6 Strategies for Energy Savings in Community Cancer Centers

BY MARY ALCARAZ, PE, LEED[AP], LC, AND JASON FIERKO, PE, CEM, LEED[AP]

Becoming more energy efficient allows community cancer centers to reduce expenses, while simultaneously improving the care environment for patients, family, and staff. Sustainability has become the industry standard in the design of new buildings; however, existing community cancer centers can be inexpensively renovated to minimize energy usage. The following are six proven strategies for adapting exterior building materials, lighting, and mechanical systems to net lower utility bills.

1. Switch to Double-Paned Glass

Patients receiving chemotherapy in one location for long periods of time may be exposed to excessive drafts or overheating due to aging windows. Upgrading a building's thermal envelope through insulation retrofits or glazing upgrades can reduce heating and cooling loads, minimize energy consumption, and create a more comfortable environment for patients and staff.

Glazing is one of the leading sources of heat gain during the summer and heat loss during the winter. Glazing upgrades can drastically reduce energy consumption and improve occupant comfort. Upgrading from single-paned clear glass to a double-paned insulating unit with a reflective coating can reduce heat transmission by 60 percent, improving the quality of the interior environment. The key to selecting an appropriate glazing system is to maximize the energy performance while providing adequate visible light transmittance. Where full glazing replacements are not feasible, field-applied tints or films on existing glazing systems can reduce cooling loads and mitigate glare issues.

2. Go Volumetric

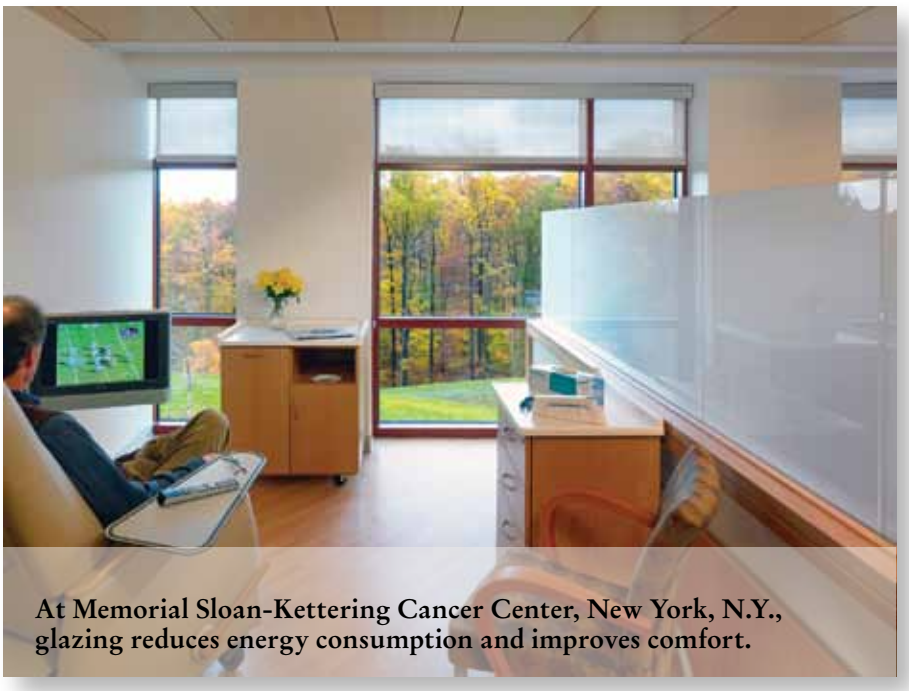
If a community cancer center has not upgraded its lighting system in the past ten years for energy efficiency, tremendous room exists for improvement. In addition to improving energy efficiency, many of these options also improve the quality of lighting.

The easy first step is to switch from T12 to T8 lamps and electronic ballasts. These lamp ballast combinations are much more efficient than T12 magnetic ballasts of the past and will pay back in less than three years time. An in-house electrician can implement a simple lamp and ballast upgrade, but note that the sockets will also need to be upgraded.

Another option is to switch from parabolic fixtures, which drive light downwards creating rooms with dark walls and a cave-like environment, to volumetric lighting. Volumetric lighting retrofits can cut the energy used by more than 40 percent. Retrofitting to volumetric lighting that is more diffuse also provides a brighter overall space. The images on page 35 show the difference in the light generated from these two types of fixtures.

