# THEY SAY THEY WANT A revolution

by Rama Ramaswami

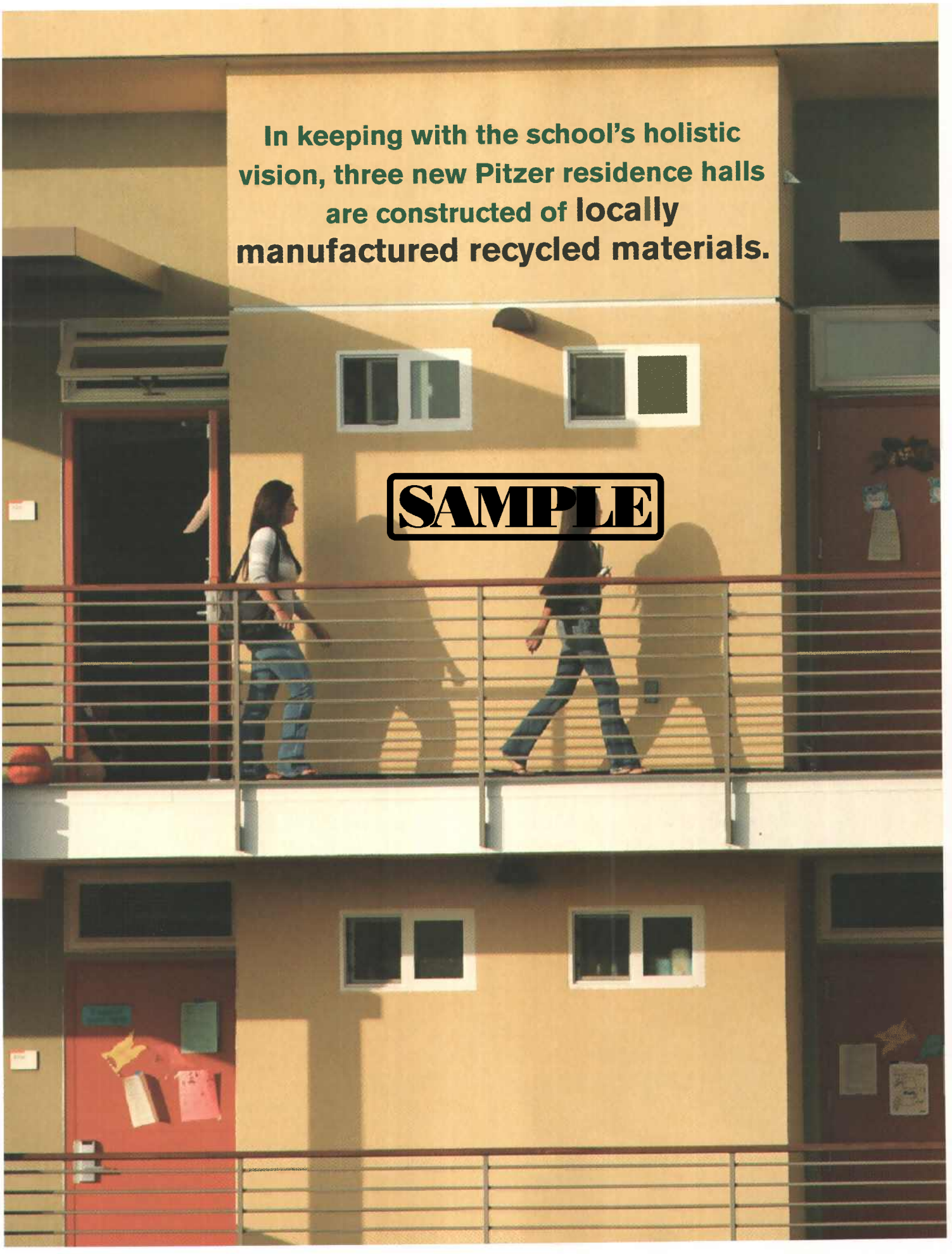


As sustainability efforts gather steam on campuses nationwide, educators find eco-friendly dorms an effective way to educate students about environmental issues.

**EVEN IF YOU DON'T** believe—and it's getting increasingly difficult not to—that the "green revolution" on college campuses is akin to the great movements for social change that rocked universities in the 1960s and '70s, there's no denying that it has taken root in such a way that no campus administrator can afford to ignore it. And unlike the flower children of yesteryear, today's students are pragmatists: Their environmental activism is actually spearheading what many social scientists and business leaders herald as the next major grassroots movement to effect social change.

