By Jiri Skopek

ESAT
Under the Hood

EFFECTIVE MANAGEMENT OF SUSTAINABILITY IN A campus setting presents a challenge to both campus executives and facilities managers. While sustainability ideals are now already very much part of students' mindset, the hardest work remains with facility staff, who are constantly searching for effective strategies to manage campus operations. There is a good reason to look at energy and sustainability as the capital investment—savings that they can achieve through energy conservation and other sustainability measures can help offset increasing deferred maintenance and capital renewal costs.

Sustainability improvements and the associated bottom-line benefits also need to be managed and measured. The first generation of green building tools such as LEED or Green Globes has traditionally focused largely on rating a facility at a single point in time focused on aspirational goals or best practices. As sustainability becomes the new norm, the focus now is on continuous benchmarking and cost-effective asset management. This requires metrics to baseline and measure progress.

APPA'S ENERGY AND SUSTAINABILITY ASSESSMENT TOOL

The APPA Energy and Sustainability Assessment Tool (ESAT) provides a dynamic database that can be used to track key energy and sustainability performance indicators, with respect to campus management and infrastructure as well as individual buildings. Since its launch in December 2012, over 175 campuses have visited ESAT online; yet only a handful has engaged in the full assessment. The objective of this article is to explain how ESAT works and the benefits of using it as a part of the campus management process.

ESAT was initially developed in 2010, through work at Carleton University, to evaluate the entire campus portfolio of 41 main buildings The project helped the facility staff to develop and test a streamlined, practical, and budget-sensitive benchmarking program, which supports a roadmap for continuous improvement for the campus. This successful pilot eventually led to an enhanced Energy and Sustainability Module, which became integrated with the APPA Facilities Performance Indicators (FPI) program.

The addition of ESAT has greatly enhanced APPA's annual FPI report. FPI is the only report readily available on the costs and practices of facilities operations at educational institutions. The report is based on an annual survey of colleges, universities, K-12 organizations, and other educational entities. It allows comparisons of average costs for different types of space and

Figure 1. Campus Assessment

OVERALL "GREEN CAMPUS" MANAGEMENT

- Landscaping
- Transportation infrastructure
- Campus policies and procedures
- Waste management
- Procurement
- Maintenance
- Occupant communications

INDIVIDUAL BUILDING TYPES

- Academic
- Residences
- Laboratory
- Athletic Facilities

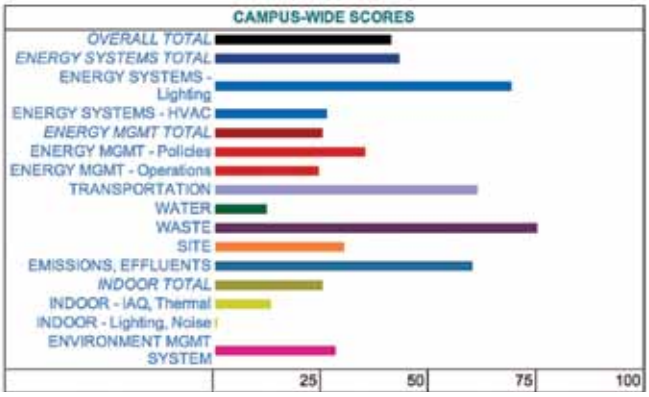
Sample Physical Attributes

» HVAC
» Lighting
» Envelope
» Water fixtures
» IAQ
» Pollution Controls

Sample Performance Metrics

» Energy
» Carbon
» Water
» Waste

Figure 2. Summary showing overall campus scores and average scores for each building type



