

Cities Leading by Example: Benefits and Framework of the Public Buildings Portfolio Management Process



Credit: City of Tacoma





CITIES LEADING BY EXAMPLE

Providence, RI | Credit: Visit Rhode Island

Hundreds of cities and states across the country have set bold, aggressive energy and climate goals. These leading governments recognize that change starts at home and most have committed to specific energy and emission reduction goals for their own facilities and operations. In the largest cities, teams of dedicated city staff members work to develop and implement plans to meet these goals. But many small and medium-sized local governments lack the capacity to develop an effective approach for tracking, managing, and strategically upgrading public building performance.

Over the last five years, New Buildings Institute (NBI) and partners EcoEdge, Maalka, National Institute of Building Science, and Integral Group have worked with mid-sized cities across the country to develop and deploy a replicable process to help cities connect the dots between goals and day-to-day operations in a cost-effective and impactful manner. The team has developed an integrated set of open-source tools and free resources with support from the Northwest Energy Efficiency Alliance and others.

This document aims to help public building portfolio holders understand the benefits of the Public Buildings Portfolio Management process and outline the approach and key lessons learned for those ready to start their own program. The process is applicable to any city, county, regional government, state agency, or school district interested in saving on operating costs, reducing emissions, and leading by example in their community.

Buildings account for 40% of global (and US) greenhouse gas emissions. 20% of the nation's floorspace is owned by state and local governments.¹



Spotlight: Grand Rapids Tracking and Planning Success

The City of Grand Rapids, Michigan owns and operates hundreds of properties. The project team worked with City staff to organize and formalize municipal energy data tracking across the municipal portfolio. By leveraging the Public Buildings Portfolio Management process and tools, the city was able to calculate a 7.8% weather-normalized energy reduction vs. baseline across approximately 200 city facilities. Grand Rapids staff members, NBI, and EcoEdge worked together to build on this success by developing a Public Building Portfolio Management strategic plan.

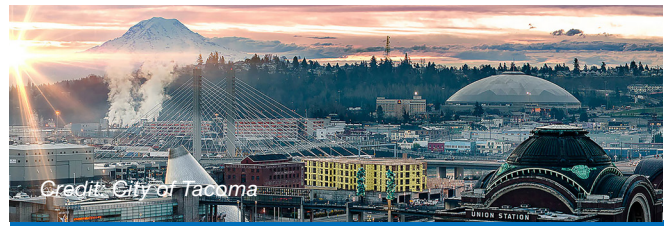
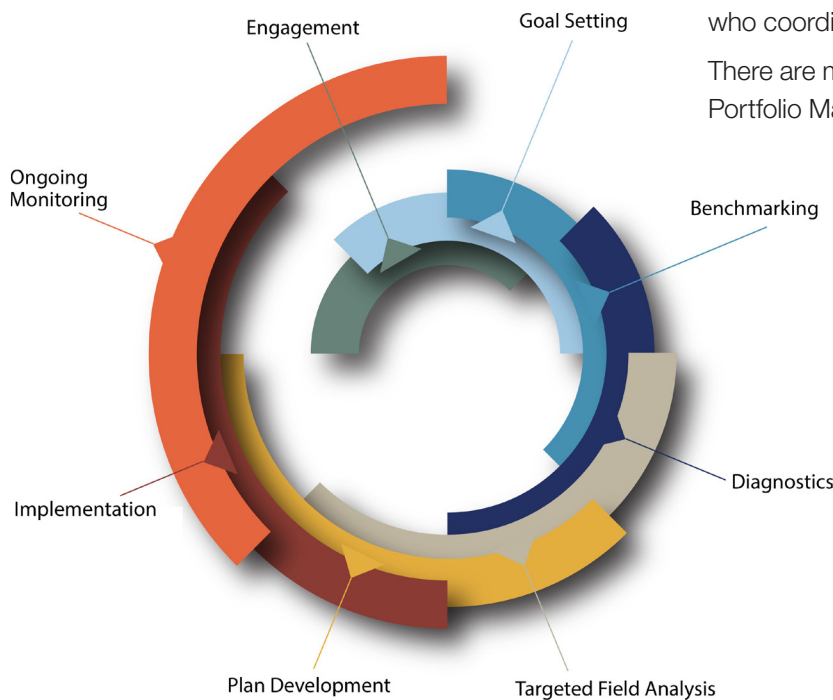
1. Sources: International Energy Agency, US Energy Information Agency, and 2012 Commercial Buildings Energy Consumption Survey.

