



## **Introduction and Basic Training**

**October 2025**

**Prepared for Users of BETTER. V.1.8**

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# Acknowledgments

- BETTER is made possible by support from the U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Building Technologies Office (BTO).
- BETTER is being developed under Cooperative Research and Development Agreement (CRADA) No. FP00007338 between the Regents of the University of California Ernest Orlando Lawrence Berkeley National Laboratory, under its U.S. DOE Contract No. DE-AC02-05CH11231, and Johnson Controls, with support from ICF.

# Tool Overview

# What is BETTER?

- The Building Efficiency Targeting Tool for Energy Retrofits (BETTER) delivers actionable insights to improve energy and financial performance in buildings and portfolios without requiring site visits or complex modeling.
- BETTER requires minimal data inputs and short run time to:
  - Benchmarks a building's electric and fossil energy usage against peers.
  - Quantify energy and cost reduction potentials at the building and portfolio levels.
  - Recommends energy efficiency (EE) measures.
- **The BETTER web app is available online at <https://better.lbl.gov>.**
- **BETTER's analytical engine is open-source and available on GitHub at <https://github.com/LBNL-JCI-ICF/better>.**

# Overview

## Value Delivered to Users:

- BETTER identifies immediate, cost-saving operational and technology EE improvements to reduce energy use costs while prioritizing buildings for more in-depth audits and analysis. BETTER:
  - Replaces level 1 audits.
  - Streamlines level 2 audits.
  - Uncovers simple no-/low-cost measures to immediately cut energy costs 5-10% portfolio-wide.

## How BETTER works:

- BETTER utilizes an open-source, data-driven analytical engine and user-friendly web interface to automatically analyze a building's monthly energy usage in response to weather conditions.

### Portfolio Summary

Number of Buildings:  
**32**

Annual Cost Savings (USD / \$ ):  
**1,291,265**  
**11.1 %**

Electricity Energy/Cost Savings:  
**11.3%**

Total Floor Area (m<sup>2</sup>):  
**820,835**

Annual Energy Savings (kWh):  
**13,905,685**  
**10.6 %**

Fossil Fuel Energy/Cost Savings:  
**6.7%**

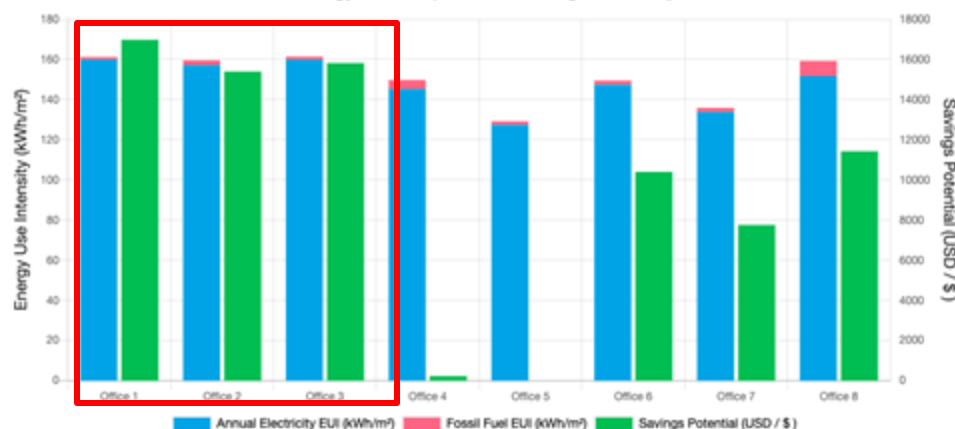
## Top Energy Efficiency Recommendations

The energy efficiency recommendations most frequently recommended:

- [Reduce Equipment Schedules](#)
- [Decrease Heating Setpoints](#)
- [Reduce Lighting Load](#)
- [Reduce Plug Loads](#)
- [Increase Cooling Setpoints](#)

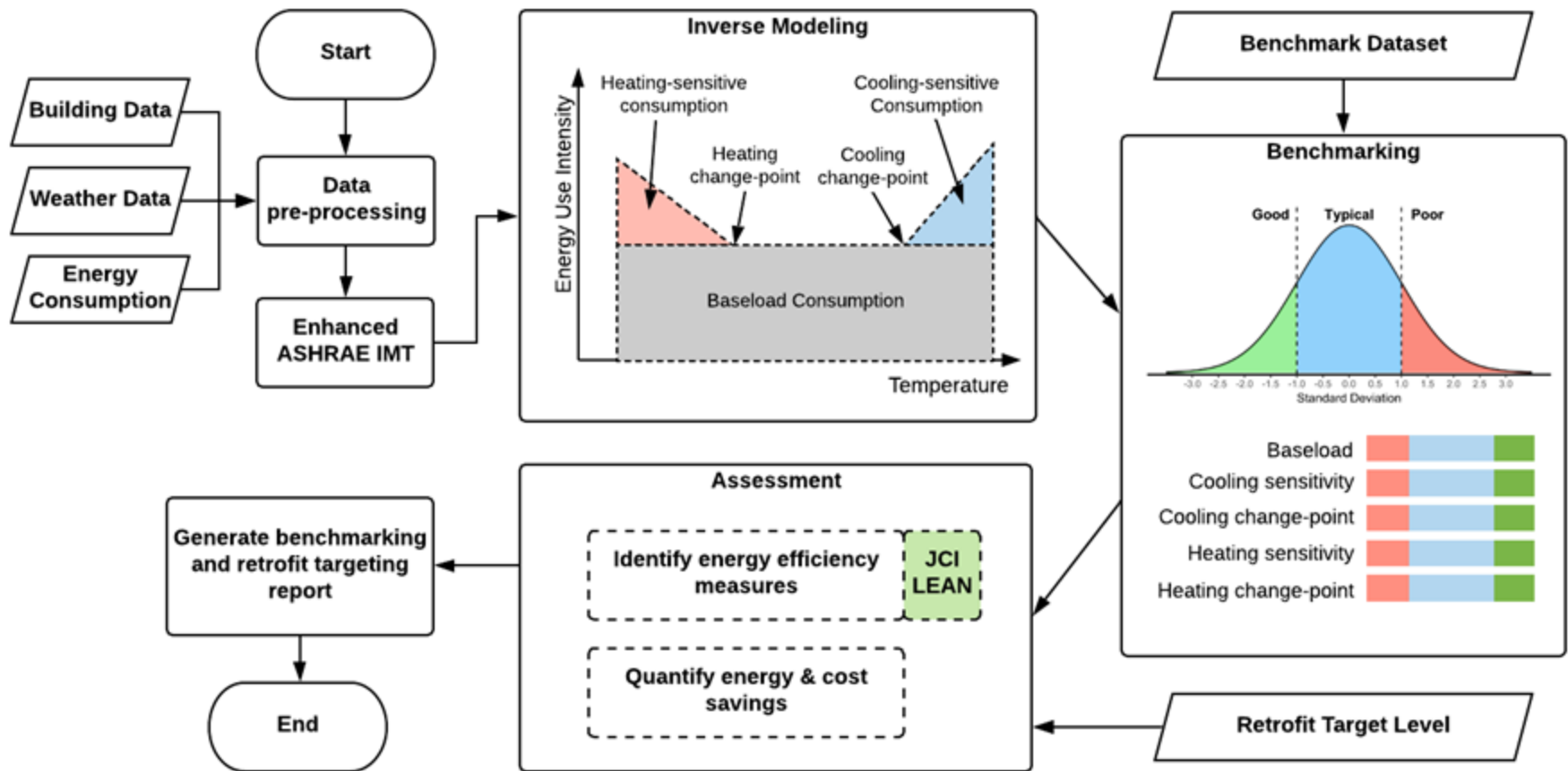
## Building Portfolio Analysis

Energy Consumption and Savings Summary



# Analytical Methodology

# Overall Workflow



# Property Information

SI Units (meters, kWh, °C)

Select Currency \* : US dollar (USD / \$ )

Gross Floor Area Unit: sq. meters

| Building ID* | Building Name* | Location*         | Gross Floor Area (Excluding Parking)* | Primary Building Space Type* |
|--------------|----------------|-------------------|---------------------------------------|------------------------------|
| 1            | Office 1       | Miami, FL         | 4982                                  | Office                       |
| 2            | Office 2       | Houston, TX       | 4982                                  | Office                       |
| 3            | Office 3       | Atlanta, GA       | 4982                                  | Office                       |
| 4            | Office 4       | Los Angeles, CA   | 4982                                  | Office                       |
| 5            | Office 5       | Las Vegas, NV     | 4982                                  | Office                       |
| 6            | Office 6       | San Francisco, CA | 4982                                  | Office                       |
| 7            | Office 7       | Baltimore, MD     | 4982                                  | Office                       |

## 1. Unit System

- Select Imperial Units (feet, kBtu, °F) or SI Units (meters, kWh, °C)

## 2. Building Location (City, State/Province, Zip, Country)

- Used to find weather data

## 3. Gross Floor Area (Exclude Parking)

- Used to normalize consumption

## 4. Primary Building Space Type

- Used for benchmarking

## 5. Currency

- Used for cost savings reporting

# Monthly Energy Consumption and Cost Data

- Minimum of 12 consecutive months of energy consumption data is required.
- Gather all electricity and fossil fuel consumption data from utility bills for each billing period.
- Energy cost is optional. If no energy cost is entered, BETTER will use a default cost per unit.
- Average outdoor air temperature is optional. If no weather data is entered, BETTER will use National Oceanic and Atmospheric Administration (NOAA) data.\*

| Building ID* | Billing Start Dates* | Billing End Dates* | Energy Type*    | Energy Unit*              | Energy Consumption* | Energy Cost | Average Outdoor Air Temperature |
|--------------|----------------------|--------------------|-----------------|---------------------------|---------------------|-------------|---------------------------------|
| 1            | 1/1/2017             | 1/31/2017          | Electric - Grid | kWh (thousand Watt-hours) | 66338               |             |                                 |
| 1            | 2/1/2017             | 2/28/2017          | Electric - Grid | kWh (thousand Watt-hours) | 55528               |             |                                 |
| 1            | 3/1/2017             | 3/31/2017          | Electric - Grid | kWh (thousand Watt-hours) | 64180               |             |                                 |
| 1            | 4/1/2017             | 4/30/2017          | Electric - Grid | kWh (thousand Watt-hours) | 62067               |             |                                 |
| 1            | 5/1/2017             | 5/31/2017          | Electric - Grid | kWh (thousand Watt-hours) | 69730               |             |                                 |

\* NOAA weather data may not be available for all locations. An error message will show on the BETTER analysis reports to prompt a user to enter average outdoor air temperature data for a given location and/or billing period as appropriate.

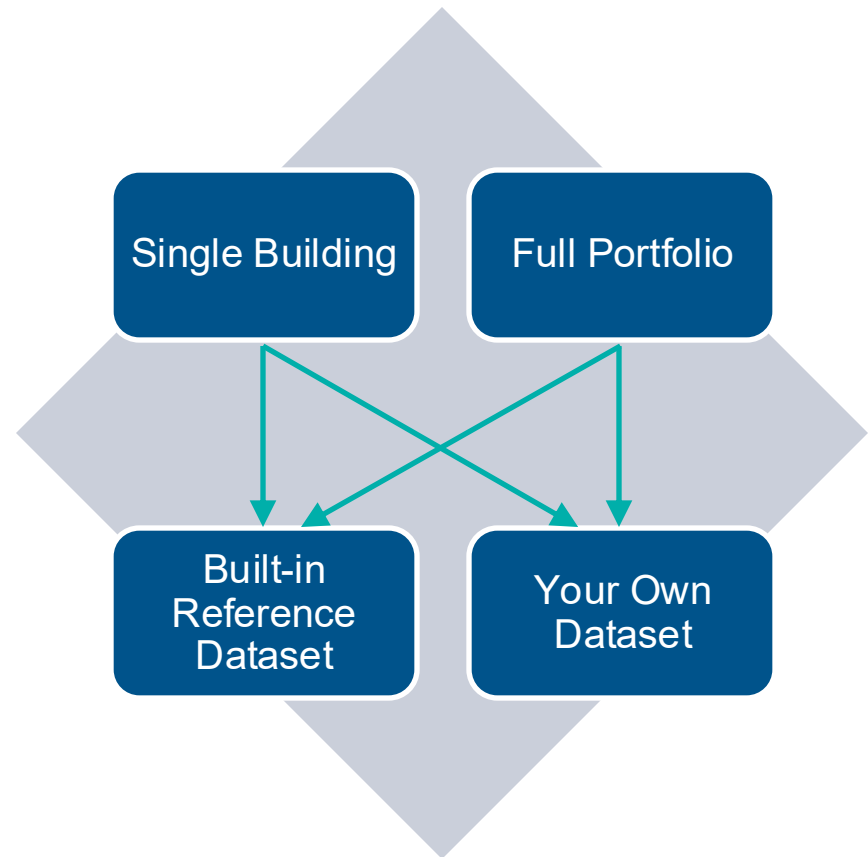
# Weather Data

- **Data Source:** National Oceanic and Atmospheric Administration (NOAA)
- **Time interval:** Sub-hourly
- **Input:** Address, billing periods start and end dates

| USAF   | WBAN  | StationID    | STATIONNAME     | CTRY | STATE | ICAO | LAT    | LON     | ELEV_M | BEGIN    | END      | EndYear |
|--------|-------|--------------|-----------------|------|-------|------|--------|---------|--------|----------|----------|---------|
| 450320 | 99999 | 450320-99999 | TA KWU LING     | CH   |       |      | 22.533 | 114.15  | 13     | 19921204 | 20171117 | 2017    |
| 450350 | 99999 | 450350-99999 | LAU FAU SHAN    | CH   |       |      | 22.467 | 113.983 | 35     | 20040713 | 20171117 | 2017    |
| 450390 | 99999 | 450390-99999 | SHA TIN         | CH   |       |      | 22.4   | 114.2   | 8      | 20040713 | 20171117 | 2017    |
| 450440 | 99999 | 450440-99999 | CHEUNG CHAU     | CH   |       |      | 22.2   | 114.017 | 79     | 20020313 | 20171117 | 2017    |
| 450450 | 99999 | 450450-99999 | WAGLAN ISLAND   | CH   |       |      | 22.183 | 114.3   | 60     | 20040122 | 20171117 | 2017    |
| 470311 | 99999 | 470311-99999 | MEILAN          | CH   |       | ZJHK | 19.935 | 110.459 | 22.9   | 20040706 | 20171117 | 2017    |
| 470312 | 99999 | 470312-99999 | ZHENG DING      | CH   |       | ZBSJ | 38.281 | 114.697 | 71     | 20040706 | 20171117 | 2017    |
| 501360 | 99999 | 501360-99999 | MOHE            | CH   |       |      | 52.967 | 122.533 | 438    | 19730101 | 20171117 | 2017    |
| 503530 | 99999 | 503530-99999 | HUMA            | CH   |       |      | 51.733 | 126.633 | 175.6  | 19560820 | 20171117 | 2017    |
| 504340 | 99999 | 504340-99999 | TULIHE          | CH   |       |      | 50.45  | 121.7   | 733    | 19570531 | 20171117 | 2017    |
| 504680 | 99999 | 504680-99999 | AIHUI           | CH   |       |      | 50.25  | 127.45  | 166    | 19610801 | 20171117 | 2017    |
| 505270 | 99999 | 505270-99999 | HAILAR          | CH   |       |      | 49.25  | 119.7   | 650    | 19560820 | 20171117 | 2017    |
| 505480 | 99999 | 505480-99999 | XIAO'ERGOU      | CH   |       |      | 49.2   | 123.717 | 288    | 19570531 | 20171117 | 2017    |
| 505570 | 99999 | 505570-99999 | NENJIANG        | CH   |       |      | 49.167 | 125.233 | 243    | 19560820 | 20171117 | 2017    |
| 505640 | 99999 | 505640-99999 | SUNWU           | CH   |       |      | 49.433 | 127.35  | 235    | 19560820 | 20171117 | 2017    |
| 506030 | 99999 | 506030-99999 | XIN BARAG YOUQI | CH   |       |      | 48.683 | 116.817 | 556.7  | 19600101 | 20171117 | 2017    |
| 506320 | 99999 | 506320-99999 | BUGT            | CH   |       |      | 48.767 | 121.917 | 739    | 19560820 | 20171117 | 2017    |
| 506560 | 99999 | 506560-99999 | LONG-ZHEN       | CH   |       |      | 48.65  | 126.667 | 305    | 19610801 | 20130120 | 2013    |
| 506580 | 99999 | 506580-99999 | KESHAN          | CH   |       |      | 48.05  | 125.883 | 237    | 19570601 | 20171117 | 2017    |
| 507270 | 99999 | 507270-99999 | ARXAN           | CH   |       |      | 47.167 | 119.933 | 997    | 19560820 | 20171117 | 2017    |
| 507450 | 99999 | 507450-99999 | SANJIAZI        | CH   |       | ZYQQ | 47.24  | 123.918 | 145.4  | 19560820 | 20171117 | 2017    |
| 507560 | 99999 | 507560-99999 | HAILUN          | CH   |       |      | 47.45  | 126.867 | 248    | 19560820 | 20171117 | 2017    |
| 507740 | 99999 | 507740-99999 | YICHUN          | CH   |       |      | 47.7   | 128.833 | 259.1  | 19570601 | 20171117 | 2017    |
| 507880 | 99999 | 507880-99999 | FUJIN           | CH   |       |      | 47.233 | 131.983 | 65     | 19560820 | 20171117 | 2017    |
| 508440 | 99999 | 508440-99999 | TAILAI          | CH   |       |      | 46.4   | 123.45  | 150    | 19610801 | 20171117 | 2017    |
| 508540 | 99999 | 508540-99999 | ANDA            | CH   |       |      | 46.383 | 125.317 | 150    | 19560820 | 20171117 | 2017    |
| 508880 | 99999 | 508880-99999 | BAOQING         | CH   |       |      | 46.317 | 132.183 | 83     | 19570602 | 20171117 | 2017    |

