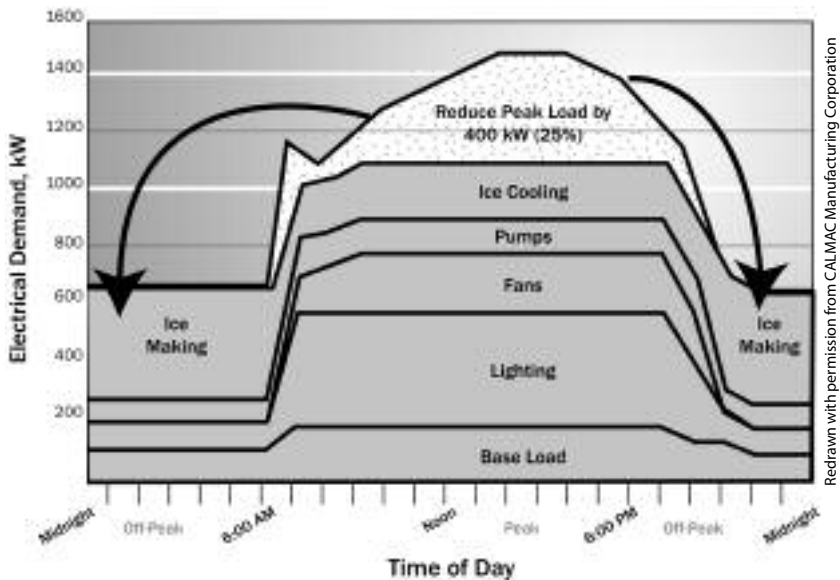


niques can be examined for their energy impacts before designs are hardened into working drawings. In the area of climate control, just as under-floor air distribution systems came into use in the late 1990s, we're now seeing a variety of other building climate management systems, including "double-envelope" renovations of older buildings in cold-climate regions to benefit from natural ventilation in cold weather. A double-skin façade at a new research center on the University of Toronto's St. George campus is an example of this trend.¹⁴⁵



Thermal Energy Storage

Thermal energy storage is a simple concept: make ice or chilled water when power is cheap, then avoid buying electricity to operate mechanical cooling systems when it is expensive. Just about any large office building, hospital, hotel and similar 24/7 facilities can benefit from thermal energy storage. As utilities are forced to increase peak-period electrical rates to



Thermal energy storage systems can shave peak power demand by 25% in large buildings and facilities.

avoid brownouts and blackouts on summer afternoons by limiting demand, thermal energy storage systems are beginning to come into their own. They reduce the pressure on the electrical grid and can save building owners considerable money. They also can save money upfront, even after paying for their cost, by limiting the size of the HVAC system purchased. They should be thought of as a component of an integrated design project, where the initial focus is on reducing the need for summer air conditioning through overhangs and shading devices, better glazing and passive solar design approaches, not as an end in themselves.

Consider the example shown in the table on page 169. By applying thermal energy storage, the building's electrical demand is lowered by 400 kilowatt, about a 25% reduction in peak demand. If the utility charges \$10 per kilowatt, not an unusual amount, the monthly savings from demand avoidance alone could be \$4,000, or nearly \$50,000 per year! These savings can continue for many months beyond the peak summer cooling period, because utilities often charge for the instantaneous peak power use in a quarter, or sometimes in an entire year. If time-of-day rates are available from the local electric utility, making power cheaper to buy during off-peak hours, the energy cost to produce the cooling would also be lower, further increasing the cost savings from installing the system (only about 10% of ice storage systems provide the full cooling load). In themselves, electric utility "demand avoidance" charges provide complete economic justification for partial storage systems. Time-of-day rates are not needed, but a faster return on investment will occur with them.



Triple Bottom Line

The triple bottom line represents a new way of thinking about green buildings and sustainability: truly appropriate measures need to incorporate consideration of ecology/environment, economy and (social) equity (the three Es), or people, planet and profits (the three Ps). The triple bottom line contrasts with the traditional business bottom line which considers only profits. Clearly businesses have been moving away from a profits-only orientation for quite some time, as the corporate social responsibility movement has taken hold: getting and keeping good employees who care about the environment and about the local community has become a central element in profitability.