

Case Study

Community Strategic Energy Management



OVERVIEW

Location: Boise, Idaho
City Size: 64 Square Miles
City Population: 228,930 (2016)
Median Income: \$54,535
Average High Temp: 90.2°F
Average Low Temp: 21.6°F
Number of City Facilities: 53



BOISE, IDAHO

The city of Boise began working on their carbon reduction goals in 2006 when Mayor Dave Bieter signed the Mayor's Climate Protection Agreement. The plan was seen as an investment in the Treasure Valley in an effort to help local air quality and a commitment by the city to do their part to address climate change. Since then, the city has implemented a number of approaches to reduce energy consumption, including incentives for high-performance and green projects, priority processing for green building projects, reduced permit fees for solar panel installations, recognition and education programs, and changes to city code to encourage high-density commercial and multifamily development, especially downtown.

The city also looked to their own operations to find energy savings. They began pursuing green building certification, including an energy component, using the US Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system. They also began tracking energy performance in their existing portfolio, with a goal of identifying and implementing energy conservation strategies. Many of the early energy conservation measures were "low-hanging fruit," such as LED street lights, interior lighting retrofits, fleet improvements and energy efficiency improvements at the wastewater treatment facilities.

As time went on, it became increasingly clear that existing buildings with aging equipment and infrastructure represented a tremendous opportunity for energy savings. The city realized that more carefully managing their own building portfolio would be the way to demonstrate leadership-by-example in their community. However, Boise was lacking a mechanism to identify inefficient buildings, prioritize upgrades and guide policy. A strategic energy management plan was needed.

Community Strategic Energy Management (SEM)

is a long-term approach to energy efficiency in public building portfolios. It brings SEM principals to the unique needs of public building decision makers and market actors, providing them with the information they need to turn broader performance and leadership goals into measurable energy savings outcomes in public buildings and schools.

Community Strategic Energy Management

With help from the Northwest Energy Efficiency Alliance (NEEA), the city of Boise took their commitment to energy efficiency to a new level. The NEEA project team partnered with the city to undertake a comprehensive approach to efficiency in the city's municipal portfolio. The team, including New Buildings Institute (NBI), EcoEdge, and Maalka, worked with city staff to benchmark their municipal buildings and develop priorities for portfolio management and performance upgrades. This process engaged multiple city departments, forming the basis for meaningful discussions of broader city energy goals, and leading to a more comprehensive approach to community Strategic Energy Management (SEM) for city buildings.

Over a series of facilitated meetings, the team created a community SEM plan that established a need for an internal energy team, documented the city's quantitative goals for energy efficiency improvements, and consolidated the approaches into one working document to guide Boise to success. The plan laid out clear tracking metrics including Energy Use Intensity (EUI) targets for particular building types and established routine ways to communicate results to key stakeholders.

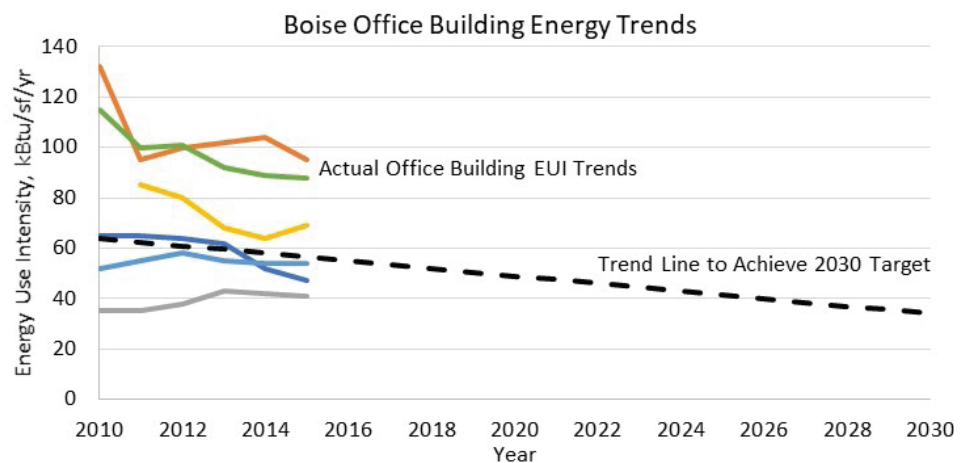
Part of the early process was to review current practices and note where things were working well. This was helpful in garnering lessons from a plug load study of City Hall, a retrofit of the main library and Idaho's first Zero Energy commercial building building at Boise's Twenty Mile South Biosolids Applications Site.

