BPS 005 – Energy Audit and Life Cycle Cost Assessment

OR BPS Background

The Oregon Building Performance Standard (OR BPS) is a mandatory program that aims to bring awareness about building energy use to owners of existing commercial buildings, and to reduce energy use and utility costs for less efficient buildings. Buildings that must comply with this program are divided into two tiers, based on Gross Floor Area and property type. The table below shows the two tiers covered by the OR BPS program and gives compliance dates.

Oregon Building Performance Standard Tiers

Gross Floor Area *(excludes parking garage area)*	**Property Type**	**Tier / Compliance Date**
35,000 to 90,000 square feet	Nonresidential, Hotel, or Motel	Tier 1 / June 1, 2030
90,000 to 200,000 square feet	Nonresidential, Hotel, or Motel	Tier 1 / June 1, 2029
200,000 square feet and greater	Nonresidential, Hotel, or Motel	Tier 1 / June 1, 2028
20,000 to 35,000 square feet	Nonresidential, Hotel, or Motel	Tier 2 / July 1, 2028
35,000 square feet and greater	Multifamily, Hospital, School, University, Dormitory, Barracks, Prison, Residential/Senior Care Facility	Tier 2 / July 1, 2028

Tier 2 buildings are required to **report Energy Use Intensity and Energy Use Intensity Targets** by their July 1, 2028, compliance date.

Tier 1 buildings are required to **report Energy Use Intensity and Energy Use Intensity Targets** and submit operation & maintenance and energy management plans by their compliance date. They must also **meet EUIt** or demonstrate an effort to **reduce energy use**. Tier 1 buildings that expect to exceed their energy target must report at least **180 days before** their compliance date, perform **energy audits** and **life cycle cost assessments,** and develop a plan to implement **cost- effective energy efficiency measures** by their June 1, 2028/2029/2030, compliance dates.

This guidance gives information about energy audits and Life Cycle Cost Assessments for Tier 1 buildings that do not meet their energy targets. Additional guidance documents are available on the OR BPS website: https://tinyurl.com/ODOE-BPS.

OR BPS Compliance Paths

There are three compliance paths that can be followed if a Tier 1 building is not expected to meet its Energy Use Intensity target (EUIt) by its compliance date:

- Conditional Compliance – Energy Efficiency Measures (EEMs) from the Energy Audit or an optional Life Cycle Cost Assessment (LCCA) have been implemented by the compliance date and the building **IS** expected to reach its energy target, but more time is needed to collect energy data for confirmation. Projected or estimated energy use and energy savings must also be reported.
- Investment Criteria – EEMs from the Energy Audit or optional LCCA have been implemented by the compliance date, but the building is **NOT** expected to reach its energy target, or EUI cannot be determined due to unavailability of energy data.
- Investment Criteria through Conditional Compliance – EEMs from the Energy Audit or optional LCCA are **NOT** implemented before the compliance date but are being phased in over time. Projected or estimated energy use and energy savings must also be reported.

All three paths begin with investigative work to figure out what energy savings opportunities the building has. This means bringing in a Qualified Energy Auditor (QEA) to do an **Energy Audit** (Level 2) of the building. The outcome of an energy audit is a list of energy savings opportunities that are expected to be cost-effective.

Energy audits for OR BPS are geared toward finding the most practical and affordable energy-efficiency improvements to buildings. Many EEMs resulting from energy audits are “no-cost” or “low-cost” items, simple tweaks to building operations or inexpensive repairs to equipment.

