

CHAPTER 10. SHIPMENTS ANALYSIS

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CHAPTER 10. SHIPMENTS ANALYSIS

10.1 INTRODUCTION

Commercial refrigeration equipment (CRE) shipments estimates are a necessary input to the national energy savings (NES), net present value (NPV) calculations, and the manufacturer impacts analysis (MIA). This chapter describes the U.S. Department of Energy's (DOE) methodology for projecting annual shipments and presents results.

The Shipments Model results are driven primarily by historical shipment data for the 15 categories of commercial refrigeration equipment under consideration. The flow chart presented in Figure 10.1.1 outlines the structure of the Shipments Model.

The model assumes that, in each year, the existing commercial refrigeration equipment stock either ages by 1 year or breaks. Broken equipment is replaced. In addition, new equipment can be shipped into new commercial floor space, and old equipment can be removed through demolitions (not shown in the diagram).

The Shipments Model is in a Microsoft Excel spreadsheet format that is accessible on the Internet at: http://www.eere.energy.gov/buildings/appliance_standards/commercial_products.html.

Further, chapter 11, section 11.5 of this Technical Support Document (TSD), discusses how to access the Shipments Model spreadsheet and other related spreadsheets, and provides basic instructions for using them. The rest of this chapter explains the Shipments Model in more detail. Section 10.2 presents the mathematical formulation of the model, section 10.3 describes the data input to the model, and section 10.4 presents the results for the base case energy-conservation standard level scenario and discusses the development of higher standard scenarios. The energy conservation standards for commercial refrigeration equipment will set the maximum rated energy consumption for all equipment within an equipment class. DOE refers to each standard level considered as a "candidate standard level."

Shipment forecasts were determined for all of the candidate standard levels for which NES and NPV are required. DOE is considering up to five trial standard levels for each of the 15 equipment classes.

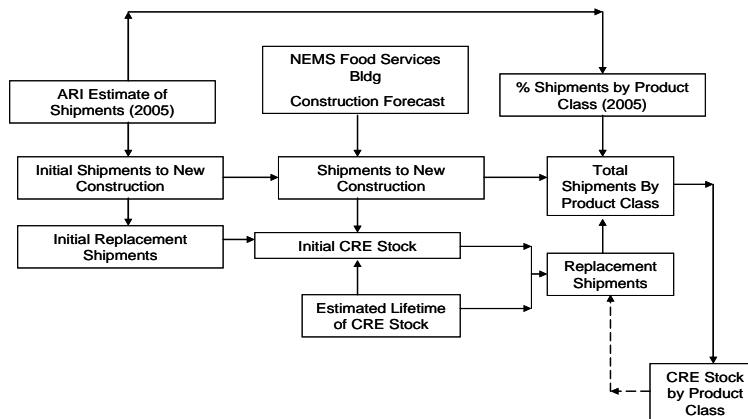


Figure 10.1.1 Flow Chart Showing Inputs to the Shipments Model

10.2 SHIPMENTS MODEL EQUATIONS

The Shipments Model is a description of commercial refrigeration equipment stock flows as a function of year and age. While there are 15 equipment classes, no coupling is assumed between them, so the equations describe each type of equipment independently.

This section begins with a definition of the different commercial refrigeration equipment stock categories. DOE formulates the equations as updates of the distribution of stock in year t as a function of age a to year $t+1$. Then, DOE presents the different purchase decisions and, in the following section, provides a description of the data sources. In the equations below, DOE first converted the equipment units to linear feet of display space cooled by those units by taking the national statistics on sales of equipment and calculating equipment capacity per linear foot of retail grocery building display space. DOE uses this calculation of existing stock, and the average age of the equipment, as a basis for calculating replacement sales. Then, DOE subtracts replacement sales from historical total sales statistics to calculate new sales of commercial refrigeration equipment. DOE forecasts new sales as a function of new construction of retail food sales space. Sales of new and replacement equipment are recorded by the year sold, and each annual vintage is depreciated over the estimated life of the equipment. Sales in each year are allocated to the 15 equipment classes in proportion to their relative historical sales.