The goals below provide the basis for energy reduction in Boise's municipal buildings.

- All new buildings will be Zero Energy by 2030.
- Existing buildings will achieve a 50% reduction in EUI on average across the portfolio compared to the baseline year of 2010.
- All major renovations will achieve an EUI at least 50% below the 2010 baseline.

"Sustainability is part of our city's marrow. It's at the core of our efforts to make Boise the most livable city in the country."

-Boise Mayor Dave Bieter

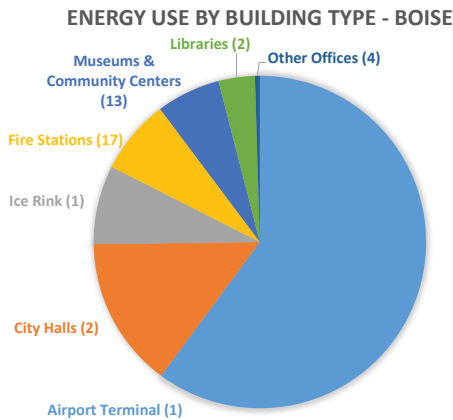


This graph shows how Boise office buildings are performing compared to the city's overall energy reduction targets for that building type.

Benchmarking and Remote Diagnostics

One key aspect of community SEM for municipalities is the use of remote diagnostics to better understand building performance issues and establish priorities. The team used the ENERGY STAR Portfolio Manager® tool to benchmark performance. Benchmarking is the practice of tracking, measuring and comparing the performance of buildings. While the initial building inventory included 53 city facilities for further analysis, the team benchmarked 46 of these buildings in Portfolio Manager, plus four additional buildings not in Portfolio Manager, for a total of 50 buildings. The analysis found that the airport used the most energy overall and provided context that the two City Hall buildings use more energy than all 17 fire stations combined. In comparison, libraries use a smaller amount of energy than other office type buildings such as city halls.

With only utility bills and basic building inputs (building location, type and size), the team used NBI's FirstView® software tool to remotely diagnose energy performance of 40 buildings. The FirstView analysis led to defining priority levels across the city's portfolio and across department, identifying which buildings warranted further attention.



Case Study: Fire Station 8

As a result of the goals set during the Community SEM process, City Council went beyond LEED Silver and established an aggressive energy target for their new fire station. Specifically, the City Council required that Fire Station 8 be designed with an Energy Use Intensity (EUI) of 27 kBtu/sf/year to align with their new leadership-by-example goals. Benchmarking and regional best-in-class examples provided clarity regarding what is achievable for fire stations. This aggressive energy target factored into the design team selection and encouraged city staff and design team members to visit a “best-in-class” fire station in Issaquah, Washington early in design.