In fact, educators emphasize that green technologies are exceptionally suited to an academic environment, since they offer a major opportunity to teach students how eco-friendly principles apply to daily life. Houston's **Rice University**, for example, is set to build a green residence hall that demonstrates sustainability in operation.

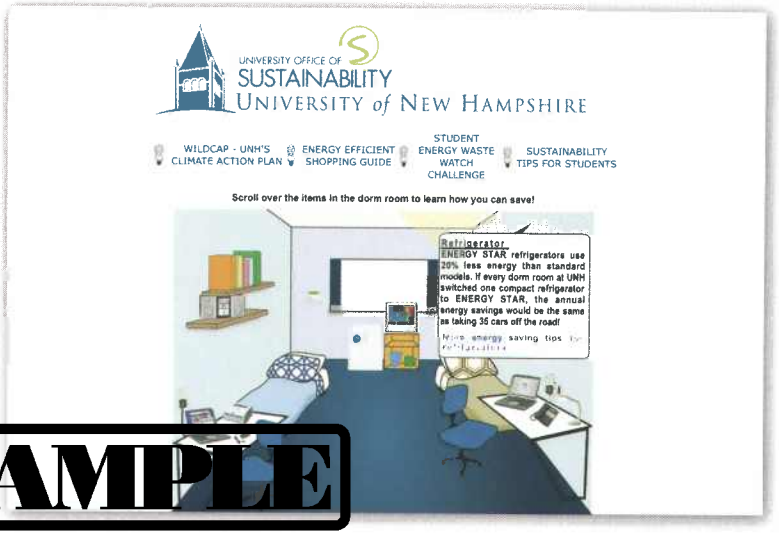
"We have a strong educational commitment to this building," says Rice's Director of Sustainability Richard Johnson. "We want this to be a teaching tool, not just a structure to live in. We've looking for ways of educating students. This is a university. It's about pedagogy. Why can't buildings be pedagogical?"


In keeping with the school's holistic vision, three new Pitzer residence halls are constructed of locally manufactured recycled materials.
SAMPLE

## Dorm as Green Model

The new residence hall will be the first structure at Rice—and among the first buildings in Houston—to receive gold-level certification from the US Green Building Council's Leadership in Energy and Environmental Design (LEED) standards program (www.usgbc.org). (LEED certification is a nationally accepted standard for the design, construction, and operation of eco-friendly buildings. Scores are awarded for performance in five areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. Buildings are deemed "certified," "silver," "gold," or "platinum," depending on the number of credits they earn in each category.) Funded by former US Energy Secretary Charles Duncan and his wife, the $30 million residence hall (to be christened Duncan College when it opens in 2009), will measure roughly 110,000 square feet and house 324 students.

According to Johnson, the university is taking "quite a lot of time and care to select the right materials," using recycled, regional, and organic materials wherever possible. Selections include low-emission paints and hardwood or cork flooring, which eliminate the chemicals and other contaminants found in carpeting. One of the building's many green features are energy-saving interlocking thermostats from Smart Systems International (acquired in 2007 by Telkonet; www.telkonet.com). These thermostats shut off air conditioners when windows or doors are open, whether or not the student is in the room. While this concept is not new, "The linking of known technologies is unique," says Johnson. "We haven't seen it done quite this way."






**UNH'S WEBSITE FEATURES** a virtual dorm room that enables students to scroll over each item in the room to learn about energy-efficient ways to use it.

Ed Bailey, Rice's external project manager, notes that interlocking thermostats are common in the hotel industry, but they have just begun to be used in college dorms. "The thermostat has the ability to interlock with occupancy sensors and with doors and windows," he says. (Note: The sensors can also be activated so that the air conditioning turns off automatically when the windows are closed and there is no one in the room.) Though Rice does not release most vendor information for publication, other features of Duncan College, he adds, are a "green" roof with low-maintenance plants that will reduce energy needs for heating and cooling, window shades that ward off excessive heat, and motion detectors that shut off lights in unoccupied rooms. Bailey is particularly proud of the new building's prefabricated bathrooms, which will be brought on-site as complete units, reducing construction waste. In addition, they will cut down on water use. "Our fixture selection includes dual-flush toilets," says Bailey. "They use either 0.8 gallons or 1.6 gallons of water per flush, based on what kind of waste is being disposed of. The toilet gives you an option of flushes."

**THE DUNCAN COLLEGE RESIDENCE HALL** at Rice will sport a "green" roof with low-maintenance plants that reduce energy needs for heating and cooling, window shades that ward off excessive heat, and motion detectors that shut off lights in unoccupied rooms.