10.2.1 Mathematical Formulation of the Shipments Model

DOE uses two commercial refrigeration equipment stock categories. The category $U_0(t,a)$ is the stock of existing units. Available information suggests that all units are assumed to have had normal repairs that do not affect the lifetime of the equipment.

In view of industry practice, available information suggests that the lifetime of a unit is 10 years in large food retailers and about 15 years in small retailers, such as convenience stores. Also, available information suggests that the initial existing stock of equipment had an average age of 5 years, based on the 10-year lifetime of a unit of equipment, and annual replacements going back 10 years. The total stock of age a in a given year t is represented by

$$U(t,a) = U_0(t,a) \tag{Eq. 10.1}$$

and the average age of the stock in year y is defined as

$$StockAge(t) = \sum_a U(t, a) \times a / \sum(U(t,a)) \tag{Eq. 10.2}$$

where:

- $U(t,a)$ = total stock of age a in a given year y ,
- $U_0(t,a)$ = stock of existing units,
- $StockAge(t)$ = average age of stock in year y ,
- a = age of stock,
- t = year.

The shipments of new stock in a given year are $U_{ship}(t)$. By definition, the age of the equipment is zero in the year that it is shipped, so that $U_{ship}(t) = U(t,0)$.

10.2.2 Stock Events

In the transition from year t to year $t+1$, two things could happen to the stock of commercial refrigeration equipment:

- existing equipment could break or be removed during a store renovation and be replaced
- the stock could simply age by one year.

In the model, early replacements (i.e., existing equipment that is replaced before it has broken) are not considered, and all broken equipment are assumed to be replaced. The following sections present the equations used to represent each possible event.

10.2.2.1 Replacing Equipment

DOE determines the probability that commercial refrigeration equipment of age a from stock U_0 will break or will be replaced using a Weibull survival distribution function $PB_0(a)=W(8,10.62)$ for large food sales (which results in a 10-year average lifetime, a minimum lifetime of about 7 years, and a maximum lifetime of about 13 years, consistent with industry comments). $PB_0(a)=W(8,16)$ for small food service outlets, i.e., convenience stores with and without gas stations (which results in an average lifetime of 15 years, with a minimum of about 9 years and a maximum of about 20 years, again consistent with industry comments). Similarly, the probability that equipment of age a from stock U_1 will break is given by the same function $PB_1(a)$. These probabilities do not depend on the model year t . DOE defines the quantities of replaced equipment as

$$UB(t, a) = PB_0(a) \times UB_0(t,a) \tag{Eq. 10.3}$$

where:

- $UB_0(t,a)$ = stock of existing units,

$PB_0(a)$ = probability that stock of existing units will break, or will be replaced,
 $U_0(t,a)$ = stock of existing units,
 a = age of stock,
 t = year.

All broken or obsolete units (removed during store renovations) are assumed to be replaced.

10.2.2.2 New Equipment

New commercial refrigeration equipment will be purchased to replace the units described above. Available information suggests that the purchase of new equipment that would go into new buildings is driven by the rate of construction of grocery floor space.

By definition:

$$EFS(t+1) = EFS(t) + NFS(t) - DFS(t) \quad \text{Eq. 10.4}$$

where:

$EFS(t)$ = the square footage of existing grocery floor space in year t ,

$NFS(t)$ = the square footage of new grocery floor space added in year t
(described in section 10.3.3),

$DFS(t)$ = the square footage demolished in year t (described in section 10.3.3.1).

The linear footage of units going into new buildings is

$$UN(t) = UN(t) \times A_0 \times NFS(t) / NFS(0) \quad \text{Eq. 10.5}$$

where:

$UN(t)$ = the number of units going into new buildings in year t ,

A_0 = an overall scale factor that accounts for the number of units covered by the standard, which are not used in all commercial building types; the default value for A_0 is 1.0, but values of 0.5 and 1.5 are used for sensitivity testing.