# Dataset and Property Types

- Benchmark a single building or your full portfolio.
- Two modes of use:
  - Benchmark against a built-in reference dataset.\*
  - Benchmark against your own portfolio.
- Built-in benchmarking datasets are for:
  - U.S. offices, K-12 schools, public libraries, hospitals, worship facilities, and multifamily buildings\*
  - Mexican offices
  - Tunisian hotels



\*At this time, the “reference” benchmark statistics for U.S. offices, K-12 schools, public libraries, hospitals, worship facilities, and multifamily buildings are not perfectly representative of the U.S. national stock because the statistics were *not* developed from the U.S. Energy Administration (EIA) Commercial Building Energy Consumption Survey (CBECS) dataset ([which is representative of the U.S. national stock](#)) but rather from *datasets developed based on voluntary contributions from U.S. industry* that are not fully representative of the U.S. national stock in terms of characteristics such as size and climate zone distribution. We are working to expand these training datasets, and hence improve associated “reference” benchmark statistics, so they are more representative of the U.S. national stock. This includes expanding the training data sets to include: *at least 30 data points for each of the 10 BETTER model coefficients for each of the [eight CBECS size categories](#) in each of the [eight International Energy Conservation Code \(IECC\) climate zones](#) in the United States (and possibly for each of the relevant subtypes A, B, and C in these zones).* Learn more at [FAQ](#). To contribute anonymous data to this effort, please email [support@better.lbl.gov](mailto:support@better.lbl.gov).

# Automatic Data Pre-Processing

- Read building information (address, space type, gross floor area, etc.) and monthly energy usage and cost data



- Search for closest weather station.
- Combine different types of fossil fuel consumptions, and convert energy consumption unit to kWh.\*



- Download sub-hourly weather file from NOAA ftp.
- Normalize energy consumption to show average kWh/(day\*m²)\* by month for at least 12 months.\*

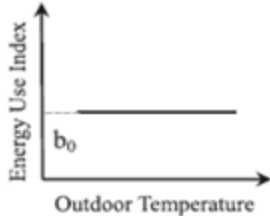
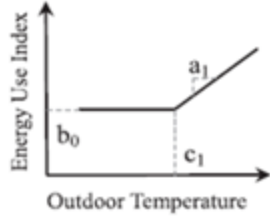
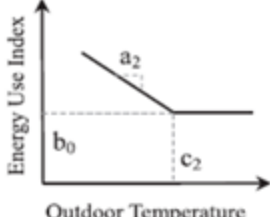
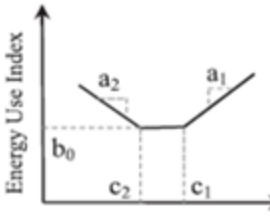


- Align and aggregate weather data with energy consumption data (arbitrary billing periods).

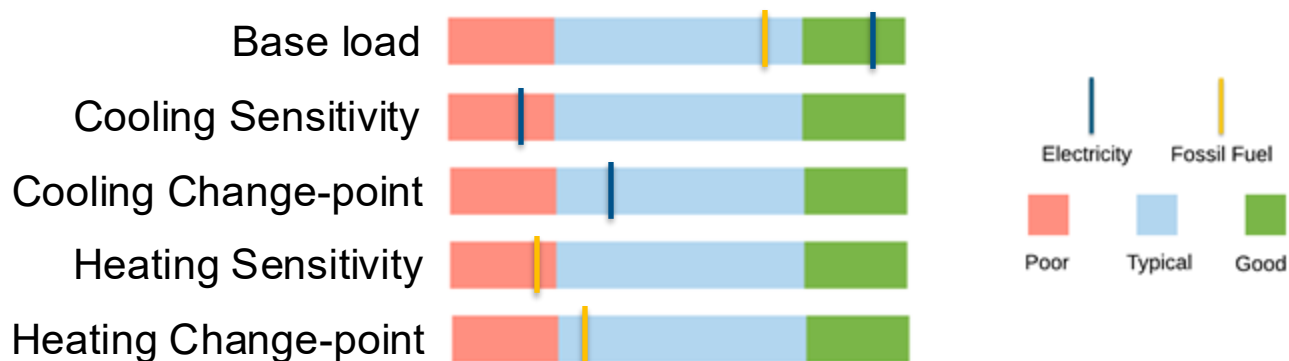
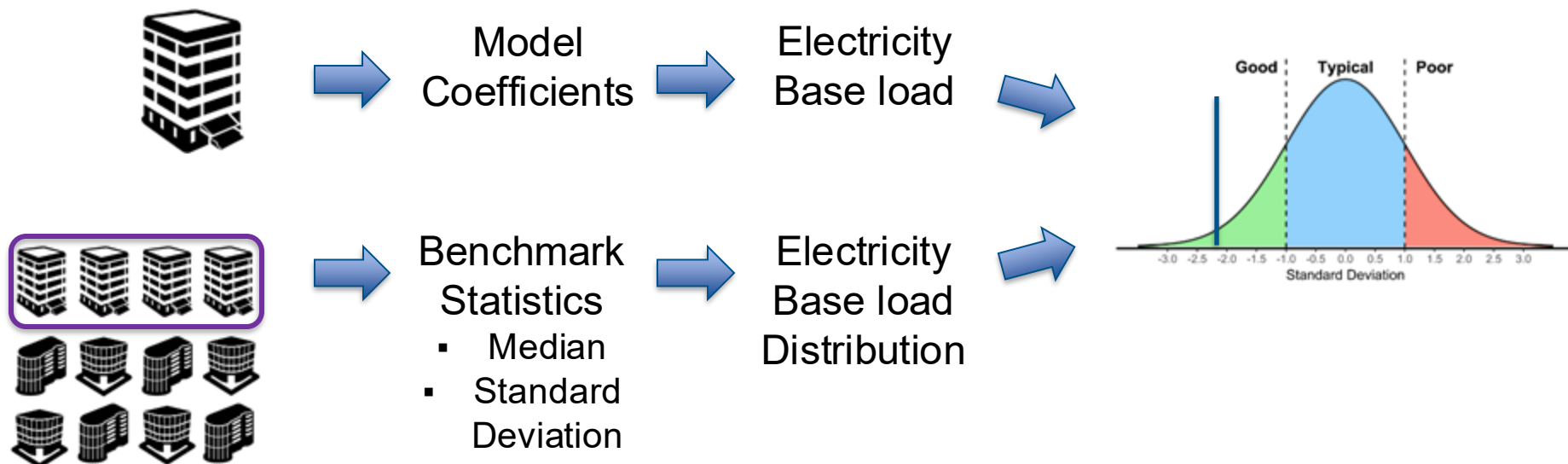


\* BETTER uses kWh and m² as common units for calculations, but may display savings in output reports in kWh/m² or kBtu/ft², depending on the unit system selected in spreadsheet upload template.

# Inverse Modeling

| Model Type       | Schematic Plot                                                                     | Model Coefficient          |                                       |                                        |                                       |                                        | Interpretation                                                                                                                                                                                                                                                                   |
|------------------|------------------------------------------------------------------------------------|----------------------------|---------------------------------------|----------------------------------------|---------------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  |                                                                                    | Baseload (b <sub>0</sub> ) | Cooling Sensitivity (a <sub>1</sub> ) | Cooling Change-point (c <sub>1</sub> ) | Heating Sensitivity (a <sub>2</sub> ) | Heating Change-point (c <sub>2</sub> ) |                                                                                                                                                                                                                                                                                  |
| 1P Model         |   | X                          |                                       |                                        |                                       |                                        | (1). The building is not heated or cooled. (2). The heating and cooling system of the building only consumes a very small amount of the total energy.                                                                                                                            |
| 3P Cooling Model |   | X                          | X                                     | X                                      |                                       |                                        | (1). The cooling system of the building starts to operate when the outdoor air temperature goes beyond the change-point. (2). The steeper the slope, the higher energy consumption growth as outdoor air temperature rises.                                                      |
| 3P Heating Model |   | X                          |                                       |                                        | X                                     | X                                      | (1). The heating system of the building starts to operate when the outdoor air temperature drops below the change-point. (2). The steeper the slope, the higher energy consumption growth as outdoor air temperature drops.                                                      |
| 5P Model         |  | X                          | X                                     | X                                      | X                                     | X                                      | The building's cooling and heating systems are driven by the same fuel type. As the outdoor air temperature drops below a certain point, the heating system starts to operate. As the outdoor air temperature rises above a certain point, the cooling system starts to operate. |

# Benchmark Coefficients

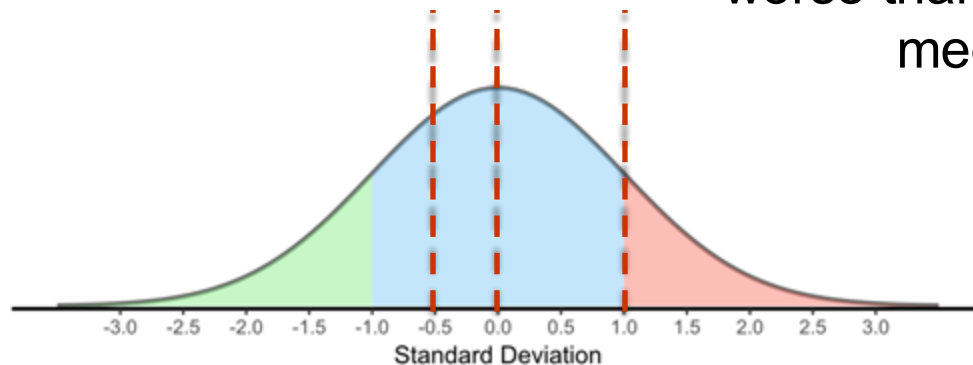


# Energy Efficiency Targeting

## Step 1. Specify energy efficiency target

Aggressive ( $\frac{1}{2}$  a standard deviation better than the dataset median)

Conservative (1 standard deviation worse than the dataset median)

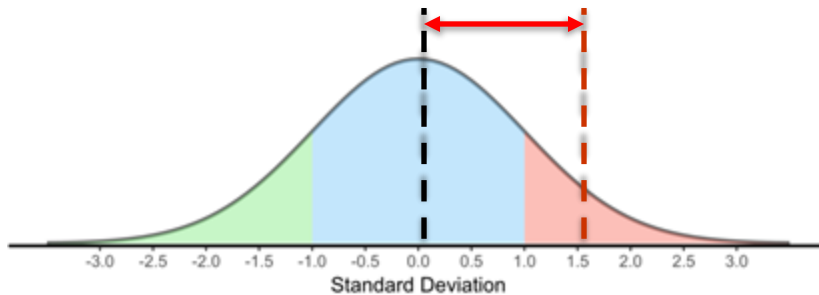


Nominal (equal to the dataset median)

# Energy Efficiency Targeting

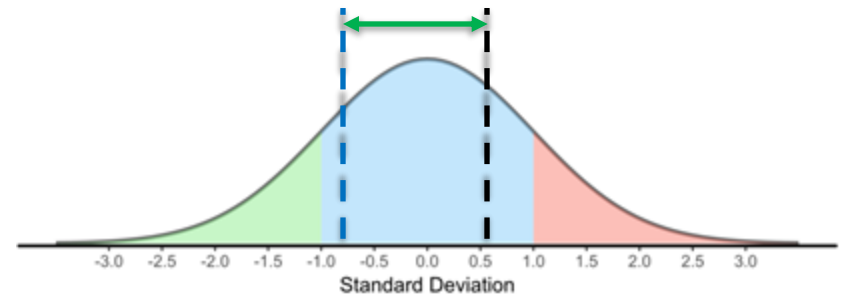
## Step 2. Determine Facility Improvement Measures (FIM)

Example A.



- Current model coefficient: **Poor**
- Target : **Nominal**
- Target is better than current, need to pick FIMs

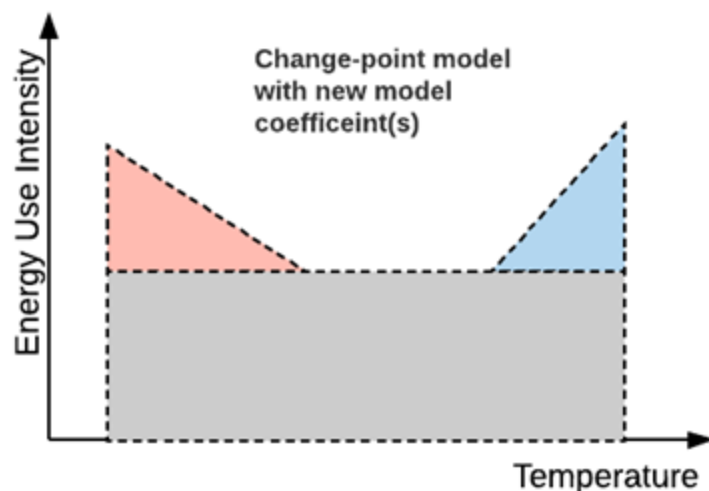
Example B.



- Current model coefficient: **Typical**
- Target : **Conservative**
- Target is worse than current, no need to pick FIMs

# Energy Savings Estimation

Step 3. Calculate potential energy and cost savings



Re-run the model to get:



Current energy  
consumption



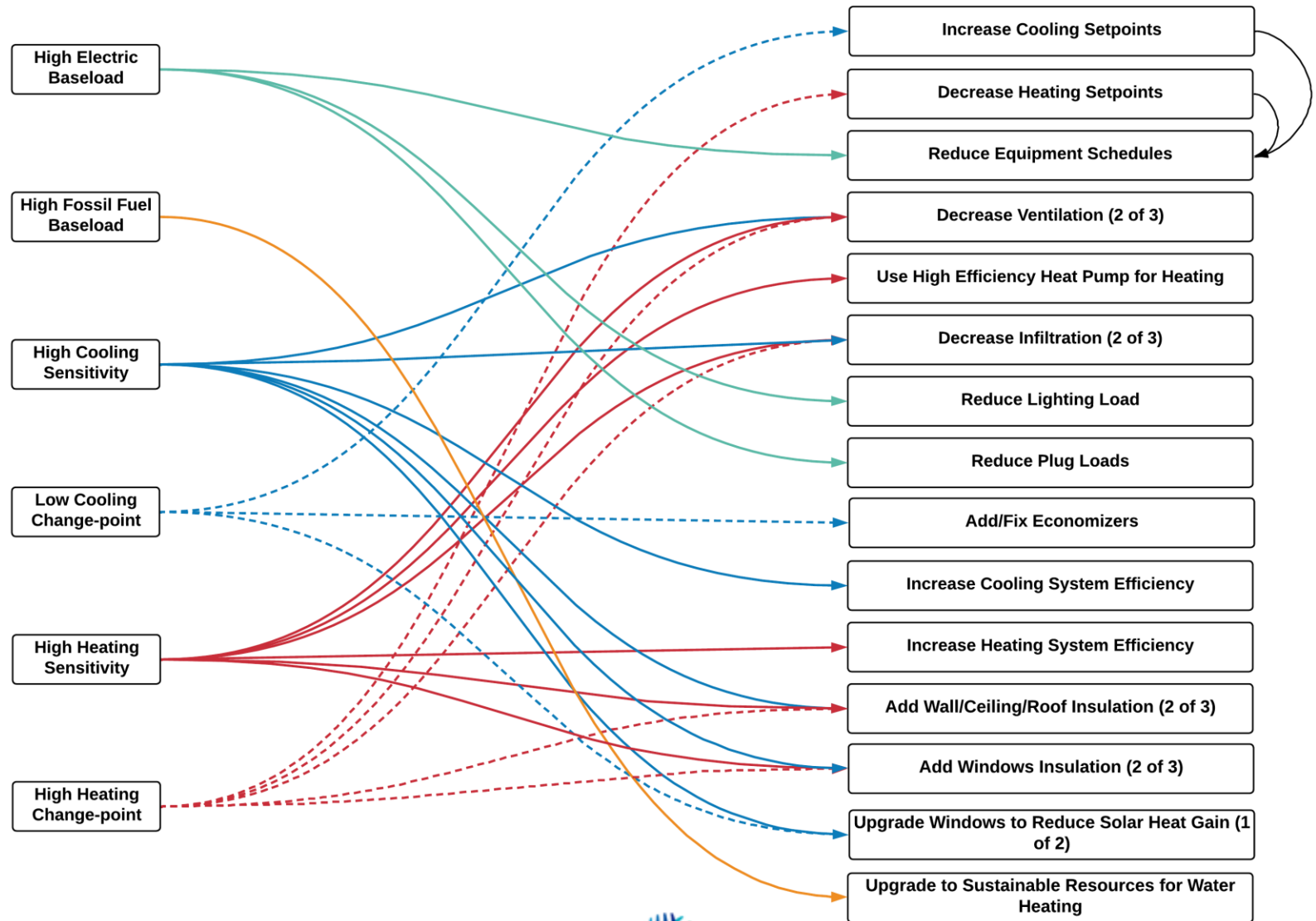
Estimated energy  
consumption with  
suggested FIMs



Estimated  
energy savings

Calculate associated cost

# Energy Efficiency Recommendations



# BETTER Interoperability

# BETTER Interoperability

- BETTER can create / analyze buildings or portfolios via custom ENERGY STAR® Portfolio Manager® Excel reports and provide BETTER analytical reports as self-contained HTML files.
- BETTER can create/analyze buildings or portfolios via BuildingSync® XML files and provide BETTER analytical reports as self-contained HTML files.<sup>1</sup>
- Software developers can access BETTER via the BETTER RESTful API to:  
(1) create and analyze a building / portfolio in BETTER; and (2) retrieve analytical reports (in JSON and / or self-contained HTML files).
- Standard Energy Efficiency Data™ (SEED) platform can run BETTER analysis reports from the SEED platform. Contact Carolyn Szum [CCSzum@lbl.gov](mailto:CCSzum@lbl.gov) for more information on how to access BETTER from the SEED platform.