Condensate capture is another eco-friendly feature. "We capture the condensate from the air conditioning units and use it for irrigation of the green roofs," says Bailey, adding that in the hot Texas climate, "there is *a lot* of condensate." Storm water is also captured and used for irrigation. (Pipe and basin systems drain and catch the water; filtration and treatment systems purify it.)

## In for the Long Haul

The green residence hall is part of a much larger sustainability initiative that Rice is showcasing as it heads toward its centennial in 2012. A utility plant under construction, for example, will feature condensate harvesting, energy modeling and monitoring, energy-efficient roofing, photovoltaic solar panels, wind turbines, and innovative technologies to reduce emissions. Rice also is investing in a

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state-of-the-art green data center. As Johnson puts it, the university takes the long view: "We're not looking to flip our buildings in five years. We're building 100-year structures. The potential for long-term use appeals to higher ed."

Green technologies and products cost more initially, and the payoff is not always immediate. Whether a green building ultimately is cost-effective, Johnson says, "depends on what your baseline is." He explains that a basic LEED-certified building is fairly close to Rice's own standards; therefore, additional cost to bring recordkeeping and energy monitoring up to LEED standards would be small.

The cost/benefit issue always is at the forefront, however. "It gets us thinking about innovations that we might have overlooked otherwise," Johnson says. "With the interlocking thermostat technology, for example, the energy savings that we anticipate, versus that of a building built to code, is 30 percent. For water management and recycling, it's between 20 percent and 30 percent."

## Doing the Right Thing

Another Texas-based school, **Angelo State University** (located in San Angelo and part of the **Texas Tech University** system), also is immersed in green construction efforts. Although the four residence halls currently under construction/renovation are not LEED-certified, according to John Russell, ASU director of facilities planning and construction, "We are going with water-reducing fixtures from Kohler (www.kohler.com) and American Standard (www.american-standard-us.com), efficient fluorescent lighting in nearly all areas of the buildings, greater insulation in the buildings, and we're trying to use more environmentally friendly materials in the construction of the facilities. We also are retrofitting older buildings with more energy-efficient lighting and plumbing fixtures, and asking the students to get involved by turning off lights. We use an energy management system, Andover Continuum from TAC (www.tac.com), to control thermostats in all of the common areas of the residence halls."

ASU technologists also recommend that PCs be turned off at the end of each day and have set up all computers on campus with power-saving settings. Older computers are handed down to elementary schools in the state. In addition, ASU is investing in projects to reclaim "grey water" (used water that is treated and recycled) for other purposes such as flushing toilets and watering campus lawns.

Underlying these improvements is the recognition that green truly is the color of the future. "Universities are supposed to be developing tomorrow's leaders and, as such, must themselves be leaders when it comes to being environmentally friendly," Russell asserts. "Students also want to do what is right. On many campuses across the country, student-led initiatives have started the movement to go green."

As an example of student involvement, Russell points to a recently completed ASU residence hall that features computer-monitored electrical meters from Square D (www.squared.com) to determine each unit's energy usage. "The intent here is to make a challenge to the students," he says. "We will offer gift cards to the occupants of the unit that uses the least amount of energy in any given month. By doing so, we feel we develop a friendly competition among the students and save utility costs at the same time. I am hoping the next residence hall, which is in the planning stage, will be at least silver-LEED-certified."

Despite the buzz about green buildings, the concept is fairly new, Russell says. He believes that contractors are still wary of LEED construction and not fully aware of the complexities involved. "At this time, another challenge is making the commitment to do the project while recognizing that the project will have a slightly higher cost." He estimates that basic LEED certification costs about 1 percent more than comparable traditional construction; silver certification would push up costs between 1 and 3 percent; and gold by 4 to 6 percent (the costs of platinum certification vary). In general, Russell says, the costs are offset within five years. ▶

## Green All Over

At the **University of New Hampshire** in Durham, Chief Sustainability Officer Tom Kelly has gained national prominence—including a Presidential Award for Excellence in 2007—for his efforts to integrate environmentalism into higher education. He views the greening of campuses as an extension of a broader ecological awareness in society that gathered momentum following the landmark Earth Summit held in Rio de Janeiro in 1992. Since then, he says, "More and more people are seeing the impact of climate change, loss of biodiversity, land use changes because of urban sprawl, and loss of community identity." He adds that soaring energy prices have thrown a new sense of urgency into the mix, turning what at first was just an operational issue on college campuses into a huge movement for cultural change.