DOE has no information on the variation in the market saturation of commercial refrigeration equipment by building type or over time. Therefore, in the model, the purchase of new equipment is driven by the construction of new floor space and that broken or removed equipment is replaced on a one-for-one basis.

10.3 DATA INPUTS

10.3.1 Historical Shipments

Historical shipments are necessary to calibrate a shipments model to the existing market. DOE's primary source of historical data for shipments of refrigeration equipment is a market study by Freedonia, Inc.¹ *Commercial Refrigeration Equipment to 2008*. The data provided in this report are aggregated at a high level with regard to equipment categorization and provide

only an estimate of shipments based on valuation data and estimated prices (valuation data similar to the U.S. census bureau data shown in chapter 3, Market and Technology Assessment). As discussed in chapter 3, the available Census Bureau data showed substantial variation in shipment valuations between the survey years, indicative of large variations in overall shipments of commercial refrigeration equipment by year. The Air-Conditioning and Refrigeration Institute (ARI) provided DOE with shipments data broken out by specific CRE equipment class for 1 year (2005) that allowed DOE to allocate sales of equipment to equipment classes. These data are also shown in chapter 3.

Within each of the equipment categories, the shipments data must be disaggregated into detailed equipment and temperature ranges for the shipment analysis. The ARI shipment ranges and equipment categories are defined in a way that allowed DOE to disaggregate the data into the 15 equipment classes of interest. For the purpose of the NOPR, DOE has used the ARI data as a starting estimate for its shipments analysis.

10.3.2 Historical Shipped Linear Feet

Historical linear feet of shipped units depicts the annual amount of commercial refrigeration equipment capacity shipped and is an alternative way to express shipments data. DOE determined the linear feet shipped for any given year by multiplying each unit shipped by its associated average length, and then summing all the linear footage values.

DOE converted the ARI data on shipped units in each equipment class to percent of total shipped linear feet of commercial refrigeration equipment for use in the Shipments Model. This established the commercial refrigeration equipment market share attributed to each equipment class. The market share calculation, and its use in forecasting shipments, is explained in section 10.3.3.1. DOE calculated the percent of shipped linear footage by dividing the linear footage shipped for each equipment class by the overall linear footage shipped for all commercial refrigeration equipment covered in this rulemaking.

Table 10.3.1 summarizes DOE's estimated division of historical annual shipments into the new, replacement, and large food sales versus small food sales.

Table 10.3.2 shows the forecasted square footage of new construction used to scale annual new CRE shipments. Square footage of additions to stock goes up and down from year to year. The year 2009 value was assumed to be the same as in 2006.

Table 10.3.1 Estimated Distribution of Linear Feet of CRE Shipments among New vs. Replacement Equipment and Large vs. Small Food Sales Outlets in 2005*

| | Replacements | New | Total |
|--------------------------|---------------------|------------|--------------|
| Large Food Retail | 69.2% | 15.9% | 85.0% |
| Small Retail | 12.2% | 2.8% | 15.0% |
| Total | 81.3% | 18.7% | 100.0% |

* Calculated from ARI data

Table 10.3.2 AEO 2007 forecast of New Food Sales Square Footage

| Year | New Construction (Million Square Feet) |
|------------------------------------|---|
| 2009 | 30.234 |
| 2010 | 30.679 |
| 2015 | 32.968 |
| 2020 | 34.979 |
| 2025 | 39.723 |
| 2030 | 42.073 |
| Annual Growth Factor, 2030-2042 | 1.86% |

DOE used the ARI shipment data to derive shipped linear footage for each of 15 smaller equipment classes, based on 10 possible equipment families, two possible equipment operating modes (remote condensing or self-contained), and three rated temperature applications (medium, low, and ice cream). Table 10.3.3 presents the typical equipment class lengths used for the conversion of per-unit shipments to linear footage within each equipment class. The premises below include data for some CRE equipment classes, which were not explicitly analyzed in the life-cycle cost analysis, but for which shipments were reported by ARI, including small-shipment