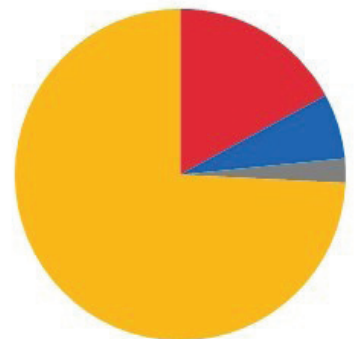
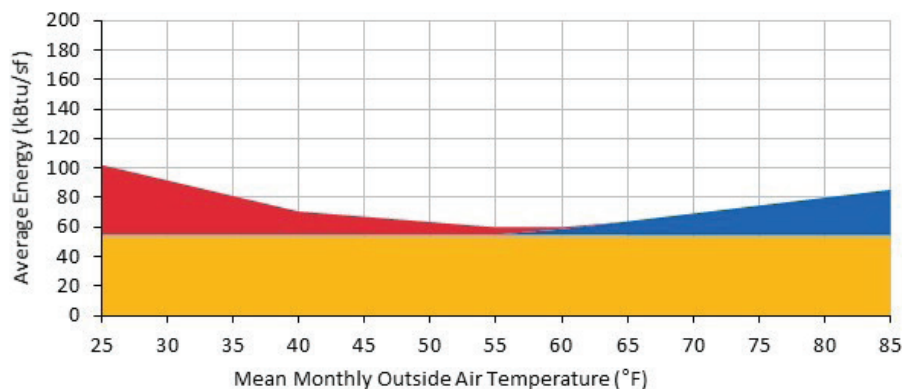
Fire Station 8 is now in operation and performing well. Some of the important design features include efficient lighting, increased insulation (R-30 in the walls and roof), air tight construction, attention to and management of thermal bridging, radiant heating in the bay and ductless heat pumps (“mini-splits”) in each dorm for individual control. The high-performance engine bay doors save energy by minimizing leakage and heat loss through enhanced insulation and high-speed operation: they open side-to-side in seven seconds. The side-to-side opening also minimizes repair costs: trucks occasionally damage conventional roll-up doors by exiting before the door is fully open. The building is prepared to add solar as funds become available and has durable materials like polished concrete floors and stainless steel counters to ensure the building effectively serves the community for years to come.



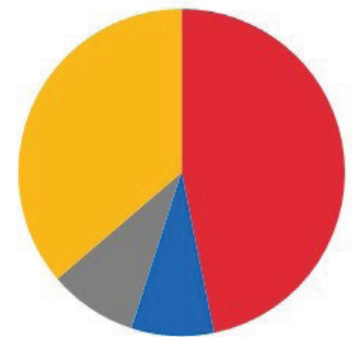
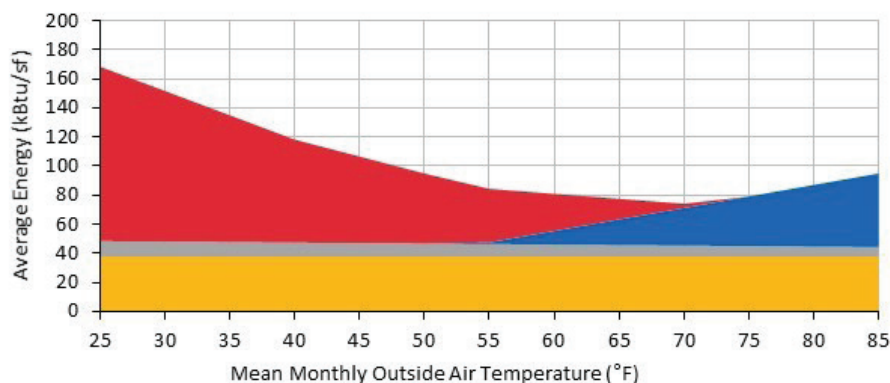
The FirstView software tool allowed the team to dive deeper into energy performance in 40 buildings before on-site assessments. As seen in the Energy Signatures, remote diagnostics on City Hall (below) show that plug loads, including servers, could be a major concern, as seen by the height of the electric baseload (yellow). The Energy Signature for City Hall West clearly diagnoses a heating and control problems, as indicated by the extensive heating load (red) which overlaps significantly with cooling energy use (blue). The diagrams shows that City Hall West bounces back and forth between heating and cooling between outside air temperatures of 50°F and 70°F, while City Hall has a smooth transition between heating and cooling at around 55°F, as is expected in well-controlled buildings.

When staff confirmed that City Hall West had comfort issues and that a chiller replacement was on the horizon, the team agreed that the next step was a focused energy audit on City Hall West. A load calculation study was undertaken to determine if a reduction in size and change in type of new chiller would be appropriate and more energy efficient. The electric baseload issues at the main City Hall would be addressed by building management staff directly. A plug load study performed by the University of Idaho's Integrated Design Lab was useful to inform these actions.