1. BETTER will not have the capability to write a BuildingSync® XML file to transmit data to other U.S. DOE applications until sometime in the future.

# Support for ENERGY STAR® Portfolio Manager®

**Goal:** Allow a user to import multiple buildings' data stored in ENERGY STAR® Portfolio Manager® for analysis with BETTER.

Step 1 - Log in to Energy Star® Portfolio Manager®

Step 2 - On the lower left corner, click on the "custom download" link

Step 3 - Select "Multiple Properties", then select the buildings you want to download data from. Note that portfolio that contains multiple buildings

Step 4 - Select the data to download. Choose "Basic Property Information", "Meter Entries", then enter the start and end dates of the meter data. Then click on the "Submit" button

Step 5 - Shortly after the following steps, you should be able to see a new notification indicating your data is ready to download. You can download this XLSX file and upload it to BETTER.

### 1. Upload Data

Data Entry Template ☐ BETTER ☒ ENERGY STAR® Portfolio Manager®

Choose file

Accounting Requests (0)

Charging Requests (0)

Notifications (1)

| Type    | Notification                                                                                    | Date      |
|---------|-------------------------------------------------------------------------------------------------|-----------|
| Success | The download you requested on September 10, 2019 is ready. <a href="#">Custom Download.xlsx</a> | 9/10/2019 |

Want to see your ENERGY STAR Notifications? View all of the historical ENERGY STAR Notifications [here](#)

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Target and Baseline  
Download energy target and energy, water and waste baselines for each property

Submit Cancel

BERKELEY LAB

Johnson Controls

# Support for BuildingSync® XML

BuildingSync® is a common schema for energy audit data that can be utilized by different software and databases involved in the energy audit process. It allows data to be more easily aggregated, compared, and exchanged between different databases and software tools.

**Goal:** Allow a user to upload data to BETTER for analysis using a BuildingSync® XML file.

From Scratch With BuildingSync® XML

**i** The "**With BuildingSync® XML**" approach allows you to use a BuildingSync® XML file to create a building instance in BETTER. An example BuildingSync® XML file could be downloaded [here](#).

BuildingSync XML File\*

---

Browse

This field is required.

Upload

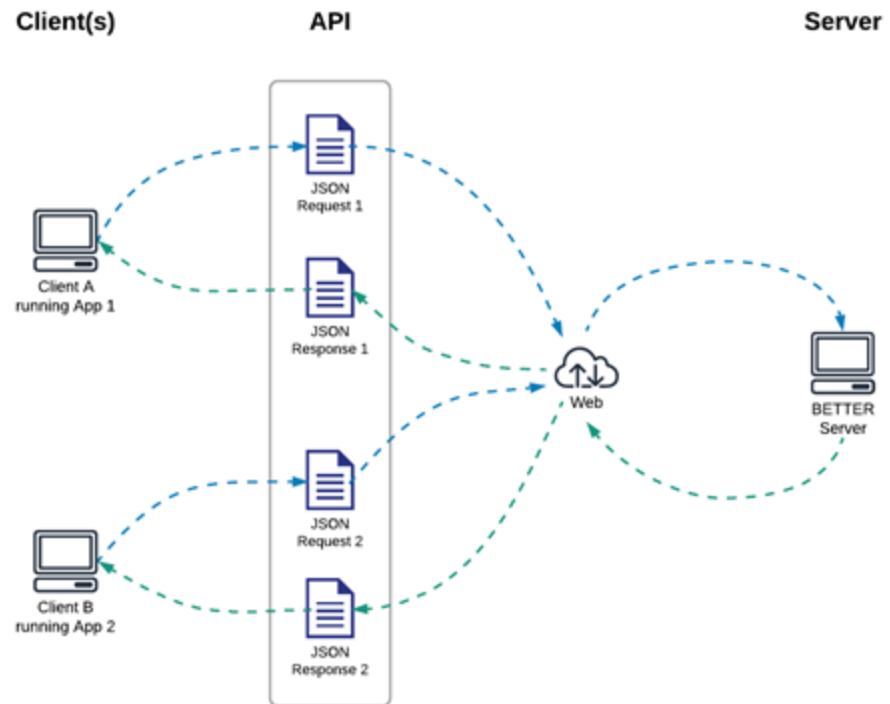
Cancel

# BETTER RESTful API

- **Access at:** <https://better.lbl.gov/docs/api/>
- **REST:** “Representational state transfer (REST) - a software architectural style that defines a set of constraints to be used for creating Web services.”
- **API:** “An interface or communication protocol between a client and a server intended to simplify the building of client-side software.”

- Public or private sector retrofit analysis tool that wants to add BETTER’s service.

- Public or private energy management platform that wants to add BETTER’s service.

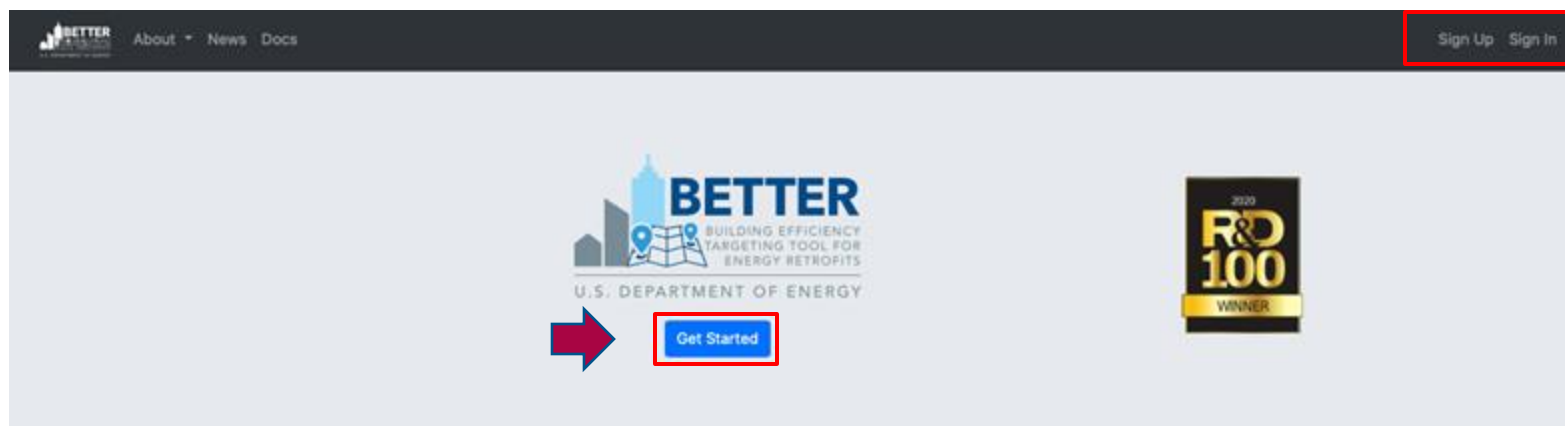


## IIA. Run BETTER Using the Web App

### 1. Access BETTER at: <https://better.lbl.gov/>.

If you already have an account, click **Get Started** or **Sign In** to access BETTER.

If you do not already have an account, click **Sign Up** to register and create an account.



#### About BETTER

BETTER is a free web application that enables building operators to quickly, easily identify the most cost-saving energy efficiency measures in buildings and portfolios using readily available building and energy data. With minimal data entry, BETTER benchmarks a building's or portfolio's energy use against peers; quantifies energy, cost, and greenhouse gas (GHG) reduction potential; and recommends energy efficiency measures (technological and operational) for individual buildings or portfolios, targeting specific energy savings levels. The source code of its modular, cross-platform analytical engine is available on GitHub and can be adopted, redeveloped, and redistributed freely under an open-source license, allowing users to incorporate BETTER's analytical capabilities into their own software platforms and tools.

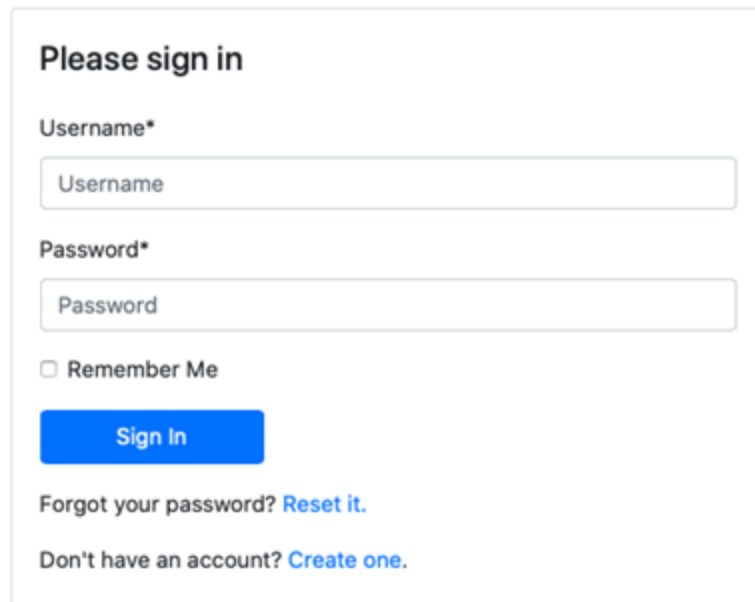


# IIA. Run BETTER Using the Web App

## 2. Sign In or Sign Up

Registered users will need to enter their username and password to access BETTER.

New users will need to register and create an account that only they can access by providing the following information:



Please sign in

Username\*

Password\*

☐ Remember Me

[Sign In](#)

Forgot your password? [Reset it.](#)

Don't have an account? [Create one.](#)

- First Name
- Last Name
- Email Address
- Country
- Organization
- Industry
- Username
- Password

# IIA. Run BETTER Using the Web App

## 3. Visit the BETTER Dashboard page

**Dashboard** is the main page of BETTER. This is where you can start to [Create New Portfolios](#) and [Create New Buildings](#) for analysis with BETTER. This is also where you can see the five most recently added portfolios and 10 most recently added buildings or navigate to pages to [View All Portfolios](#) and [View All Buildings](#) in your account.

**BETTER Dashboard**

Units System: **SI** App ccszum@ibl.gov

**Recent Portfolios**

View All Portfolios **Create New Portfolio**

Sample Portfolio - BET...

- # Buildings: **33**
- Total Floor Area (m²): **1,140,268**
- Currency: **US dollar (USD / \$)**
- Date Updated: **June 29, 2021, 12:02 a.m.**

Delete Details

**Recent Buildings**

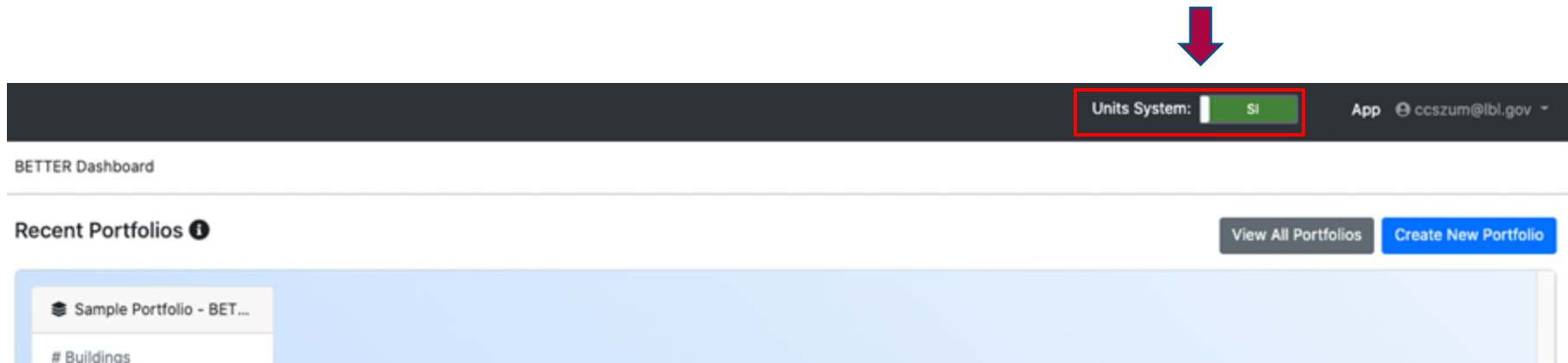
View All Buildings **Create New Building**

| ID # | Building Name #             | Space Type # | Location #    | Floor Area (m²) # | Portfolio Name #                                                  | Date Updated # | View                 | Delete                 |
|------|-----------------------------|--------------|---------------|-------------------|-------------------------------------------------------------------|----------------|----------------------|------------------------|
| 424  | <a href="#">1525 Wilson</a> | Office       | Arlington, VA | 319,423.0         | <a href="#">Sample Portfolio - BETTER Template Test - 6.28.21</a> | 06/29/2021     | <a href="#">View</a> | <a href="#">Delete</a> |
| 392  | <a href="#">Office 3</a>    | Office       | Atlanta, GA   | 4,992.2           | <a href="#">Sample Portfolio - BETTER Template Test - 6.28.21</a> | 06/28/2021     | <a href="#">View</a> | <a href="#">Delete</a> |
| 421  | <a href="#">Office 32</a>   | Office       | Miami, FL     | 46,320.0          | <a href="#">Sample Portfolio - BETTER Template Test - 6.28.21</a> | 06/28/2021     | <a href="#">View</a> | <a href="#">Delete</a> |
| 420  | <a href="#">Office 31</a>   | Office       | Fairbanks, AK | 46,320.0          | <a href="#">Sample Portfolio - BETTER Template Test - 6.28.21</a> | 06/28/2021     | <a href="#">View</a> | <a href="#">Delete</a> |
| 419  | <a href="#">Office 30</a>   | Office       | Duluth, MN    | 46,320.0          | <a href="#">Sample Portfolio - BETTER Template Test - 6.28.21</a> | 06/28/2021     | <a href="#">View</a> | <a href="#">Delete</a> |

## IIA. Run BETTER Using the Web App

### 4. Select the Unit System on the Dashboard page

On the **Dashboard** page, go to upper right corner of the upper navigation bar to select the **unit system** in which you want to enter/view data in BETTER. To view/enter data in the the international system of units (kWh, square meters, °C), select **SI**. To view/enter data in the imperial system of units (kBtu, square feet, °F), select **IP**. You can change the system in which you view/enter data in BETTER at any time by changing the unit system.\*



\* NOTE: The exception to this is that, currently, when creating a new building or portfolio **From Scratch**, building gross floor area needs to be entered in square meters. This will be updated at a later date to allow users to enter building gross floor area in square feet.

# Create a New Portfolio

## IIA. Run BETTER Using the Web App

### 5. Create a New Portfolio on the Dashboard page

For users with portfolios they want to analyze with BETTER, clicking **Create New Portfolio** on the **Dashboard** page will direct you to the **Create a New Portfolio** page. There, users have three options to create a new portfolio:

- a. **Option a:** The **With BETTER Template** approach allows users to use a customized Excel template to batch-upload multiple buildings' data and a portfolio.
- b. **Option b:** The **With Portfolio Manager® Template** approach allows users to import multiple buildings' data stored in ENERGY STAR® Portfolio Manager®.
- c. **Option c:** The **From Scratch** approach allows you to create an empty portfolio to which you can add buildings via the web interface or from a BuildingSync® XML file later.