Table 10.3.3 Equipment Linear Dimensions Assumed for Shipments Analysis

| Equipment Class ^a | Assumed Length (ft) | Basis |
|------------------------------|---------------------|---|
| VOP.RC.M | 10 | Average of 8 ft and 12 ft, Manufacturer Interviews |
| VOP.RC.L | 10 | Average of 8 ft and 12 ft, Manufacturer Interviews |
| VOP.SC.M | 4 | Baseline Equipment used for Engineering Analysis |
| SVO.RC.M | 10 | Average of 8 ft and 12 ft, Manufacturer Interviews |
| SVO.SC.M | 4 | Baseline Equipment Used for Engineering Analysis |
| HZO.RC.M | 10 | Average of 8 ft and 12 ft, Manufacturer Interviews |
| HZO.RC.L | 10 | Average of 8 ft and 12 ft, Manufacturer Interviews |
| HZO.SC.M | 4 | Baseline Equipment Used for Engineering Analysis |
| HZO.SC.L | 4 | Baseline Equipment Used for Engineering Analysis |
| VCT.RC.M | 10 | Average of 3 door and 5 door (30" per door), MFG Interviews |
| VCT.RC.L | 10 | Average of 3 door and 5 door (30" per door), MFG Interviews |
| VCT.SC.I | 5 | Baseline Equipment Used for Engineering Analysis |
| VCS.RC.M | 5 | Engineering Estimate |
| VCS.RC.L | 5 | Engineering Estimate |
| VCS.RC.I | 5 | Engineering Estimate |
| VCS.SC.I | 5 | Baseline Equipment Used for Engineering Analysis |
| HCT.RC.M | 5 | Engineering Estimate |
| HCT.RC.L | 5 | Engineering Estimate |
| HCT.RC.I | 5 | Engineering Estimate |
| HCT.SC.I | 3.4 | Baseline Equipment Used for Engineering Analysis |
| HCS.RC.M | 5 | Engineering Estimate |
| SOC.RC.M | 8 | Average of 4 ft, 8ft, 12 ft, all common equipment lengths |
| SOC.RC.L | 8 | Average of 4 ft, 8ft, 12 ft all common equipment lengths |

* Equipment class designations consist of a combination (in sequential order separated by periods) of a equipment family code (VOP=vertical open, SVO=semivertical open, HZO=horizontal open, VCT=vertical transparent doors, VCS=vertical solid doors, HCT=horizontal transparent doors, HCS=horizontal solid doors, or SOC=service over counter), an operating mode code (RC=remote condensing or SC=self-contained), and a rating temperature code (M=medium temperature (38°F), L=low temperature (0°F), or I=ice-cream temperature (-15°F)). For example, "VOP.RC.M refers to the "vertical open, remote condensing, medium temperature" equipment class. See chapter 3, market and technology assessment, for a more detailed explanation of the equipment class terminology

design classes as well as equipment designed to operate at 45°F, 20°F, and 10°F product temperatures. DOE presumed that equipment designed to operate at these latter design temperatures would have similar dimensions as for the medium, low, and ice cream temperature categories, respectively. DOE was then able to estimate the annual linear footage shipped for each of the 15 equipment classes and the entire set of commercial refrigeration equipment. Total linear footage shipped within the 15 equipment classes analyzed accounted for 99.9 percent of the total linear footage shipped in the medium, low, and ice cream temperature categories and 98.7 percent of the linear footage shipped at all temperatures. The shipments analysis relies on the 15 equipment classes to represent the CRE market. **Error! Not a valid bookmark self-reference.** shows the fraction of the linear footage shipped by each of these 15 equipment classes.

10.3.3 Commercial Grocery Display Space and Market Saturation

The amount of commercial floor space is the main driver for commercial refrigeration equipment shipments and is appropriately one of the basic inputs into the Shipments Model. As discussed in section 10.2.2, the model divides commercial display space into two components: display space from new construction floor space (NFS), and existing display floor space (EFS).

