

# APPA Promotes Leadership in **ENERGY AND SUSTAINABILITY** with **NEW**

# FPI Tool



By Darryl K. Boyce

**A**lthough sustainability best practices for buildings are generally well understood, campuses face unique challenges because they are developed to support a diverse community with a variety of facilities. From academic facilities and labs to residences and sports facilities, all operate under one organizational umbrella. This can make it difficult to compare the performance of individual buildings because of their varying operational requirements. It can also be a challenge to determine where resources should be allocated toward facility upgrades to derive the greatest environmental benefit or return on investment.

For a number of years APPA has been developing and enhancing the Facilities Performance Indicators program (FPI) used by APPA members to assess and benchmark critical areas related to the construction, operation, and maintenance of institutional facilities. The FPI program has developed into a comprehensive database to support ongoing performance monitoring and benchmarking.

The FPI program is currently being expanded to provide assessments and tracking of energy use and other sustainable operations criteria related to the campus and individual building operations. A working group was established under the APPA Information and Research Committee to review and evaluate strategies to expand the assessment in the critical areas of energy use and sustainable operations.

There are a number of programs that focus on buildings, such as USGBC's LEED, Green Globes, and the joint U.S. EPA/DOE's ENERGY STAR program; and those that focus on the campus, such as AASHE's STARS (Sustainability Tracking and

Rating System) and Campus Sustainability Assessment Framework (CSAF) programs, all of which were evaluated for APPA's new assessment program.

In addition to the assessment programs that are generally structured on a single point in time evaluation of sustainability, there are also programs available to support the tracking and evaluation of CO<sub>2</sub> emissions related to the building and campus operations, such as Clean Air-Cool Planet's Carbon Calculator.

To achieve the greatest benefit from an energy use/sustainable operations assessment tool, the database needs to be dynamic so that the user can track and analyze key indicators, by building type, on a monthly basis.

A system based on the Green Globes assessment structure was proposed, and Carleton University in Ottawa, Ontario, Canada, agreed to work with Jones Lang LaSalle to develop and pilot the enhanced Energy Module for the FPI program. The new program is called the Energy and Sustainability Assessment

## TESTING AND DEVELOPMENT

In 2010, Carleton University undertook the ambitious project to pilot the evaluation its entire campus portfolio of 41 main buildings. Working with Jones Lang LaSalle, the university helped to develop and test a roadmap or benchmarking process that is streamlined, practical, and budget-sensitive for campuses. The process involved the following steps:

- Step 1: Establish a baseline assessment of performance, features, and operations
- Step 2: Establish goals, objectives, performance indicators, and

targets

Step 3: Develop strategies and action plans

Step 4: Identify funding

Step 5: Implement the plan

Step 6: Monitor results

At the heart of an energy and sustainability program is the need to baseline performance, establish key performance indicators, develop and implement an action plan, and monitor results. Although this may sound easy enough the reality is that not all buildings on a campus are submetered, hence the energy and water consumption of some buildings will need to be modeled or estimated. Even the most comprehensive energy and water consumption data needs to be reconciled to properly understand the energy use of each building on a campus.

In order to assess the buildings under the FPI's new energy and sustainability program, the 41 main buildings were classified into four categories based on their primary functional characteristics:

1. Office/Academic
2. Research/Laboratories
3. Residences
4. Sports/Athletics

Building on the Green Globes assessment methodology, the new energy and sustainability program was restructured, adapted, and modified as follows: the campus-wide management criteria were separated from building specific criteria, and additional questions (relating to the specific building type) were added in order to determine the baseline rating. The operations managers and sustainability officer of the university together completed a

