blueprints
Energy Efficiency & Conservation Block Grant Program

Blueprint 2A How-To Guide: Energy Efficiency – Energy Audits, Building Upgrades

Introduction

The Energy Efficiency and Conservation Block Grant (EECBG) Program Blueprints are model projects and programs that EECBG participants can pursue, covering a range of areas in energy planning, energy efficiency, renewable energy, transportation electrification, clean energy finance, and workforce development. Each Blueprint outlines several high-level key activities, which are suggested steps participants can take as they pursue the Blueprint. The Blueprint How-To Guides go into further detail, providing more granular steps, recommendations, and resources within each key activity. The How-To Guides are designed to support practitioners as they move from planning to implementing their EECBG projects and programs. By using these documents, communities can quickly identify where they need to start, where they need to go next to make progress, and how they can leverage existing resources to get ahead.

Key Terms in this Document

- **Benchmark**: Compare a building's energy performance to other similar buildings, past performance, or a standard reference point.
- **Building-specific data**: Data such as floor area, date built, and percentage of floor area occupied.
- **Central energy database**: System that manages utility bill information, identifies assets with the greatest opportunity for improvement, and streamlines communication and decision-making with key stakeholders in your organization.

Key terms continue in the text box on the next page.

KEY ACTIVITY CHECKLIST:BLUEPRINT 2A

1. Building Energy Assessments

- ☑ Gather utility bills and building-specific data.
- ☑ Select a benchmarking platform and set up an account.
- ☑ Benchmark your buildings to identify buildings with poor energy performance to select for an energy audit.

2. Energy Audits

- ☑ Hire an Energy Auditor.
- ☑ Determine available funding sources.

3. Building Upgrades

- ☑ Review results of the energy audits. Identify the ideal sequence of upgrades, which items can be implemented immediately, and which upgrades need further study or should be incorporated into longer-term plans.

SCEP
STATE & COMMUNITY ENERGY PROGRAMS

Key Activities

KEY ACTIVITY 1: BUILDING ENERGY ASSESSMENTS

➢ **Goal: Identify buildings that need an energy audit.**

Step 1: Gather utility bill and building data to establish a baseline

How? Follow the checklist:

- ❑ **Identify which buildings to focus on**. A best practice is to gather data for all buildings in your portfolio so you can evaluate and prioritize the opportunities for energy performance improvements. If you've already identified buildings to focus on, however, (e.g., office buildings, buildings you know need improvement), you could focus on gathering data just for those.
- ❑ **Gather utility bill data**. Gather 12+ months of consecutive utility bills for the selected buildings. If you don't already have access to your organization's utility bills, try to identify who receives and pays utility bills in your organization. Accounting, finance, procurement, and budget offices are a good place to start. Another approach is to gather data directly from the utility companies. Some utilities provide customers with the billing data needed specifically for benchmarking[1]. If your utility does not have a standard benchmarking data sharing process in place, they may have a customer representative or account manager for your organization that could assist.
- ❑ **Gather building-specific data**. This includes data such as year built, building size in square feet, and percentage of floor area occupied. Start collecting the data you have access to – your organization's facilities management team may have this data in their records. For remaining items, you may need to schedule building walk-throughs. **Tip**: You'll need to gather specific data points required by the benchmarking platform you select, which can differ by building type. See Step 2 below for more information on benchmarking platforms.

KEY TERMS CONTINUED

- **Energy audit**: Inspection of a building's energy-consuming equipment and operations. There are different audit levels differing in complexity and level of detail.
- **Energy service company (ESCO)**: Turnkey contractor that designs, installs, and commissions an energy savings project, is responsible for monitoring, measuring, and verifying the savings, and in some cases, even maintains and operates the new equipment.
- **Retro-commissioning**: Fine-tuning existing buildings and systems in order to make them operate optimally and more efficiently through scheduling, sequencing, controls programming, and optimizing set points.

What to consider:

- **Data collection is time-consuming**. The data gathering process is the most time-consuming part of this key activity. The amount of time it takes will depend on utility processes, how utility bills are paid (i.e., electronic or paper records), and whether your organization already saves and records its utility bills.
- **Common challenge: utility bills are confusing!** Billing data may come in spreadsheet or PDF format. If there are multiple utility accounts for one address, you'll need to ensure the accounts are

[1] ENERGY STAR resources to aid in accessing whole-building utility data: https://www.energystar.gov/buildings/owners_and_managers/existing_buildings/use_portfolio_manager/find_utilities_provide_data_benchmarking

attributed to the correct buildings. This might require confirming meter locations using the meter numbers on the bill. You may need to format and arrange the data in a more useful way (also called data conditioning). For example, you may need to convert PDF data into spreadsheet format to enable automatic calculations. If you are new to reviewing commercial utility bills, this DOE Better Plants® Program presentation could help identify what to look for: **Understanding Your Utility Bills: Electricity (DOE)**. See slides 13 and 29 for details of a typical electricity bill.