For this analysis, commercial square footage with commercial refrigerated display space refers to both new and existing stock of food sales buildings.

Table 10.3.4 Percent of Shipped Linear Feet of Commercial Refrigeration Equipment

| Equipment Class | Percentage of Shipped Units |
|---|-----------------------------|
| Vertical Open.Remote Condensing.Medium (VOP.RC.M) | 25.9% |
| Vertical Open.Remote Condensing.Low (VOP.RC.L) | 1.3 |
| Vertical Open.Self Contained.Medium (VOP.SC.M) | 1.7 |
| Vertical Closed Transparent.Remote Condensing.Medium (VCT.RC.M) | 1.9 |
| Vertical Closed Transparent.Remote Condensing.Low (VCT.RC.L) | 25.7 |
| Vertical Closed Transparent.Self Contained. Ice Cream (VCT.SC.I) | 0.6 |
| Vertical Closed Solid.Self Contained.Very Low (VCS.SC.I) | 0.2 |
| Semi-Vertical Open.Remote Condensing.Medium (SVO.RC.M) | 19.8 |
| Semi-Vertical Open. Self Contained.Medium (SVO.SC.M) | 2.6 |
| Service Over Counter.Remote Condensing.Medium (SOC.RC.M) | 5.0 |
| Horizontal Open.Remote Condensing.Medium (HZO.RC.M) | 3.1 |
| Horizontal Open.Remote Condensing.Low (HZO.RC.L) | 9.5 |
| Horizontal Open.Self Contained.Medium (HZO.SC.M) | 0.2 |
| Horizontal Open.Self Contained.Low (HZO.SC.L) | 0.5 |
| Horizontal Closed Transparent.Self Contained.Ice Cream (HCT.SC.I) | 2.1 |
| | 100.0% |

Sources: ARI and CRE framework meeting comments

10.3.3.1 Floor Space – New Construction

DOE took the projected floor space construction after the year 2003 from the National Energy Modeling System (NEMS) projection published in the *Annual Energy Outlook 2007 (AEO 2007)*.² AEO 2007 lists the projections for years 2009, 2010, 2015, 2020, 2025, and 2030. For unlisted years in this range, DOE derived NFS data by linear interpolation of the existing years. Beyond 2030, DOE extrapolated NFS from the 10-year trend of NEMS projected data between 2020 and 2030.

The total of new display space is the estimated total shipments in linear feet for 2006, times an index of new construction of square feet of food sales buildings for each future year, divided by its 2006 value. All existing display space is presumed to be replaced when demolished.

10.3.3.2 Market Shipments

DOE used the above shipments data to estimate the market shipments in year t of each commercial refrigeration equipment class y , $MKTSHIP(t,y)$, defined in terms of linear feet of display space occupied by the new and replacement shipments of equipment class y . Because the percent of shipments in each class is relatively constant over time and the lifetime of each class is the same, the ratio of shipments to a class is indicative of the market share for that class, $MKT(y)$. DOE estimated the $MKT(y)$ for a particular equipment class to be a constant value equal to the average of the yearly percent historical shipments to that class. These percentages are reported in **Error! Reference source not found.**

$$MKTSHIP(t,y) = MKT(y) \times (UN(t) + UB(t)) \quad \text{Eq. 10.6}$$

Where:

$MKTSHIP(t,y)$ = total market shipments, in linear feet of display space, of equipment class y in year t ,

$MKT(y)$ = percentage of total market shipments in equipment class y ,

$UN(t)$ = total shipments to new buildings in year t ,

$UB(t)$ = total replacement shipments in year t .

10.3.4 Equipment Utility

The equipment utility is a measure of the economic value of a linear foot of commercial refrigeration equipment to the customers. This is the value associated with energy savings. Because there are not enough historical data available on the commercial refrigeration equipment market to develop and calibrate a full demand and supply model, economic factors are used to calculate annualized cost and calibrate market shares for the Shipments Model and are discussed below.