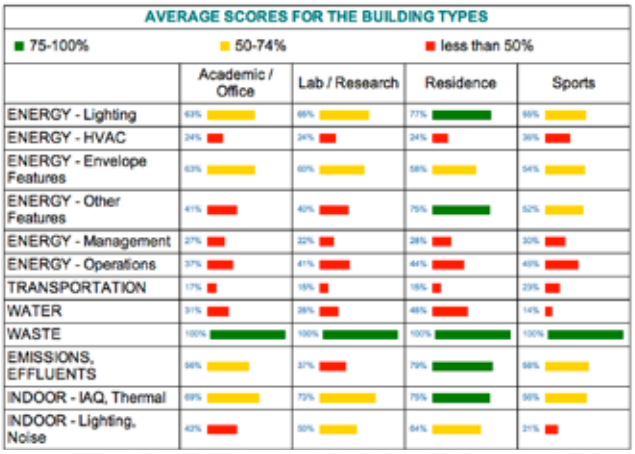
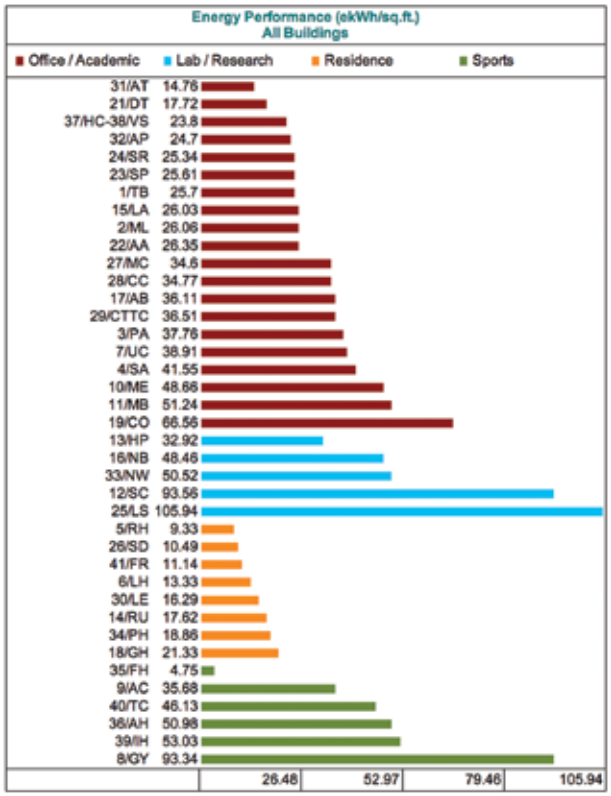
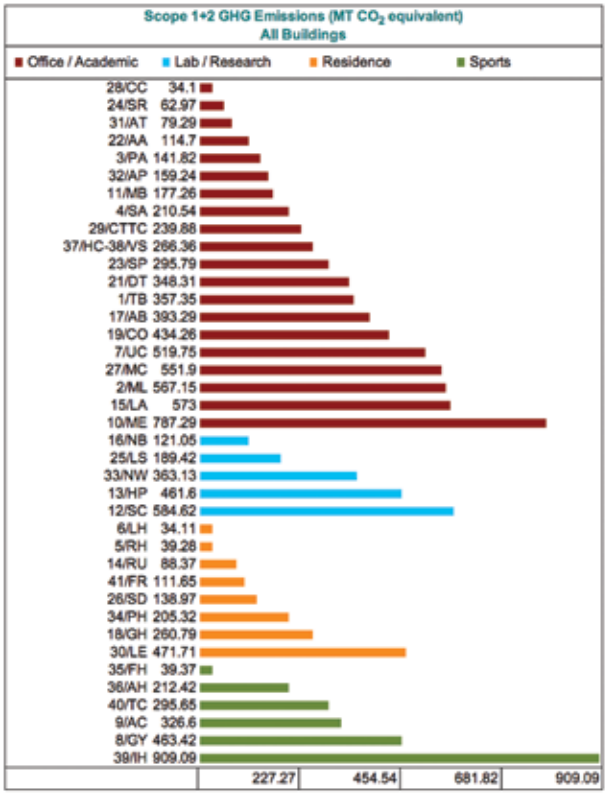


Figure 3. Energy intensity (ekWh/SF) and carbon (MTCO2) benchmarks for individual buildings are grouped by building type





institutions including staffing levels, salaries, and performance levels for custodial, grounds, maintenance, and other functional areas. With the addition of ESAT, the FPI report can now provide more detailed benchmarking of energy and sustainability performance of the individual campus buildings and campus operations as a whole.