With BETTER Template

With Portfolio Manager® Template

From Scratch



The "With BETTER Template" approach allows you to use a customized Excel template to batch-upload multiple buildings' data and a portfolio. Download [this BETTER template](#) and follow the instructions to enter your building data on the Property Information and Utility Data tabs, making sure to follow the formatting requirements in the template. Once your information has been entered into the template, save the file to your computer, and upload it below.

Visit the [appendix](#) of this presentation for a snapshot of the data input fields in the BETTER and ENERGY STAR® templates.

# IIA. Access the Web App Home to Create New Portfolio

## 5a. Option a: Create a New Portfolio with BETTER Template

On the **Create a New Portfolio** page, click the **With BETTER Template** tab and then the **BETTER Template** link to download the customized Excel template to batch-upload multiple buildings' characteristics and energy data. Instructions for entering data are included on the Excel template itself.

| Building ID* | Building Name* | Location*   | Gross Floor Area (m <sup>2</sup> )* | Primary Building Space Type* | Currency* |
|--------------|----------------|-------------|-------------------------------------|------------------------------|-----------|
| 1            | Office 1       | Miami, FL   | 5789                                | Office                       | US Dollar |
| 2            | Office 2       | Houston, TX | 4982                                | Office                       | US Dollar |
| 3            | Office 3       | Chicago, IL | 5227                                | Office                       | US Dollar |

| Building ID* | Billing Start Dates* | Billing End Dates* | Energy Type*                 | Energy Unit* | Energy Consumption* | Cost  |
|--------------|----------------------|--------------------|------------------------------|--------------|---------------------|-------|
| 1            | 1/1/2016             | 1/31/2016          | Electricity - Grid Purchased | kWh          | 124760              | 12456 |
| 1            | 2/1/2016             | 2/29/2016          | Electricity - Grid Purchased | kWh          | 149320              | 14985 |
| 1            | 3/1/2016             | 3/31/2016          | Electricity - Grid Purchased | kWh          | 127920              | 13021 |

Visit the [appendix](#) of this presentation for a snapshot of the data input fields for the BETTER Template.



With BETTER Template

With Portfolio Manager® Template

From Scratch

**i** The "With BETTER Template" approach allows you to use a customized Excel template to batch-upload multiple buildings' data and a portfolio. Download [this BETTER template](#) and follow the instructions to enter your building data on the Property Information and Utility Data tabs, making sure to follow the formatting requirements in the template. Once your information has been entered into the template, save the file to your computer, and upload it below.

Once all required information has been entered in the BETTER Template, save it, then use the **Browse** and **Upload** buttons to select and upload the Excel file to BETTER.

Choose file

Browse

Upload

# IIA. Access the Web App Home to Create New Portfolio

## 5b. Option b: Upload Data with the Portfolio Manager® Template

On the **Create a New Portfolio** page, click the **With Portfolio Manager® Template** tab and then the **instructions** link to access step-by-step guidance on how to auto-generate a customized Excel workbook from within ENERGY STAR® Portfolio Manager® that is pre-populated with multiple buildings' data so it can be batch-uploaded to BETTER.

[From Scratch](#)

[With BETTER Template](#)

[With Portfolio Manager® Template](#)

The "With Portfolio Manager® Template" approach allows you to import multiple buildings' data stored in **ENERGY STAR® Portfolio Manager®**. Follow the **instructions** to auto-generate an Excel workbook from within Portfolio Manager® that is pre-populated with multiple buildings' data so that it can be batch-uploaded and analyzed by BETTER. Once the Excel workbook has been generated, save the file to your computer, and upload it below.



Once the Excel workbook has been generated, save it to your computer, then use the **Browse** and **Upload** buttons to select and upload the file to BETTER.

Visit the [appendix](#) of this presentation for a snapshot of the data input fields for the ENERGY STAR® Portfolio Manager® Template.

Choose file

Browse

Upload

# IIA. Access the Web App Home to Create New Portfolio

## 5c. Option c: Upload Data with the From Scratch

On the **Create a New Portfolio** page, click the **From Scratch** tab and then enter the **Portfolio Name** and click **Save**. You will be directed to the **Dashboard** page. There, click on **Details** for the portfolio you just created to arrive at the **Portfolio Information** page. Then, click **Create a New Building** to build a portfolio step-by-step by adding individual buildings **From Scratch** or **With BuildingSync® XML** files. See slides 44-55 for instructions for how to Create a New Building.

The image is a composite of three screenshots from a web application, illustrating the process of creating a new building. Red boxes and arrows highlight key elements.

**Top Left Screenshot: Create a New Portfolio**

- Navigation tabs: "With BETTER Template", "With Portfolio Manager® Template", and "From Scratch" (selected).
- Text: "The 'From Scratch' approach allows you to create an empty portfolio. You can add buildings to the portfolio later."
- Form field: "Portfolio Name\*" (highlighted with a red box and an arrow).
- Text: "All fields marked with \* are required"
- Buttons: "Save" (highlighted with a red box and an arrow) and "Cancel".

**Top Center Screenshot: Recent Portfolios**

- Section: "Recent Portfolios ⓘ"
- Card: "Test 2"
- Details: "# Buildings: 0", "Total Floor Area (m²): 0", "Currency: USD", "Date Updated: July 16, 2021, 9:59 p.m."
- Buttons: "Delete" and "Details" (highlighted with a red box and an arrow).

**Top Right Screenshot: Add New Building**

- Section: "Add New Building" (highlighted with a red box and an arrow).
- Navigation tabs: "From Scratch" (selected) and "With BuildingSync® XML".
- Text: ⓘ The "From Scratch" approach allows you to create a building with the web-interface. Fill in the basic information below to create a blank building, then go to the building detail page to add utility bills.
- Form fields: "Building Name\*" (with placeholder "Enter a building name."), "Space Type\*" (dropdown menu with "Office" selected), "Gross Floor Area (m2)\*" (with placeholder "This is the gross floor area of the building as measured between principal exterior surfaces. It should exclude area for parking."), and "Location\*" (with placeholder "For buildings located in the United States, please enter state, city or ZIP code. For buildings located outside of the United States, please enter the country and city. This information will be used to find corresponding weather data, fuel prices, and GHG emission factors.").
- Text: "All fields marked with \* are required"
- Buttons: "Save" (highlighted with a red box and an arrow) and "Back".

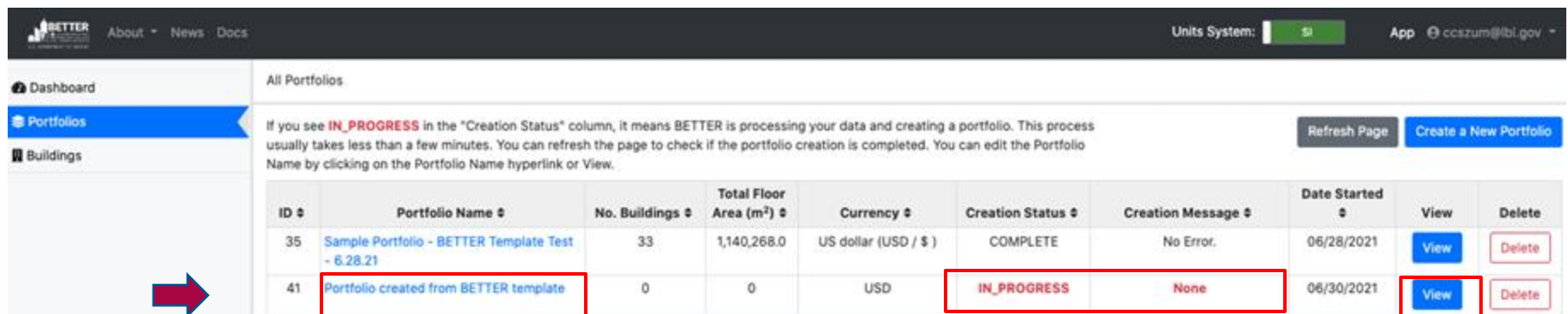
**Page Footer**

- Logos: U.S. DEPARTMENT OF ENERGY, Office of ENERGY EFFICIENCY & RENEWABLE ENERGY, BUILDING TECHNOLOGIES OFFICE, BERKELEY LAB, Johnson Controls, and Building E1.

## IIA. Run BETTER Using the Web App

### 6. Visit the Portfolio Staging page

After uploading portfolio data to BETTER, users will automatically be directed to the **Portfolio Staging** page. On this page, you will see a table listing any prior portfolios you created along with the portfolio you just uploaded.



The screenshot shows the BETTER web app interface. The top navigation bar includes 'About', 'News', and 'Docs'. The left sidebar has 'Dashboard', 'Portfolios', and 'Buildings'. The main content area is titled 'All Portfolios' and contains a table of portfolios. The table has columns for ID, Portfolio Name, No. Buildings, Total Floor Area (m²), Currency, Creation Status, Creation Message, Date Started, View, and Delete. The first row shows a 'Sample Portfolio - BETTER Template Test - 6.28.21' with a status of 'COMPLETE'. The second row shows a 'Portfolio created from BETTER template' with a status of 'IN\_PROGRESS'. A red arrow points to the 'Portfolio created from BETTER template' row. The 'IN\_PROGRESS' status and 'None' creation message are also highlighted with red boxes.

| ID | Portfolio Name                                    | No. Buildings | Total Floor Area (m²) | Currency             | Creation Status | Creation Message | Date Started | View                 | Delete                 |
|----|---------------------------------------------------|---------------|-----------------------|----------------------|-----------------|------------------|--------------|----------------------|------------------------|
| 35 | Sample Portfolio - BETTER Template Test - 6.28.21 | 33            | 1,140,268.0           | US dollar (USD / \$) | COMPLETE        | No Error.        | 06/28/2021   | <a href="#">View</a> | <a href="#">Delete</a> |
| 41 | Portfolio created from BETTER template            | 0             | 0                     | USD                  | IN_PROGRESS     | None             | 06/30/2021   | <a href="#">View</a> | <a href="#">Delete</a> |

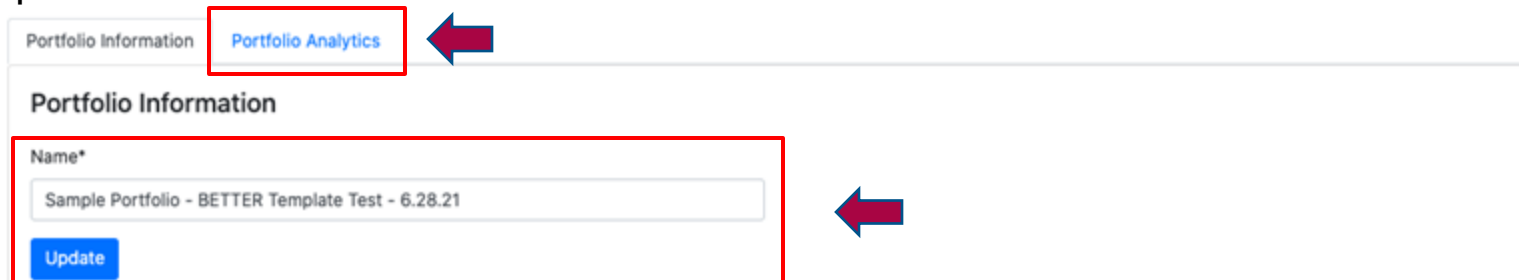
For the portfolio you just uploaded, the Creation Status will most likely say **IN\_PROGRESS** and the Creation Message will say **None**. Wait a minute or two and then click **Refresh Page**.<sup>\*</sup> After that, the Creation Status should switch to **COMPLETE** and Creation Message to **No Error**, which means all building and energy data for the portfolio is uploaded. Click **View** or the **Portfolio Name** to go to the **Portfolio Information** page to view all buildings in the portfolio and customize the portfolio name.

<sup>\*</sup> NOTE: Depending on the size of the portfolio, you may need to click **Refresh Page** a few times until the **Creation Status** switches to **COMPLETE** and **Creation Message** to **No Error**.

## IIA. Run BETTER Using the Web App

### 7. Visit the Portfolio Information page

After creating a new portfolio and clicking [View](#) or the [Portfolio Name](#), users will automatically be directed to the **Portfolio Information** page. Start by going to the [Name\\*](#) field and customizing the name of the portfolio you just created. Then click [Update](#). Next, click on the [Portfolio Analytics](#) tab to get started creating analytical reports.



Prior to creating analytical reports, you can also review the summary table of buildings in the portfolio. Clicking on  will allow you to sort the buildings in the table (alphabetically or numerically) by characteristic (i.e., building name, space type, location, and floor area). Clicking [Building Name](#) or [View](#) will allow you to view and edit building characteristics and utility bill details for each building. [Add New Building](#) will allow you to add new buildings to the portfolio.

Buildings in the Portfolio [Add New Building](#)

Below is a summary table of buildings in the portfolio. Click on the building name link or the view button to go to the building information page.

| Building Name ↕          | Space Type ↕ | Location ↕  | Floor Area (m <sup>2</sup> ) ↕ | View                 | Delete                 |
|--------------------------|--------------|-------------|--------------------------------|----------------------|------------------------|
| <a href="#">Office 3</a> | Office       | Atlanta, GA | 4,992.2                        | <a href="#">View</a> | <a href="#">Delete</a> |

BETTER)

## IIA. Run BETTER Using the Web App

### 8. Visit the Portfolio Analytics page and Create Portfolio Summary Report

On the **Portfolio Analytics** page, users can click [Add New Analytics](#) to create a unique analytical report for the portfolio.

Portfolio Information

Portfolio Analytics

#### Portfolio Analytics

| Analytics ID ↕ | Time Generated ↕ | Savings Target ↕ | Benchmark Statistics ↕ | Model R <sup>2</sup> ↕ | Number of Buildings ↕ | Energy Savings Potential (kWh) ↕ | Cost Savings Potential [US dollar (USD / \$ )] |
|----------------|------------------|------------------|------------------------|------------------------|-----------------------|----------------------------------|------------------------------------------------|
| 14             | None             | Nominal          | Default                | 0.6                    | 32                    | 20,154,954                       | 1,799,431                                      |

Click the button below to add a new analytics.

Add New Analytics



| Status ↕ | View    | Action | Delete |
|----------|---------|--------|--------|
| COMPLETE | Details | Rerun  | Delete |

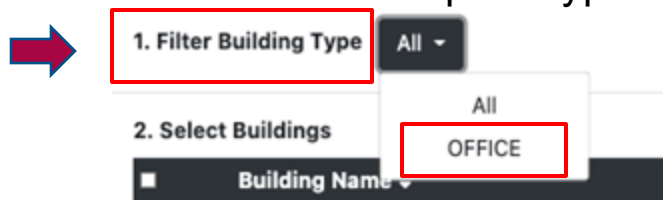
Any reports created for the portfolio are also stored in a table on this page. Clicking on  will allow you to sort the reports in the table (alphabetically or numerically) by characteristic (energy savings potential, cost savings potential, etc.). Clicking on [Details](#) will direct you to the analytical report for review and download.

## IIA. Run BETTER Using the Web App

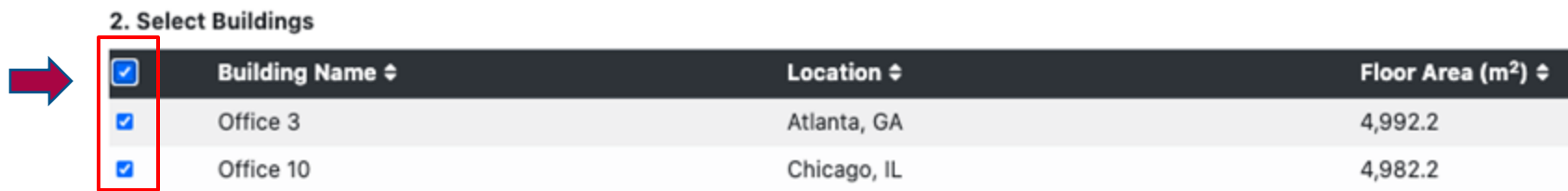
### 9. Select Building Space Type and Buildings in the Portfolio for Analysis

After clicking on [Add New Analytics](#) on the **Portfolio Analytics** page, users will be directed to a page to select the parameters for the analytical report.

**Step 1:** Select the building space type for analysis. \*NOTE: at this time, users cannot select the “All” option and must select one space type only per analytical run (e.g., office).



**Step 2:** After selecting the space type, select the specific buildings for analysis. Use the checkboxes to select any number of buildings to analyze, from a single building to the full list. Clicking the checkbox in the header row will select all buildings in the list.