Among the first college administrators to focus full-time on environmental issues, Kelly has presided over many of UNH's remarkable milestones in sustainability. The US Department of Energy ranks the university in the top 5 percent for energy efficiency among similar institutions in the country (go to www.eia.doe.gov to see the rankings). UNH brought a combined heat and power (cogeneration) plant online last year, and in 2008 will become the first US university to use landfill gas as its primary energy source. In yet another first for a university, in May 2006 UNH earned the Environmental Protection Agency's Energy Star rating (www.energystar.gov) for three of its residence halls. Since then, it has earned Energy Star ratings for four more residence halls and one administrative building. The university estimates that compared to buildings of a similar size, the eight Energy Star buildings will prevent pollution equivalent to annual emissions from 230 vehicles—more than 135,000 gallons of gasoline—while saving UNH more than $180,000 a year in energy bills.

**At Angelo State University, a new residence hall features computer-monitored electrical meters to determine each unit's energy usage. The 'challenge to the students' will include gift cards to unit occupants who use the least amount of energy in any given month.**

While emphasizing that eco-friendly dorms are just a piece of the entire sustainability effort on the UNH campus, Kelly does believe that green residence halls are a unique way to educate students. "Dorms are part of the physical infrastructure of the campus," he says. "Through energy efficiency, lighting, and so on, sustainable buildings have some operational impact. But from the educational point of view, depending on the greenness of the buildings, dorms can have a very powerful effect. Students live in dorms every day; green tech can be woven into their educational experience."

Clearly, Kelly is all for having students participate fully in the greening process. But although eco-friendly features can be built into structures invisibly, he warns that educationally, that's a missed opportunity. "If the green technology is built-in but invisible to the students, you'll miss the chance to educate. Technology needs to be paired with education. We see them as two essential components. When you practice sustainability, you're teaching students the 'how,' but technology shows them the 'why' of sustainability." Even old buildings, says Kelly, can be retrofitted for energy efficiency and serve as teaching tools. "A lot of what goes on at universities involves incremental upgrades. The same is true in dorms. Sometimes they're still heated with electricity and are dinosaurs. But you try to combine technological upgrades with behavioral changes."

Not surprisingly, green behavior is now an integral part of student life at UNH. The university's website features a virtual dorm room that enables students to scroll over each item in the room to learn about energy-efficient ways to use it. They learn, for instance, that notebook computers use 80 percent less energy than desktops, and have the added advantage of mobility. (To see the virtual dorm room, go to www.sustainableunh.unh.edu/climate_ed/vdorm/virtual_dorm.html.) The "room" was designed by Stan Barker of AdWorks (www.adworks.net), an advertising and marketing agency.

In fact, the first three residence halls to earn Energy Star ratings did so because of student involvement: As part of a course on energy and the environment, undergraduate students entered data on each building's energy use into the EPA's Portfolio Manager software (available from the Energy Star website), which scores buildings on a scale of 1 to 100, with 50 representing an average building and 75 or more qualifying for an Energy Star label. One of the dorms scored 87 and each of the other two scored 84. The stu-

dents also measured the lighting, ventilation, and temperature in each building.

And there are other ways to engage students, including energy efficiency competitions, says Kelly. For example, the Energy Waste Watch Challenge (www.unh.edu/etf/challenge.html), run by the UNH student group Ecological Advocates (www.sustainableunh.unh.edu/ecologicaladvocates.html), is an energy and water-use reduction contest held on the UNH Durham campus during the fall. Students compete to see which residence hall or apartment complex has most reduced energy and water consumption from their building's average consumption over the previous three years. The top three winners receive cash prizes and a trophy. UNH reports that thanks to the contest, its residence halls and apartments saved 227,600 kilowatt hours in electricity and $45,000 in energy and water costs in fall 2007 and spring 2008.



In addition, through its "power down" initiative, the college encourages all faculty, staff, and students to turn off and unplug all electronic equipment when they are away for nights, weekends, or breaks.

Kelly emphasizes that precise monitoring of energy use and savings is essential to educate students about environmentalism. "With [illegible] it is very difficult to [illegible] their impact," he says. "Real-time feedback allows education and technology to come together in an interesting way." Like many of his counterparts, Kelly is reluctant to pinpoint a precise return on investment for green technologies. "It depends on how far you go," he says. "Lighting and occupancy sensors from WattStopper [www.wattstopper.com] have paid for themselves, and as energy prices go up, they will pay off more quickly. By contrast, photovoltaic panels have long payback periods, and the savings alone may not justify them. Yet, in the Northeast, a case can be made for solar hot water. You pick and choose the green aspect of buildings, depending on their payoff."

