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STEP 2: Assess Performance

Understanding current and past energy use is how many organizations identify opportunities to improve energy performance and gain financial benefits.

Assessing performance is the periodic process of evaluating energy use for all major facilities and functions in the organization and establishing a baseline for measuring future results of efficiency efforts.

Key aspects include:

Data Collection and Management

2.1

Gather and track data — Collect energy use information and document data over time.

Baselining and Benchmarking

2.2

Establish baselines — Determine the starting point from which to measure progress.

2.3

Benchmark — Compare the energy performance of your facilities to each other, peers and competitors, and over time to prioritize which facilities to focus on for improvements.

Analysis and Evaluation

2.4

Analyze — Understand your energy use patterns and trends.

2.5

Technical assessments and audits — Evaluate the operating performance of facility systems and equipment to determine improvement potential.

Assessing your energy performance helps you to:

- Categorize current energy use by fuel type, operating division, facility, product line, etc.
- Identify high performing facilities for recognition and replicable practices.
- Prioritize poor performing facilities for immediate improvement.
- Understand the contribution of energy expenditures to operating costs.
- Develop a historical perspective and context for future actions and decisions.
- Establish reference points for measuring and rewarding good performance.

STEP 2.1: Gather and Track Data

Evaluating energy performance requires good information on how, when, and where energy is being used. Collecting and tracking this information is necessary for establishing baselines and managing energy use.

Organizations of all sizes have established systems for gathering and tracking energy use data. For commercial buildings ENERGY STAR's Portfolio Manager tracks energy use over time. In the case of industrial plants, the ENERGY STAR industry specific Energy Performance Indicator (EPI) can be used to track yearly energy use patterns. EPIs are currently available for wet corn milling, auto manufacturing and cement manufacturing. All or part of data collection and management can also be outsourced. Regardless of what method you use to gather and track data, consider the steps below.

Key Steps:

Collect data

The data must be complete and accurate because it will be used for analysis and goal setting. Consider the following when collecting energy use data:

- **Determine appropriate level of detail** — The level and scope of data collection will vary from organization to organization. Some may choose to collect data from submeters on individual processes while others may only look at a utility bill.
- **Account for all energy sources** — Inventory all energy purchased and generated on-site (electricity, gas, steam, waste fuels) in physical units (kWh, mMBtu, Mcf, lbs of steam, etc.) and on a cost basis.
- **Document all energy uses** — For the sources identified above, assemble energy bills, meter readings, and other use data.
  - Energy data may reside in the accounting department, be held centrally or at each facility, or can be acquired by contacting the appropriate utilities or energy service providers.
  - Gather at least two years of monthly data or a more frequent interval if available. Use the most recent data available.
- **Collect facility and operational data** — To be able to normalize and benchmark, it may be necessary to collect non-energy related data for all facilities and operations, such as building size, operating hours, etc.

Establish Tracking System

A system for tracking performance can range from a simple spreadsheet to detailed databases and IT systems. In developing an appropriate tracking system for your organization, consider the following:

- **Scope** — The design of your tracking system will be shaped, in large part, by the level and scope of information that will be tracked and the frequency of data collection.
- **Maintenance** — Tracking systems must be easy to use, update, and maintain.
- **Reporting and communicating** — Use tracking systems to communicate energy performance to other parts of the organization and motivate change. Consider developing formats that express energy performance information in ways that are easily understandable across the organization. A good tracking system should make such reporting easy!

Suggestions

- At a minimum, collect data by fuel type at an individual building or facility level
- Collect data from submeters, if possible
- Use actual, not estimated, use data, if possible
- Use data that is current and timely
- Use tracking systems to develop quarterly and annual reports that profile energy performance
- Use tracking systems to allow facilities to compare their performance to their peers
- Use an existing tracking system, such as ENERGY STAR's Portfolio Manager and Energy Performance Indicators (EPIs) to organize data and benchmark against the industry.