## IIA. Run BETTER Using the Web App

### 10. Select the Savings Target for the Portfolio

**Step 3:** Select the savings target for the portfolio from the options shown.

**Conservative:** The savings goal will be one standard deviation worse than the median performance of the benchmarking peer group.

**Nominal:** The savings goal will be equal to the median savings of the benchmarking peer group.

**Aggressive:** The savings goal will be one half standard deviation better than the median performance of the benchmarking peer group.



# IIA. Run BETTER Using the Web App

## 11. Select the Benchmark Statistics for the Portfolio

**Step 4:** Select Benchmark Statistics from the options shown.

**Reference:**\* BETTER will automatically benchmark buildings in the portfolio against reference benchmark statistics developed by Lawrence Berkeley National Laboratory (LBNL) that match the property type(s) selected in Step 1. The reference benchmark statistics for each space type are derived from a sample of buildings and include the median and standard deviation for the electricity and fossil fuel inverse model coefficients for the sample (i.e., heating and cooling baseload, heating and cooling change-points, and heating and cooling sensitive consumption). For information on the regression model coefficient definitions, visit: [https://better.lbl.gov/how\\_it\\_works/](https://better.lbl.gov/how_it_works/). For information on how the reference statistics were developed visit the FAQ page Analysis Settings topic.

**Generate:** BETTER will generate benchmark statistics based only on the buildings selected for analysis in Step 2, so your buildings will be compared against others in your own portfolio. This option will provide more accurate statistics if you selected at least 30 buildings for analysis in Step 2. Note: Generating benchmark statistics may take several minutes.

Default benchmark statistics are only available for US offices, multifamily buildings, public libraries, hospitals, worship facilities, and K-12 schools; Tunisia hotels; and Mexico offices at this time. We are working on adding statistics for new space types.

4. Benchmark Statistics

☒ Reference ☐ Generate

Reference: BETTER will benchmark your buildings' change-point model coefficients (and change-points, and heating and cooling slopes) against the median and standard deviation for each of these change-point model

\*At this time, the “reference” benchmark statistics for U.S. offices, multifamily buildings, public libraries, hospitals, and K-12 schools are not perfectly representative of the U.S. national stock because the statistics were *not* developed from the U.S. Energy Administration (EIA) Commercial Building Energy Consumption Survey (CBECS) dataset ([which is representative of the U.S. national stock](#)) but rather from *datasets developed based on voluntary contributions from U.S. industry* that are not fully representative of the U.S. national stock in terms of characteristics such as size and climate zone distribution. We are working to expand these training datasets, and hence improve associated “reference” benchmark statistics, so they are more representative of the U.S. national stock. This includes expanding the training data sets to include: *at least 30 data points for each of the 10 BETTER model coefficients for each of the [eight CBECS size categories](#) in each of the [eight International Energy Conservation Code \(IECC\) climate zones](#) in the United States (and possibly for each of the relevant subtypes A, B, and C in these zones). Learn more at [FAQ](#). To contribute anonymous data to this effort, please email [support@better.lbl.gov](mailto:support@better.lbl.gov).*

## IIA. Run BETTER Using the Web App

$R^2$  is the proportion of the variance in the dependent variable (energy use) that is predictable from the independent variable (outdoor air temperature).

### 12. Select the Minimum $R^2$ Threshold for the Portfolio

**Step 5:** Select the Minimum  $R^2$  Threshold. Then click **Create and Run**.

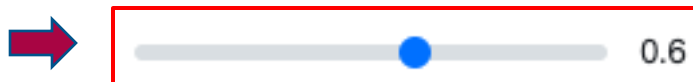
R-squared ( $R^2$ ) is a statistical measure that represents the proportion of the variance for a dependent variable that's explained by an independent variable, or variables, in a regression model. In the case of BETTER,  $R^2$  indicates to what extent variations in outdoor air temperature explain variations in building energy use intensity. An  $R^2$  of 1 means that all movement in energy use intensity is completely explained by movements in outdoor air temperature. In general, we recommend users select an  $R^2$  of 0.6 or higher for a portfolio or building. If the  $R^2$  of a model is 0.6, then approximately 60% of the observed variation in energy use intensity can be explained by variation in outdoor air temperature.

When analyzing a portfolio, selecting a higher  $R^2$  level may mean that fewer regression models are fit. As a result, BETTER may estimate lower energy/cost savings and recommend fewer energy efficiency improvements for the portfolio, but these savings/improvement recommendations will be very reliable.

When a lower  $R^2$  is selected, BETTER may estimate higher energy/cost savings and recommend more energy efficiency improvements for a portfolio, but these savings/improvement recommendations may be less reliable than if a higher  $R^2$  is selected.

**In general, we recommend users select an  $R^2$  of 0.6 or higher for a portfolio.**

#### 5. Minimum Model $R^2$



## IIA. Run BETTER Using the Web App

### 13. Visit the Portfolio Analytics Staging page

After setting the analyses parameters for the portfolios, users will automatically be directed to the **Portfolio Analytics Staging** page.

#### Portfolio Analytics Staging Page

You can only generate portfolio analytics after generating analytics for each building in the portfolio. Below is a list of buildings in this portfolio and the analytics status for each. If any building still need to have its analytics generated, please click the "Generate All Uncompleted Building Analytics." Otherwise, if some analytics are still being run, please simply refresh this page until the system reports that all building analytics are finished. You may then run the portfolio analytics.

[Refresh Page](#)[Generate Portfolio Analytics](#)

#### Building Analytics for Selected Buildings in this Portfolio:

[Remove All Failed Building Analytics](#)[Generate All Uncompleted Building Analytics](#)

| Building Name ⓘ | Location ⓘ  | Space Type ⓘ | Building Analytics ⓘ                         | Status ⓘ    | Status Message ⓘ | Remove ⓘ               |
|-----------------|-------------|--------------|----------------------------------------------|-------------|------------------|------------------------|
| Office 16       | Miami, FL   | Office       | <a href="#">Building Analytics (ID: 384)</a> | IN_PROGRESS | None             | <a href="#">Remove</a> |
| Office 17       | Houston, TX | Office       | <a href="#">Building Analytics (ID: 385)</a> | IN_PROGRESS | None             | <a href="#">Remove</a> |

On this page, you will see a list of buildings in the portfolio and the analytics status for each. If any building still needs to have its analytics generated, click the [Generate All Uncompleted Building Analytics](#). Continue to periodically click [Generate All Uncompleted Building Analytics](#) and [Refresh](#) until the system reports that all building analytics are finished. You will see Status **COMPLETE** and Status Message **No Errors: Duration** for each building when this process is complete. If BETTER cannot generate analytics for a given building, click [Remove All Failed Building Analytics](#). Clicking this will not remove the building from the portfolio, just the analysis report. Once all building analytics are completed, click [Generate Portfolio Analytics](#) to view the **Portfolio Summary Report**.

Ready to generate Portfolio Analytics

[Generate Portfolio Analytics](#)

#### Building Analytics for Selected Buildings in this Portfolio:

[Generate All Uncompleted Building Analytics](#)

| Building Name ⓘ | Location ⓘ      | Space Type ⓘ | Building Analytics ⓘ                         | Status ⓘ | Status Message ⓘ                      | Remove ⓘ               |
|-----------------|-----------------|--------------|----------------------------------------------|----------|---------------------------------------|------------------------|
| Office 4        | Los Angeles, CA | Office       | <a href="#">Building Analytics (ID: 405)</a> | COMPLETE | No errors. Duration : 0.6008 seconds. | <a href="#">Remove</a> |

# IIA. Run BETTER Using the Web App

## 14. View and Download the Portfolio Summary Report

After clicking [Generate Portfolio Analytics](#), BETTER will direct you to an interactive **Portfolio Summary Report**. Scroll through the report to view interactive charts and graphs that provide the following information on the portfolio:

- Annual energy and cost reduction potential.
- Top 5 energy efficiency recommendations and guidance for implementation.
- Electricity and fossil energy use intensity (EUI) and cost savings comparisons by building.
- Tables and graphs to sort, rank, and prioritize buildings for upgrades.

Click the [Download](#) button on the upper right hand corner of the report to download an HTML version of the report which can be stored on your computer or emailed to stakeholders. Opening the HTML report in a web browser from an email or a computer by double-clicking renders it most effectively.



**BETTER V.1.0 Portfolio Summary Report**  
[Sample Portfolio\\_July 23 2021](#)  
Generated at

[Download](#)

**Overview**

|                                       |                                           |
|---------------------------------------|-------------------------------------------|
| Number of Buildings                   | Total Gross Floor Area (m <sup>2</sup> ): |
| <b>32</b>                             | <b>820,835.0</b>                          |
| Cost Savings (US dollar (USD / \$ )): | Energy Savings (kWh):                     |
| <b>1,900,242</b>                      | <b>20,548,658</b>                         |
| <b>20.2%</b>                          | <b>19.6%</b>                              |

Go to the Utilize Results section (slide 61) for more information on how to use the Portfolio Summary Report to improve portfolio energy and financial performance.

Users can also scroll down to the **Building Analytics List** and click on the names of individual buildings to view **Building Summary Reports** which provide a building's annual energy and cost reduction potential, energy efficiency recommendations and implementation guidance, annual utility cost and savings breakdowns by load type, etc. This **Buildings Summary Report** can also be downloaded as an HTML file for storage and sharing.

| Building Name | Building Location | Building Area (m <sup>2</sup> ) | Annual Electricity Consumption (kWh) | Annual Fossil Fuel Consumption (kWh) | Annual Electricity Cost (US dollar (USD / \$ )) | Annual Fossil Fuel Cost (US dollar (USD / \$ )) | Annual Electricity EUI (kWh/m <sup>2</sup> ) | Annual Fossil Fuel EUI (kWh/m <sup>2</sup> ) | Annual Cost Savings Potential (US dollar (USD / \$ )) | Annual Energy Savings (%) |
|---------------|-------------------|---------------------------------|--------------------------------------|--------------------------------------|-------------------------------------------------|-------------------------------------------------|----------------------------------------------|----------------------------------------------|-------------------------------------------------------|---------------------------|
| Office 26     | Chicago, IL       | 46,320.0                        | 5,494,875                            | 937,856                              | 474,207.7                                       | 24,000.9                                        | 118.6                                        | 20.2                                         | 48,161                                                | 9.3 %                     |

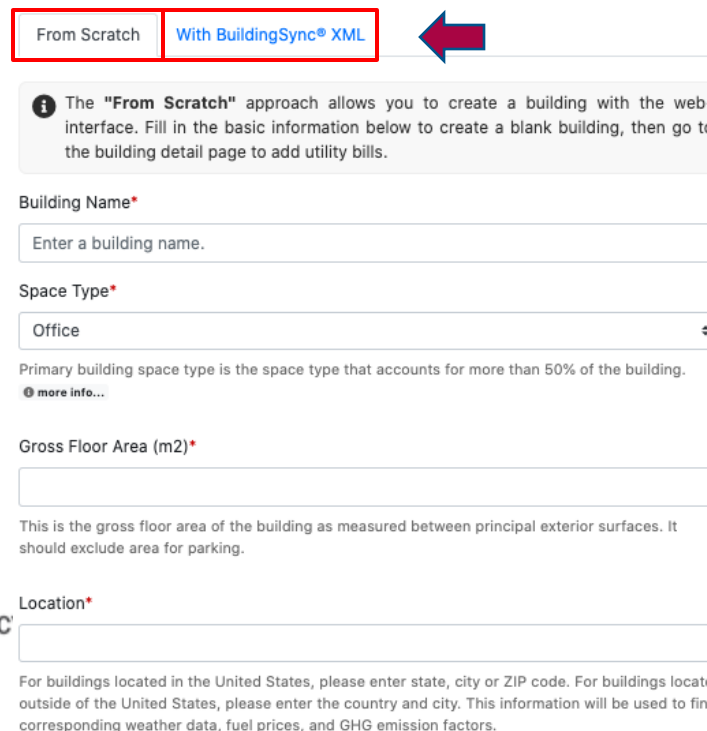
# Create a New Building

## IIA. Run BETTER Using the Web App

### 15. Create a New Building on the Dashboard page

For users with individual buildings they want to analyze with BETTER, clicking **Create New Building** on the **Dashboard** page will direct you to the **Add a New Building** page. There, users have two options to create a new portfolio:

- a. **Option a:** The **From Scratch** approach allows users to create a building on the web-interface.
- b. **Option b:** The **With BuildingSync® XML** approach allows you to use a BuildingSync® XML file to create a building in BETTER. Visit <https://buildingsync.net/> to learn more about BuildingSync®.



From Scratch With BuildingSync® XML

**i** The "From Scratch" approach allows you to create a building with the web-interface. Fill in the basic information below to create a blank building, then go to the building detail page to add utility bills.

**Building Name\***

Enter a building name.

**Space Type\***

Office

Primary building space type is the space type that accounts for more than 50% of the building.  
[more info...](#)

**Gross Floor Area (m2)\***

This is the gross floor area of the building as measured between principal exterior surfaces. It should exclude area for parking.

**Location\***

For buildings located in the United States, please enter state, city or ZIP code. For buildings located outside of the United States, please enter the country and city. This information will be used to find corresponding weather data, fuel prices, and GHG emission factors.

# IIA. Access the Web App Home to Create New Portfolio

## 15a. Option a: Create a New Building from Scratch

On the **Create a New Building** page, click the **From Scratch** tab and then fill in the fields on the web interface as follows:

- **Building Name:** Enter any building name.
- **Space Type:** Select the primary building space type from the drop-down menu. This is the space type that accounts for more than 50% of the building. For example, if the building has offices that account for 60% of the gross floor area (excluding parking) and retail stores that account for 40%, then the primary space type should be "office." If no space type accounts for more than 50%, then the building is mixed use. To evaluate mixed use spaces, determine the size and monthly energy consumption for each space in the building and analyze each of these spaces separately in BETTER.
- **Gross Floor Area:** This is the gross floor area of the building as measured between principal exterior surfaces. It should exclude area for parking. \*NOTE: Currently, gross floor area needs be entered in m<sup>2</sup> regardless of the unit system selected on the upper right navigation bar.
- **Location:** For buildings located in the United States, please enter city, state (e.g., Cambridge, MA) or ZIP code. For buildings located outside of the United States, please enter the country and city (e.g., Mexico City, Mexico).

Then click **Save**.

**Add a New Building**

There are two ways to create a new building. Click on the tab below for more details.

**From Scratch**   **With BuildingSync® XML**

The "From Scratch" approach allows you to create a building with the web-interface. Fill in the basic information below to create a blank building, then go to the building detail page to add utility bills.

**Building Name\***  
Sample Office 1

**Space Type\***  
Office

**Gross Floor Area (m²)\***  
12000

**Location\***  
Washington, DC

All fields marked with \* are required

**Save**   **Cancel**

## IIA. Access the Web App Home to Create New Portfolio

### 15b. Option b: Create a New Building **With BuildingSync® XML**

On the **Create a New Building** page, click the **With BuildingSync® XML** tab and then choose the BuildingSync® XML file you want to upload from your computer and click **Upload**.

The screenshot shows the 'Create a New Building' web app interface. At the top, there are two tabs: 'From Scratch' and 'With BuildingSync® XML'. The 'With BuildingSync® XML' tab is selected. Below the tabs, there is an information box with an 'i' icon and text: 'The "With BuildingSync® XML" approach allows you to use a BuildingSync® XML file to create a building instance in BETTER. An example BuildingSync® XML file could be downloaded [here](#).' Below this, there is a label 'BuildingSync XML File\*' followed by a text input field containing '---'. To the right of the input field is a 'Browse' button. A red box highlights the 'Browse' button, and a red arrow points to it from the right. Below the input field, there is a red error message: 'This field is required.' At the bottom of the form, there are two buttons: 'Upload' and 'Cancel'. The 'Upload' button is highlighted with a red box, and a red arrow points to it from the left.

## IIA. Run BETTER Using the Web App

### 16. Visit the All Buildings page

After creating a new building [From Scratch](#) or [With Building Sync® XML](#), users will automatically be directed to the **All Buildings** page. On this page, you will see a table listing any prior buildings you created along with the building you just created. Clicking on  will allow you to sort the buildings in the table (alphabetically or numerically) by characteristic (i.e., ID, building name, space type, location, floor area, portfolio name, and date updated). If a new building was created independent of a portfolio [From Scratch](#) or [With BuildingSync® XML](#) it will not have a Portfolio Name assigned.\* Click the [Building Name](#) or [View](#) to add utility bill information to the building.

