



# BENCHMARKING CITY PROPERTIES: CITY OF HOUSTON CASE STUDY

## Texas City Efficiency Leadership Council Best Practice

**Houston:** Benchmarking City Properties: City of Houston Case Study

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### Description of Best Practice

The City of Houston is actively benchmarking almost 10 million square feet of its building space in about 400 of its properties. This includes every metered building in the city's portfolio, excluding the airport system and Houston First, a local government corporation that manages a number of city-owned facilities. Seven million square feet are included in the Department of Energy's Better Building Challenge with the intention of including the remaining 3 million square feet in the next couple of years.

As the process moves forward, benchmarking data may be used in a variety of ways including:

- Prioritizing buildings for energy retrofits;
- Tracking progress of energy retrofitting projects; and
- Developing building energy report cards to aid Green Teams in designing behavioral programs.

### Motivation and Stakeholders for Benchmarking

This project, led by the Mayor's Office of Sustainability, was driven largely by the city's decision to participate in the U.S. Department of Energy's (DOE) Better Building Challenge. The citywide benchmarking effort includes participation from representatives in all major city departments, with the greatest support coming from the General Services Department, Human Resources and Administration and Regulatory Affairs (ARA). The departmental stakeholders provide context for facility operations such as hours of operation, building uses and occupancy.

### Benchmarking Tools and Process

The city's sustainability team uses the U.S. Environmental Protection Agency's (EPA) **Portfolio Manager** to benchmark public facilities. This online tool is free to the public and is required both for the challenge and for Energy

Star Certification purposes. The city's benchmarking team is responsible for gathering the data needed for Portfolio Manager, namely square footage, space types, computers, operating hours, energy consumption and number of employees.

### Data Sources

The sustainability team gathers data using a variety of resources and methods while taking advantage of support from other city departments. The three most valuable data sources are utility and building data and operating hours from the General Services Department; building age, square footage and date of ownership from the ARA Department; and building occupancy data from Human Resources. For facilities without available square footage data (an important metric for any benchmarking process), the Sustainability Team uses Google Earth to approximate square footage. When using this method, the team flags the property to note that future verification of its square footage is needed. The team also works with department representatives to fill data gaps such as occupancy hours and number of occupants. In cases where data are simply unavailable – for example, determining the number of computers in certain offices the team uses Portfolio Manager's default values.

## BENCHMARKS AND THE LAW

Recent Texas legislative activity also has influenced benchmarking. In 2011, the 82nd Legislature enacted **Senate Bill 898**. It requires political subdivisions, institutions of higher education and state agencies with facilities located in federal Clean Air Act non-attainment and near-non-attainment areas to set goals to reduce electricity consumption by 5% a year for 10 years. They must report to the State Energy Conservation Office (SECO) annually on their progress toward meeting the goals. The reporting requirement took effect in September 2011. Benchmarking is key to meeting the requirements of this law. See SECO's **Non-Attainment Area Energy Reporting webpage** for more information.

## HOW TO BENCHMARK WITH EPA'S PORTFOLIO MANAGER

### 1. Choose the building type

There are 18 board categories of building types and 80 primary functions built into the application.

### 2. Enter energy data

Data can be entered manually for each building using the Property Wizard and Meter Wizard, or multiple properties can be tracked on spreadsheets to be uploaded all at once.

### 3. Verify the data

Portfolio Manager has a data quality checker to find and correct errors.

### 4. Interpret the results

Hundreds of metrics are available to help compare data to the benchmarks that are most useful.

### Data Upload

The Sustainability Team has been able to gather and upload data back to 2008. At present, the team uploads new utility data twice a year, with the expectation of moving to quarterly uploads in 2016. The utility upload is facilitated through direct communication with the General Services Department. It sends the team a spreadsheet containing all pertinent electricity and natural gas data for uploading

twice a year. The team expects to move toward a multi-account upload using a Portfolio Manager template in the future. Currently, however, it appears to be more effective to upload data on an individual basis.

