BUILDING ENERGY ASSET SCORE

ASSET SCORE OVERVIEW

WHAT IS THE ASSET SCORE?

A building's Asset Score reflects the building's as-built physical characteristics and overall energy efficiency, independent of occupancy and operational choices.

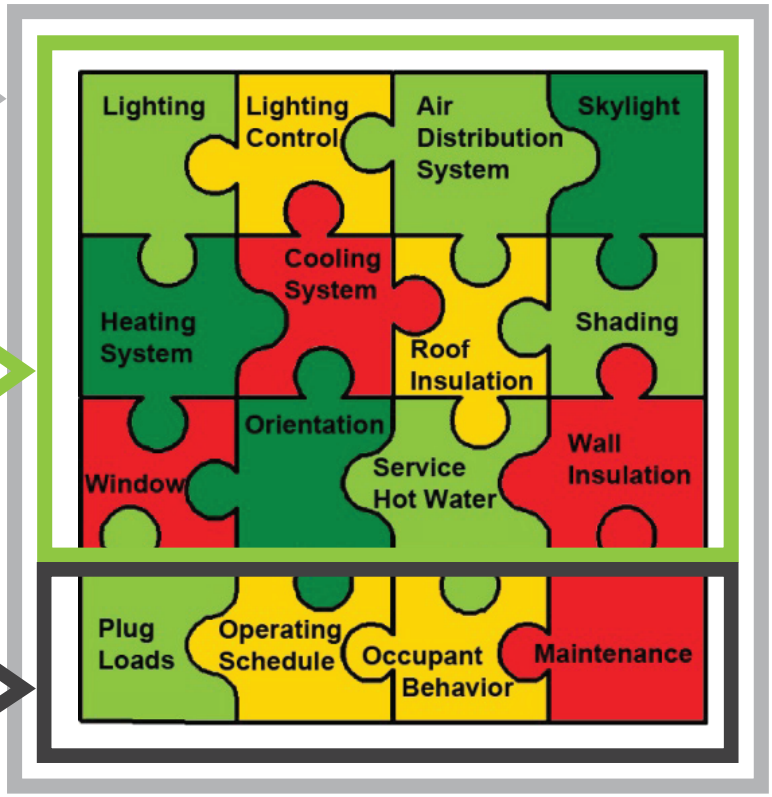
A building's energy use is affected by its structure, its energy systems, operation and maintenance, and occupants' behavior. ENERGY STAR® Portfolio Manager evaluates overall energy use based on utility bills.

A building's Asset Score is based on:

- Building envelope (window, wall, roof, floor)
- HVAC system (heating, cooling, ventilation)
- Lighting system (luminaire and lighting control)
- Service hot water system
- Other major energy-using equipment

The Asset Score is calculated by applying standard assumptions for the following operational conditions:

- Occupant Density
- Building Operating Schedule
- Plug-Load Density
- Indoor Temperature Setpoints and Ventilation Rates



Additional information on the Building Energy Asset Score can be found at: http://energy.gov/eere/buildings/building-energy-asset-score

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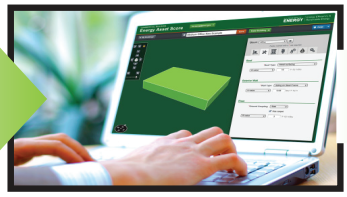
BUILDING ENERGY ASSET SCORE

WHAT'S IN AN ASSET SCORE REPORT?

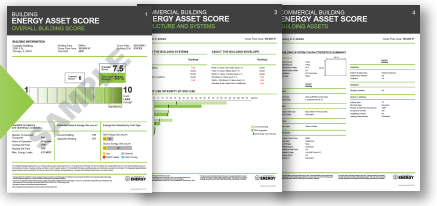
3 STEPS TO RECEIVE AN ASSET SCORE

1. Collect building data



2. Enter data into the Asset Scoring Tool

The Asset Scoring Tool is not intended to replace engineering analysis needed for building retrofits.



3. Receive an Energy Asset Score Report

The Asset Score Report includes:

- the building's current score as well as its expected score after efficiency upgrades
- recommendations for efficiency upgrades
- an assessment of individual building energy systems; and
- a list of data used to score the building.

SCORE

This page provides the building's Asset Score, operational assumptions, total estimated source energy use, and estimated energy use by fuel type.

The Asset Scoring Tool applies weather adjustment factors to convert the building's estimated energy use intensity into a score ranging from 1 to 10, with 10 associated with the most energy efficient buildings. Two building scores are provided—the current score for the building and an estimated score that could be achieved if recommended efficiency upgrades are made. The scores are both based on standard operating assumptions for the building type. Estimated savings associated with the upgrades are also provided.

UPGRADE OPPORTUNITIES

This page lists recommended upgrades that can lead to energy and cost savings as well as a higher score.

