DOE Building Tools Demonstrations

Drury B. Crawley
U.S. Department of Energy
Washington, D.C. U.S.A.

ABSTRACT

The U.S. Department of Energy (DOE), through the Building Energy Tools program, sponsors development of a variety of building energy design tools from tools that analyze the properties and performance of major building components (e.g., lighting) to tools that evaluate the energy and economic performance of whole buildings. DOE also sponsors development of new simulation approaches, validation of algorithms, and evaluation of tool performance. DOE disseminates and supports its; tools through partnerships with the private sector. In this demonstration, four whole-building energy tools are presented: PowerDOE, Energy-10, Building Design Advisor, and Softdesk Energy.

POWERDOE

PowerDOE is a new building energy simulation program being jointly developed by DOE and EPRI. Based on DOE-2, PowerDOE has a graphical user interface running under Windows™ that makes it much easier to use than DOE-2, while retaining DOE-2's calculational power and accuracy. Interface features include menu-drive input; on-line help; graphical results display; building component libraries; link to CAD packages; and option to automatically generate a building description from type and vintage.

PowerDOE has an open architecture to encourage third-party development of specialized performance analysis modules that can be attached to the core program. For example, the object-oriented SPARK when linked to PowerDOE will allow simulation of new HVAC technologies of arbitrary complexity.

PowerDOE is aimed at architects and engineers--to help achieve energy-efficient designs; utilities--to support marketing and DSM; researchers--for analysis of advanced technologies; and state and federal agencies--to aid in development and support of energy-efficiency standards.

PowerDOE runs on DOS-based computers (486 or above) with Windows, at least 20 mb free hard disk working space, and an SVGA monitor.

ENERGY-10

Energy-10 is a design tool for small commercial buildings (generally less than 10,000 ft^2). Energy-10 can automatically generate building descriptions, apply sets of energy-efficient building features, and rank order these features by energy performance, operating costs, or life-cycle cost criteria. Energy-10 allows designers to evaluate energy-efficient options in very early stages of the design process.

Detailed information on a building's energy-use characteristics is available throughout the design process, from predesign to the start of construction. Energy-10 performs hour-by-hour calculations of a building's thermal, HVAC, and lighting behavior through a complete year of operation. The simulation is based on local utility rates, building occupancy schedules, and hourly weather data for the climatic region in which the building will be located.

Energy-10 generates energy performance comparisons in a variety of graphical formats. Bar graphs compare loads and costs, and line graphs show monthly loads, daily and monthly profiles, daylighting effectiveness, and hourly performance for any period.

Designers using Energy-10 can dramatically reduce energy use in residential and small commercial buildings--without increasing the limited time available for design.

Energy-10 runs on DOS-based computers (486 or above) with Windows, at least 20 mb free hard disk working space, and an SVGA monitor.

BUILDING DESIGN ADVISOR

Building Design Advisor (BDA) is a multimedia-based, integrated building design support environment that will assist building designers with the integrated consideration of multiple design solutions with respect to multiple design criteria, throughout the building design process. BDA will be linked to multiple analysis tools and multiple databases. Moreover, BDA will support context-dependent design advice toward performance improvement. The initial version of BDA is a

Windows™ application. BDA is linked to PowerDOE, a schematic design tool, a daylighting tool, and a multimedia case studies database.

The Graphical User Interface of BDA is based on two main elements--the Desktop and the Browser. The Desktop is a spreadsheet-like interface that allows building designers to compare multiple design solutions and case studies with respect to multiple design considerations. The Browser allows building designers to quickly access all descriptive and performance parameters of building components and systems considered by analytical tools and databases linked to BDA.

BDA runs on DOS-based computers (486 or above) with Windows, at least 30 mb free hard disk working space, and an SVGA monitor.

SOFTDESK ENERGY

Softdesk Energy automatically transfers building design geometry to energy software for estimating energy loads. Softdesk Energy operates from within two CAD environments (AutoArchitect and AutoCAD). Softdesk Energy uses ASHRAE's simplified energy analysis method to estimate heating and cooling loads for any building design in locations throughout the U.S. Designers can begin using Softdesk Energy at very early stages of design to obtain rough estimates of loads. Throughout design, these estimates can be refined as construction details and building operating schedules are determined.

Softdesk Energy runs on DOS-based computers (486 or above) with Windows, AutoCAD, AutoArchitect, at least 30 mb free hard disk working space, and an SVGA monitor.

CONTACTS

PowerDOE

Simulation Research Group
Lawrence Berkeley Laboratory
MS 90-3147
Berkeley, California 94720 U.S.A

Hirsch & Associates
12185 Presilla Road
Camarillo, California 93012-9243 U.S.A.

Energy-10

Doug Balcomb
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, Colorado 80401-3393 U.S.A.

Building Design Advisor

Konstantinos Papamichael
Lawrence Berkeley Laboratory
MS 90-3111
Berkeley, California 94720 U.S.A.

Softdesk Energy

Softdesk, Inc.
7 Liberty Hill Road
Henniker, New Hampshire 03242 U.S.A.