

Building Analytics Success Story

Carleton College



Carleton

Advanced Energy Information Systems (EIS) provide energy managers with an essential view into their energy data that supports proactive energy management. But you can't get to the point of reaping the rewards of analysis until you clear the hurdle of pulling disparate data sources into the software and embedding EIS review into organizational practices. Carleton College exemplifies the use of EIS as a central pillar of its energy management team's daily habits.

Taming the Data Beast

Like many large higher education campuses, Carleton's sustainability efforts require them to track a broad mix of data sources: electricity (a combination of interval and monthly meters), natural gas, fuel oil, domestic water, wind turbine generation, solar PV generation, steam production, and condensate return. Considerable effort and time was invested in pulling all these data — 135 meters and 120 utility accounts — into a reliable database that could feed into an EIS.

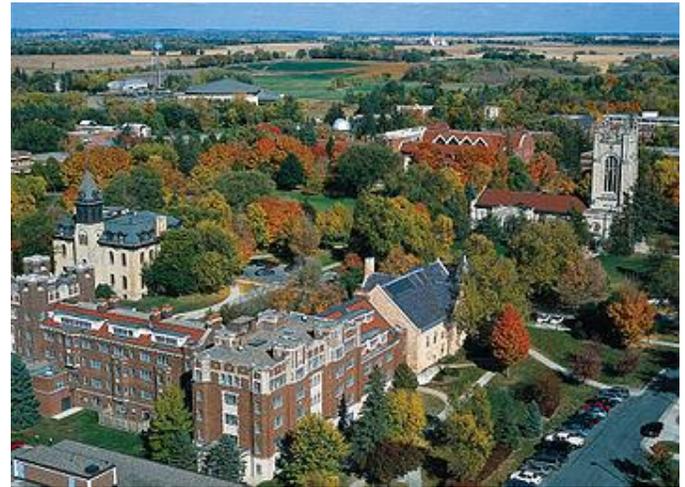
What is an EIS?

An EIS is a combination of software, data acquisition, and communication systems used to store, analyze, and display building energy meter data on an hourly or more frequent basis.

Energy Management Culture

Carleton uses actionable information from its EIS to inform its Energy Team's working practices. The EIS incorporates a wide array of analytic charting and data visualization capabilities to drive a regular cycle of checks by the team:

- **Daily:** Check for offline/flat-lined meters.
- **Weekly:** Review automated reports that rank buildings by total kilowatt-hours (kWh), kWh/sq. ft. and kWh/occupant. Review trend analyses, heat maps, and load profiles to identify anomalies like unusual nighttime usage, oscillations, and spikes.
- **Annually:** Review consumption and generation (normalized for weather) and track annual trends.



It took time to get through the data quality control phase due to our diverse metering infrastructure, but now we're all set up and trust what we are seeing.

- Martha Larson, Manager of Campus Energy and Sustainability

Quick Facts

Location: Northfield, Minnesota

Building type: Higher Education, including classrooms, labs, dormitories, food service, and assembly

