# Case Study
# Public Buildings Portfolio Management

Credit: City of Boise


Credit: Cole Architects

## 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:** 65

## BOISE, IDAHO

The City of Boise formalized their carbon reduction goals in 2006 when Mayor 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 commit to doing 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 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" certification, with the aim of maximizing energy points in the U.S. 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, so it was difficult to know where to start.

**Public Buildings Portfolio Management** provides public building decision makers and market actors with key information and an actionable framework to turn broader performance and leadership goals into measurable energy savings outcomes in public buildings and schools.

## Public Buildings Portfolio Management

With help from the Northwest Energy Efficiency Alliance, 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, policymakers, and other stakeholders, forming the basis for meaningful discussions of broader city energy goals, and leading to a more comprehensive approach to Public Buildings Portfolio Management for the city.

This approach began with a review of current city policies and practices, including the "Sustainable City" initiative under Boise's overarching livability framework, called LIV. This framework revealed that the main goals for their Boise's portfolio were to:

1. **Lead by Example** through transparency, fiscal responsibility and high standards
2. **Inspire the Community** through citizen engagement, public/private collaborations and incentives
3. **Build Resilience** through promotion of resource efficient infrastructure, alternative fuels and renewable energy

Over a series of facilitated meetings, the energy team created a plan that established an energy team, developed quantitative goals for energy efficiency improvements, and consolidated the approaches into one working document to guide the team to success. The plan set up 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 Boise's first Zero Energy commercial building called the 20 Mile South Biosolids Applications Site.

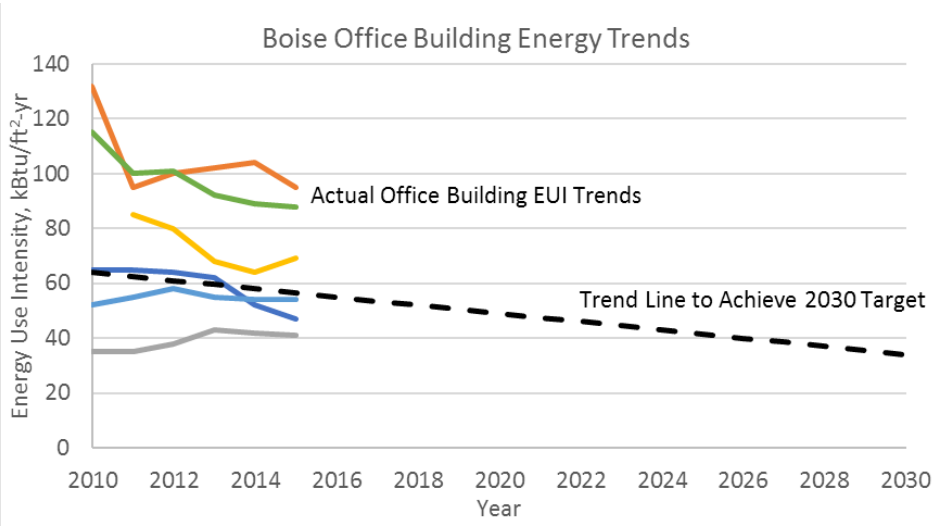
"Sustainability is part of our city's marrow. It's at the core of our efforts to make Boise the most livable city in the country."

Boise Mayor Dave Bieter

Eventually, the team established clear and quantifiable energy targets based on the 2030 Challenge. The goals below provide the basis for energy reduction in Boise's municipal buildings.

- New buildings and major renovations will be constructed to be 70% below the national average EUI baseline beginning in 2015/2016.
- All new buildings and major renovations will be carbon-neutral (using no fossil fuel greenhouse gas emitting energy to operate) by 2030.
- Existing buildings will achieve a 50% reduction in energy use on average across the portfolio compared to the baseline of year of 2010.

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




Expanding these goals to the community, the city followed the STAR Communities plan. These broader goals aim to achieve 80% reduction by 2050 in community-wide greenhouse gas (GHG) emissions by:

- Reducing EUIs of the community building stock
- Reducing transportation emissions
- Promoting renewable energy

Credits: Cole Architects

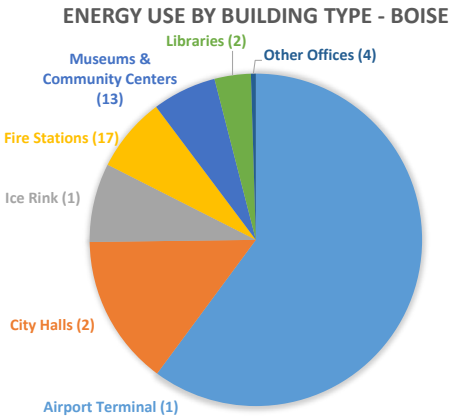
## Case Study: Fire Station 8

As a result of the goals set during the 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 EUI of 27 kBtu/sf²/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.