In Practice

General Motors Corporation — Good Tracking Pays

Establishing a tracking system requires an investment of time and money. But, once the system is in place, it can pay for itself by highlighting which facilities use the most energy, pointing to areas of greatest opportunity, and even

identifying errors in utility bills, such as overcharges, that might have otherwise gone unnoticed and paid.

General Motors estimates that its tracking system, which took over $1 million to develop, has paid for itself multiple times.

Normalize Data

The energy use of facilities varies greatly, partly due to factors beyond the energy efficiency of the equipment and operations. These factors may include weather or certain operating characteristics.

Normalizing is the process of removing the impact of these factors on energy use to fairly compare the energy performance of facilities and operations. Portfolio Manager, developed by EPA for benchmarking energy performance, automatically normalizes key variables for selected building spaces, including office buildings, K-12 schools, grocery stores, hospitals, and hotels. EPA's Energy Performance Indicators (EPIs) benchmark energy performance and normalize variables for wet corn milling plants, auto manufacturing plants and cement manufacturing plants.

For others wanting to normalize:

Determine normalization factors

Determine key factors that need to be addressed to effectively compare facilities. Relevant factors are frequently organization-specific.

For commercial and institutional buildings common normalization factors include:

- Climate zone
- Facility size
- Fuel choice
- Price/cost of energy
- Actual weather history
- Hours of operation
- Occupancy levels
- Special features

For industrial facilities common normalization factors include:

- Inputs
- Product type
- Output
- Production processes

Find a corrective variable

Determine a suitable metric that can be used to correct for key normalization factors. Corrective variables, depending on the building type, may include floor space, amount of product, value of shipments, or number of beds.

Weigh factors

Create a multiplier that reflects the importance of each variable in relation to its impact on energy use.

STEP 2.2: Establish Baselines

Measuring energy performance at a specific time establishes a baseline and provides the starting point for setting goals and evaluating future efforts and overall performance. Baselines should be established for all levels appropriate to your organization.

The main steps involve using the date you've collected to:

- **Establish base year** — Establish a base year (weather-normalized) or an average of several historical years. Use the most complete and relevant sets of data available.
- **Identify metrics** — Select units of measurements that effectively and appropriately express energy performance for your organization. (e.g. ENERGY STAR benchmark score, Btu/square foot, Btu/ product, total energy cost/square foot).
- **Publish results** — Announce performance baselines to facilities, managers, and other key stakeholders in your organization.

Suggestions

- Some voluntary environmental initiatives have specific baseline years. If your organization is participating in such an initiative, check to see if a specific base year has been established.
- If price is not used as a normalizing factor, then be sure to use a source energy accounting method. Otherwise, if your facilities use a combination of fuels, your baseline data may contain errors.

STEP 2.3: Benchmark

EPA has made this step easier by providing a national energy performance rating system, currently available for office buildings, K-12 schools, grocery stores, hotels, and hospitals. The rating system, found in Portfolio Manager, allows you to compare your performance against similar facilities. In the case of cement, wet corn milling and auto assembly plants the industry specific Energy Performance Indicators (EPIs) serve as national energy performance rating systems to allow for comparison against similar facilities.

Benchmarking can be done in variety of ways. Facility or organizational performance may be benchmarked to:

- **Past performance** — A comparison of current versus historical performance.
- **Industry average** — Based on an established performance metric, such as the recognized average performance of a peer group.
- **Best in class** — Benchmarking against the best in the industry and not the average.
- **Best Practices** — A qualitative comparison against certain, established practices considered to be the best in the industry.

The key steps in benchmarking include:

- Determine the level of benchmarking (for example — equipment, process line, facility or organizational).
- Develop metrics.
- Conduct comparisons.
- Track performance over time.

Suggestions

Benchmarking with Portfolio Manager

ENERGY STAR's Portfolio Manager, lets you compare the energy performance of your facilities to similar buildings nationwide. Portfolio Manager also normalizes for weather and several other important building and operational characteristics, allowing comparisons to be made on a level playing field.