The Public Buildings Portfolio Management Process

Public Buildings Portfolio Management is a long-term, strategic approach to energy efficiency in public building portfolios. With the overarching community vision and goals in mind, the process begins by engaging the right stakeholders and collecting information about current practices and policies. Benchmarking allows for the comparison of the measured energy performance of buildings to themselves, their peers within the portfolio, or best in class buildings of that same type. Diagnostics can uncover opportunities and focus limited auditing resources on high priority and known problem areas across the portfolio. This targeted field analysis leads to the development of a strategic plan that prioritizes opportunities across the portfolio. Ongoing monitoring and communication of results help to ensure the goals and objectives of the plan are effectively tracked and results communicated back to key public decision makers.

This turnkey approach for managing and improving the energy use of public buildings can:

- Demonstrate good governance and fiscal responsibility
- Save money and energy while contributing to the achievement of climate goals
- Facilitate interagency communications & coordination
- Increase transparency and staff accountability
- Improve service delivery to customers and citizens



Spotlight: Tacoma Energy Champion

The project team worked with the City of Tacoma in 2016-2017 to benchmark and analyze municipal facilities, but a backlog of deferred maintenance needs and limited staff resources stymied progress. In 2018, the City hired a Resource Conservation Manager to act as the energy champion. Since then, progress in Tacoma has been consistent and substantial, including enhanced energy team engagement, financial and organizational improvements, and building upgrade projects.

Stakeholder Engagement

Identifying and engaging municipal building stakeholders early raises awareness and understanding of the value of energy management in the public building portfolio as well as the relationship of municipal building performance to broader policy goals. A cross-departmental **energy team** can ensure that each aspect of Public Buildings Portfolio Management is addressed. Often, the Director of Sustainability or the Resource Conservation Manager serves as the **energy champion**, an overall point person who coordinates the effort.

There are many reasons to engage in the Public Buildings Portfolio Management process and it is important to consider each stakeholder's drivers and priorities. Executives such as City Council or School Board members are interested in fiscal responsibility, demonstrating good governance, and meeting their energy and emissions goals. Department heads, facilities staff, and building operators want to address deferred maintenance problems, better plan for capital projects, and enhance their facilities for city staff and members of the community. Bringing together a multi-faceted energy team can help cities achieve multiple goals simultaneously in a strategic, coordinated, efficient way.



Community Engagement Workshop | Cambridge, MA

Goal Setting

Many communities have already defined their long-term vision and goals, often in terms of energy efficiency, emissions reduction, community livability, or air quality. Setting more aggressive goals and timelines for public buildings is a key demonstration of leadership-by-example. The aim of Public Buildings Portfolio Management is to build from the community's vision and to identify the opportunity that the public building portfolio represents to help meet existing goals.

Goals require clear ways to measure progress toward achievement, both in metrics (what) and methods (how). This team has worked with cities to define SMART (Specific, Measurable, Actionable, Realistic, and Time-bound) energy performance goals across the public building portfolio and at the building level. A critical step is to create interim targets for building performance in order to help break long timeframes into realistic segments. These targets can be aligned with key

municipal non-energy considerations such as capital planning, facility condition assessments, and equipment replacement schedules.