Energy Signature of City Hall



Energy Signature of City Hall West



— Temperature Dist ■ Heating ■ Cooling ■ Thermal Baseload ■ Electric Baseload

Outcomes

The Community SEM process has driven cultural and organizational change that saves energy in the city of Boise. Policymakers are tracking the progress of the energy team and have a much better understanding of the importance of energy performance in their own portfolio. EUI targets for particular building types and clear measurement protocols and metrics help them better understand building performance issues and priorities. The city now publishes a livability report with a section on energy that tracks progress toward clearly stated municipal building goals.

This process also allowed the city to focus its resources on the best opportunities for performance improvement, even before they did expensive site assessments. By identifying significant energy users and buildings with performance that was out of line with comparable facilities, the city was able to prioritize analysis and upgrade resources on the subset of buildings that represented the most significant opportunity for performance improvement. The process also identified low-cost/no-cost opportunities to better manage building performance.

As a result of these efforts, the city is now focusing on the 17 high priority buildings out of the 50 analyzed. These 17 buildings use about 70% of all energy in the city's Portfolio Manager buildings. (The airport terminal and ice rink together use more than half of all energy portfolio-wide.) The city can focus limited auditing resources on the highest priority buildings across the entire building portfolio. Thanks to this effort the city has committed about 1.5 FTE to work on community SEM efforts on an ongoing basis, and has enhanced operations and maintenance strategies at the department level into city planning efforts.

Another important outcome of the community SEM process relates to inter-departmental communications. Including finance personnel in most workshops helped to build an understanding of ways to prioritize projects to align with strategic goals to save energy and money. Together they have begun to develop standard criteria for prioritizing building upgrades. Meetings with the information technologies and communications departments were helpful and could also result in energy savings. Thanks to the Community SEM process the IT Department identified opportunities to incorporate energy savings criteria into a new asset management software purchase.

Interdepartmental communications were also helpful to compare results of like building types (i.e. public assembly, public safety, libraries). This uncovered synergies where building types overlap. For example, the managers of the fire station at the airport were inspired to aim for higher levels of efficiency after they learned about the Fire Department's energy targets for new fire stations.

The city is working to establish the means by which the city will disclose energy use at various municipal facilities. The Livability Report plus public displays of energy performance such as the one at the new Library! at Brown Crossing will allow Boise to lead by example and work towards broader energy disclosure policies that impact the entire community.

“Perhaps the most important realization that came from this project was to emphasize efficiency first in design and operation. By emphasizing efficiency, we’re able to make substantive reductions in the near term to establish program momentum while reducing future capital costs for upgrades.”

-Steve Burgos, Director, City of Boise
Public Works Department



Credit: City of Boise

Boise Energy Team

“This successful project delivered several outcomes that will positively affect our city in the decades to come.”

-Steve Burgos, Director, City of Boise
Public Works Department

Lessons Learned

- Benchmarking performance is the foundation for any municipal leadership-by-example program. Data in Energy Star Portfolio Manager must accurately map meters to appropriate buildings. Data collection and cleaning can be time consuming. Boise hired staff responsible for ensuring that benchmarking data is regularly updated, includes all meters, and accurately maps meters to appropriate buildings. Automated data cleaning tools, such as Maalka’s free, open-source Data Quality Tool (dataquality.maalka.com), can lower costs for the enhanced SEM approach.
- City Council and staff have many responsibilities and competing priorities, so helping the energy team establish a clear plan with reportable metrics and a defined approach to communicate results to key stakeholders is critical to successful implementation.
- Analyzing the city portfolio, both overall and for particular departments, is helpful in planning and priority setting. This helps the city uncover the most promising financial investments across the city and lays the groundwork for department-specific plans necessary for successful implementation.
- Establishing a formal mechanism for conversations and communications among city departments and staff in the context of energy performance can lead to significant new initiatives, ideas, and approaches that support broad progress toward city goals. Through this process new staff members became empowered in city efforts to reduce energy use.
- Energy performance targets at the building level, usually defined in terms of Energy Use Intensity (EUI), are a key tool to bridge the gap between broad executive commitments to energy efficiency and climate goals and day-to-day building management. Boise now has EUI targets for a number of building types.