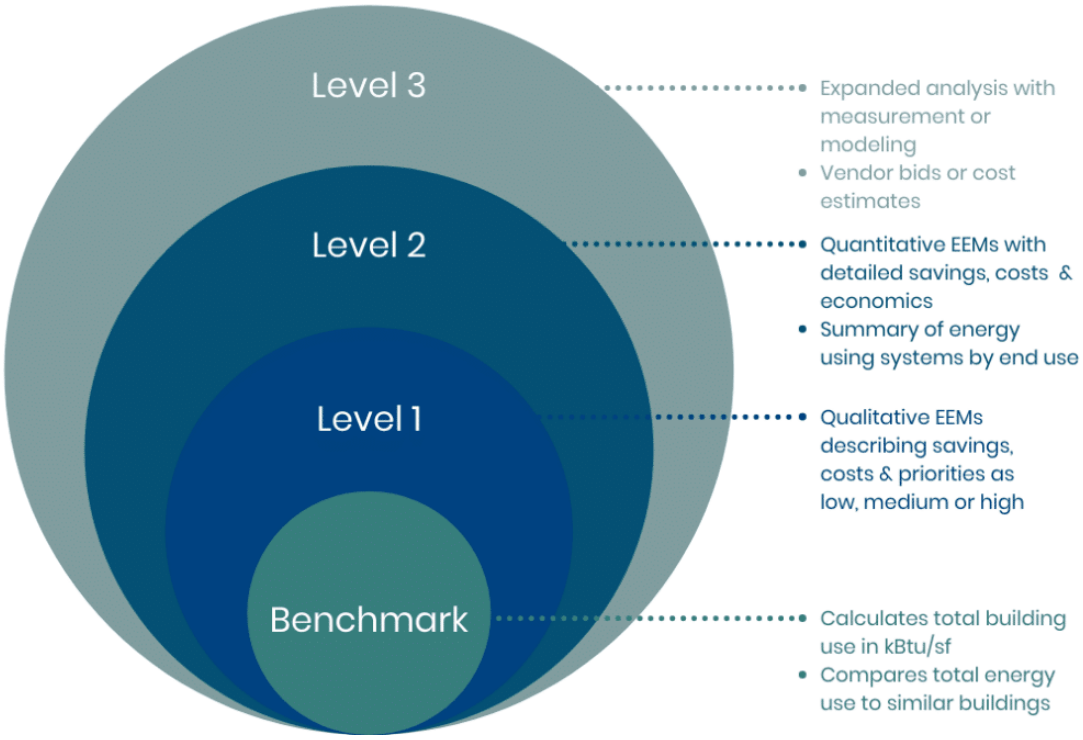
Some EEMs may involve the replacement of old, inefficient equipment that was already near the end of its life. Other measures might require greater up-front capital expenditure or may need to wait until existing equipment has reached the end of its useful life.

If all EEMs from the Energy Audit can be installed, then a Life Cycle Cost Assessment does not need to be performed. However, building owners often need to refine the list of measures based on their needs and budget. In this case, a more sophisticated financial analysis called a **Life Cycle Cost Assessment** can be undertaken by the Qualified Energy Auditor. The LCCA can create an optimized schedule for implementation and may eliminate some of the EEMs from the opportunity list. An LCCA is required to determine the optimized bundle of energy efficiency measures if following the Investment Criteria Pathway for compliance.

OR BPS Energy Audit

An energy audit is an investigation of a building by a Qualified Energy Auditor who looks for opportunities to reduce the building's energy use. The audit should be a Level 2 audit and follow procedures laid out in ANSI/ASHRAE/ACCA 211 Standard for Commercial Building Audits. As shown in the figure below, a Level 2 audit provides a quantitative analysis of EEMs.

ASHRAE Levels of Energy Audits (courtesy kW Engineering)



The outcome of a Level 2 Energy Audit is a list of cost-effective EEMs. The metric used to evaluate cost-effectiveness is simple payback, in units of years, which is defined as the annual savings of an EEM divided by the cost to implement that measure. A cost-effective EEM should save more money over its lifetime than it costs to implement, so its simple payback should be less than its Effective Useful Life (EUL).