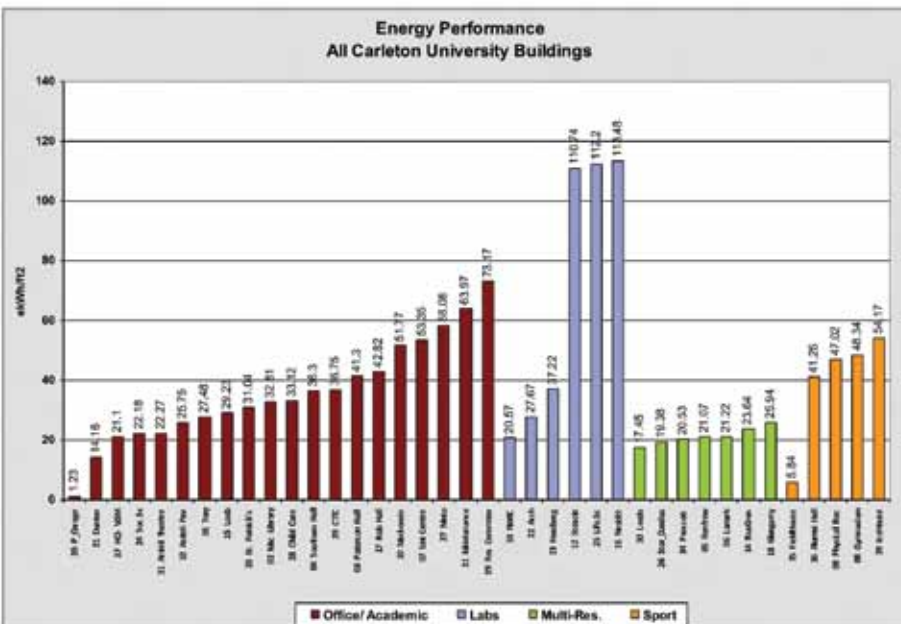
questionnaire for the campus as a whole and for each building, using the appropriate survey for each building type.

The building-specific questionnaire addresses five categories:

1. The building-specific questionnaire addresses five categories:
2. Energy
3. Water
4. Resources (waste reduction and site)
5. Emissions, Effluents, and Pollution Control
6. Indoor Environment

In addition to completing the assessment questionnaire, a walk-through audit was carried out at each building. The audit helped to ensure accuracy of the responses to the questionnaire and to generate a list of opportunities for improvement. It also helped to identify specific building upgrades that should be implemented that would have a positive impact on energy use and greenhouse gas (GHG) emissions. Already planned capital improvements were also incorporated into the strategic energy and water reduction plan—not only for each building but also for the campus as a whole.

Carleton University benefits from an extensive submetering system that monitors energy (electricity, steam, chilled water) and water consumption at each building. This submetering system was evaluated for accuracy, and utilized to develop weather-correlated energy and water baselines for each building. The energy and water data was analyzed in detail using BEAT (Building Energy



Allocation Tool), which has been developed to enhance ESAT's evaluation of energy use for each building by type of use and calculates greenhouse gas emissions based on the type energy that is used. The tool also trends the monthly data, supports the identification of excesses and anomalies, and logically breaks out the actual energy use by major end users, thus improving the accuracy of the estimated energy and water cost reductions and retrofit costs.

The campus has a single main electricity service with an annual cost (calendar year 2010) over \$7 million, with the natural gas annual cost approximately \$3 million. Despite the construction of new buildings, and an increase in enrollment, Carleton was able to confirm that they had reduced their energy costs by over \$160,000 in 2010 versus 2009.

Data collected in the assessments for each of the 41 buildings was packaged into a Portfolio Report, thus enabling the university to evaluate building upgrades at the individual building level, or to leverage economies of scale for system retrofits that are planned for a number of buildings, such as lighting retrofits, HVAC controls replacement, and building envelope upgrades. Building and operational improvement opportunities totaling over \$37 million were identified, and we estimated that implementation of these improvements would generate an estimated \$1.5 million in annual utility cost savings, and a reduction of over 600 tons in greenhouse gas emissions per year.

The Carleton University experience can serve as a model to other institutions that are struggling to identify meaningful, cost-effective energy and carbon reduction strategies and sustainability improvement measures. Sustainability at Carleton includes operating the campus in a manner that protects and strengthens the physical and social environment for present and future students, staff, and faculty. This relates largely to energy and environmental sustainability. Carleton's philosophy also states that greening the campus should embody the kind of thought leadership that will influence tomorrow's decision-makers and help to redefine concepts of "quality of life" and "economic growth"—which can contribute to a powerful move-

ment that will literally help to save the planet.

