APPENDIX 8A. USER INSTRUCTIONS FOR LIFE-CYCLE COST SPREADSHEET

TABLE OF CONTENTS

LIST OF TABLES

APPENDIX 8A. USER INSTRUCTIONS FOR LIFE-CYCLE COST SPREADSHEET

8A.1 INTRODUCTION

Detailed results of the life-cycle cost (LCC) and payback period (PBP) analyses for automatic commercial ice-making equipment can be examined using a Microsoft Excel spreadsheet available on the U.S. Department of Energy's (DOE's) Building Technologies (BT) website at http://www1.eere.energy.gov/buildings/appliance_standards/commercial/automatic_ice_making_equipment.html.

8A.2 USER INSTRUCTIONS FOR LIFE-CYCLE COST SPREADSHEET

The spreadsheet allows the user to perform LCC analyses of any of 21 separate equipment classes of automatic commercial ice-making (ACIM) equipment. To fully execute the spreadsheet requires Microsoft Excel and Oracle's Crystal Ball software, both of which are commercially available.

The spreadsheet posted on the DOE website represents the latest version of the applicable model and has been developed and tested with Microsoft Excel 2007 and with Oracle Crystal Ball, Fusion Edition, Release 11.1.2.0.00. Table 8A.2.1 describes the worksheets in the LCC spreadsheet.

Table 8A.2.1 Description of Worksheets in LCC Spreadsheet

Worksheet	Description
Labels	This is used as a go-between for user inputs and the rest of the worksheets. Modifying this worksheet can change and possibly impair operation of the model, so DOE recommends caution when editing this worksheet.
LCC Summary	Contains the input selections and a summary table of energy and water use, operating costs, LCC, and payback.
Crystal Ball	Contains outputs for each equipment class from the Crystal Ball/Monte Carlo analysis.
NIA Output	Contains a full output of all data that is uploaded to the National Impacts Analysis Model.
Econ Trends	Contains electricity and water price forecasts. Also contains experiential (price) learning data inputs.
Markups	Contains data used to derive industry baseline and incremental markups.
Engineering	Contains the manufacturer price data for units at each efficiency level. Also contains data on harvest rates, utilization rates, energy and water consumption, and summarizes other engineering derived data.
Discounted Costs	Contains annual operating costs in cash flow tables.
Discount Rate	Contains all data used to calculate discounts rates for each building type and an aggregate discount rate for the United States.
Electricity Prices	Contains *AEO2011*[1] population-weighted electricity prices by state, AEO2011 electricity price projections, and electricity price ratios derived for the various building types using 2003 Commercial Building Energy Consumption (CBECS) data.
Water Prices	Contains population-weighted water/wastewater prices by state, and water/wastewater price projections.
Installation Costs	Contains adjustment factors to vary installation costs by state. Derived from data published by RS Means Publishers and Consultants.

Table 8A.2.1 (cont.)

Worksheet	Description
Sales Tax	Contains data on sales tax rates and population data by state.
Population	Contains 2010 census data on population by state.
Maintenance and Repair Costs	Contains inputs for different schedules of maintenance and repair costs and summarizes the data in an annualized format.

Basic instructions for operating the LCC spreadsheets are as follows:

1. Once you have downloaded the LCC file from the DOE BT website, open the file using Excel. Select "Yes" when asked if you want to enable macros. At the bottom of the Excel window, click the tab for the Summary worksheet. Note that if you plan to run the Monte Carlo routine, you will need to have Crystal Ball loaded as an add-in and activated.

2. Use Excel's View/Zoom commands at the top menu bar to size the display to your monitor.

3. You can interact with the spreadsheet by clicking choices or entering data using the graphical interface on the LCC Summary worksheet. Select choices from the various drop-down input boxes throughout the LCC Summary worksheet.

4. From the user-defined input options, select from the buttons and boxes for the following: (1) assumed baseline level; (2) equipment class; (3) analysis year (year of purchase) ; (4) economic growth case; (5) year to discount costs to; (6) standard efficiency level; (7) building type; (8) state or region to analyze; (9) conservation program to model; (10) installation cost escalation; (11) repair cost escalation; (12) analysis type; (13) price learning toggle; and (14) discounting toggle. You can start a complete Crystal Ball simulation by clicking the Monte Carlo button. All inputs, with the exception of some conservation program inputs, are either drop-down option boxes or toggle boxes (checked boxes make the statement true).

    a. Equipment classes are defined as particular combinations of equipment families, cooling methods, harvest rate bins, and ice-making processes. Because there are three potential equipment families, two potential cooling methods (air and water), and two or three possible harvest rate bins, and two different ice-making processes, there are 21 potential equipment classes that could be analyzed. If you select a combination of equipment families, cooling methods, harvest rate bins, and ice-making processes that results in a potential equipment class that has not been analyzed by DOE (because few or no shipments have been identified), the Annual Electricity Bill shown on the Summary tab will be $0 or blank.

    b. There is room for up to eight possible efficiency levels, including the baseline efficiency level, though not all equipment classes have eight representative levels. If an equipment class contains fewer than eight levels, the extra levels will have blank values in the calculated output cells on the LCC Summary tab.

5. This spreadsheet gives the user two types of calculation methods:

    a. If base and sensitivity analysis is chosen, then all calculations are performed for a set of single input values, usually an average. The new results are shown on the Summary tab as soon as the input values are changed through a drop-down or toggle box.

    b. Alternatively, if the Monte Carlo option is chosen or if the button is clicked, the spreadsheet generates a set of results from calculations for each equipment family, cooling method, harvest rate bin, and ice-making process (which together define an equipment class). For a number of inputs, the Crystal Ball software has custom distributions that it uses to set the level of the input. The model runs each of the studied classes in turn, performing 10,000 model runs for each. At the end of each equipment class run, the model records to the Crystal Ball tab a large number of outputs that you can then work with for further analyses. The Monte Carlo button executes a macro written in Visual Basic for Applications to loop through all equipment classes and selected efficiency levels. The Monte Carlo analysis usually takes 4−8 hours to complete for all 21 equipment classes.

REFERENCES

1. DOE 2011. *Annual Energy Outlook*. U.S. Department of Energy, Energy Information Administration. Washington, D.C. DOE/EIA-0383(2011).