### Data Validation

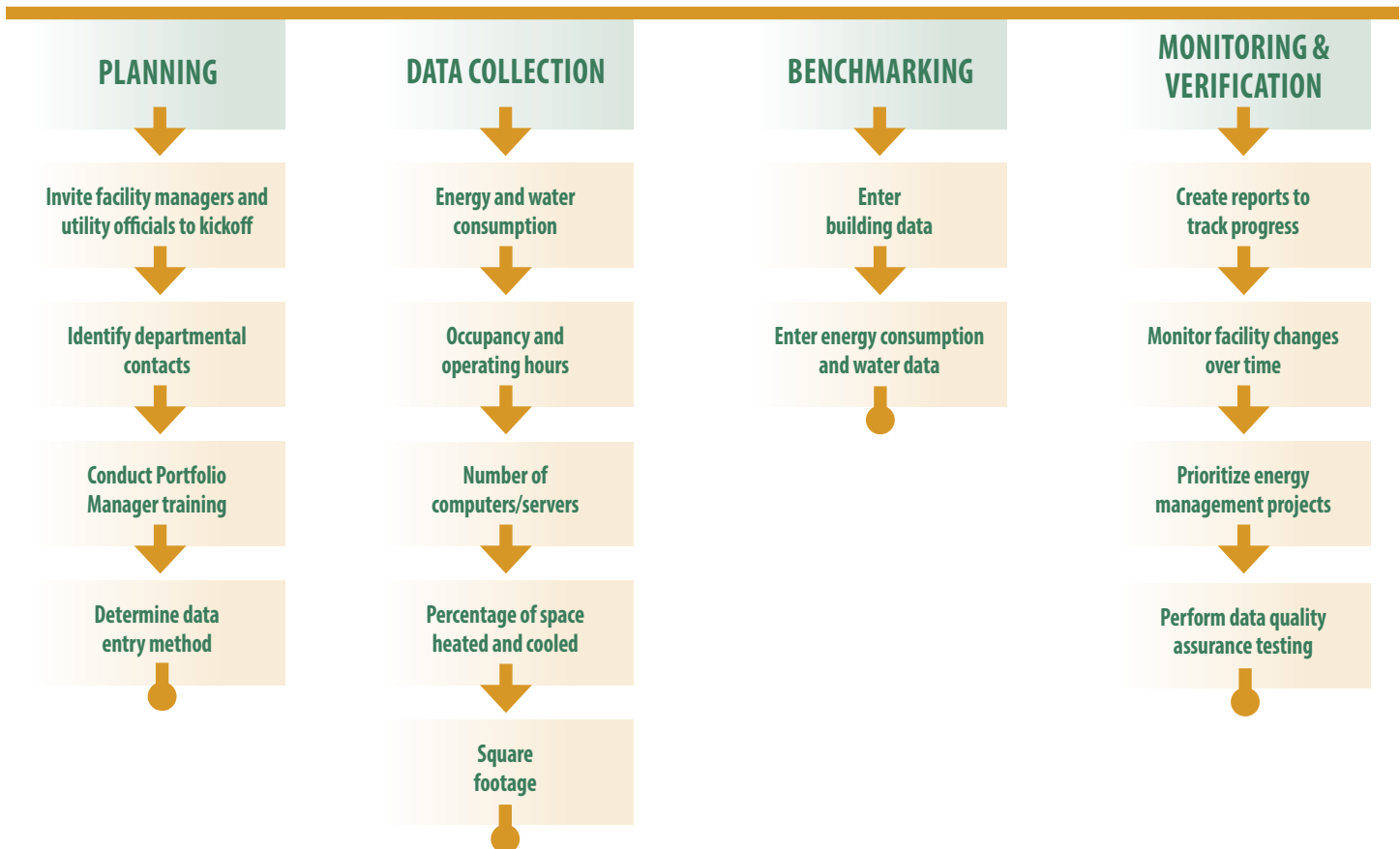
For quick review purposes, the city visually inspects outliers (unusual data points) during the manual data entry process. The city also utilizes Portfolio Manager's Data Quality Checker to determine if data are missing or to identify other irregularities. Further, the city looks at several of Portfolio Manager's reports regarding source energy usage intensity (EUI) and site EUI to identify any significant changes that could be anomalies over time. Finally, the city works with the DOE to validate its data for the buildings participating in the Better Building Challenge.

