APPENDIX 10-A. USER INSTRUCTIONS FOR SHIPMENTS AND NATIONAL IMPACT ANALYSIS SPREADSHEET MODELS

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APPENDIX 10-A. USER INSTRUCTIONS FOR SHIPMENTS AND NATONAL IMPACT ANALYSIS SPREADSHEET MODEL

10-A.1 USER INSTRUCTIONS

The results obtained in the shipments analysis and the national impact analysis (NIA) can be examined and reproduced using the Microsoft Excel spreadsheet available on the U.S. Department of Energy's (DOE)'s website at:
http://www1.eere.energy.gov/buildings/appliance_standards/commercial/electric_motors.html.

The shipments model is in the spreadsheet called "MEM_Prelim_Shipments_Model.xls," and the NIA in the spreadsheets "MEM_Prelim_NIA_Summary.xlsm," "MEM_Prelim_NIA_DesignAB.xlsx," "MEM_Prelim_NIA_DesignC.xlsx" and "MEM_Prelim_NIA_FirePump.xlsx." These spreadsheets implement the calculations described in Chapters 9 and 10. Further, the NIA spreadsheets enable the user to simulate national impacts under different parameters and scenarios. To run the spreadsheets the user needs to have Microsoft Excel 2007 or a later version.

10-A.1.1 Shipments Model Spreadsheet Description

The shipments model spreadsheet performs calculations to forecast the shipments of motors covered by the rulemaking. The methodology for developing the shipments model is described in Chapter 9. The shipments model spreadsheet, or workbook, consists of the following worksheets:

(a) <u>Shipments</u>: Calculates and provides a summary of the shipment forecasts for the entire analysis period (2015-2044) and beyond.

(b) <u>Invest. vs. Ship.</u>: Presents how DOE developed a relationship between shipments and private fixed investment in selected equipment and structure.

(c) <u>Invest. vs. Tol. Invest.</u>: Calculates projections for private fixed investment in equipment and structure for selected sectors.

(d) <u>Tot. Invest. vs. GDP</u>: Calculates projections for total private fixed investment.

(e) <u>Census</u>: Presents the Census data used to develop the historical shipments index

10-A.1.2 National Impact Analysis Spreadsheets Description

The NIA spreadsheets perform calculations to forecast the changes in national energy savings (NES) and net present value (NPV) due to an energy efficiency standard. For a standard set at a given candidate standard level (CSL), the energy consumption and the costs associated with each equipment class, as well as the corresponding NES and NPV results rely on the

shipments estimated in the shipments spreadsheet and on calculation performed by three *accountability spreadsheets*, each dedicated to a specific equipment category. A fourth, *summary spreadsheet* provides the accountability spreadsheets with general parameters and tables, and summarizes their results. Figure 10-A.1.1 presents the general organization and interactions between the spreadsheets comprising the NIA model. The following subsections describe, respectively, the worksheets comprising the summary and the accountability spreadsheets, and provide instructions to operate the NIA model.
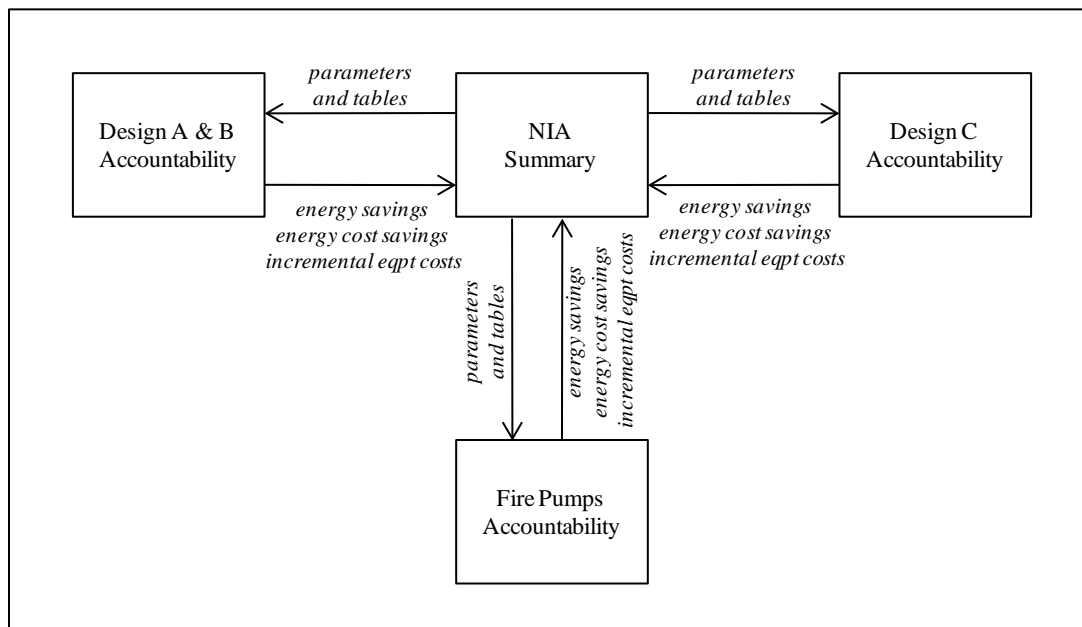