HOW ESAT BENEFITS CAMPUSES

ESAT benefits campuses by providing a holistic approach to planning. As with any robust planning process, a baseline assessment is critical to understanding where the facility is currently at with regards to energy and sustainability, in order to establish targets and develop an action plan. Once the improvements have been implemented, a reassessment serves to monitor the progress and provide feedback on the effectiveness of the measures over a period of time. An added benefit is that ESAT enables a campus to benchmark its performance against other campuses.

The ESAT benchmarking tool has been set up to allow updates at any time. When FPI does its annual reporting, a "snapshot" of the following data from all the campuses is captured anonymously and transferred to the FPI.

- Energy performance benchmark
- Age distribution
- Data capture-size distribution
- Percentage of energy efficiency features found on campus
- Number of submetered buildings
- Carbon emissions benchmarks
- Water performance benchmarks
- Percentage of buildings that have various water efficiency features
  - Percentage of
  - Student and staff participation on the sustainable programs
- Buildings that have various Best Operating Features (BOP) related to the following
  - Utilities management
  - HVAC and electrical
  - Landscaping and site
  - Cleaning
  - Waste management
  - Hazardous materials management
  - Purchasing

HOW ESAT BENCHMARKS CAMPUS PERFORMANCE

A campus typically consists of several building types, which can be broadly classified as Academic Buildings, Labs, Sports Facilities (or other Auxiliaries), and Residences. These are

subject to the usual energy and environmental performance benchmarking including energy, carbon, water, waste, pollution control and IAQ. ESAT has a specific assessment for each building type.

In addition, certain campus-wide management and operations are evaluated such as landscaping, transportation infrastructure, waste management, procurement, maintenance, and occupant communications. To provide a comprehensive view of the campus operations, both the CAMPUS assessment and the assessment for each INDIVIDUAL BUILDING should be completed.

CAMPUS ASSESSMENT VS. ASSESSMENT OF EACH INDIVIDUAL BUILDING

The Campus assessment and the assessments of each Individual Building both address the same key elements: Energy, Water, Transportation, Waste, Site, Emissions, Indoor Environment, and Environmental Management. Most of the sections have one or more subsections. For example, under the Energy Management sub-section are Policy, Audit, Management and Monitoring. Most questions require Yes or No answers. Pop-up tips further clarify the question. For some questions, you may find a circumstance when the criterion is Non-applicable. The rules for non-applicability are always explained in the tips.

Figure 4. Benchmarking Report—Energy Management Section

Campus-wide Energy Management

X There is an energy management policy endorsed by senior management
√ Buildings on the campus have had an energy audit within the past three years
X Building energy audits are followed up with energy reduction plans
√ Energy consumption is monitored by a qualified person to identify anomalies and take corrective action
X There are energy usage targets
X There is movement towards the targets
√ Carbon emissions are reported
X Steps are taken to analyze and reduce peak electricity demand
√ There are financial provisions to improve the energy efficiency of campus buildings