All Buildings



| ID  | Building Name                   | Space Type | Location    | Floor Area (m <sup>2</sup> ) | Portfolio Name                                                    | Date Updated | View                 | Delete                 |
|-----|---------------------------------|------------|-------------|------------------------------|-------------------------------------------------------------------|--------------|----------------------|------------------------|
| 562 | <a href="#">Sample Office 1</a> | Office     | Miami, FL   | 4,982.0                      | ( none )                                                          | 07/05/2021   | <a href="#">View</a> | <a href="#">Delete</a> |
| 392 | <a href="#">Office 3</a>        | Office     | Atlanta, GA | 4,992.2                      | <a href="#">Sample Portfolio - BETTER Template Test - 6.28.21</a> | 06/28/2021   | <a href="#">View</a> | <a href="#">Delete</a> |

Create New Building

\* NOTE: You cannot assign a building to an existing portfolio after creating it independently of a portfolio. The only way to add a new building to an existing portfolio is to first click on the [Portfolio Name](#) hyperlink, or [View](#) associated with the portfolio, to arrive at the **Portfolio Information** tab. Then, click on [Add New Building](#) to see options to add a new building to the existing portfolio.

## IIA. Run BETTER Using the Web App

### 17. Visit the Building Information page

After clicking [View](#) or the [Building Name](#) on the **All Buildings** page for the building you just created, you will arrive at the **Building Information** page. Here you will see the information you just entered on the building. To make changes to this information, click [Edit Building](#) and replace the information in the fields and click [Save Building Info](#). To add 12 consecutive months of utility bill information needed for analysis using BETTER, click [Add a Utility Bill](#).

Building Information

Building Analytics

|                                                                                   |                              |           |
|-----------------------------------------------------------------------------------|------------------------------|-----------|
|  | Name                         | Office 32 |
|                                                                                   | Space Type                   | Office    |
|                                                                                   | Floor Area (m <sup>2</sup> ) | 46,320.0  |
|                                                                                   | Location                     | Miami, FL |



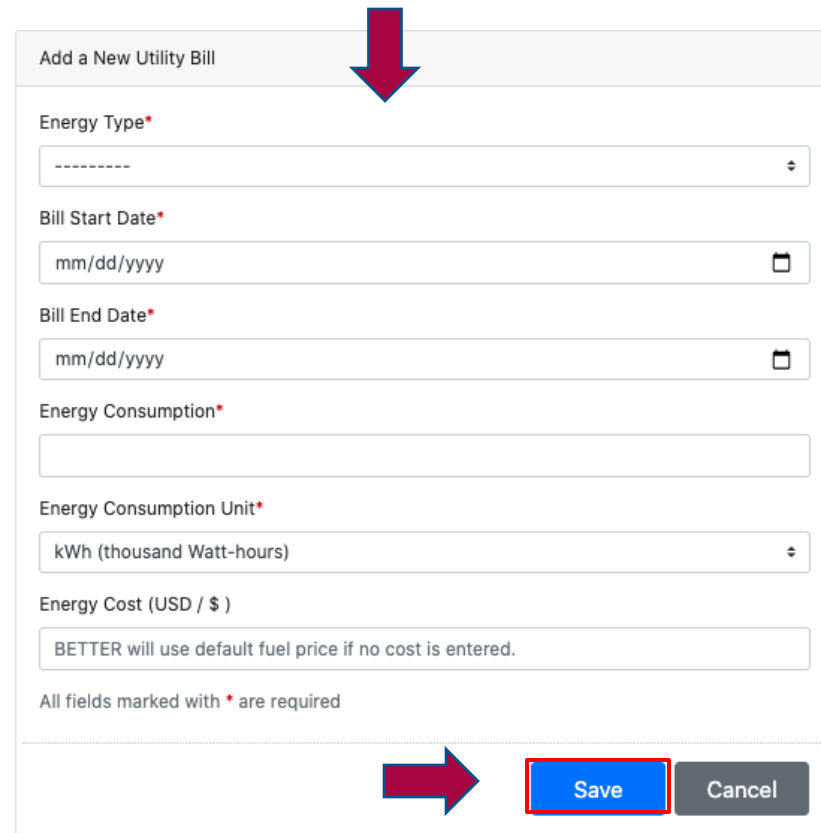
Edit Building

## IIA. Run BETTER Using the Web App

### 18. Visit Add a New Utility Bill page and Add a Utility Bill

After clicking [Add a Utility Bill](#), users will be directed to the **Add a New Utility Bill** page. Enter the required data as follows and then click [Save](#). Repeat this process until at least 12 consecutive months of data for each fuel used in the building are entered.

- **Energy Type:** Select the fuel type for which you are entering utility bill information (i.e., consumption and cost) from the drop-down menu.
- **Bill Start Date:** This is the start date for the utility bill for the fuel type selected. Enter in the format mm/dd/yyyy.
- **Bill End Date:** This is the end date for the utility bill for the fuel type selected. Enter in the format mm/dd/yyyy.
- **Energy Consumption:** This is the numerical consumption value for the date range and energy type you've entered.
- **Energy Consumption Unit:** Select the energy unit associated with the energy consumption from the drop-down menu. The units shown will correspond to the unit system selected in the upper right navigation bar. Check your utility bill carefully to make sure you are entering the correct unit.
- **Energy Cost (USD / \$):** This is the numerical cost value in U.S. dollars (USD) for the date range and energy type you've entered. \*NOTE: At this time, energy cost must be entered in USD. In the future, users can select to input and display cost savings in alternative currencies.



The screenshot shows the 'Add a New Utility Bill' form. A red arrow points to the top of the form. The form contains the following fields:

- Energy Type\***: A dropdown menu with a placeholder '-----'.
- Bill Start Date\***: A date input field with a placeholder 'mm/dd/yyyy' and a calendar icon.
- Bill End Date\***: A date input field with a placeholder 'mm/dd/yyyy' and a calendar icon.
- Energy Consumption\***: A text input field.
- Energy Consumption Unit\***: A dropdown menu with 'kWh (thousand Watt-hours)' selected.
- Energy Cost (USD / \$)**: A text input field with the text 'BETTER will use default fuel price if no cost is entered.'

Below the fields, it says 'All fields marked with \* are required'. At the bottom right, there is a red arrow pointing to a blue 'Save' button, which is highlighted with a red border, and a grey 'Cancel' button.

## IIA. Run BETTER Using the Web App

### 19. Visit the Building Analytics page and Add a Building Analytics Report

After 12 consecutive months of data for each fuel used in the building has been entered into BETTER (see example below) click on the **Building Analytics** tab to select the parameters for analysis of the building.

Building Information

Building Analytics



|                              |           |
|------------------------------|-----------|
| Name                         | Office 32 |
| Space Type                   | Office    |
| Floor Area (m <sup>2</sup> ) | 46,320.0  |
| Location                     | Miami, FL |

Edit Building

Utility Consumption

Add a Utility Bill

| Energy Type ↕   | Bill Start Date ↕ | Bill End Date ↕ | Consumption ↕                      | Cost (\$) ↕ | Edit    | Delete |
|-----------------|-------------------|-----------------|------------------------------------|-------------|---------|--------|
| Electric - Grid | Jan. 1, 2018      | Jan. 31, 2018   | 417711.0 kWh (thousand Watt-hours) | 39,849.63   | Details | Delete |
| Electric - Grid | Feb. 1, 2018      | Feb. 28, 2018   | 375908.0 kWh (thousand Watt-hours) | 35,861.62   | Details | Delete |
| Electric - Grid | March 1, 2018     | March 31, 2018  | 425522.0 kWh (thousand Watt-hours) | 40,594.8    | Details | Delete |

# IIA. Run BETTER Using the Web App

## 20. Add Building Analytics

On the **Building Analytics** tab, you will see a table listing information on any prior analytical reports run for the building. Clicking on  will allow you to sort the buildings in the table (alphabetically or numerically) by characteristic (i.e., ID, savings target, benchmark statistics, model R<sup>2</sup> threshold, energy savings potential, cost savings potential, and status (i.e., whether the analysis report is completed or not)). Click [Add New Analytics](#) to run an analytical report on the building.



Building Information Building Analytics

List of Building Analytics

| ID  | Savings Target  | Benchmark Statistics  | Model R <sup>2</sup> Threshold  | Energy Savings Potential (kWh)  | Cost Savings Potential [US dollar (USD / \$)]  |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 602                                                                                  | Nominal                                                                                          | Default                                                                                                | 0.6                                                                                                              | 3,967                                                                                                            | 203                                                                                                                             |

Add New Analytics

| Status  | View                    | Download                 | Action                | Delete                 |
|--------------------------------------------------------------------------------------------|-------------------------|--------------------------|-----------------------|------------------------|
| COMPLETE                                                                                   | <a href="#">Details</a> | <a href="#">Download</a> | <a href="#">Rerun</a> | <a href="#">Delete</a> |

## IIA. Run BETTER Using the Web App

### 21. Select the Savings Target for the Building

**Step 1:** Select the savings target for the building from the options shown.

**Conservative:** The savings goal will be one standard deviation worse than the median performance of the benchmarking peer group.

**Nominal:** The savings goal will be equal to the median savings of the benchmarking peer group.

**Aggressive:** The savings goal will be one half standard deviation better than the median performance of the benchmarking peer group



## IIA. Run BETTER Using the Web App

Reference benchmark statistics are only available for U.S. offices, multifamily buildings, public libraries, hospitals, worship facilities, and K-12 schools; Tunisia hotels; and Mexico offices at this time. We are working on adding statistics for new space types.

### 22. Select Reference Benchmark Statistics for the Building

#### Step 2: Select Benchmark Statistics.

**Reference:**\* BETTER will automatically benchmark a building against reference benchmark statistics developed by Lawrence Berkeley National Laboratory (LBNL) that match the property type(s) selected. The reference benchmark statistics for each space type are derived from a sample of buildings and include the median and standard deviation for the electricity and fossil fuel inverse model coefficients for the sample (i.e., heating and cooling baseload, heating and cooling change-points, and heating and cooling sensitive consumption). For information on the regression model coefficient definitions, visit: [https://better.lbl.gov/how\\_it\\_works/](https://better.lbl.gov/how_it_works/). For information on how the reference statistics were developed visit the FAQ page Analysis Settings topic.

#### 4. Benchmark Statistics

☒ Reference☐ Generate

Country

✓ United States

Mexico

Reference: BETTER will benchmark your buildings' change-point model coefficients (e.g., electric and fossil baseloads, heating and cooling change-points, and heating and cooling slopes) against the median and standard deviation for each of these change-point model coefficients derived from a dataset for the selected space type. Currently, reference statistics are only available for U.S. offices and K-12 schools and Mexican offices. To learn more about the datasets and how the reference statistics were developed visit the [FAQ page](#) Analytical Settings topic.

\* Note: At this time, the "reference" benchmark statistics for U.S. offices, multifamily buildings, public libraries, hospitals, worship facilities, and K-12 schools are not perfectly representative of the U.S. national stock because the statistics were *not* developed from the U.S. Energy Administration (EIA) Commercial Building Energy Consumption Survey (CBECS) dataset ([which is representative of the U.S. national stock](#)) but rather from *training datasets developed based on voluntary contributions from U.S. industry* that are not fully representative of the U.S. national stock in terms of characteristics such as size and climate zone distribution. We are working to expand these training datasets, and hence improve associated "reference" benchmark statistics, so they are more representative of the U.S. national stock. This includes expanding the training data sets to include: *at least 30 data points for each of the 10 BETTER model coefficients for each of the [eight CBECS size categories](#) in each of the [eight International Energy Conservation Code \(IECC\) climate zones](#) in the United States (and possibly for each of the relevant subtypes A, B, and C in these zones).* To contribute anonymous data to this effort, please email [support@better.lbl.gov](mailto:support@better.lbl.gov).

## IIA. Run BETTER Using the Web App

$R^2$  is the proportion of the variance in the dependent variable (energy use) that is predictable from the independent variable (outdoor air temperature).

### 12. Select the Minimum $R^2$ Threshold for the Building

**Step 5:** Select the Minimum  $R^2$  Threshold. Then click **Create and Run**.

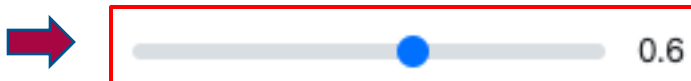
R-squared ( $R^2$ ) is a statistical measure that represents the proportion of the variance for a dependent variable that's explained by an independent variable, or variables, in a regression model. In the case of BETTER,  $R^2$  indicates to what extent variations in outdoor air temperature explain variations in building energy use intensity. An  $R^2$  of 1 means that all movement in energy use intensity is completely explained by movements in outdoor air temperature. In general, we recommend users select an  $R^2$  of 0.6 or higher for a portfolio or building. If the  $R^2$  of a model is 0.6, then approximately 60% of the observed variation in energy use intensity can be explained by variation in outdoor air temperature.

When analyzing a portfolio, selecting a higher  $R^2$  level may mean that fewer regression models are fit. As a result, BETTER may estimate lower energy/cost savings and recommend fewer energy efficiency improvements for the portfolio, but these savings/improvement recommendations will be very reliable.

When a lower  $R^2$  is selected, BETTER may estimate higher energy/cost savings and recommend more energy efficiency improvements for a portfolio, but these savings/improvement recommendations may be less reliable than if a higher  $R^2$  is selected.

**In general, we recommend users select an  $R^2$  of 0.6 or higher for a portfolio.**

#### 5. Minimum Model $R^2$



## IIA. Run BETTER Using the Web App

Go to the Utilize Results section (slide 61) for more information on how to use the Building Summary Report to improve building energy and financial performance.

### 24. View and Download the Building Summary Report

After clicking **Create and Run**, BETTER will direct you to an interactive **Building Summary Report**. Scroll through the report to view interactive charts and graphs that provide the following information on the building:

- Annual energy and cost reduction potential.
- Energy efficiency recommendations and implementation guidance.
- Annual utility cost and savings breakdowns by load type.
- Monthly electric and fossil energy use trends.
- Electricity and fossil fuel change-point models and benchmarks.

Click the **Download** button on the upper right hand corner of the report to download an HTML version of the report which can be stored on your computer or emailed to stakeholders. Opening the HTML report in a web browser from an email or a computer by double-clicking renders it most effectively.

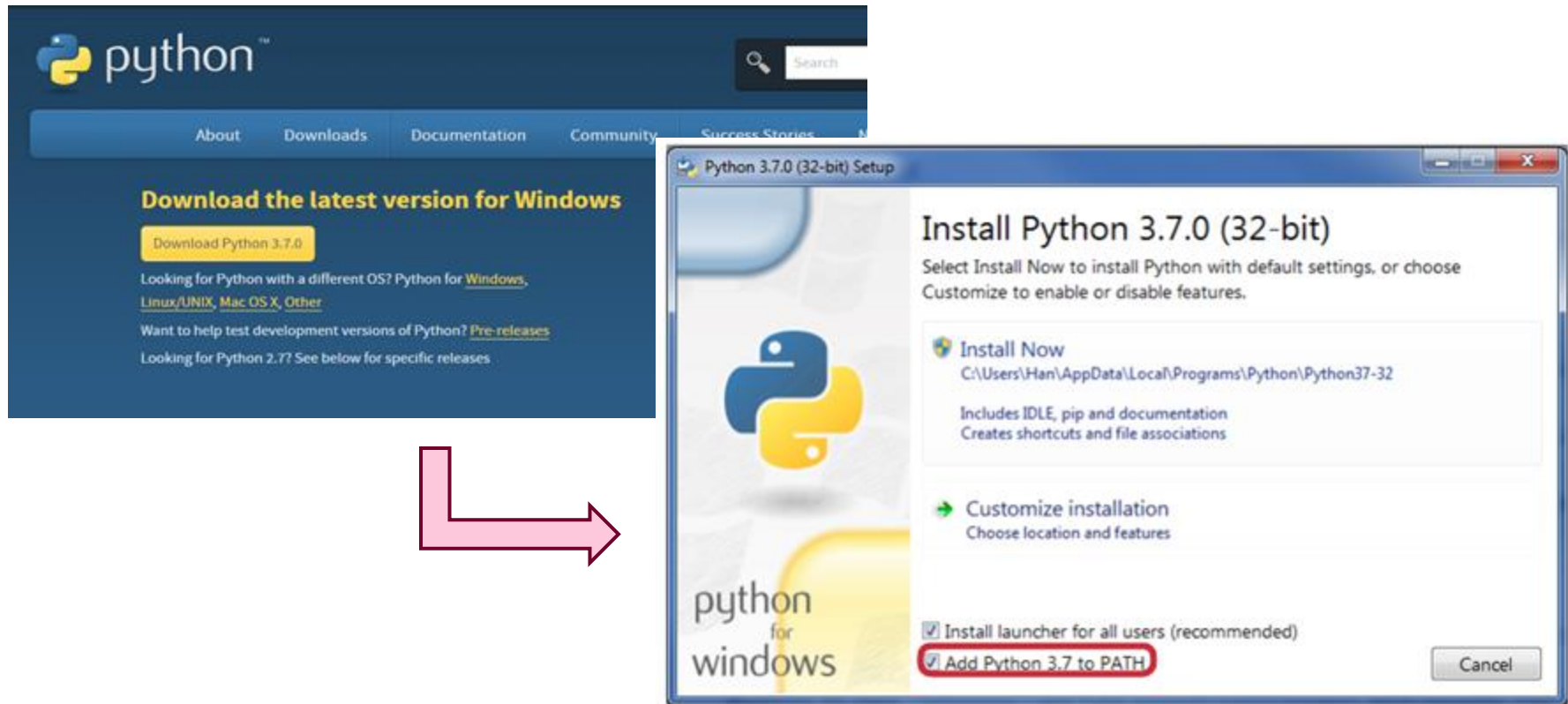
**BETTER V.1.0 Building Summary Report**  
Office 25  
Generated at 2021-07-23  
[Download](#)

|                                                                                  |                                                                                     |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Overview</b>                                                                  |                                                                                     |
| Building Type:<br><b>Office</b>                                                  | Gross Floor Area (m <sup>2</sup> ):<br><b>46,320.0</b>                              |
| Building Location:<br><b>Seattle, WA</b>                                         | Closest Weather Station:<br><b>Station: 727934-94248 : Renton Municipal Airport</b> |
| Potential Cost Savings (US dollar (USD / \$ )):<br><b>86,903</b><br><b>16.3%</b> | Potential Energy Savings (kWh):<br><b>978,638</b><br><b>15.4%</b>                   |