Figure 10-A.1.1   National lmpact Analysis Spreadsheets Architecture

10-A.1.2.1 Summary Spreadsheet Organization

The summary spreadsheet consists of the following six worksheets which support the accountability spreadsheets and summarize their results.

(a) Lifetime: Presents, for each equipment category, motor survival probabilities by sector and horsepower (HP) range.

(b) Efficiency Tables: Presents, for each equipment category, the efficiency levels by CSL and equipment class.

(c) General Tables & Parameters: Presents all tables and single-value parameters used by the accountability spreadsheets.

(d) Shipments: Presents total historical and forecast shipments, as well as shipment distributions across equipment class groups, and motor HP and configuration.

(e) <u>Summary</u>: Enables the user to select CSLs, scenarios and sensitivity levels to be simulated by the accountability spreadsheets, and summarize their results.

(f) <u>Scenario Results</u>: Automatically simulates pre-determined combinations of scenarios and sensitivity levels, and summarize results in a pivot-table.

10-A.1.2.2 Accountability Spreadsheets Organization

The accountability spreadsheets consist of the following 11 worksheets which calculate the national energy savings, the national energy cost savings, and the national (non-energy) incremental equipment costs for all equipment classes of each equipment category.

(a) <u>Shipments</u>: Presents the base case shipments forecast by sector for all equipment classes, and estimates shipments for the standards case scenario (in this version, equal to the base case).

(b) <u>Efficiency Distribution</u>: Presents the base case energy efficiency distribution by motor HP, and calculates the corresponding distributions to the standards case according to the CSL selected in the Summary spreadsheet.

(c) <u>Unit Energy Consumption</u>: Calculates, for all equipment classes and efficiency levels, the lifetime source energy consumption of a unit shipped in each year of the analysis period, according to the sector to which it is shipped and the application for which it is used.

(d) <u>Natl Energy Consumption</u>: Calculates, for all equipment classes, the base case and the standards case national lifetime energy consumption and losses from units shipped in each year of the analysis period. The calculation is disaggregated by sector and application.

(e) <u>Natl Energy Savings</u>: Calculates, for all equipment classes, the national energy savings by sector.

(f) <u>Unit Energy Cost</u>: Calculates, for all equipment classes and efficiency levels, the lifetime energy cost of a unit shipped in each year of the analysis period, according to the sector to which it is shipped and the application for which it is used.

(g) <u>Natl Energy Cost</u>: Calculates, for all equipment classes, the base case and the standards case national lifetime energy costs from units shipped in each year of the analysis period. The calculation is disaggregated by sector and application.

(h) <u>Natl Energy Cost Savings</u>: Calculates, for all equipment classes, the present-value of the national energy cost savings by sector.

(i) <u>Unit Eqpt Costs</u>: Calculates, for all equipment classes and efficiency levels, the lifetime non-energy equipment costs of a unit shipped in each year of the analysis period, according to the sector to which it is shipped.

(j) <u>Natl Eqpt Costs</u>: Calculates, for all equipment classes, the base case and the standards case national lifetime non-energy equipment costs from units shipped in each year of the analysis period. The calculation is disaggregated by sector and application.

(k) <u>Natl Eqpt Incr Costs</u>: Calculates, for all equipment classes, the present-value of the national (non-energy) incremental equipment costs by sector.