- **Economies of scale**. If you are gathering and conditioning data for a few buildings, it may be worth going through the process for all buildings.

BEST PRACTICE: CREATE A CENTRAL ENERGY DATABASE

A central energy database will enable you to continue the process for Key Activity 1 more efficiently in the future – making your EECBG dollars go further! There are energy database products you can purchase (some have the capability to sync with **ENERGY STAR® Portfolio Manager®**), or you could follow Step 3 of the **Energy Data Management Guide (DOE)** to build your own using Microsoft Excel, Access, or the **Standard Energy Efficiency Data (SEED) Platform (DOE)**. To get an idea of the energy database products available, start by reviewing **ENERGY STAR service and product provider (SPP) partners** in the "Energy Management" category. These companies help commercial buildings to run more efficiently by helping clients with benchmarking energy performance, improving efficiency, and earning recognition. Your IT Department may be able to assist you in this process.

Step 2: Select a benchmarking platform and setup an account

How? Follow the checklist:

- ❑ **Select your benchmarking platform**. After you've collected all the relevant utility billing data and building characteristics, that information needs to be used to identify buildings that need an energy audit. If you've created your own Excel or Access database, you could compare your buildings against each other by comparing their energy use per square foot—also known as energy use intensity (EUI)—and focus on the buildings with the highest EUI. However, it is best practice to use a benchmarking platform that can provide industry standard building performance metrics. Key Activity 1 Resources include publicly accessible and free benchmarking tools to consider.
- ❑ **Familiarize yourself with the platform**. Create an account to access the platform, and review training materials. Refer to the resources created for your selected benchmarking platform.
- ❑ **Review required benchmarking data**. Ensure all data points required by the selected benchmarking platform are gathered. Revisit *Step 1* if data is missing. Use tools such as ENERGY STAR Portfolio Manager's **Data Collection Worksheet** to create a list of data points to crosscheck

What to consider:

- **Think about your budget and energy management goals**. Decide if it's a priority to use a free publicly available tool. This will focus your benchmarking platform options.
- **You might already have a benchmarking tool**. As mentioned above, some energy database products available for purchase have the capability to sync with **ENERGY STAR Portfolio Manager**. If you've invested in energy database software, you might already have benchmarking capabilities.

Step 3: Benchmark your buildings and prioritize them for energy improvement

How? Follow the checklist:

- ❑ **Enter utility bill data and building data.** Conduct data entry in the selected benchmarking platform. **Tip:** Ask a colleague or facilities management staff to review the entered building data for data entry errors and to confirm building equipment information and energy usage patterns.
- ❑ **Review the results and identify buildings that are underperforming**. These are good candidates for energy audits and upgrades.

What to consider:

- **It takes some time**. The ENERGY STAR Program estimates that it will take new users 1-2 hours to enter information for a single building after all necessary data is collected.
- **But you can save time!** Save time adding and editing multiple properties using ENERGY STAR Portfolio Manager bulk upload spreadsheets.
- **Tap into existing resources**. The ENERGY STAR Program offers training guides and demonstration videos and guidance on how to analyze your benchmarking results.
- **You can also look into organizations that can help**. As mentioned in Step 1, ENERGY STAR SPP partners offer energy management assistance (including benchmarking energy performance). A subset of SPPs[2] can help you exchange data with Portfolio Manager.

KEY ACTIVITY 1 RESOURCES

Data collection tools and resources:

ENERGY STAR Portfolio Manager Data Collection Worksheet

Energy Data Management Guide (DOE)

Publicly accessible and free benchmarking tools:

ENERGY STAR Portfolio Manager

Building Energy Asset Score (DOE)

Facility Energy Decision System (PNNL)

KEY ACTIVITY 2: ENERGY AUDITS

➢ **Goal: Develop a list of potential energy upgrades to pursue.**

Step 1: Hire an energy auditor

How? Follow the checklist:

- ❑ **Check with your utility first**. See if they offer no- or low-cost energy audits. Energy audit services are also offered by energy services companies (ESCOs), energy consultants, and engineering firms. Some state energy offices also offer programs to support energy audits and energy savings performance contracts, or ESPCs.
- ❑ **If needed, map out your procurement process**. If a competitive selection process needs to be followed, this will include identifying potential individuals or firms, defining the scope and requesting bids, reviewing qualifications, considering Justice40 and inclusion goals, and contracting with the chosen person or firm. The Guide to Energy Audits (DOE) includes a sample RFP, RFQ, and energy audit agreements.

[2] ENERGY STAR Service Providers that exchange data with Portfolio Manager via Web Services: https://www.energystar.gov/buildings/benchmark/get_started/service_providers_exchange_data

- ❑ **Finalize and run your procurement process.** The exact procurement process will depend on your jurisdiction's contracting requirements. If a Request for Proposals (RFP) process is not required, consider utilizing a Request for Qualifications (RFQ) to select an auditor. If an RFP process is required, auditor qualifications can be reviewed in proposals. Portions of these procedures may also be adopted for a sole-source approach.