U.S. DEPARTMENT OF ENERGY  
BUILDING

## IIB. Run BETTER Using the Python Code

- [Download](#) and install Python 3.6.0 or later



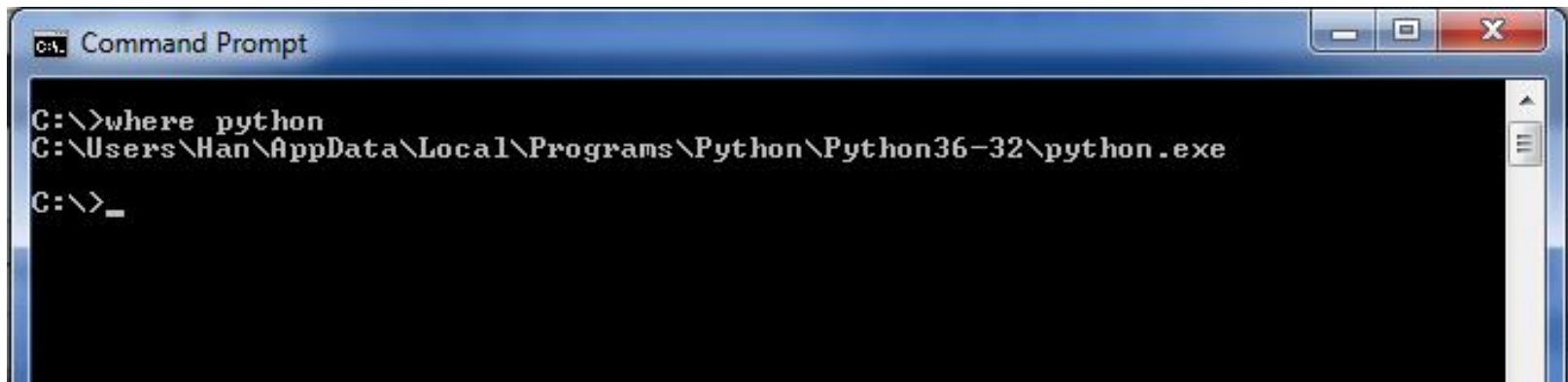
**During Python installation, select the “Add Python 3.x to Path” option, keep other default settings**

# IIB. Run BETTER Using the Python Code

## 2. Check that Python is installed correctly

- a) Windows: open command prompt, type “where python” and hit enter. Check if the message indicates Python 3.6.0 or later has been downloaded (e.g. Python 36 stands for Version 3.6 in the screenshot)
- b) MacOS: open terminal, type “which python” and hit enter

If the command doesn't show the desired message, you need to add Python to the path (environment variables). Refer to this link for [Windows](#), and this link for [MacOS](#).



```
Command Prompt
C:\>where python
C:\Users\Han\AppData\Local\Programs\Python\Python36-32\python.exe
C:\>_
```

## IIB. Run BETTER Using the Python Code

### 3. Download the source code

- a) Download the Source Code zip file from the [Github directory \(latest release\)](#)
- b) The tool directory should contain the files and folders shown below

**4. Install dependencies:** double-click on “setup.py”. The script will automatically install dependencies if steps 1-3 were successful.

| Name                                                                                           | Type               | Size |
|------------------------------------------------------------------------------------------------|--------------------|------|
|  better       | File folder        |      |
|  data         | File folder        |      |
|  .gitignore   | GITIGNORE File     | 1 KB |
|  copyright    | File               | 1 KB |
|  install.bat | Windows Batch File | 1 KB |
|  LICENSE    | File               | 4 KB |
|  README.md  | MD File            | 8 KB |
|  setup.py   | PY File            | 1 KB |

# IIB. Run BETTER Using the Python Code

## 5. Run the tool

*Note that detailed instructions will be kept up to date in the ReadMe file posted on Github.*

a. Input data:

- i. Open the [portfolio.xlsx](#) file in the `./data` folder
- ii. Input data accordingly.
- iii. Save the file.

b. Run the tool:

- i. Open `./better/run.py` file using a text editor.
- ii. For a single building analysis:
  - i. Uncomment line 11 (`run_single(...)`) and comment line 13 (`run_batch(...)`). Make the below edits in line 11.
  - ii. Set the target building ID based on the ID in `portfolio.xlsx` (e.g., `bldg_id=1`).



```
6
7  from demo import *
8  # Notes:
9      # Saving target: 1 ~ conservative, 2 ~ nominal, 3 ~ aggressive
10     # Change the building id and saving target for the building
11     run_single(bldg_id=1, saving_target=2, cached_weather=False)
12     # Uncomment the line below [delete the '#' before run_batch]
13     #run_batch(start_id = 1, end_id = 20, saving_target=2, cached_w
```

# IIB. Run BETTER Using the Python Code

## 5. Run the tool (continued)

*Note that detailed instructions will be kept up to date in the ReadMe file posted on Github.*

- iii. For a whole-portfolio analysis:
  - i. Uncomment line 13 (`run_batch(...)`) and comment line 11 (`run_single(...)`). Make the below edits in line 13.
  - ii. Set the start and end building IDs based on the IDs in portfolio.xlsx (e.g., `start_id=1, end_id=20`).
- iv. Set the saving target level (1 = conservative, 2 = nominal, 3 = aggressive – e.g., `saving_target=2`).
- v. Run the analysis by running `python run.py` from your cmd or terminal.
- vi. Retrieve output reports from the `./outputs` folder.



```
7 from demo import *
8 # Notes:
9     # Saving target: 1 ~ conservative, 2 ~ nominal, 3 ~ aggressive
10    # Change the building id and saving target for the building
11    #run_single(bldg_id=1, saving_target=2, cached_weather=False)
12    # Uncomment the line below [delete the '#' before run_batch(
13    run_batch(start_id = 1, end_id = 20, saving_target=2, cached_wea
```

# Utilize Results

### III. Utilize Results

With minimal data inputs, BETTER delivers actionable insights to improve energy and financial performance in buildings and portfolios without requiring site visits and complex modeling.

BETTER's self-contained HTML analytical reports include the following information:

#### **At the Portfolio Level:**

1. Annual energy and cost reduction potential.
2. Top 5 energy efficiency recommendations.
3. Electricity and fossil energy use intensity (EUI) and cost savings comparisons by building.
4. Ability to sort, rank, and prioritize buildings for upgrades.

#### **At the Building Level:**

5. Annual energy and cost reduction potential.
6. Energy efficiency recommendations and implementation guidance.
7. Annual utility cost and savings breakdowns by load type.
8. Monthly electric and fossil energy use trends.
9. Electricity and fossil fuel change-point models and benchmarks.

### III. Utilize Results

#### Chart 1. Portfolio Annual Energy and Cost Reduction Potential

##### Overview

Number of Buildings

**32**

Total Gross Floor Area (m<sup>2</sup>):

**820,845.0**

Cost Savings (US dollar (USD / \$ )):

**20.4%**

Energy Savings (kWh):

**20,154,954**

Electricity Energy/Cost Savings:

**21.1%**

Fossil Fuel Energy/Cost Savings:

**16.9%**

[More energy and cost details](#)



Click the **More Energy and Cost Details** link for deeper analysis.

| Energy                                                     |             |             |
|------------------------------------------------------------|-------------|-------------|
| Energy Type                                                | Electricity | Fossil Fuel |
| Annual Energy Consumption (kWh)                            | 83,289,199  | 15,239,777  |
| Annual Site Energy Use Intensity (kWh/m <sup>2</sup> )     | 136.4       | 20.1        |
| Annual Energy Saving (kWh)                                 | 17,583,942  | 2,571,011   |
| Annual Energy Saving Percentage (%)                        | 21.1        | 16.9        |
| Combined Annual Energy Consumption (kWh)                   | 98,528,977  |             |
| Combined Annual Energy Use Intensity (kWh/m <sup>2</sup> ) | 128.0       |             |
| Combined Annual Energy Saving (kWh)                        | 20,154,954  |             |
| Combined Annual Energy Saving Percentage (%)               | 20.5        |             |

# III. Utilize Results

## Chart 2: Portfolio Top 5 Energy Efficiency Recommendations

The energy efficiency recommendations most frequently recommended across your portfolio are:

- [Reduce Equipment Schedules](#)
- [Reduce Plug Loads](#)
- [Reduce Lighting Load](#)
- [Decrease Heating Setpoints](#)
- [Increase Cooling Setpoints](#)



Click each **recommendation** for the list of buildings in the portfolio for which the energy efficiency measure applies and resources to help implement the measure.

- [Increase Cooling Setpoints](#)

(12 out of 32 buildings)

*Building(s):*

[Office 26](#); [Office 29](#); [Office 9](#); [Office 19](#); [Office 12](#); [Office 24](#); [Office 13](#); [Office 31](#); [Office 28](#); [Office 30](#); [Office 23](#); [Office 25](#);

*Description:*

Your building starts cooling at a lower temperature than a typical building. Check the occupied and unoccupied cooling setpoint during the cooling season. Cooling system and auxiliary systems' energy consumption will be reduced by increasing the cooling setpoint.

*Resources:*

- US Department of Energy: [US DOE Energy Asset Score Recommendations Guide, pp. 17-20](#)

Best candidates for audits are highlighted in red.

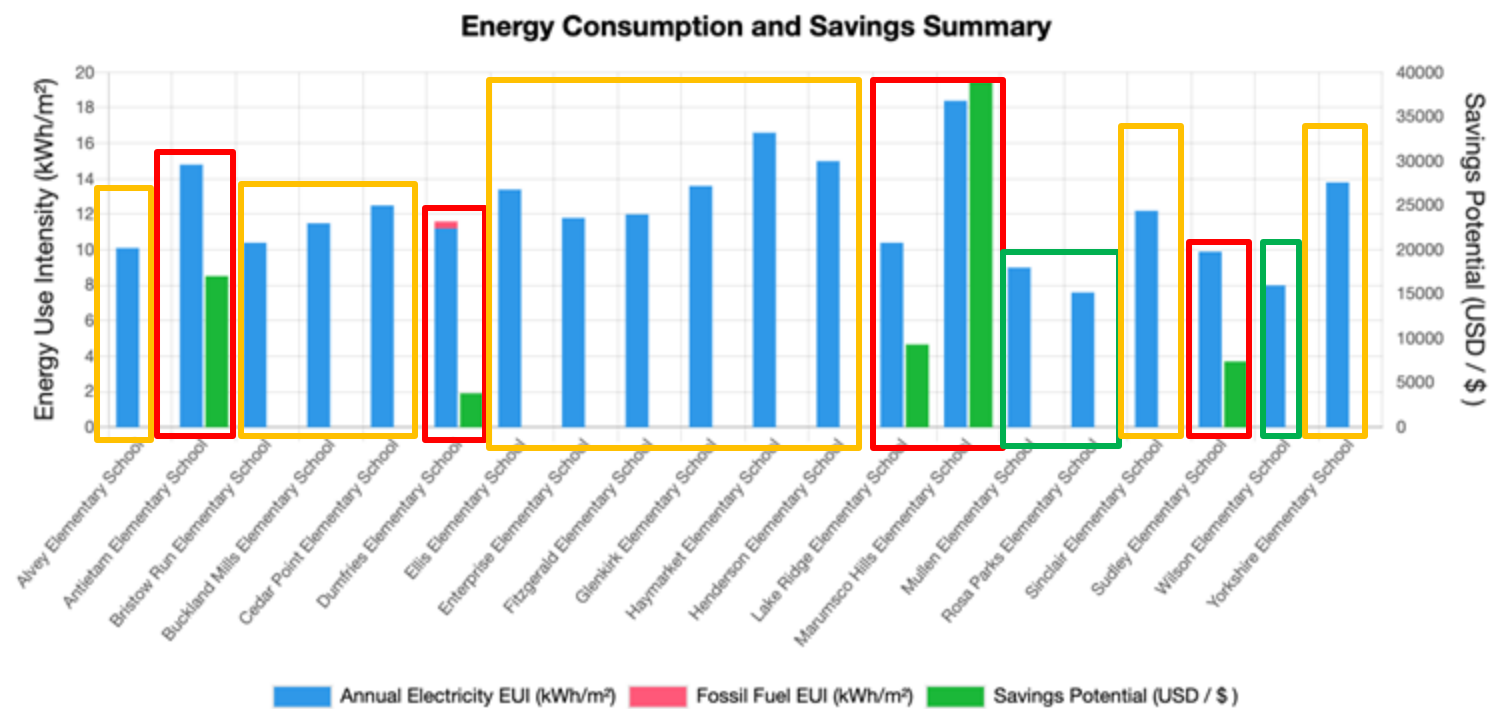
Buildings for no-/low-cost O&M tune ups are highlighted in yellow.

Buildings to assess for best practices are highlighted in green.

### III. Utilize Results

#### Chart 3. Portfolio Electricity and Fossil Energy Use intensity (EUI) and Cost Savings Comparisons by Building

- Compare and rank buildings across a portfolio according to annual electricity and fossil EUI and annual cost savings potential.
- Buildings with high cost savings potential are good candidates for audits and further analysis.
- Buildings with high fossil EUI represent opportunities for electrification and decarbonization.



### III. Utilize Results

#### Chart 4. Sort, Rank, and Prioritize Buildings in a Portfolio for Upgrades

- Use the  to rank buildings across a portfolio according to annual electricity and fossil EUI, annual cost savings potential, etc.
- Buildings with high cost savings potential are good candidates for audits and further analysis.
- Click on any [Building Name](#) to view an analysis report for that particular building.

#### Building Analytics List

| Building Name  | Building Location  | Building Area (m <sup>2</sup> )  | Annual Electricity Consumption (kWh)  | Annual Fossil Fuel Consumption (kWh)  | Annual Electricity Cost (US dollar (USD / \$ ))  | Annual Fossil Fuel Cost (US dollar (USD / \$ ))  | Annual Electricity EUI (kWh/m <sup>2</sup> )  | Annual Fossil Fuel EUI (kWh/m <sup>2</sup> )  | Annual Cost Savings Potential (US dollar (USD / \$ ))  | Annual Energy Savings (%)  |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <a href="#">Office 17</a>                                                                     | Houston, TX                                                                                         | 46,320.0                                                                                                          | 8,076,233                                                                                                              | 81,067                                                                                                                 | 638,022.5                                                                                                                         | 1,933.1                                                                                                                             | 174.4                                                                                                                            | 1.8                                                                                                                              | 243,188                                                                                                                                   | 38.1 %                                                                                                        |
| <a href="#">Office 18</a>                                                                     | Phoenix, AZ                                                                                         | 46,320.0                                                                                                          | 7,486,566                                                                                                              | 531,708                                                                                                                | 708,229.2                                                                                                                         | 16,356.5                                                                                                                            | 161.6                                                                                                                            | 11.5                                                                                                                             | 223,769                                                                                                                                   | 33.3 %                                                                                                        |
| <a href="#">Office 19</a>                                                                     | Atlanta, GA                                                                                         | 46,320.0                                                                                                          | 7,346,394                                                                                                              | 369,461                                                                                                                | 714,804.1                                                                                                                         | 11,231.6                                                                                                                            | 158.6                                                                                                                            | 8.0                                                                                                                              | 166,351                                                                                                                                   | 22.3 %                                                                                                        |

# III. Utilize Results

## Chart 5. Building Annual Energy and Cost Reduction Potential

### Overview

Building Type:  
**Office**

Gross Floor Area (m<sup>2</sup>):  
**46,320.0**

Building Location:  
**Albuquerque, NM**

Closest Weather Station:  
**Station: 723650-23050 : Albuquerque Intl Sunport Airport**

Potential Cost Savings (US dollar (USD / \$ )):  
**139,198**  
**20.8%**

Potential Energy Savings (kWh):  
**1,515,023**  
**20.0%**

Electricity Energy/Cost Savings:  
**21.1%**

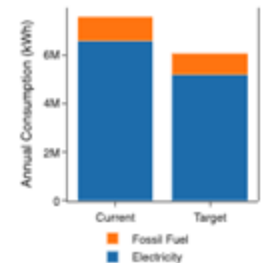
Fossil Fuel Energy/Cost Savings:  
**12.9%**

*Note: The annual estimates are based on the most recent 12 months of data input into BETTER.*

[More energy and cost details](#)



| Energy Type                                                | Electricity | Fossil Fuel |
|------------------------------------------------------------|-------------|-------------|
| Annual Energy Consumption (kWh)                            | 6,579,014   | 1,000,397   |
| Annual Site Energy Use Intensity (kWh/m <sup>2</sup> )     | 142.0       | 21.6        |
| Annual Energy Saving (kWh)                                 | 1,386,043   | 128,980     |
| Annual Energy Saving Percentage (%)                        | 21.1        | 12.9        |
| Combined Annual Energy Consumption (kWh)                   | 7,579,412   |             |
| Combined Annual Energy Use Intensity (kWh/m <sup>2</sup> ) | 163.6       |             |
| Combined Annual Energy Saving (kWh)                        | 1,515,023   |             |
| Combined Annual Energy Saving Percentage (%)               | 20.0        |             |



Click the **More Energy and Cost Details** link for deeper analysis.