10.3.5 Equipment Price

Equipment price is the price paid by the customer for a unit of commercial refrigeration equipment. It includes both the purchase price of the equipment and installation costs. DOE converts the equipment price to a price per linear-foot-cooled based on the length of the equipment class.

As discussed in the engineering analysis (chapter 5) and the life-cycle cost and payback period analysis (chapter 8), equipment prices in this analysis are a function of energy consumption level). DOE based equipment price projections on energy consumption level, but did not develop estimates of market trends in efficiency. DOE developed a mix of energy consumption levels for the base case (i.e., the case without new energy conservation standards)

and for each candidate standard level envisioned. The efficiency mixes are discussed in detail in chapter 11, section 11.2.2.1.

10.3.5.1 Operating Costs

Operating costs consist of maintenance costs, repair costs, and energy costs.

Maintenance and Repair Costs. Each unit of commercial refrigeration equipment incurs yearly routine maintenance and standard repair costs. DOE converted these costs to a cost per unit and per linear foot of cooling capacity for each equipment class. Because DOE has very little information on either current or potential maintenance costs, an assumption was entered into the NOPR analysis of \$156/year/ unit (2007\$) for basic maintenance from *R S Means Cost Works*, to which is added a figure for lighting maintenance, which varies with the amount of efficient LED lighting added (see chapter 8, section 8.2.3.4). Whereas basic maintenance cost is assumed independent of refrigeration equipment class and energy efficiency, repair costs are potentially a function of both (see chapter 8, section 8.2.3.3). Thus, both projections for maintenance costs and repair costs are projected to increase with increasing energy-efficiency standards levels. Both maintenance and repair costs are discussed in detail in chapter 11, section 11.3.2.2.

Energy Costs. The annual energy costs for a single CRE unit depend on the annual energy use per linear foot given the energy consumption level of the unit (energy use intensity or EUI), and the price of electricity. The determination of the EUI for an individual CRE unit is discussed in chapters 6 and 7, and the development of electricity prices is discussed in the life-cycle cost and payback period analysis (chapter 8, section 8.2.3.1). Coupling the EUI with electricity price data enables DOE to derive the annual per unit energy cost for each energy consumption level. Chapter 8 discusses how the EUI data are combined with the electricity price data to derive annual electricity costs.

Available information suggests that the average annual energy costs for any given year change as the average efficiency of the shipped units improves. In any given year, there is a distribution of energy consumption levels for shipped equipment and the Shipments Model uses the shipment-weighted average efficiency for that given year. DOE based its projections of annual energy cost for each equipment class on the mix of energy consumption levels projected within that class, the total shipments for the equipment class, and future electricity prices. DOE developed a mix of energy consumption levels representative of the base case (i.e., the case without new efficiency standards) and for each candidate standard level. As noted earlier, the mix of energy consumption levels within each equipment class is discussed in detail in chapter 11, section 11.2.2.1. The impact of the mix of energy consumption levels on the average per unit energy costs for shipments within an equipment class is also discussed in detail in chapter 11, section 11.2.2.1.

The mix of energy consumption levels allow for the determination of projected annual energy costs in 2007 dollars as a function of candidate standard level. To factor in the impact of future electricity prices, DOE used electricity price projections from the *AEO 2008* to appropriately scale the above projected energy costs (for scaling purposes, the scaling factor for the year 2007 equals 1.0).

10.3.5.2 Discounted Costs

When a decision is made to purchase commercial refrigeration equipment, an energy-conscious purchasing agent will consider the total lifetime cost of the equipment. Typically, these lifetime costs are discounted to represent the present value of these costs. DOE discounted the total operating costs (i.e., maintenance, repair, and energy costs) over the full lifetime of the equipment. Commercial refrigeration equipment lifetimes range from 1 to as many as 20 years, but based on discussions with industry, the typical value is 10 years in large food retailers and 15 years in small retailers, usually based on the fact that large grocery stores are either renovated or the refrigeration equipment is replaced for aesthetic reasons at about 10-year intervals, but that small food retailers usually try to make their equipment last longer and update less frequently (see chapter 8 for further details).