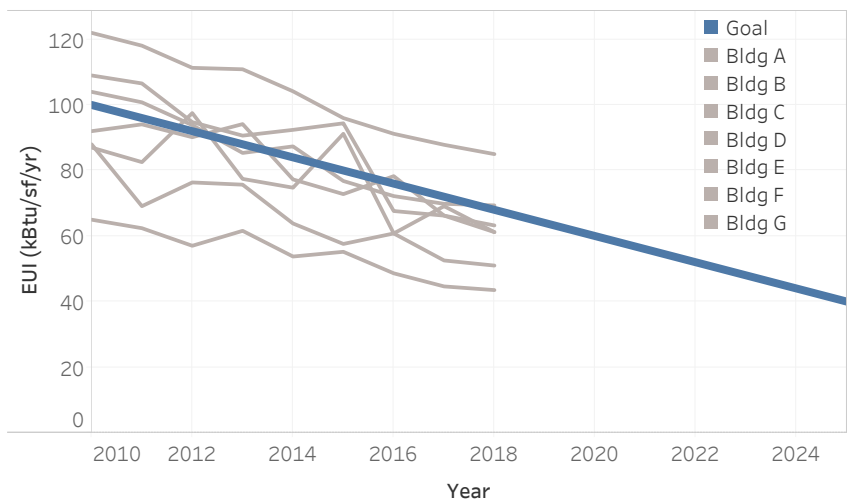
Taking a clear-eyed, comprehensive look at the jurisdiction's energy and climate goals, and evaluating how its operations contribute to the overall energy and climate picture, is critical to achieving those goals. Template tracking tools and [open-source software tools](#) developed as a part of this program can help predict the scale of opportunities in municipal buildings to help staff members connect the dots between long-term goals and day-to-day facility operations.

Setting interim EUI targets helps cities connect the dots between broad, long-term goals and day-to-day facility operations.

Spotlight: Boise Energy Targets

The City of Boise set a goal for all new construction and major renovations to be zero energy by 2030 and for existing buildings to achieve a 50% reduction in energy use on average by 2030 (against a 2010 baseline). The energy team translated these goals into building-specific EUI targets. Benchmarking is used to track performance and achievements as shown in this chart.

Municipal Building Energy Use



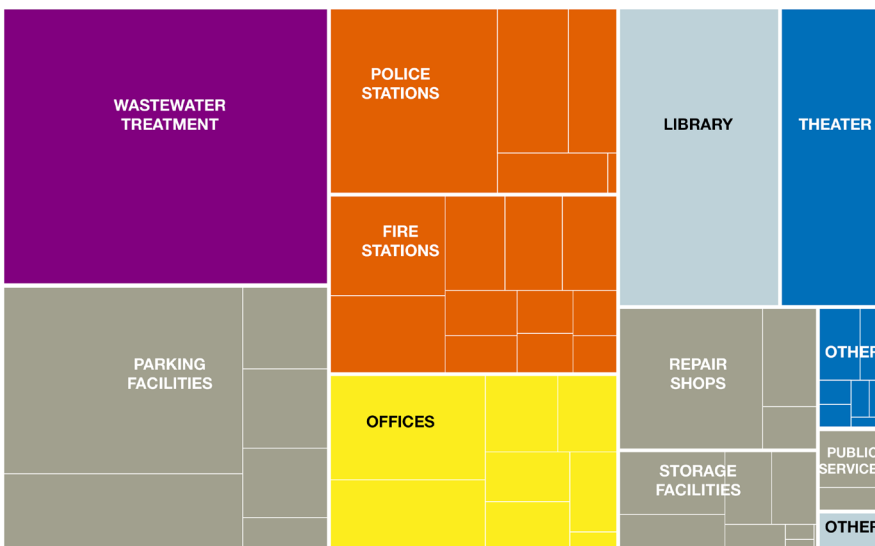
Benchmarking

Building energy benchmarking involves tracking a building's energy performance over time. As the old adage goes, you can't improve what you don't measure. Benchmarking lays the foundation for improving energy performance across a portfolio. Cities begin by defining a master facilities list and then working with utility providers and others to report and record energy performance across their facilities.

A variety of tools are available on the market for energy tracking and benchmarking. The most commonly used benchmarking platform is Energy Star Portfolio Manager (ESPM), a free tool that can be used to track data, generate reports, set goals, and effectively overview any number of buildings across many different building types. Data quality should be checked prior to analyzing benchmarking results. The free [Data Quality Tool](#) is available to help.

Benchmarking is the process of monitoring and recording building energy performance over time. Benchmarking allows owners to compare buildings to their peers and to track progress toward goals.

Building energy benchmarking is a key foundational step toward achieving energy and utility cost savings. Municipalities and school districts benchmark facilities in order to better understand their building stock, identify operational opportunities, and address performance drift. Tracking building energy use over time can help identify the impacts of operational changes such as set points or lighting controls, maintenance work, or capital improvements. Buildings benchmarked over a 3-year period showed an average of 2.4% annual savings in energy². Ultimately, benchmarking is critical to enabling informed decision making for building portfolio holders.