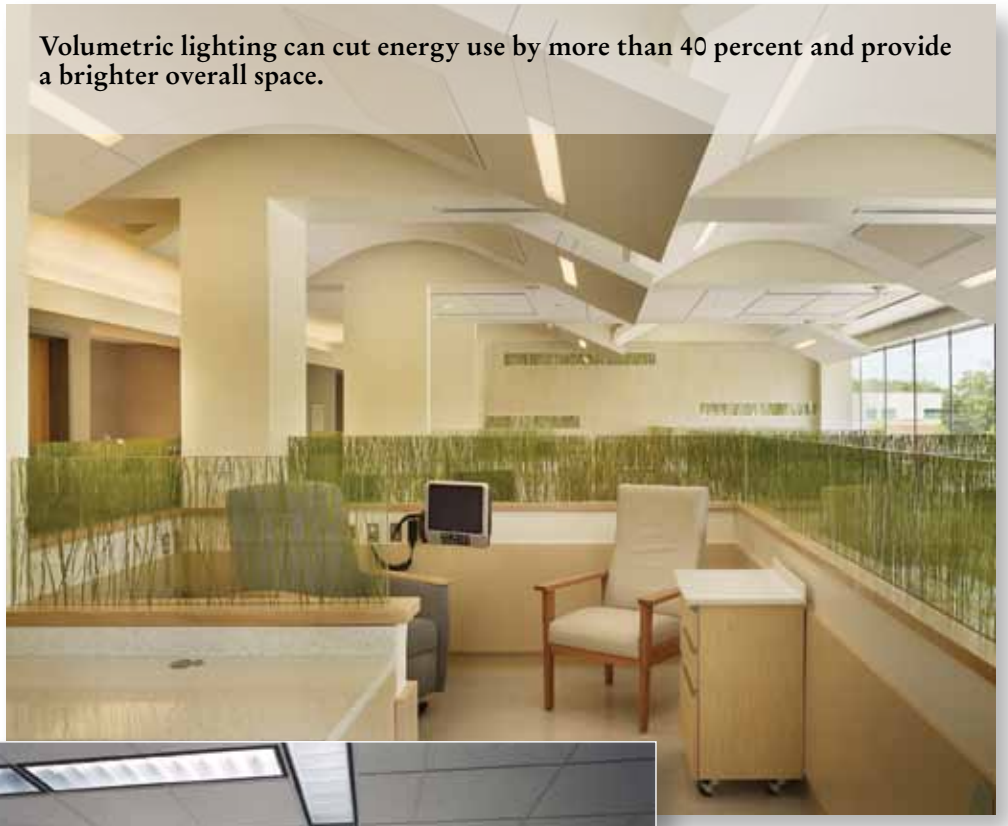
If a facility has incandescent lighting, there are options for energy savings with retrofit lamps. Compact fluorescents with built-in ballasts are viable options for non-dimming conditions. LED retrofits are now on the market and have a higher initial cost, but will last longer than fluorescents, are dimmable, and have no mercury that can create a hazard upon burn out. While still expensive, the price of LED retrofits is becoming more reasonable.

Bi-level stairway lighting fixtures with built-in occupancy sensors are an excellent investment. Since inpatient stairwell lights are on around the clock, these sensors more than pay for themselves. Stairwells can be dimly lit when unoccupied and then bump up to a higher level of lighting when occupants enter. The bi-level option is a great way



At Memorial Sloan-Kettering Cancer Center, New York, N.Y., glazing reduces energy consumption and improves comfort.

PHOTOGRAPHS COURTESY OF EWINGCOLE



Volumetric lighting can cut energy use by more than 40 percent and provide a brighter overall space.

Parabolic fixtures drive light downwards, creating rooms with dark walls and a cave-like environment.

to save energy in either retrofit or new construction.

3. Seize Control

The first tier of lighting control savings comes with the use of wall mounted or ceiling mounted occupancy sensors. The pay-back in energy savings is typically less than three years.

A second tier option is to convert to a centralized system. Depending on the existing lighting panels, this conversion may be a simple retrofit. For community cancer centers, a centralized system offers several advantages, including:

- The ability to automatically turn lights off for time of day
- Maintenance control through a web-based interface
- Controls that can be integrated with the existing building automation system.

Another type of centralized control is a relay-based system where a panel can be placed adjacent to the existing control panel and circuits re-routed through the relays for automated control.

Decentralized control systems are available where the control modules are actually at the fixture or area to be controlled. These systems are well-suited to office buildings or areas where daylight harvesting can be implemented. (Daylight harvesting can be defined as a control system that reduces artificial light in building interiors when natural light is available, to reduce energy consumption.)