10.4 RESULTS

Table 10.4.1 shows the shipments forecast for the commercial refrigeration equipment classes for the base case energy consumption level (or Level 1) divided into new and replacement units for large and small food sales outlets.

Table 10.4.2 shows total shipments by equipment type.

Table 10.4.1 Forecasted Shipments of New and Replacement Commercial Refrigeration Equipment for Large and Small Food Sales Outlets, 2012-2042 (Base Case)

| Division | Thousands of Linear Feet Shipped by Year and Equipment Class | | | | | | | | |
|--------------------------|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------------|
| | 2012 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2042 | Cumulative |
| New Large | 249 | 256 | 271 | 308 | 327 | 358 | 393 | 407 | 9830 |
| New Small | 44 | 45 | 48 | 54 | 58 | 63 | 69 | 72 | 1,735 |
| Replacement Large | 1,269 | 1,201 | 1,254 | 1,282 | 1,385 | 1,480 | 1,641 | 1,708 | 42,535 |
| Replacement Small | 188 | 193 | 189 | 181 | 191 | 202 | 210 | 217 | 6,027 |
| Total | 1,750 | 1,694 | 1,763 | 1,826 | 1,960 | 2,103 | 2,313 | 2,404 | 60,125 |

Table 10.4.2 Forecasted Shipments for Commercial Refrigeration Equipment, 2012-2042, Level 1 (Base Case)

| Equipment Class | Thousands of Linear Feet Shipped by Year and Equipment Class | | | | | | | | Cumulative |
|-----------------|--|-------|-------|-------|-------|-------|-------|-------|------------|
| | 2012 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2042 | |
| VOP.RC.M | 453 | 439 | 457 | 473 | 508 | 545 | 599 | 623 | 15,576 |
| VOP.RC.L | 23 | 22 | 23 | 24 | 25 | 27 | 30 | 31 | 779 |
| VOP.SC.M | 30 | 30 | 31 | 32 | 34 | 37 | 40 | 42 | 1,047 |
| VCT.RC.M | 32 | 31 | 33 | 34 | 36 | 39 | 43 | 44 | 1,112 |
| VCT.RC.L | 450 | 436 | 454 | 470 | 504 | 541 | 595 | 619 | 15,472 |
| VCT.SC.I | 11 | 11 | 11 | 12 | 12 | 13 | 15 | 15 | 382 |
| VCS.SC.I | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 94 |
| SVO.RC.M | 346 | 335 | 348 | 361 | 387 | 416 | 457 | 475 | 11,881 |
| SVO.SC.M | 46 | 44 | 46 | 48 | 51 | 55 | 60 | 63 | 1,568 |
| SOC.RC.M | 87 | 84 | 88 | 91 | 98 | 105 | 115 | 120 | 2,995 |
| HZO.RC.M | 53 | 51 | 54 | 55 | 60 | 64 | 70 | 73 | 1,826 |
| HZO.RC.L | 167 | 162 | 168 | 174 | 187 | 201 | 221 | 230 | 5,740 |
| HZO.SC.M | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 135 |
| HZO.SC.L | 8 | 8 | 8 | 8 | 9 | 10 | 11 | 11 | 280 |
| HCT.SC.I | 36 | 35 | 36 | 38 | 40 | 43 | 48 | 49 | 1,238 |
| Total | 1,750 | 1,694 | 1,763 | 1,826 | 1,960 | 2,103 | 2,313 | 2,404 | 60,125 |

As equipment purchase price increases with lower energy consumption levels, a drop in shipments could be expected relative to the base case. Although there is a provision in the spreadsheet for a change in shipments as the efficiency level increases (or energy consumption level decreases), DOE has no information with which to calibrate such a relationship. Therefore, for the NOPR analysis, DOE presumes that the shipments do not change in response to candidate standard levels.

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