Relative Energy Use of Buildings in a Sample City Portfolio

Each small rectangle in this treemap diagram represents a single building. The size of each rectangle is representative of the building's share of all energy use portfolio-wide. In this city, the wastewater treatment plant (upper left, purple) and the six parking facilities (lower left, grey) together account for about a third of total energy consumption across all city buildings. Police, fire, and municipal offices are also responsible for significant usage.

A Tale of Two Cities

This project team engaged with two Northwest cities of similar size: Eugene, Oregon and Tacoma, Washington. The tools used by the two cities were very different. In Eugene, one dedicated staff member had been tracking energy performance across the entire municipal portfolio for more than 20 years, but the task of building the customized tool, keeping data up to date, and using the information to improve performance fell to that one staff member. In Tacoma, no one person was in charge of tracking municipal building performance and each municipal department had developed its own process and tools, to varying degrees of success. This required a different approach in each city, but the result was the same – implementation of a standard process to collect, cleanse, and track building energy data.

2 US EPA ENERGY STAR® Portfolio Manager™ Data Trends, Benchmarking and Energy Savings, October 2012.

Diagnostics

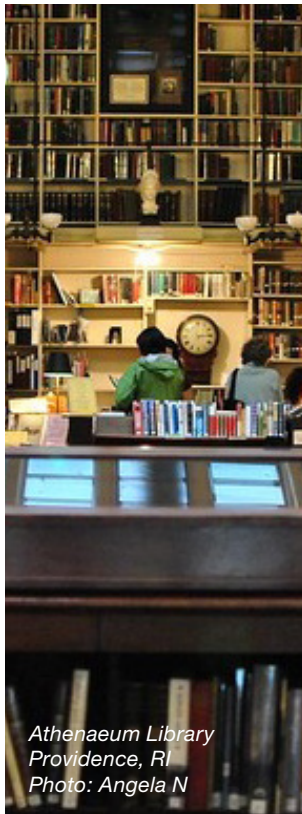
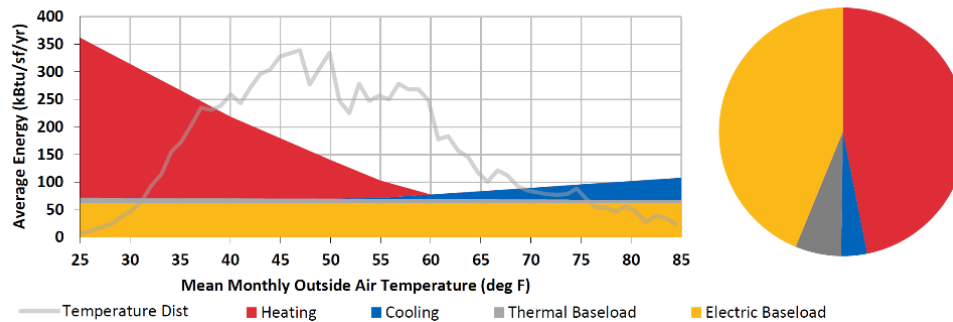
Building energy diagnostics build on benchmarking data as the next step in the process. By analyzing benchmarking data across the portfolio, city staff and their collaborators can uncover high priority opportunities for energy improvements without resorting to expensive sub-metering. A variety of software tools, including NBI's [FirstView®](#), can remotely disaggregate benchmarking data into energy end uses and diagnose building-level opportunities (e.g. HVAC controls issues). These virtual

energy audits are an important low-cost tool to define a prioritized list of buildings that deserve a walk-through building assessment.

Once city staff or consultants have evaluated buildings across the portfolio and identified opportunities for operational and capital improvements, it is helpful to combine the results of those analyses into a broader view at the portfolio level. It is useful to evaluate groups of similar buildings or city departments, as well as to evaluate all buildings across the entire portfolio.

Consumption by End Use Energy Signature

The Consumption By End Use Energy Signature shows the total energy use split into four end use categories: heating (electric, gas, and/or steam), cooling, electric baseload (e.g. plugs, lights, and equipment), and thermal baseload (e.g. gas or steam used for water heating). This plot shows cumulative energy use at a range of outside temperatures and can offer insights into building consumption patterns. [Click here to learn more.](#)



Athenaeum Library
Providence, RI
Photo: Angela N

Spotlight: Providence Priorities

After benchmarking and analyzing buildings across their portfolio, the Energy Team of Providence, Rhode Island sat down with NBI and EcoEdge to prioritize buildings for further investigation and upgrade using four priority levels:

Priority level 1: high energy use vs. target and/or high potential energy savings, high share of overall municipal energy use, and/or high visibility: one or more strong reasons to invest!