4. Get the Most from Your Motor

Variable flow mechanical systems matched with pump or fan motors driven by variable speed drives (VSD) have the potential for large energy savings. Since the power use of a motor changes with speed, large energy savings can be achieved by reducing motor speeds to match actual loads in the system. The installation of a VSD on an existing constant flow system can save energy consumption upwards of 50 percent and pay back within two to five years. Community cancer centers may be good candidates for upgrading air-handling systems to VSDs because they have specific occupancy schedules and typically include a large amount of windows, which have a highly variable heating and cooling load depending on the outdoor conditions.

The use of VSDs is not limited to air or water systems. VSDs have also been successfully incorporated on cooling tower fans and chillers to improve efficiency at times when the cooling tower is not required to operate at its full design capacity.

5. Renew, Reuse, Recycle

All community cancer centers have multiple streams of waste energy that can be recycled and reused. These waste streams can take the form of exhaust air from buildings, boiler blow down, or boiler exhaust flue gases. The first step in creating an energy recovery plan is to identify all of the waste energy streams from your facility. Once the streams are identified, you can focus on transferring energy from building exhaust air into the outdoor air ventilation system to be pre-conditioned.

Outdoor ventilation air is required by code to be introduced into all buildings to provide acceptable indoor air

At Monter Cancer Center, Lake Success, N.Y., various energy strategies are used to achieve LEED NC [new construction] Silver certification rating.

quality. The energy used to heat or cool the unconditioned outdoor air is a major source of energy use in any facility. In most buildings, the same quantity of air that is introduced for ventilation is exhausted to the atmosphere to balance the building's pressure relationship.

Airside energy recovery reclaims the energy from the exhaust air stream and preconditions the ventilation air coming into the facility, reducing overall energy use. Airside energy recovery results in pre-heating of the outside air during the heating mode by using the heat in the exhaust air stream, and pre-cooling the outside air during the cooling mode by injecting heat into the exhaust air stream.

Although several methods of airside energy recovery exist, a desiccant wheel that transfers both sensible and latent energy often results in large energy savings. Many desiccant technologies can transfer both heat and moisture, allowing moisture to be retained in a building in the winter and removed from the ventilation air stream in the summer.

6. Check Your Temperature

Community cancer centers with a centralized direct digital control system have the potential to considerably reduce energy use with minor revisions to their current control sequences. For example, resetting water temperatures on chiller systems by gauging with outdoor-air wet-bulb temperature can reduce energy use. Success in this strategy is largely based on the chiller performance map and should be carefully reviewed prior to implementation.

Similar to water systems, supply air temperatures can be reset upward to minimize cooling and reheating. This strategy requires each occupied zone to be "polled" by the automation system to determine the maximum acceptable supply air reset temperature. When implementing this strategy, you must monitor space humidity, as increased supply air temperatures can lead to increased humidity levels.

Systems currently using variable speed drives for control are most likely determining the speed of the motor based on a pressure set point in the system. This set point is often established during peak load times, but may be higher than required for off-peak periods. A pressure reset sequence sets the pressure control set point to the minimum value that provides enough water or air to the critical equipment or space. The implementation of a pressure reset sequence can provide higher turndowns, reduced energy consumption, and maximize the value of the variable speed drive.

In facilities with highly variable occupancies, demand-controlled ventilation (DCV) strategies can greatly reduce energy consumption. In a DCV system, space carbon dioxide levels are monitored and the quantity of ventilation air introduced into the system is adjusted based on actual occupancy levels, instead of providing a constant quantity of ventilation air regardless of occupancy. Reductions in ventilation air flow rates result in reductions in energy consumption for conditioning.

Economizers allow outdoor air to be used for conditioning when conditions permit. The controller compares the conditions in the return air stream to those of the outside air and chooses the best source. Economizers are not limited to air systems, waterside economizers, through the use of a plate and frame heat exchanger between the condenser and chilled water systems, can bypass the chiller and provide "free" chilled water when outdoor air temperatures permit. Waterside economizers are recommended in facilities with year-round chilled water loads, which is often the case in healthcare facilities.

Carpe Diem

The strategies discussed in this article are only a sampling of potential energy conservation opportunities available in cancer centers. Some strategies may be simple to implement with quick paybacks, while others require more in-depth analysis. As energy prices continue to escalate, community cancer centers should audit their energy use and formulate a plan for dealing with an uncertain energy future.

Mary Alcaraz, PE, LC, CEM, LEED AP, is an electrical engineer, lighting designer, energy manager and Principal with EwingCole. Jason Fierko, PE, CEM, LEED AP, is a mechanical engineer at EwingCole in Philadelphia.