An unexpected outcome of the assessment at Carleton University is that it is engaging students directly in the university's sustainability program. Carleton, in conjunction with Ontario Centres of Excellence, Ottawa Hydro, and Jones Lang LaSalle, is providing energy audit training to interested students as an extracurricular activity. Students learn about the complex and interactive nature of building operations and maintenance (with

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Energy Efficient Features	Residential Buildings								
	5/RH	6/LH	14/RU	14/GR	18/GH	26/SD	30/LE	34/PH	41/FR
<b>Lighting</b>									
Percentages of compact fluorescents light	70%<	70%<	70%<	70%<	70%<	70%<	70%<	70%<	70%<
Percentages of T8 or T5 fluorescent lights in the building area	70%<	70%<	70%<	70%<	70%<	70%<	70%<	70%<	70%<
Percentages of light-emitting diodes (LEDs) exit signs are	<40%	70%<	<40%	<40%	<40%	<40%	70%<	70%<	70%<
Other types of LED lighting	○	○	○	○	○	○	○	○	○
High-intensity fluorescent fixtures in large areas that require high lighting levels	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
time-clocks and/or photocells on outdoor lighting	●	●	●	●	●	●	●	●	●
Percentage of high efficiency lighting	80%<	80%<	80%<	80%<	80%<	80%<	80%<	80%<	80%<
<b>Control</b>									
Temperature setback and weather compensation implemented	●	●	●	●	●	●	●	●	●
Building automation systems (BAS)	Full	Full	Full	Full	Full	Full	Full	Full	Full
<b>Hot Water</b>									
High-efficiency water heating equipment	●	●	●	●	●	●	●	●	●
Percentage of hot water faucets saving devices	50%<	50%<	50%<	50%<	50%<	50%<	50%<	50%<	50%<
DHW temperatures maintained between 50° and 55° C	●	●	●	●	●	●	●	●	●



a focus on sustainability), as the university further develops and refines energy and water reduction strategies at the building level through the additional input from student audits.

**SUPPORTING APPA MEMBERS THROUGH THE FPI'S ENERGY AND SUSTAINABILITY ASSESSMENT TOOL (ESAT)**

APPA chose the Green Globes approach because it firmly establishes energy, water, and environmental baselines for each building against which the performance of implemented retrofits can be accurately measured. For many campuses, the temptation to embark directly on specific energy retrofits—without the benefit of establishing baselines for each building—may lead to missing out on some low-cost, no-cost opportunities, or focusing on major capital expenditures to the exclusion of other cost-effective upgrade opportunities. Taking smaller steps on a solid foundation allows institutions to embark on a variety of projects—involving one or multiple buildings—with the assurance that their decision making is sound, and that their targets for sustainable building performance are achievable and measurable over the short, medium, and long terms.

Based on the Carleton experience, APPA is adopting the campus Energy and Sustainability Assessment Tool (ESAT) as a benchmarking protocol for member institutions. This will be linked to the annual APPA Facilities Performance Indicators survey and report. The assessment will be entirely Web-based, allowing participating colleges, universities, and schools to first baseline their current environmental performance, and then continually monitor and improve the performance of their campus portfolio.

The Web-based Campus Energy and Sustainability Assessment Tool is currently in development is available now and is in beta format for all to test and use this year. It will be accessed by FPI participants through the current Energy Module. Learn

more about the new module at [www.appa.org/research/FPI/index.cfm](http://www.appa.org/research/FPI/index.cfm).

The current high-level campus energy use data will still be available to track campus total consumption, and the new comprehensive database will be accessed only by the participating APPA institution members to provide secure data management and evaluation. As always, there is no cost for survey participation or report access to APPA member institutions.

A set of primary indicators for each building type will be transferred to the FPI database on an annual basis, as part of the FPI annual report, to enhance the value of the FPI benchmarking program specifically in the areas of building energy use and sustainable operations.

**NEXT STEPS**

Our plan is to make the new Energy and Sustainability Assessment Tool available year-round for any institution that wants to participate. You'll be able to input data, revise and update as needed, and have access to basic reports at any time throughout the year.

In addition, as mentioned above, certain key data points will be transferred annually to the Facilities Performance Indicators database and will become part of the calculations that comprise the annual FPI report. The energy and sustainability reports will be invaluable to you as you better understand your campus's carbon footprint and prepare or modify your climate action plans for improvement. ☺

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