## Reinventing Residence Halls

An ambitious project to rebuild its dorms recently earned national media attention for **Pitzer College** in Claremont, CA. Pitzer, one of seven institutions known collectively as **The Claremont Colleges**, has set out to build what may well be one of the greenest dorms in the country. At the end of its three-phase Residential Life Project, part of a master plan to transform the campus (Phase One was completed in September 2007 with the opening of three new green residence halls; Phase Two is underway), the college expects to become the first in the nation to boast all gold-LEED-certified residence halls.

Although the media focused on the earth-friendly dorms designed by Carri-



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er Johnson (www.carrierjohnson.com), Pitzer President Laura Skandera Trombley is quick to emphasize that the college has been committed to sustainability throughout its curriculum for many years, working on such projects as xeriscaping the entire campus (landscaping in ways that do not require supplemental irrigation). Founded in the 1960s, the college remains true to the spirit of that era, emphasizing community values and social and environmental responsibility. "So when the opportunity came to reinvent the residential life program," says Trombley, "we talked about environmental and institutional values we wanted to emulate."

In keeping with this holistic vision, the three new residence halls included in Phase One are constructed of materials made of recycled content, much of it manufactured locally. Energy-saving features include compact fluorescent lighting from Sylvania (www.sylvania.com), natural lighting, a high-efficiency chiller from Trane (www.trane.com), and windows interlocked to an HVAC system from Johnson Controls (www.johnsoncontrols.com). The bathrooms feature low-flow shower heads (Moen; www.moen.com), faucets (Niagara Conservation; www.niagaraconservation.com), and toilets (Caroma; www.caromausa.com). Residential rooms and halls are constructed with low-emission materials including adhesives, sealants, paints, and carpets. Photovoltaic panels from Solar Integrated (www.solarintegrated.com) provide 15 kilowatts of renewable energy. The buildings also sport a green garden roof and water-efficient landscaping; watering is monitored by irrigation controls from Weathermatic (www.weathermatic.com).

All of these features will generate a sizable payoff, according to Larry Burik, project manager at the college. "The residence hall construction is 30 percent more efficient than new construction that is not green. We expect to see savings immediately for utility usage, but over the long haul, each system has a unique payback. We have a break-even model of seven to 11 years, which is a fairly fast return."

The idea of green IT, still slow to take hold at most organizations, is gathering momentum on college campuses, and Pitzer is paying attention. "We were very careful to include IT in the project," says Trombley, adding that the pressure on IT is increasing as students expect fully wireless environments, large bandwidths, and unlimited online access from anywhere, at any time. Mark Ingalls, Pitzer's director of IT, is replacing network equipment with newer, energy-efficient versions from Cisco Systems (www.cisco.com), and has invested in flat-panel displays—Dell (www.dell.com) monitors for PCs and NEC (www.nec.com) for Mac systems (www.apple.com)—which, he says, are "30 percent more energy-efficient." He also encourages students and employees to shut down equipment when not in use. In addition the university recycles its old computers, which vendors come in to pick up.

While Pitzer doesn't have a green data center yet, it is "starting to move down that road," says Ingalls, with the ongoing replacement of some of the college's older, power-hogging servers. "It used to be an advantage to hold on to systems as long as they functioned, but not any more," he says. But full integration of IT with building facilities and maintenance systems—a concept generating buzz in energy conservation circles—is still some years away (see "IT Meets BAS," *CT* May 2008; www.campustechnology.com/articles/61516). For the moment, Ingalls is working on integrating photovoltaic meters (from Solar Integrated) with the college's website, so that energy usage is visible. "There will be some tie-in, and we will make that available shortly," he says.

Throughout the project, one of Pitzer's challenges was to achieve maximum sustainability without breaking the bank. But Trombley is confident that earth-friendly construction is affordable. "We're still calculating the additional expense," she says. "So far, it's added only 5 percent to the overall project cost. This is a $26 million construction project, of which $3 million is in soft costs. Building green is not so much about budget as a commitment to building green. It takes more time and care. You have to be more diligent in selecting the architect and be on top of the associated soft costs." **CT**

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**WEB EXTRAS**

**New Dartmouth (NH) Dorm Cluster Broadcasts Energy Usage to Students** www.campustechnology.com/articles/62582.

**Scheduling to Reduce Energy Consumption** www.campustechnology.com/articles/60700.