# III. Utilize Results

## Chart 6: Building Energy Efficiency Recommendations

### Energy Efficiency Recommendations

- Reduce Plug Loads
- Reduce Lighting Load
- Decrease Heating Setpoints
- Increase Cooling Setpoints
- Reduce Equipment Schedules



Click **Details** for descriptions of each measure and implementation guidance.

### Energy Efficiency Measures

Hide Resources ▲

#### Reduce Plug Loads

Your building plug load is higher than that of a typical building. Anything that is plugged into standard electric receptacles or outlets falls under the “plug load” category. Personal computers, monitors, printers, coffeemakers, and other office/lab/lighting equipment are examples of plug loads. Consider upgrading your equipment to more efficient models (e.g., ENERGY STAR certified) and operate on a schedule where possible. Advanced power strips and other monitoring devices can help you target your most energy-intensive devices.

##### Resources:

- US Department of Energy: [Assessing and Reducing Plug and Process Loads in Office Buildings](#), Better Buildings Solutions Center
- US Department of Energy: [Decision Guides for Plug and Process Load Controls](#), Better Buildings Solutions Center
- US Department of Energy: [Energy-Efficient Products List](#)
- US Department of Energy: [Lessons Learned and the Future of Plug Load Controls](#), Better Buildings Solutions Center
- US Department of Energy: [Leveraging the Advanced Power Strips \(APS\) Technical Specification for Commercial Buildings](#), Better Buildings Solutions Center
- US Environmental Protection Agency: [ENERGY STAR Building Upgrade Manual Chapter 7: Supplemental Load Reduction](#)
- US Environmental Protection Agency: [ENERGY STAR Certified Products](#)
- Lawrence Berkeley National Laboratory: [Energy Efficiency Standards Group: Products](#)

#### Reduce Lighting Load

Your building lighting load is higher than that of a typical building. Lighting load is a significant portion of any building's energy consumption, but lighting efficiency and controls have a big impact on lighting system performance. Consider upgrading bulbs and fixtures to improve efficiency and check existing (or upgrade to) controls that dim and turn off the lights appropriately. Take advantage of natural daylighting whenever possible. Lights near existing windows or skylights can be controlled to dim or turn off for maximum daylight utilization. Renovations to the building envelope and internal space configurations are good opportunities to improve lighting system performance.

##### Resources:

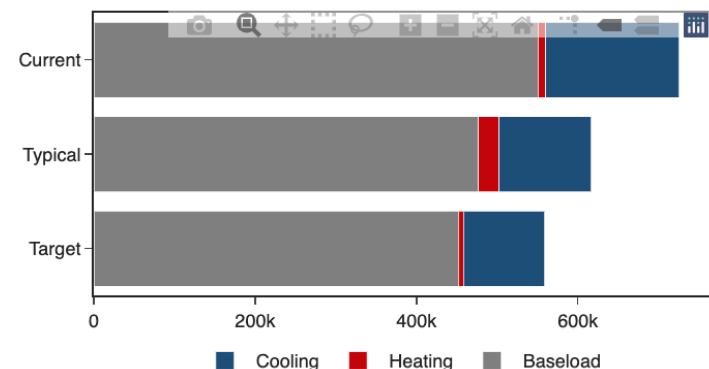
- US Department of Energy: [US DOE Energy Asset Score Recommendations Guide](#), pp. 8-11
- US Environmental Protection Agency: [ENERGY STAR Building Upgrade Manual Chapter 6: Lighting](#)
- Lawrence Berkeley National Laboratory: [Lighting and Electronics](#)
- National Institute of Building Sciences: [Advanced Lighting Systems: An Overview](#), Federal Energy Management Program (FEMP) course offered through Whole Building Design Guide

### III. Utilize Results

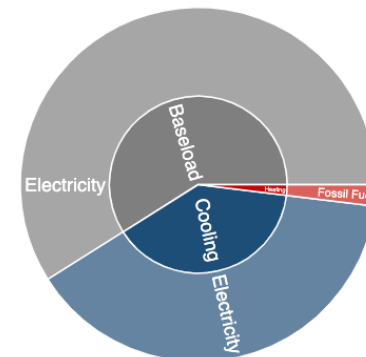
#### Chart 7. Annual Utility Cost and Savings Breakdowns by Load Type

- Assess the breakdown of annual utility costs and potential savings by load type (e.g., cooling, baseload, and heating).
- Baseload:** constant energy use which does not depend on outdoor temperature. Associated with equipment which is in constant use such as lighting, ventilation, and appliances.
- Heating:** increased energy use observed in colder outdoor temperatures due to the operation of heating equipment.
- Cooling:** increased energy use observed in warmer outdoor temperatures due to the operation of cooling equipment.

Cost Breakdown [US dollar (USD / \$ )]



Cost Savings Breakdown [US dollar (USD / \$ )]

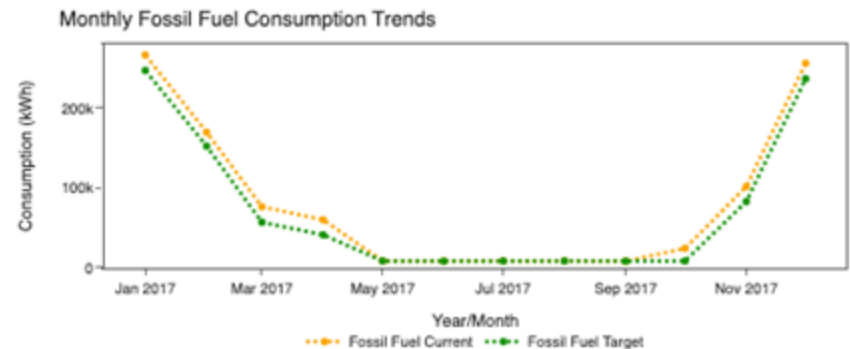
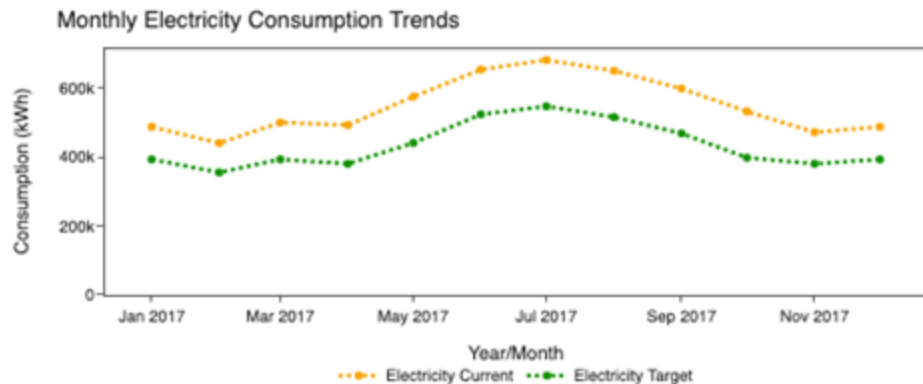


### III. Utilize Results

#### Chart 8. Building Monthly Electric and Fossil Energy Use Trends.

Track the effectiveness of energy efficiency measures:

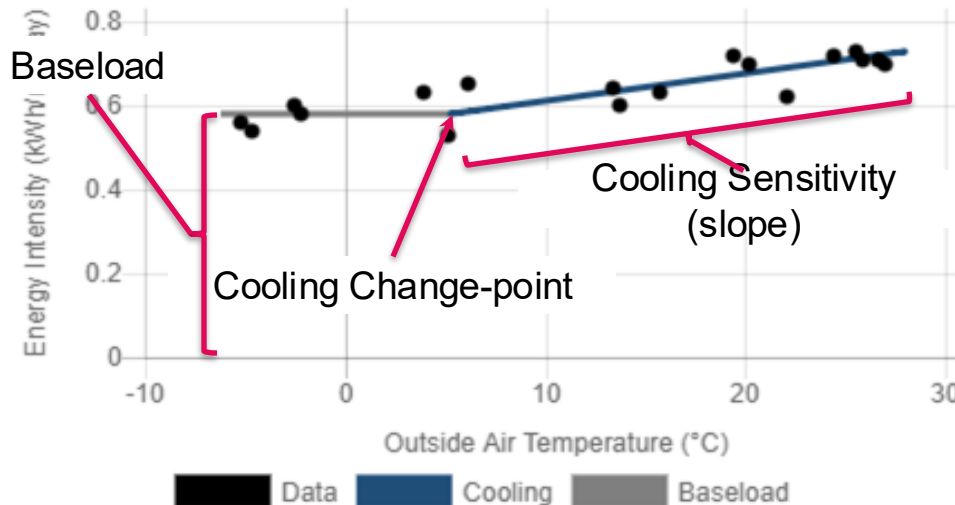
- Continue to enter energy data and run the tool.
- Monitor performance relative to potential savings.
- Generate updated recommendations.



# III. Utilize Results

## Chart 9. Building Electricity and Fossil Fuel Change-point Models and Benchmarks

Electricity Change-point Model



- Normalized energy use data is fit to change-point models to characterize the building's response to outdoor temperature.
- Change point model parameters (normalized by building gross floor area) are compared to the distribution of buildings in the dataset.
- Parameters that fall in the bottom of the distribution will trigger certain preset recommendations (e.g. poor baseload performance will lead to recommendations to reduce lighting and plug load use).

### Electricity Consumption Benchmarking

Baseload  
(Typical)



Cooling Change-point  
(Poor)



Cooling Sensitivity  
(Typical)



# For more information, please contact:

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## Additional Resources

- BETTER URL: <https://better.lbl.gov/>
- Analytical engine source code: [github.com/LBNL-ETA/BETTER\\_analytical\\_engine](https://github.com/LBNL-ETA/BETTER_analytical_engine)
- Articles, reports, and training videos: <https://better.lbl.gov/news/> and [https://better.lbl.gov/how\\_it\\_works/](https://better.lbl.gov/how_it_works/)

# Appendix

# BETTER Template Building Information Inputs

SI Units (meters, kWh, °C)

Select Currency \* : US dollar (USD / \$ )

Gross Floor Area Unit: sq. meters

| Building ID* | Building Name* | Location*         | Gross Floor Area (Excluding Parking)* | Primary Building Space Type* |
|--------------|----------------|-------------------|---------------------------------------|------------------------------|
| 1            | Office 1       | Miami, FL         | 4982                                  | Office                       |
| 2            | Office 2       | Houston, TX       | 4982                                  | Office                       |
| 3            | Office 3       | Atlanta, GA       | 4982                                  | Office                       |
| 4            | Office 4       | Los Angeles, CA   | 4982                                  | Office                       |
| 5            | Office 5       | Las Vegas, NV     | 4982                                  | Office                       |
| 6            | Office 6       | San Francisco, CA | 4982                                  | Office                       |
| 7            | Office 7       | Baltimore, MD     | 4982                                  | Office                       |

## 1. Unit System

- Select Imperial Units (feet, kBtu, °F) or SI Units (meters, kWh, °C)

## 2. Building Location (City, State/Province, Zip, Country)

- Used to find weather data

## 3. Gross Floor Area (Exclude Parking)

- Used to normalize consumption

## 4. Primary Building Space Type

- Used for benchmarking

## 5. Currency

- Used for cost savings reporting

# BETTER Template Energy Consumption and Cost Inputs

- Minimum of 12 consecutive months of energy consumption data is required.
- Gather all electricity and fossil fuel consumption data from utility bills for each billing period.
- Energy cost is optional. If no energy cost is entered, BETTER will use a default cost per unit.
- Average outdoor air temperature is optional. If no weather data is entered, BETTER will use National Oceanic and Atmospheric Administration (NOAA) data.\*

| Building ID* | Billing Start Dates* | Billing End Dates* | Energy Type*    | Energy Unit*              | Energy Consumption* | Energy Cost | Average Outdoor Air Temperature |
|--------------|----------------------|--------------------|-----------------|---------------------------|---------------------|-------------|---------------------------------|
| 1            | 1/1/2017             | 1/31/2017          | Electric - Grid | kWh (thousand Watt-hours) | 66338               |             |                                 |
| 1            | 2/1/2017             | 2/28/2017          | Electric - Grid | kWh (thousand Watt-hours) | 55528               |             |                                 |
| 1            | 3/1/2017             | 3/31/2017          | Electric - Grid | kWh (thousand Watt-hours) | 64180               |             |                                 |
| 1            | 4/1/2017             | 4/30/2017          | Electric - Grid | kWh (thousand Watt-hours) | 62067               |             |                                 |
| 1            | 5/1/2017             | 5/31/2017          | Electric - Grid | kWh (thousand Watt-hours) | 69730               |             |                                 |

\* NOAA weather data may not be available for all locations. An error message will show on the BETTER analysis reports to prompt a user to enter average outdoor air temperature data for a given location and/or billing period as appropriate.

# ENERGY STAR® Portfolio Manager® Template Inputs

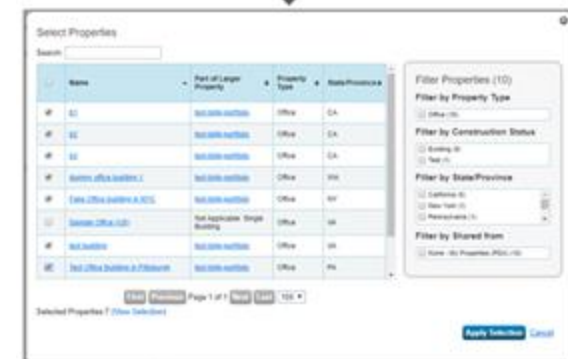
## Property Information

- Portfolio Manager ID
- Street Address
- City
- State/Province
- Postal Code
- Country
- Year Built

## Meter Entries

- Portfolio Manager Meter ID
- Meter Name
- Meter Type
- Meter Consumption ID
- Start Date
- End Date
- Delivery Date
- Usage/Quantity

Step-by-step guidance available on BETTER (<https://better.lbl.gov/runbetter/>).



## Property

| Property Name | Portfolio Manager ID | Street Address   | Street Address 2 | City/Municipality | State/Province | Other State/Province | Postal Code | Country       | Year Built |
|---------------|----------------------|------------------|------------------|-------------------|----------------|----------------------|-------------|---------------|------------|
|               |                      | 1 Cyclotron Road | Not Available    | Berkeley          | California     | Not Available        | 94720       | United States | 1994       |

## Meter Entries

| Property Name | Portfolio Manager ID | Portfolio Manager Meter ID | Meter Name  | Meter Type  | Meter Consumption ID | Start Date | End Date   | Delivery Date | Usage/Quantity |
|---------------|----------------------|----------------------------|-------------|-------------|----------------------|------------|------------|---------------|----------------|
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414283           | 1/1/2015   | 1/31/2015  | Not Available | 65338.33       |
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414284           | 2/1/2015   | 2/28/2015  | Not Available | 58134.72       |
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414285           | 3/1/2015   | 3/31/2015  | Not Available | 62858.33       |
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414286           | 4/1/2015   | 4/30/2015  | Not Available | 57974.17       |
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414287           | 5/1/2015   | 5/31/2015  | Not Available | 66433.33       |
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414288           | 6/1/2015   | 6/30/2015  | Not Available | 71758.61       |
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414289           | 7/1/2015   | 7/31/2015  | Not Available | 73295          |
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414290           | 8/1/2015   | 8/31/2015  | Not Available | 76405.28       |
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414291           | 9/1/2015   | 9/30/2015  | Not Available | 65691.39       |
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414292           | 10/1/2015  | 10/31/2015 | Not Available | 62875.28       |
| b1            | 7946502              | 63303050                   | Natural Gas | Natural Gas | 3180414293           | 11/1/2015  | 11/30/2015 | Not Available | 58813.89       |