What to consider:

- **Review sample documents.** Sample RFPs and contracting documents from other organizations and connect with peers. RFPs and RFQs are most effective if they provide enough information about your project to allow prospective auditors to give accurate cost estimates and examples of similar work that they have successfully completed.
- **Loop in the facilities management team**. Include this team in your project team and procurement process as early as possible. They can assist with technical questions about the buildings, provide facility access as needed, and their buy-in will lead to successful outcomes.
- **Discuss building operation practices.** Ask potential auditors to consider building operation practices, such as operating equipment only when needed and maximizing use of the energy management control system with seasonal adjustments, in the audit process. Optimizing building operations can have a significant impact on energy and cost savings.

KEY ACTIVITY 2 RESOURCES

Guide to Energy Audits (DOE)

Achieving Energy Savings in Small- and Medium-Sized Public Facilities: A Strategic Approach to Prioritizing and Financing (DOE)

Energy Audits for Small Businesses (ENERGY STAR)

Step 2: Determine funding source(s)

How? Follow the checklist:

- ❑ **Determine an approximate budget to complete energy audits.** Audit costs vary by the level of detail and analysis conducted and the intended use of the results. For example, Level 3 energy audits, also referred to as Investment Grade Audits, are the most complex and provide detailed information for budgeting and investment decisions. The Guide to Energy Audits (DOE) includes information about the different energy audit levels (pages 8-9) and estimated cost ranges ($0.12-$0.50 per square foot, as of 2000, see page 3).
- ❑ **Decide how audits will be funded**. if you want to fund the energy audits separately from future energy upgrades or if you want to combine those services through an ESPC. Involve your facilities, procurement, and budget office colleagues in considering what is the best approach for your organization.
- ❑ **Make your EECBG dollars go further!** Check with your utility and state energy office for financial incentives, procurement resources, and tapping into existing budgets.

KEY ACTIVITY 3: BUILDING UPGRADES INCLUDING ENERGY EFFICIENCY, GRID-INTERACTIVITY, AND ELECTRIFICATION UPGRADES

➢ **Goal: Select and conduct upgrades identified through energy audits.**

How? Follow the checklist:

- ❑ **Meet to review the audit results**. Meet with the energy auditor and key building staff to review the analysis, results, and recommended upgrades.
- ❑ **Think about all benefits**. Discuss potential benefits from upgrades such as improved occupant comfort, energy savings, cost savings, and opportunities to participate in grid-interactive programs.
- ❑ **Discuss the ideal sequence of upgrades**. Some upgrades could be implemented immediately while others may need further study or could affect other projects. For example, weatherization measures (including building envelope improvements) can reduce the heat load and necessary size of new HVAC equipment.

What to consider:

- **Prepare for results**. Review examples of energy audit results to help prepare for the kind of information you will receive. This Audit Template tool (DOE) and the following audit results are good places to start: Chandler, AZ Municipal Airport, City of Mountain Village, AK, and Anaheim, CA Public Utilities.
- **Look for upgrades that complement each other**. Comprehensive upgrades can achieve 2.5 to 7 times more savings than typical single-measure retrofits and enable more advanced improvements..[3]
- **Compare audit results to your capital improvement program (CIP) project list**. Consider which energy upgrades could be added to the scope of a CIP project (i.e., adjusting the efficiency specifications for new equipment), and consider upgrades that should be delayed until after a CIP project is completed (i.e., installing solar PV after a near-term rooftop replacement is complete).
- **Prioritize**. Strategically prioritize potential energy upgrades and financing/funding options using the Achieving Energy Savings in Small- and Medium-Sized Public Facilities: A Strategic Approach to Prioritizing and Financing (DOE) to guide your approach.
- **Remember to check in on the performance of the selected upgrades**. Quantifying the reduction in your energy bills can help make the case for similar projects in the future. Running this analysis also helps communicate the benefits of this type of work to your community and offers a "lead by example" opportunity. This type of analysis could also help promote policies like benchmarking requirements and building performance standards.

PROJECTS TO LOOK FOR

- ☑ Comprehensive upgrades – typically involving efficiency measures in two or more building systems (e.g., lighting, building envelope, HVAC) with one building-wide energy savings goal
- ☑ Electrification
- ☑ Enabling grid-interactivity (e.g., demand response)
- ☑ Onsite renewables (solar, wind, geothermal) and battery storage for resilience benefits
- ☑ Retro-commissioning
- ☑ A blend of projects with both high and low return on investment to optimize the bundle of measures balancing deferred maintenance needs, energy savings and financial goals

[3] American Council for an Energy-Efficient Economy (ACEEE), Moving the Needle on Comprehensive Commercial Retrofits, May 2022: https://www.aceee.org/research-report/b2203