Priority level 2: moderate to high energy use, moderate potential savings and/or visibility: a good upgrade candidate

Priority level 3: minimal reason to upgrade for energy reasons: new construction, already very energy efficient, or minimal potential for cost-effective energy savings

Priority level 4: buildings in which no upgrades are worth pursuing due to the building's condition, plans for demolition/sale, etc.

During a single in-depth meeting, the team used FirstView results as well as non-energy considerations such as capital plans to define the priority levels for more than 80 municipal buildings. This prioritization was very useful when developing the municipal facilities strategic energy plan.



Zero Net Energy Center | San Leandro, CA | Photo: FCGA Architecture

Targeted Field Analysis

The portfolio analysis identifies trends and prioritizes candidates for further investigation. Generally speaking, targeting a limited number of buildings based on data-driven prioritization rather than conducting in-depth assessments of every facility in a portfolio is a more efficient and effective use of time and money. This strategic prioritization helps decision makers determine where to perform building assessments that will identify concrete, actionable improvements at the facility level.

Many considerations, not all related to energy consumption, influence the timing and scope of potential energy upgrades. System maintenance and replacement issues, occupant satisfaction, fire and life safety, and other factors can trigger projects—and therefore energy savings opportunities. Combining energy performance analysis with broader issues can leverage funding to serve multiple needs and makes energy upgrades more cost-effective—and more likely to be implemented.

Both energy diagnostics and targeted field analysis can be especially useful when combined with other information about facilities. For example, a master list of facility equipment across all buildings helps department heads, facilities and operations staff, and planners anticipate future needs and align building upgrades with maintenance requirements. Centrally tracking existing equipment, including age and condition, enables and streamlines the implementation of equipment efficiency and performance standards. Energy audits can build off of both remote diagnostics and facility condition assessments for maximum impact.

Prime opportunities for rolling energy efficiency improvements into other projects occur at specific points in time: when addressing deferred maintenance, at equipment end of life, and in the course of major renovation and new construction.

Targeting Field Analysis for Maximum Impact

A considered and deliberate approach to field analysis can make a big difference in energy outcomes—and costs. Cities can leverage benchmarking data and virtual energy audits to optimally scope facility field analysis.

ASHRAE provides well-respected standards for three levels of building audits:

Level 1: A simple walk-through to identify low-cost/no-cost energy conservation measures (ECMs).

Level 2: A detailed building survey, breakdown of energy use, and savings/cost analysis of ECMs.

Level 3: An investment-grade audit based on rigorous engineering analysis focused on costs and savings of capital-intensive ECMs.

Consider how best to devote limited energy audit resources across the portfolio by right-sizing the field analysis for each facility.

Plan Development and Implementation

The Public Buildings Portfolio Management plan is where it all comes together. The purpose of identifying stakeholders and goals, benchmarking, diagnostics, and performing targeted facility assessments is to build an informed, coherent, and reliable basis for this plan. A template plan is available to provide a solid beginning for each city, county, school district, or other jurisdiction to build upon, adding in their unique goals, targets, facilities, and considerations.

This plan may be a new document or may be a feature added into existing master planning and other framework elements. In either case, it is important that the plan is based on reliable data (e.g. benchmarking data) and helps the jurisdiction set and achieve their SMART goals. NIBS and NBI created a free web-based progress tracking tool for jurisdictions implementing strategic energy plans and enhancing energy and climate related policies. (See the [Life-Cycle Energy Performance Framework for Cities](#).)

Financing

While a well-crafted long-term strategic energy management plan can be a powerful tool, financing for projects is often a major challenge to achieving climate and energy efficiency goals. A range of financial analysis tools are available to help decision makers and others fully understand the cost, benefits, and financial implications of the Public Buildings Portfolio Management plan (see the [Public Buildings Portfolio Management Implementation Guide](#)).

