking, and therefore the comparison relates to the results reported for that phase.

Table 6.8.5 Water Heater Manufacturer and Retail Markup Comparison

Water Heater Type	Implicit Markup Based on Retail Prices	Calculated Markup
Gas (40 gallon)	2.43	2.04
Electric (50 gallon)	2.10	1.99
Oil (30 gallon)	2.13	2.01
Gas Instantaneous	2.43	2.26

6.8.3 Application of Markups

The example provided below for gas water heaters illustrates how DOE used the baseline and incremental markups to derive a consumer product price in the case of replacement applications moving through the retailer channel. Assuming the baseline manufacturer cost is $160 and the change in manufacturer cost to meet a given energy conservation standard is $15, the resulting baseline consumer product cost (CPP_{BASE}) and higher energy efficient product cost (CPP_{STD}) are:

$$CPP_{BASE} = COST_{MFG} \times \left(MU_{MFG} \times MU_{RET} \times Tax_{SALES}\right)$$
$$= \$160 \times 1.31 \times 1.45 \times 1.074 = \$326$$

$$CPP_{STD} = CPP_{BASE} + \Delta COST_{MFG} \times \left(MU_{MFG} \times MU_{INCR} \times Tax_{SALES}\right)$$
$$= \$342 + (\$15 \times 1.31 \times 1.15 \times 1.074) = \$342 + \$24 = \$350$$

DOE used the overall markups for replacement and new home applications in the LCC analysis by applying the appropriate markup to products assigned to the replacement and new home market segments (see chapter 8 for discussion of this assignment).

The rebuttable payback period analysis does not distinguish between replacement and new home applications, so it requires an average overall markup for each major heating product. The average overall markup depends on the share of replacement and new home applications in total shipments. DOE derived these shares for 2013 (for direct heating equipment and pool heaters) or 2015 (for water heaters) from the Shipments Model, as described in chapter 9, and then calculated weighted-average overall markups. Tables 6.8.6 and 6.8.7 show the shares and weighted-average overall markups for each major heating product.

Table 6.8.6 Weighted-Average Overall Markups for Water Heaters

	Gas Storage WH	Electric Storage WH	Oil Storage WH	Instantaneous Gas WH
Overall Baseline Markup				
Overall markup for replacement applications	2.06	2.01	2.04	2.20
Market share of replacement applications (%)	85	80	85	70
Overall markup for new home applications	2.43	2.38	2.41	2.55
Market share of new home applications (%)	20	20	15	30
Weighted-avg overall markup	**2.24**	**2.08**	**2.10**	**2.31**
Overall Incremental Markup				
Overall markup for replacement applications	1.66	1.62	1.64	1.88
Market share of replacement applications (%)	85	80	85	70
Overall markup for new home applications	1.92	1.88	1.91	2.11
Market share of new home applications (%)	20	20	15	30
Weighted-avg overall markup	**1.80**	**1.67**	**1.68**	**1.95**

Table 6.8.7 Weighted-Average Overall Markup for Pool Heaters and Direct Heating Equipment

	Pool Heaters	Gas Wall Fan DHE	Gas Wall Gravity DHE	Gas Floor DHE	Gas Room DHE	Gas Hearth DHE
Overall Baseline Markup						
Overall markup for replacement applications	2.08	2.52	2.52	2.52	2.51	2.51
Market share of replacement applications (%)	67	90	90	100	90	50
Overall markup for new home applications	2.30	3.15	3.15	3.15	3.15	3.15
Market share of new home applications (%)	33	10	10	0	10	50
Weighted-average overall markup	**2.15**	**2.59**	**2.59**	**2.52**	**2.58**	**2.83**
Overall Incremental Markup						
Overall markup for replacement applications	1.75	2.00	2.00	2.00	1.99	1.98
Market share of replacement applications (%)	67	90	90	100	90	50
Overall markup for new home applications	1.82	2.49	2.49	2.49	2.49	2.49
Market share of new home applications (%)	33	10	10	0	10	50
Weighted-average overall markup	**1.75**	**2.05**	**2.05**	**2.00**	**2.04**	**2.24**

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