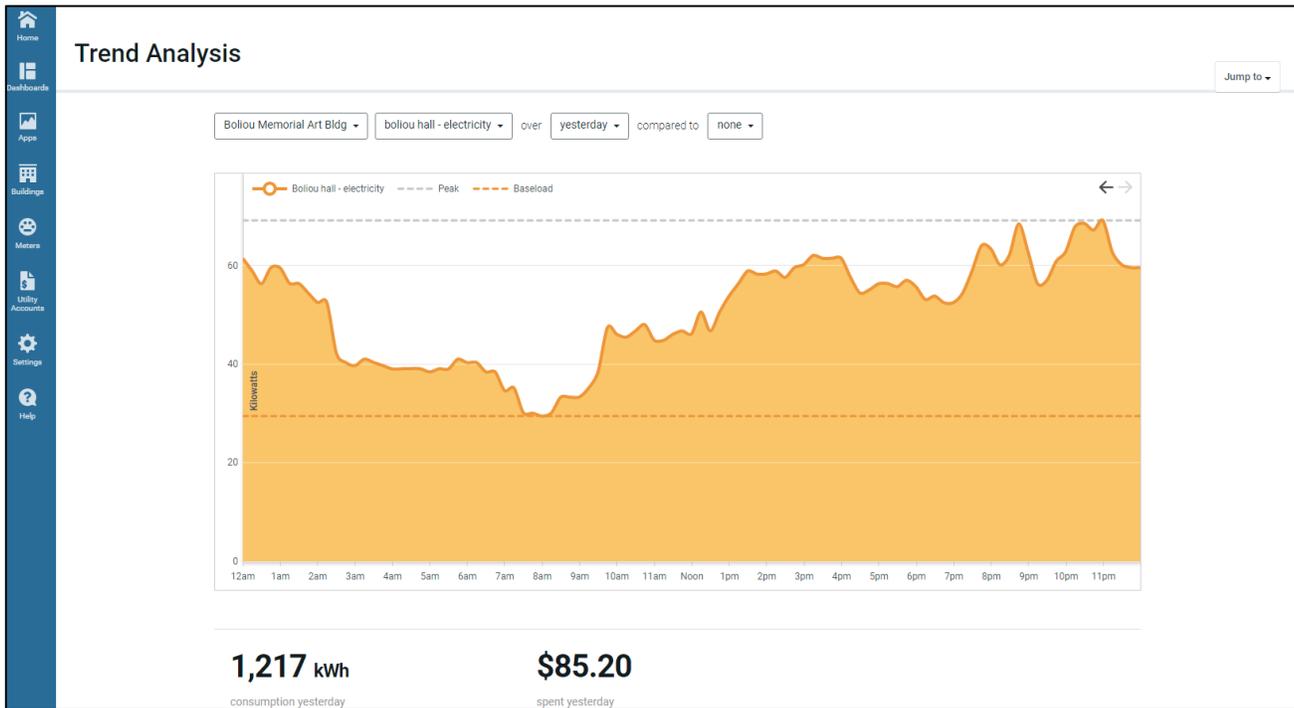
Gross floor area covered by FDD: 2 million sq. ft.

Total buildings with EIS: 103

Energy Management and Information Systems (EMIS) Tool: Lucid BuildingOS

Smart Energy Analytics Campaign: Recognition for New Installation of EIS

Carleton College was recognized by campaign partners during Smart Cities week in October 2017, acknowledging its exemplary work to save energy through the use of EMIS.



Carleton uses EIS time series charts to identify unusual nighttime patterns, oscillations, spikes, and other signs of suboptimal building system performance.

After EIS review, the Energy Team follows up by studying equipment operation using the building automation system or querying building occupants to identify causes of anomalies.

In addition to the regular EIS review cycles, Carleton’s Energy Team (which includes 2–3 student team members, the Maintenance Manager, and the Energy Manager) periodically leverages measurement and verification capabilities in the EIS to track return on investment for projects.

From Insights to Action

The most critical element of any EIS is the action taken *in response to* the analytics. Carleton’s early phase of EIS installation focused on meter audits and picking off the “low hanging fruit” energy conservation measures that can bring considerable savings:

- Carleton uses its EIS to support existing building commissioning at 3–6 buildings per year — a best practice that typically saves 5%–15% of whole building energy use.

- Lighting timers, LED fixtures, and occupancy sensors have been the most common upgrades, followed by the addition of variable frequency drives, demand control ventilation, and duct static pressure resets.

One additional benefit beyond direct energy savings is the use of energy data in college classes as a hands-on way to help engage students with building system performance and energy efficiency.

We engage students in our energy management team, giving them real-world experience analyzing data and identifying opportunities.

- Martha Larson, Manager of Campus Energy and Sustainability

Since implementing its EIS workflow process in 2016, Carleton has taken practical steps to see that its EIS is a core element of energy management practices. As a result, it has started reaping the rewards through better operations management.

The Smart Energy Analytics Campaign is a public-private sector partnership program focused on commercially available Energy Management and Information Systems (EMIS) and monitoring-based commissioning practices.

The Campaign couples technical assistance with qualitative and quantitative data collection to inform research, development, and field study priorities. Partnering participants are encouraged to share their progress and may receive national recognition for implementations that achieve significant energy savings.