During the Energy Audit, the Qualified Energy Auditor reviews building components and systems, including:

- Building Envelope: inspect roof, walls, floors, windows, doors to look for opportunities to increase insulation levels or solar reflectance and reduce air leakage.
- HVAC Equipment: assess the condition and efficiency of furnaces, boilers, package or split air conditioners or heat pumps, chillers, cooling towers, ventilation and exhaust

fans, and all equipment control settings and operations.
- HVAC Distribution: evaluate HVAC distribution systems, including fans, pumps, ductwork, and piping, and review their control settings and operations.
- Service water heating systems: appraise efficiency and operation of water heaters and water-using appliances like sinks, showers, dishwashers, and laundry facilities.
- Lighting Systems: examine light fixtures and their controls looking for opportunities to improve lighting and add daylighting or occupancy/vacancy/timer controls.
- Refrigeration, Appliances and Plug Loads: inspect other energy-using equipment in the building to assess its efficiency and any prospects for improved operations and controls.
- Power systems: evaluate any existing energy generation and energy storage equipment and look for opportunities to install more of this equipment.

Appendix H of the Building Performance Standard includes a longer and more specific list of potential EEMs that a Qualified Energy Auditor can assess.

The outcome of an energy audit is a list of cost-effective EEMs, and should include the following:

- EEM description
- EEM Expected Useful Life (EUL)
- Existing equipment the EEM affects or replaces
- Age and condition of existing equipment
- Estimated EEM cost, including materials and labor
- Estimated EEM incremental cost compared to the status quo or to replacement with minimally efficient equipment, may include any available rebates or incentives
- Estimated annual energy savings of the EEM
- Estimated annual utility cost saving of the EEMs, may also include maintenance costs
- Estimated simple payback (Annual savings / Incremental EEM cost, in years)
- Estimated annual GHG emissions reductions, based on emissions factors for electricity, natural gas, and other fuel suppliers listed at Department of Environmental Quality: Greenhouse Gas Emissions Reported to DEQ : Action on Climate Change : State of Oregon for the latest year on record.

Auditors must use the free, online ***Audit Template*** tool to collect and analyze building audit information. Output from this tool serves as the ***Form E: Energy Audit*** report that gets submitted to the OR BPS program. For Tier 1 buildings not meeting their energy target, the Energy Audit must be performed and ***Form E: Energy Audit*** must be submitted **before the compliance date**.

Note: A ***Form A*** or ***Form G*** program application should have been submitted for the building at least 180 days before the compliance date.

OR BPS Life Cycle Cost Assessment

If the Tier 1 building owner or Qualified Person would like a more in-depth look at how to schedule or finance EEM implementation, a Life Cycle Cost Assessment (LCCA) can be performed. An LCCA evaluates the costs and savings of energy efficiency measures over their Effective Useful Life compared to the existing building equipment and operations. It assesses the cost of capital, finance, maintenance expenses, plus any savings from utility bills, associated tax breaks, or incentives. It should include:

- Energy use and remaining life of existing equipment
- Estimates of EEM equipment costs
- Cost of labor to design, analysis, and commission EEMs
- Utility bill savings over EEM Effective Useful Life
- Maintenance expenses over the EEM Effective Useful Life
- Financing costs, including interest and fees
- Tax credits and write-offs
- Rebates or incentives from utilities or other entities

This assessment can help the building owner and Qualified Person decide how to stage building improvements over time. Since OR BPS does not require existing equipment to be replaced before the end of its useful life, this extra analysis can help refine the list of EEMs from the Energy Audit. By considering the age and condition of existing equipment, potential savings of EEMs, and the availability of capital, an LCCA can be used to develop an attainable EEM implementation schedule.

Like the Energy Audit, an LCCA should be performed by a Qualified Energy Auditor. OR BPS expects to require the use of an LCCA tool that is compliant with NIST Handbook 135 and capable of supporting the evaluation criteria required by Normative Appendix X of the Oregon Building Performance Standard. Expect more details about the LCCA tool soon. The LCCA is documented by the Qualified Energy Auditor using ***Form L: Life Cycle Cost Assessment***, with the main output being an optimized bundle of measures and a schedule for their implementation.

For Tier 1 buildings not meeting their energy target, the LCCA must be performed and the ***Form L: Life Cycle Cost Assessment (LCCA)*** report must be submitted **before the compliance date**.

Note: ***Form A*** or ***Form G*** program application should have been submitted for the building at least 180 days before the compliance date.

See BPS 001 – Tier 1 and Tier 2 Compliance and BPS 006 – Energy Professionals for more information.