Renewable Energy on the Campus

X "Green electricity" is purchased

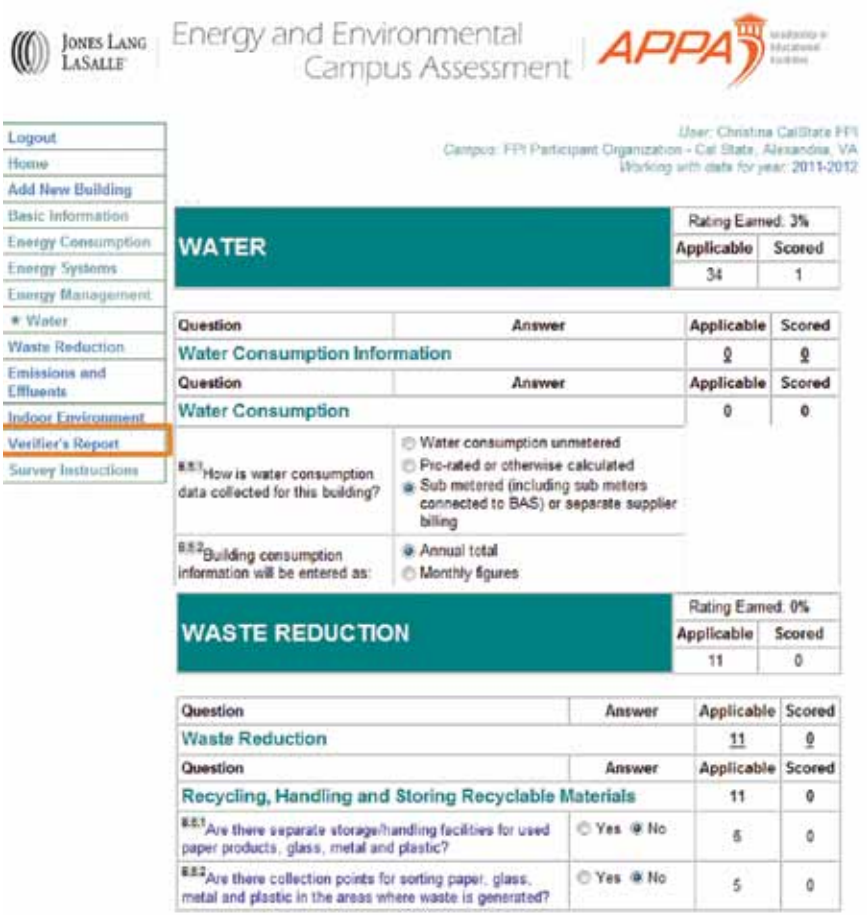
Individual Building Features	Audit: The building has had a recent energy audit	Metered electricity: The building is metered for electricity	Metered fuel: The building is metered for fuel	Sub-metering: Major energy uses within the building are sub-metered	Renewable Energy
Office & Academic Buildings					
1/TB	100%	Yes	Yes	100%	0%
10/ME	100%	Yes	Yes	0%	0%
11/MB	100%	Yes	Yes	N/A	0%
15/LA	100%	Yes	Yes	0%	0%
17/AB	100%	Yes	Yes	0%	0%
19/CO	100%	Yes	Yes	100%	0%
2/ML	100%	Yes	Yes	0%	0%
21/DT	0%	Yes	Yes	0%	0%
22/AA	100%	Yes	Yes	N/A	0%
23/SP	100%	Yes	Yes	N/A	0%

The reason that ESAT is divided into two parts—Campus assessment, and an assessment for each Individual Building—is to facilitate and streamline the collection and reporting of data.

Having the two parts facilitates the capture of data no matter what the submetering profile is for the campus. For example, where there is no submetering of energy for each building or where district heating is used, or where there is no data on water consumption or the amount of waste generated by each building, then this quantitative data can be captured for the entire campus in the Campus assessment. Alternatively, where there is submetering at the individual building level, the data can then be entered for each building and the total aggregated into the Campus assessment.

The Campus assessment also stream-

Figure 5. Verifier Report



lines data collection for criteria that apply to the campus as a whole and all the buildings. For example, where there is the same campus-wide procurement policy for all the facilities, the data only needs to be entered once in the Campus assessment.

The Individual Building questions address the energy and sustainability features of a building or operational and management practices specific to the type of the building against generally recognized best practice. If available, energy, water, and waste quantitative data specific to the building are also captured. For the Individual Building assessments, the user must first enter the individual building type (i.e., Academic, Lab, Sports Facility, or Residence).

Because some campuses may be rather large or some institutions may have satellite campuses in different locations, the assessment makes it possible to organize the buildings into building groups. Ideally, a building group should be no larger than 80 buildings. The reason for this is that the online diagram with more than 80 buildings loses clarity. Where more than 80 buildings are on single campus, the building group can be organized by building type.

ASSESSMENT REPORT

Once the inputs are completed, the benchmarking report is generated, which addresses the overall operation and management of the campus and provides an aggregated portfolio report on the performance of individual buildings by a building type.

The ESAT report also provides granular information. For example, Figure 4 shows which campus-wide criteria were met with respect to Energy Management. The lower part of the table shows which individual buildings met various sets of criteria. The green-amber-red coding shows at a glance the high, medium, and low scores.

The assessment also presents a Verifier Report, which documents how the questions have been answered and how many points from the available points were allocated. This provides a transparency of the scoring (see Figure 5).

