

## APPENDIX F. SHIPMENTS SPREADSHEET

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## APPENDIX F. SHIPMENTS SPREADSHEET

### F.1 INTRODUCTION

The Water Heater Shipments Spreadsheet contains all of the necessary input information and calculations to forecast water heater shipments by fuel type for a set of regulatory scenarios (trial standard levels). The spreadsheet is contained in a Microsoft Excel 97 file. The filename is **Shipments.xls**.

### F.2 WORKSHEETS

#### F.2.1 Start

This worksheet provides an outline of the contents of the spreadsheet. In addition, it serves as the ‘user interface’ for updating and modifying model parameters (see Section F.3 below).

#### F.2.2 Reference

This worksheet describes of the sources of key input data, and the mathematical form of the model which predicts fuel-type market shares to new housing.

#### F.2.3 Input Worksheets

There are several worksheets which contain data from other sources which are used in the calculation of shipments predictions. These are:

##### F.2.3.1 Engineering

The engineering worksheets contain water heater equipment and energy consumption data for design options of varying efficiency. This data comes directly from the Life Cycle Cost analysis. Each trial standard level is composed of a combination of one design option for each fuel type (see Tables 9.7.1, 9.7.2, 9.7.3 and 9.7.4 in Section 9.7 for definitions of trial standard levels). The configuration defining each trail standard level is contained explicitly in the engineering worksheets. The engineering worksheets also contains an estimate of market share by efficiency level, which is used along with the other data to calculate average values of equipment cost and energy consumption for each trial standard level.

##### F.2.3.2 Price Projections

This worksheet contains fuel prices for each year from 1980 to 2030. Predictions of future prices are given for four cases: Reference, Low and High growth scenarios from *Annual Energy Outlook 2000 (AEO2000)*, and a projection provided by the Gas Research Institute. The user can select which scenario to use via a pull-down menu on the ‘START’ worksheet (see Section F.3).

### **F.2.3.3 Housing and Income**

This worksheet is similar to the ‘Price Projections’ worksheet. It contains predictions of new housing starts and average household income for the *AEO2000* Reference, Low and High Growth Cases.

### **F.2.3.4 Energy Price**

This worksheet contains the user’s selection of fuel price, housing and income data from the ‘Price Projections’ and ‘Housing and Income’ worksheets (see Section F.3). In the case that fuel price projections from the Gas Research Institute are selected, housing and income predictions are taken from the *AEO2000* Reference Case.

### **F.2.3.5 Retirement Function**

This worksheet contains data relating to the forecast of water heater replacements. The retirement function gives the probability that a water heater will fail, and therefore need replacement, depending on how old it is.

## **F.2.4 Calculation Worksheets**

These worksheets perform all of the calculations necessary to forecast water heater shipments. The algorithm of the model is implemented by applying formulas to input data contained in the above worksheets. The calculation worksheets also serve a ‘bookkeeping’ function, displaying intermediate results for each year and water heater fuel type.

### **F.2.4.1 Market Share New**

This worksheet implements the fuel-type market share model. The model consists of an econometric calculation which depends on equipment costs and energy consumption taken from the ‘Engineering’ worksheets, as well as fuel price, housing and income data taken from the ‘Energy Price’ worksheet.

### **F.2.4.2 Elec WH**

This worksheet calculates the total number of electric water heaters shipped, for each year in the forecast period. It uses the ‘Retirement Function’ worksheet to keep track of how many electric water heaters are replaced, and keeps track of the age of the remaining stock. It also calculates the number of electric water heaters which are shipped to new housing, based on the housing data contained in ‘Energy Price’ and the electric water heater market share calculated in ‘Market Share New’.

### **F.2.4.3 Gas WH**

Same as ‘Elec WH’, for gas water heaters.

### **F.2.4.4 Oil WH**

Same as ‘Elec WH’, for oil water heaters.

### **F.2.4.5 LPG WH**

Same as ‘Elec WH’, for LPG water heaters.

## **F.2.5 Output Worksheets**

These worksheets provide the user with both detailed and at-a-glance results. They also provide output data to the National Energy Savings analysis.

### **F.2.5.1 Shipment Summary**

This worksheet contains the results of the calculations worksheets. Annual shipments are listed for each trial standard level by fuel type, for the period 1981-2030. The ‘Shipment Summary’ worksheet serves as the primary output data used by the National Energy Savings spreadsheet described in Appendix G.

### **F.2.5.2 ChartBase**

This chart displays each year’s shipments of each fuel type for the Base Case scenario.

### **F.2.5.3 Chart1-4**

These charts display each year’s shipments of each fuel type for Trial Standard Levels 1 through 4.

### **F.2.5.4 Charts-fuel**

There is one chart for each fuel type - each chart displays annual shipments for the base case scenario and all trial standard levels.

### **F.2.5.5 Chart - Incremental**

These charts are identical to ‘Charts-fuel’, except that each shows the *difference* in shipments between a given trial standard level and the base case scenario.

### **F.3 USING THE SPREADSHEET**

The 'Shipments Summary' worksheet contains the results of the water heater shipments forecast for a reference case of assumptions and inputs. In order to provide more flexibility, the spreadsheet facilitates some user modifications to the model. These modifications are controlled from the 'START' worksheet. The user may select a particular macroeconomic forecast which determines fuel prices, housing construction and income data to be used by the model. The user may also directly input new values for implicit discount rates, which quantify consumer preference for immediate, over delayed savings. The trial standard level represented in the calculation worksheets is also controlled from the 'START' worksheet.

The 'Update' button reruns all model calculations and summarizes the result in the 'Shipments Summary' worksheet. The user must click on the 'Update' button in order to implement desired modifications. The user should also update the spreadsheet whenever it is first opened, in order to be certain that the results listed in 'Shipment Summary' really correspond to the parameters selected.