

Software for Energy Design

by Bruce Sullivan



Which comes first, the building design or the energy analysis? It's a classic chicken-or-egg problem. Once dimensions for walls, windows, and floors are set, a designer is usually reluctant to change them based on an energy analysis. At that point, the only way to save energy is by using more insulation, better windows, or more efficient mechanical equipment. While there's nothing wrong with fine-tuning these components, you can often get more Btus for your buck by altering the basic house design.

Almost ten years ago, G.Z. "Charlie" Brown, professor of architecture at the University of Oregon, began developing a computer program that would provide energy-use estimates at the preliminary design phase. The program is called *Energy Scheming* (version 2.0 for Mac computers is \$195 from the Energy Studies in Buildings Lab, Department of Architecture, University of Oregon, Eugene, OR 97403; 503/346-5647). *Energy Scheming* doesn't calculate the precise heating and cooling loads needed by engineers, mechanical contractors, and energy techies. But the software does give a rough estimate of how energy use is affected by basic architectural issues like orientation, elevation, floor plans, and window placement.

Graphical Data Entry

The program includes a set of simple drawing tools, along with the ability to electronically import drawings from other Mac CAD programs. If you have a flatbed scanner, you can even scan in your preliminary sketches.

The distinguishing feature of *Energy Scheming* is its graphic presentation. Virtually every function can be operated with the computer's mouse; in fact, you could complete an entire building study without touching the keyboard. To set dimensions for walls, floors, and other elements, for instance, the user need only drag the mouse over a segment of the drawing with the Tape Measure Tool. You can choose from

among predefined building assemblies (such as a 6-inch wall), or build your own assemblies from a menu of components including siding, sheathing, insulated wood-framed wall, drywall. You can also enter numerical R-values for any component.

Several features remove the drudgery from energy calculations. The program lets you graphically select roof slope, for instance, and window area is automatically subtracted from wall area. Descriptions of building elements can be changed at any time, allowing you to experiment with many options.

Sizing windows. *Energy Scheming* lets you create up to five daylighting zones in a building, to which you then assign windows and skylights. A Rule-of-Thumb menu helps you quickly determine optimum window sizes for solar heating, natural ventilation, and daylighting. You can change window area and see the effect of that change immediately. It's worth having the program for this feature alone.

Energy Use

For any given design, the program will calculate energy use for four representative days of the year. The easiest way to view the results is the Graphic Report which shows hour-by-hour ener-

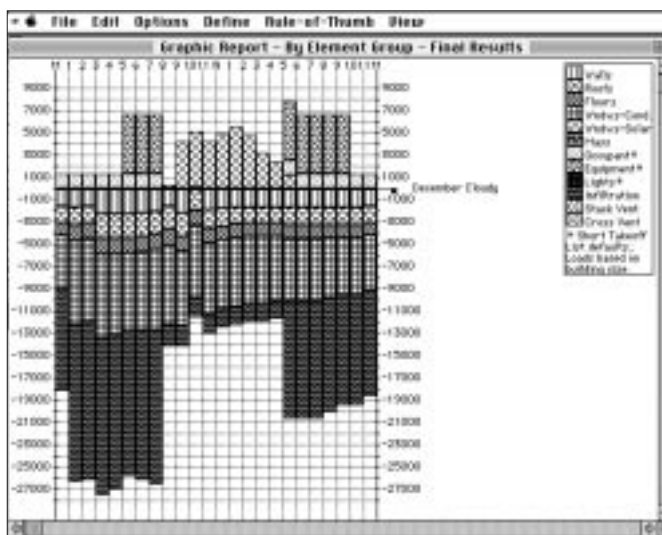
gy data for each of the four days. Heat gains appear as bars above the graph's zero axis, while losses appear below. Your goal is to shorten the bars, so they get as close to the zero axis as possible. Each time you make a design change, the graph shows its effect on the energy load. Detailed numeric reports are also available that present virtually every energy input and output.

The program lets the user choose nearly any type of building material or "energy strategy" — such things as operable window shades and mechanical ventilation. Luckily, the program makes assumptions about most of these variables for you, so you can get started on a project quickly, and tinker with the details later.

Expect to spend 8 to 10 hours learning how the program works. After the initial learning curve, producing an energy study of a house takes just a couple of hours. Anyone who has mastered a CAD program should have no problem working with *Energy Scheming*.

Version 3.0 of *Energy Scheming* will go a step further by including suggested energy-saving design changes and strategies. Brown and his colleagues have also developed a module for Softdesk that will let AutoCAD users assess the energy use of their final designs. ■

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In this report from Energy Scheming software, each design change alters the graphic display of energy-use data. The shorter the graph's bars, the less heat gain and heat loss in the design.