10-A.1.2.3 National Impact Analysis Spreadsheet Operating Instructions

Basic instructions for operating the NIA spreadsheet are as follows:

1. After downloading the NIA set of spreadsheet files from DOE's website, open the Summary file using Excel. Once loaded, this spreadsheet will ask if the user wants to open the additional files. If you intend only to see the existing results, the answer maybe "No." However, if you plan to do your own simulations you must answer with "Yes," in which case Excel will automatically open the three additional accountability spreadsheet files and activate back the Summary spreadsheet.

2. If you intend only to see the existing results, click on the tab for the worksheet "Scenario Results." To select results for specific combinations of parameters and scenarios one can either use: (a) the filtering feature in the column headers, or (b) the pivot-table located at the right side of the results listing.[a]

3. If you intend to run your own simulations, there are two options: (a) running the model for a specific combination of parameters and scenarios, and (b) running the model for pre-determined combinations of parameters and scenarios. The two options can be operated as follows:

   (a) For a specific combination of parameters and scenarios:

   Click on the tab for the worksheet "Summary." This worksheet serves as the user interface for running the model for a particular combination of parameters and scenarios. To provide flexibility, the spreadsheet permits some user modifications to the model. The user may select a particular:

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[a] To learn more on how to use Excel pivot-tables refer to "PivotTable I: Get started with PivotTable reports in Excel 2007" in <http://office.microsoft.com/en-us/excel-help/pivottable-i-get-started-with-pivottable-reports-in-excel-2007-RZ010205886.aspx>.

- *Discount rate*, which enables the user to set a discount rate (in percentage) and affects the present-values of energy savings and incremental equipment (non-energy) costs;
- *Economic growth* which enables the user to select an annual economic outlook (AEO) macroeconomic forecast and determines the electricity prices to be used by the model;
- *Product price trend*, which enables the user to select a scenario of motor price trends and affects motor manufacturer selling prices (MSPs) over the analysis period;
- *Energy Savings*, which enables the user to select whether the energy savings are to be reported as source energy savings or as full-fuel-cycle energy savings;
- *CSLs*, which enables the user to select a CSL as the standard level for each equipment category, and affects the standards case efficiency distribution; and
- *Sensitivity*, which enables the user to change (with a direct multiplier) all motors MSP, repair cost and operating hours values, and affects energy consumption and costs, as well as equipment non-energy costs.

Once the desired parameters are set, the user should start the spreadsheet calculation. This can be done either by pressing F9 or navigating through the Excel menu as follows: Formulas >> Calculate Now.

(b) For pre-determined combinations of parameters and scenarios:

Click on the tab for the worksheet "Scenario Results." This worksheet can automatically calculate results for all equipment class groups, CSLs, and discount rates considering all Reference scenarios. It can further extend these calculations to selected alternative scenarios (including scenarios for sensitivity analysis). To enable the automatic calculation one must answer "Yes" to the "Recalculate all?" question, or otherwise the worksheet will just show the results from the earlier run (see item 2 above on how to examine results from a model run). After answering with a "Yes" to the "Recalculate all?" message, the following alternatives will be posted to the user:

- "Only Reference scenarios?"
  Yes: simulate only the Reference economic growth and the Constant product price trend scenarios
  No: enables the selection of additional scenarios to be simulated (see the next item).

- "Select scenarios to simulate:"
  "E=Economic growth,"
  "F=Source/FFC savings,"
  "P=Prod price trend,"
  "*=All"

E: simulates the Low- and High AEO economic growth scenarios, in addition to the Reference one

F: calculates both source and full-fuel-cycle energy savings

P: simulates the Decreasing and Increasing product price trend scenarios, in addition to the Constant one

*: simulates all economic growth and product price trend scenarios.

- "Include sensitivity analysis?"
  Yes: enables the user to setup the sensitivity level to be simulated (see the next item)
  No: only the reference values for hours of operation, MSP and repair cost will be simulated.

- "Enter percentage:"
  Enables the user to type the percentage corresponding to the desired sensitivity level to be simulated (for example, to simulate hours of operation, MSP and repair cost values 10 percent lower and higher than the former values just enter the number 10).

- "Run:"
  "<…> scenarios,"
  "<yes/no> sensitivity analysis."
  This message summarizes what it will be simulated. To start the simulation process, click Ok; otherwise, click Cancel.

During the simulation process, messages in the left side of the lower message bar will report the process progress and an estimate of the remaining time. Once the simulation is over, the user can then examine the results (see item 2 above on how to examine results from a model run).