## Benchmarking and Remote Diagnostics

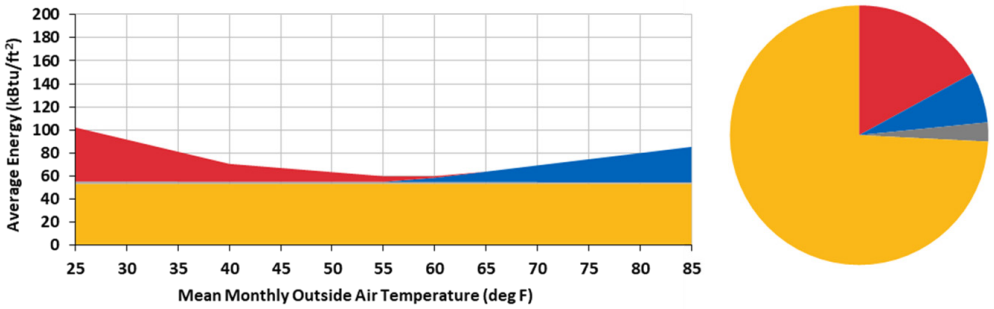
One key aspect of Public Buildings Portfolio Management for municipalities is the use of remote diagnostics to better understand building performance issues and establish priorities. The team used the Energy Star Portfolio Manager tool to benchmark performance. Benchmarking is the practice of tracking, measuring and comparing the performance of buildings. While the initial building inventory included 65 city facilities for further analysis, the team benchmarked 47 of these buildings in Portfolio Manager and focused more detailed analysis on a subset of 40 buildings.



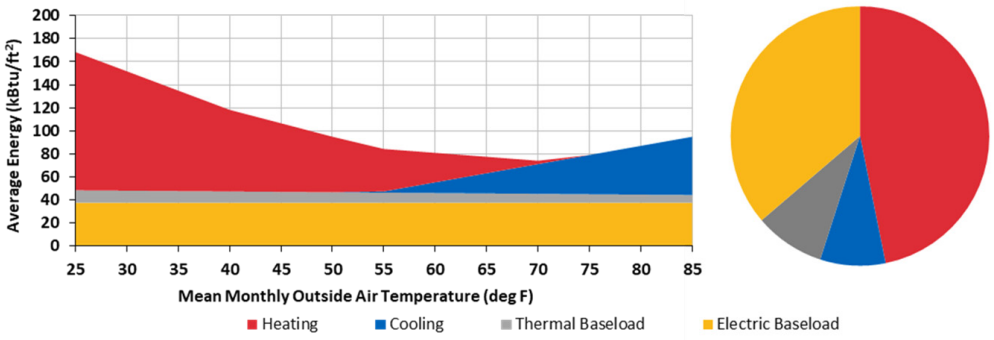

With only utility bills and basic building inputs (building location, type and size), the team used NBI's FirstView® software tool to remotely diagnose energy performance of these 40 buildings. The FirstView analysis led to defined priority levels across the city's portfolio and across department, identifying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

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 are the 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 the outside temperatures of 50 and 70 °F, while City Hall has a smooth transition between heating and cooling at around 55 °F.

### Energy Signature of City Hall




### Energy Signature of City Hall West



When staff confirmed that City Hall West had comfort issues and that chiller replacement was on the horizon, the team worked to establish financial criteria to show the Return on Investment (ROI) associated with an investment in high performance equipment. The team agreed that the next step was a focused energy audit on City Hall West, whereas the electric baseload issues at the main City Hall would be addressed by building management staff directly. A plug load study lead by the University of Idaho's Integrated Design Lab was useful to inform these actions.

## Outcomes

The process has driven cultural and organizational change that saves energy in the City of Boise. Policymakers are closely 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 track and understand building performance issues and priorities. The city now publishes an annual sustainability report with a section on energy that tracks progress toward clearly stated municipal building goals.

"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,
Environmental Manager, City of Boise

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 16 high priority buildings across their portfolio. These 16 buildings use about 70% of all energy in the city's portfolio. (The airport and ice rink together use more than half of all energy portfolio-wide.) Each department has its own action plan and priorities, and the city can focus limited auditing resources on the highest priority buildings across the entire building portfolio. Thanks to this effort the city has added 1.5 FTE to work on Public Buildings Portfolio Management efforts on an ongoing basis, and they have enhanced operations and maintenance strategies at the department level into city planning efforts.

Another important outcome of the process relates to inter-departmental communications. Including finance 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 developed standard criteria for prioritizing building upgrades. Meeting with the Information Technologies and Communications departments will also result in energy savings. Thanks to the process the IT Department identified opportunities to save energy and developed criteria for a new asset management software they were already intending to buy.

Interdepartmental communications were also helpful to compare results of like building types (community stations, fire stations, police stations, libraries and office buildings). This uncovered synergies where building types overlap. For example, the fire station at the airport was inspired to aim for higher levels of efficiency after they learned about the Fire Department's energy targets.

Credit: City of Boise

*Boise Energy Team*

Because of the Public Buildings Portfolio Management process, the city is now working to establish the means by which the City will disclose energy use at various municipal facilities. The annual sustainability report plus public displays of energy performance such as the one at the new Library! at Brown Crossing will allow Boise to them lead by example and work towards broader energy disclosure policies that impact the entire community.

## 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 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, but 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 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 all building types. The fire station energy target is less than half the code baseline.

"This successful project delivered several outcomes that will positively affect our City in the decades to come."

Steve Burgos,
Environmental Manager, City of Boise

neea maalka ecoedge nbi new buildings institute

Northwest Energy Efficiency Alliance (NEEA), and team members New Buildings Institute (NBI), EcoEdge, and Maalka, are working with Northwest cities to benchmark their municipal buildings and develop priorities for portfolio management and performance upgrades.