By inputting energy and building information, this tool provides a benchmark score on a scale of 1-100. Buildings with a score of 75 or over are eligible for the ENERGY STAR Label.

Many of the most effective energy management programs rate the performance of their entire building portfolio. This type of comparison allows energy managers to identify inefficient buildings for upgrades.

EPA recognizes buildings with superior performance. Buildings that earn the ENERGY STAR use about 40 percent less energy than average buildings, without compromising comfort or services.

Benchmarks are currently available for office buildings, K-12 schools, grocery stores, hospitals, and hotels. Additional buildings space benchmarks are planned for the future. Check the Portfolio Manager section of the ENERGY STAR web site for recent updates.

Search the registry of ENERGY STAR Labeled Buildings and Plants to learn more.

STEP 2.4: Analyze Data

Analyzing data to determine energy use trends can help an organization gain a better understanding of the factors that affect energy performance and identify steps for reducing energy consumption.

There are a variety of ways data can be analyzed depending upon the needs of the organization. The following analyses provide a starting point:

Quantitative Reviews

- **Develop use profiles** — Identify energy consumption peaks and valleys, and determine how they relate to operations or key events.
- **Compare performance** — Compare the use and performance data of similar facilities in your industry.
- **Assess the financial impacts** — Identify areas of high-cost energy use.
- **Identify data gaps** — Determine areas where more information is needed.

Qualitative Reviews

- **Conduct interviews** — Seek informed opinions from colleagues, specific anecdotes and lessons learned, systems-specific information (e.g., HVAC, lighting, refrigeration), and in-house audits or surveys.
- **Review policies and procedures** — Review organizational policies and operating procedures to determine their impact on energy use.

In Practice

University of Virginia — Rooting Out the Energy Hogs

Metering and benchmarking energy for plants, facilities, space types, and systems are at the heart of the University of Virginia's (UVA) energy management program. With over 577 buildings ranging in age, design, and function, maintaining good data is key for understanding performance and identifying areas for improvement.

By analyzing meter and utility use information, UVA's energy management program identifies "energy hogs" that are targeted as energy efficiency opportunities. Energy hogs are flagged by UVA's tracking/trending program whenever it detects high total utility use, high relative utility use (by facility type), or unusual utility use, such as chilled water use during winter months for an office building.. These types of issues are identified by an "exception report" and may indicate design or operational problems that warrant further investigation.

Through its careful analysis of energy use information, UVA's energy management program was able to control and reduce energy use, saving $5 million in 2002.

STEP 2.5: Conduct Technical Assessments & Audits

Knowing your organization's baseline energy use and the relative performance of your entire portfolio is only part of the information needed. Periodic assessment of the performance of equipment, processes, and systems will help you identify opportunities for improvement.

Energy audits are comprehensive reviews conducted by energy professionals and/or engineers that evaluate the actual performance of a facility's systems and equipment against their designed performance level or against best available technology. The difference between these is the potential for energy savings.

The main steps for conducting technical assessments and audits are:

- **Assemble audit team** — Expertise should cover all energy-using systems, processes, and equipment. Include facility engineers, system specialists, and other support. Outside support may be helpful and provide an objective perspective or specific expertise.
- **Plan and develop an audit strategy** — Identify and prioritize systems for evaluation, assign team members to tasks, and schedule completion dates for the activities. Use benchmarking results to identify poor-performing facilities whose equipment and systems should be targeted for evaluation.
- **Create audit report** — Based on the audit results, produce a detailed summary of actual steps that can be taken to reduce energy use. The report should recommend actions from simple adjustments in operation to equipment replacement. Estimates of resource requirements for completing actions should be included.

Suggestions

Use the ENERGY STAR Service & Product Directory to help you locate energy service providers such as utilities and energy service companies that may be qualified to serve as part of the audit team.