Key Benefits of Public Buildings Portfolio Management Planning

- Building a roadmap to achieving the community's vision and goals
- Ensuring that progress toward energy and climate goals is achieved and maintained
- Minimizing building utility costs
- Bringing long-term stability and clarity to project budgeting and financial forecasting
- Merging multiple priorities, both energy and non-energy, into combined projects
- Demonstrating leadership by example, good governance, and transparency

Building Procurement

This team has worked to document best practices in project procurement and has provided guidance on topics such as performance-based procurement, green leasing, owner's project requirements, design team interviews, request for proposals/qualifications, and more in the [State and Local Government Toolkit](#).

Spotlight: Boise's Strategic Plan Implementation

Since 2006, Boise has implemented a number of approaches to reduce energy consumption in their own city operations. As time went on, it became increasingly clear that existing buildings with aging equipment and infrastructure represented a tremendous opportunity for energy savings. City staff realized that more carefully managing their own building portfolio would be the way to demonstrate leadership by example. With help from the Northwest Energy Efficiency Alliance, the City of Boise engaged this project team from 2015-2017 to create and implement a strategic plan.

The city worked hard to drive cultural evolution, enhance inter-departmental communication, and committed about 1.5 Full Time Equivalent (FTE) of staff time to work on plan implementation on an ongoing basis. City Council is on board with aggressive EUI targets for new construction (see the [Fire Station 8 Case Study](#)).



West Berkeley Public Library | Berkeley, CA | Photo: Harley Ellis Devereaux

Ongoing Monitoring and Continuous Improvement

Tracking performance against goals and targets, both at the organizational level and the facility level, is key to continuous improvement. Clearly assigning responsibility for facility energy performance target tracking and reporting helps ensure that the plan is a living document and is fully implemented. Gaining executive buy-in and making plan implementation part of someone's job description is important to ensure follow-through.

Regular reporting is essential to communicate the progress of the Public Buildings Portfolio Management process, to share successes and lessons learned, and to ensure transparency with the public. Many jurisdictions choose to report internally (for example, to decision makers such as City Council) as well as externally (to the community, as in an annual energy or sustainability report). Tracking the impacts of energy efficiency projects as they are implemented helps decision makers and the public see the benefits of spending limited time and money on energy efficiency.

The cadence of reporting varies by audience. Management may want quarterly reports that show year-over-year comparisons of energy use and cost per building and for the entire portfolio. Facility staff may want monthly reports that show daily variations as well as overall trends year-over-year. Community-oriented external reports often publicize goals, projects, incentives, and metrics such as EUI, showing building progress toward goals on an annual basis.

Using this framework offers local government staff a ready-made pathway to enhance community engagement. By defining building performance targets that are in line with the community's broader energy and climate vision, the jurisdiction can demonstrate that they are taking their commitments to the community seriously and are making concrete progress toward that vision – while reducing energy costs and thus increasing the budget for other priorities. This is a natural priority for elected officials who must answer to the public at election time, but also for other government employees whose job it is to serve their community.

Boise, ID | Photo: Bob Young





Discovery School | Arlington, VA | Photo: VMDO Architects

Apply this Framework in your City, County, State, or School District

With support from the Northwest Energy Efficiency Alliance and others, NBI, EcoEdge, and Maalka have worked with cities around the country to develop, field-test, and refine the Public Buildings Portfolio Management framework and its accompanying integrated set of open-source software tools and free resources. This document is intended to give a brief overview of the process, to help cities understand the scale of the engagement, and to showcase the benefits of undertaking this process. This team stands ready to support other cities, states, school districts, or other organizations seeking to lead by example under this framework .

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More information about the process, including a detailed implementation guide, case studies, and links to a wide variety of resources, is available at NBI's Public Buildings Portfolio Management web page, newbuildings.org/public-buildings-portfolio-management.

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New Buildings Institute (NBI) is a nonprofit organization driving better energy performance in buildings. We work collaboratively with industry market players—governments, utilities, energy efficiency advocates, and building professionals—to promote advanced design practices, innovative technologies, public policies, and programs that improve energy efficiency. We also develop and offer guidance and tools to support the design and construction of energy efficient buildings.

Throughout its 20-year history, NBI has become a trusted and independent resource helping to drive buildings that are better for people and the environment.

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