### Getting Started

Benchmarking measures building energy use intensity (EUI) in terms of energy usage per square foot. British thermal units (BTUs) are the primary unit of energy measurement. A variety of factors influence a building's energy use intensity. These factors include size, usage, operating hours and number of occupants, as well as location within a climate zone.

EPA's **Portfolio Manager** is a free energy usage measurement tool available online, enabling cities to conduct their own benchmarking exercises. Most of the electric utilities in the state will provide free benchmarking to public facilities. A city can contact its local utility and ask for a benchmarking study.

## FOUR-PHASED APPROACH TO BENCHMARKING



## Lessons Learned

The Sustainability Team offers the following advice based on its experience with benchmarking:

- **Involve other departments**

From the outset, develop a team of stakeholders to foster departmental engagement. This will ease access to non-utility data, which increase the richness of the overall dataset.

- **Contact the retailer**

For a deregulated electricity market such as Houston, engage the retail electricity provider (REP) to ensure that it is providing the appropriate data in a format easily transferrable to Portfolio Manager. REPs have experience with this process and typically just need to be asked.

- **Use Portfolio Manager**

Begin the benchmarking efforts with Portfolio Manager. There may be better third-party applications available, but the EPA's version is free and relatively easy to use, and it continues to improve. Its functionality will only increase with the new Standard Energy Efficiency Data (SEED) platform.

## Responding to Challenges

Creating a fully functional benchmarking program for municipal facility energy efficiency can be a challenging undertaking. But it also presents opportunities for innovation and collaboration, both internal and external.

The Sustainability Team cleared numerous hurdles to get Houston's program up and running smoothly. Many of them involved data – quality, access and collection.

These obstacles are not unique and so may be faced by other cities. The table below summarizes several challenges common to effective benchmarking and the responses staff made, or is making, to address each of them.

## RESPONDING TO CHALLENGES

| CHALLENGES  | RESPONSES   |
|---|---|
| High quality facility data (e.g., square footage, age, occupancy/hours, ways of use, equipment) are difficult to access because they must be collected from various sources; utility usage information is not centralized.  | <ul style="list-style-type: none"><li>• Cultivate relations with and educate city risk management/insurance teams on the importance of providing specific data on each building.</li><li>• Develop relationships with department heads and Human Resources to jointly create and implement strategies for collecting data, reducing errors and eliminating confusion.</li></ul>   |
| Few city staff are properly trained to gather and report facility data so as to enable energy benchmarking.   | <ul style="list-style-type: none"><li>• Form a cross-functional team to educate other city departments about benchmarking and get buy-in to provide data.</li></ul>   |
| Information about facility operations (e.g., buildings opening, closing, changing hours of operation) is not typically shared, making it difficult to include new facilities or reconcile energy usage in existing facilities.  | <ul style="list-style-type: none"><li>• Engage and develop relations with the department responsible for facilities design and construction.</li><li>• Compare existing meters with current bills to determine what has been added or deleted from the previous year's list.</li></ul>  |
| Utility bills are difficult to obtain, making it problematic to enter accurate data and identify billing errors. Furthermore, without bills it is difficult to determine if utility data provided are accurate and were entered correctly by the department receiving the bills.                                    | <ul style="list-style-type: none"><li>• Involve natural gas and electricity utilities in the process and develop a shared system that regularly provides energy data.</li><li>• Request that utility bills be provided to benchmarking staff as well as to the departments responsible for payment, or ask those departments to scan and forward bills to the benchmarking staff.</li><li>• When only energy usage data are provided without an actual bill, identify outliers by searching for anomalies once data are entered into Portfolio Manager.</li></ul> |
| The multi-facility templates in Portfolio Manager do not work well, causing difficulty when uploading data for a large number of facilities.  | <ul style="list-style-type: none"><li>• Create spreadsheet templates to import data, reducing the need to upload each facility's data individually.</li></ul>   |
| Portfolio Manager is weak on measurement and verification; i.e., the ability to verify pre- and post-retrofit project energy usage and costs over time. Some cities see its primary shortcoming as providing an insufficient level of detail, such as day-to-day weather normalization or avoided use by fuel type. | <ul style="list-style-type: none"><li>• Investigate using more robust information systems; e.g., Noesis, eSight, Resource Advisor and Lucid.</li></ul>  |