Figure 6. Cost of Improvements and Savings Report

Item shaded in green	this is an opportunity that should be investigated immediately
Item shaded in amber	this opportunity should be investigated in more detail at the site level to determine feasibility
Item unshaded	this generates a long payback, but a detailed engineering assessment should be carried out to determine the feasibility and to develop more accurate costs and related paybacks

Savings by Building	Lighting Systems and Plug Load	HVAC Systems and Controls	Cooling Systems	Heating and DHW Systems	Water Reduction Measures
Office & Academic Buildings					
1/TB Tot cost:	$113,550	$68,130	$34,070	$56,030	$72,250
Savings:		$6,810		$2,520	$6,500
Capital Cost:		$76,550		$5,100	$70,170
Payback:		11.2 Years		2 Years	10.8 Years
Items:	High-efficiency package units, High-efficiency water heating, Low flush urinals, Low flow faucets				
10/ME Tot cost:	$250,170	$150,100	$75,050	$226,740	$99,270
Savings:		$15,010	$9,010	$15,310	$8,930
Capital Cost:		$112,810	$206,820	$92,130	$103,410
Payback:		7.5 Years	23 Years	6 Years	11.6 Years
Items:	High-efficiency package units, High-efficiency chillers, High-efficiency water heating, Hotwater saving devices, Low flush urinals, Low flow faucets				
11/MB Tot cost:	$56,330	$33,800	$16,900	$60,990	$6,470
Savings:	$4,730	$3,380		$3,660	
Capital Cost:	$21,910	$26,290		$12,710	
Payback:	4.6 Years	7.8 Years		3.5 Years	
Items:	Automated lighting controls, High-efficiency package units, High-efficiency water heating, Hotwater saving devices				

For more information about ESAT go to *http://www.appa.org/esat/index.cfm.* ESAT is open and available for your data input.

CAPITAL COST OF IMPROVEMENT AND SAVINGS REPORT

While it is not necessary that all buildings be entered to generate a report, the greatest benefit is gained from the combined overall campus results along with the individual building reporting, which includes Level 1 energy and water audits. These can be used for budgeting capital costs of the building improvement as well as utility savings.

USING ESAT TO DEVELOP A CAMPUS FACILITIES FOUNDATION FOR ACTION

To effectively develop and manage any program you need to measure and evaluate the current state, establish key indicators, and continue to measure the key indicators to ensure that the program is providing the desired result. For the areas affected by the campus and facilities operations, APPA's Energy and Sustainability Assessment Tool is an effective means for review and improvement.

The ESAT program at Carleton University made it possible to evaluate each building at a baseline point in time. With the baseline in place, the university and its energy services partner have initiated detailed audits of selected facilities, developed retrofit/renewal scopes of work, and are in the process of implementing the projects and measuring results compared to the baseline.

Carleton University plans to utilize this approach across the campus to continually improve the use of energy and reduce its overall campus environmental footprint.

CONCLUSION

ESAT is well positioned to meet an increasing demand for a simple asset management tool, which can track overall campus and individual buildings performance on ongoing basis. Through the link with APPA's Facilities Performance Indicators (FPI) survey and report, there is now a possibility to correlate some of the energy and sustainability indicators with other campus indicators (financial, space, etc.). With the ever-increasing power of the analytics, the combined ESAT and FPI database will provide a valuable source of data mining on all aspect of your campus' facilities performance.

In the meantime, the ESAT's benefits can therefore be summarized thus:

1. Assesses the energy and sustainability performance of campuses in terms of their overall campus operations, and their individual buildings
2. Provides a benchmarking framework against which campuses can compare themselves anonymously
3. Provides the basis to develop a campus-wide strategy and action plans for individual buildings and campus operations, including a Level 1 energy and water audit, along with orders of magnitude of savings and payback time
4. Packages a vast amount of data about campus operations and individual buildings in a manner that tells a story at a glance
5. Integrates ESAT benchmarks into the FPI database to report on Built Assets and Operations.

Jiri Skopek is managing director, sustainability, for Jones Lang LaSalle, Toronto, ON. This is his first article for *Facilities Manager*, and he can be reached at *jiri.skopek@am.jll.com*.