Based on the building information entered, the Asset Scoring Tool identifies potential opportunities for improving HVAC equipment, envelope, glazing, service hot water, and lighting. These recommendations are not intended to replace a detailed engineering analysis or to determine decisions to purchase specific equipment or materials. Rather, the list of recommendations can serve as a starting point to help users recognize the types of projects that may enhance building energy performance.

STRUCTURE AND SYSTEMS

This page provides evaluations of individual energy systems, including the building's envelope (e.g., windows, walls, roof, floor); lighting; heating and cooling; and hot water.

This information can help users identify which parts of the building are most in need of attention. This simple evaluation can help building owners and operators understand what underlies the score. While two buildings may share the same numeric Asset Score, the underlying reasons for those scores and the areas with greatest potential for improvement may differ entirely.

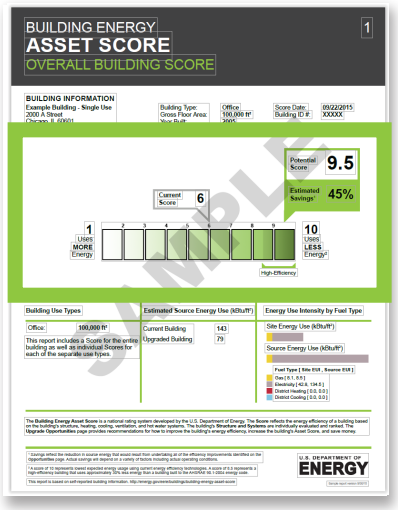
BUILDING ASSETS

This page(s) lists the data used to score the building and serves as a quick reference to review data inputs.

Buildings can easily be rescored with the Asset Scoring Tool if any of these building features change in the future.

BUILDING ENERGY ASSET SCORE

UNDERSTAND YOUR REPORT



*The source energy use intensity used to calculate your Asset Score **CANNOT** be directly compared to your utility bills. This is because the Asset Scoring Tool assumes standard building operations and normal weather conditions when modeling a building's energy use.*

INTERPRET YOUR SCORE

How is your building's score calculated?

- The Asset Scoring Tool uses an energy model to estimate the building's energy use intensity (EUI). The model applies the information you provide about the building's overall characteristics and energy systems as well as standard assumptions about operation and weather.
- The estimated EUI is adjusted to account for local climate and then converted into a score ranging from 1 to 10. If you have a mixed use building, the score is created using a weighted average of the scores for the individual use types based on square footage.
- The 10 point scale reflects a range of EUIs, where 1 corresponds to a very high EUI and 10 is associated with a very low EUI level. The EUI range varies depending on use type.

Current Score **6**

The Asset Score is intended to provide a simple method to understand a building's energy assets as well as compare the estimated energy performance of different buildings under equivalent operating conditions.

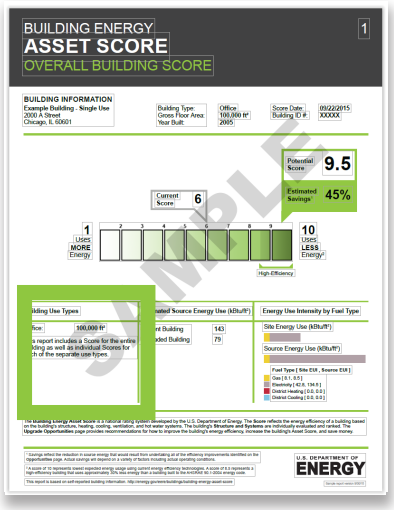
Given that energy use varies significantly depending on the building's function, buildings are scored according to use type. For example, the 10 point scale used to score multi-family buildings is different from the one used to score office buildings.

Score with Upgrades **7.5**

Your building's Score with Upgrades is based on an estimated EUI for the building if recommended efficiency upgrades are implemented. A building's upgrade potential is affected by its structure type, existing system types, and available fuel types.

BUILDING ENERGY ASSET SCORE

OPERATIONAL ASSUMPTIONS[1]



The Asset Scoring Tool applies standard assumptions about occupant density, operating schedules, temperature setpoints, and electric plug loads based on building type.

STANDARD OPERATING CONDITIONS

The Asset Scoring Tool calculates operating hours using a standard occupancy schedule based on building type.

Table 1 – Standard Occupant Densities[1]

Building Types	Standard Occupant Densities *(ft²/person)*
Assisted Living Facility	**250**
City Hall	**200**
Community Center	**20**
Courthouse	**14**
Education	**40**
Library	**100**
Lodging	**250**
Medical Office	**200**
Multi-family	**380**
Office	**200**
Parking Garage	**NA**
Police Station	**33**
Post Office	**33**
Religious Building	**8**
Retail	**67**
Senior Center	**20**
Warehouse (unrefrigerated)	**NA**

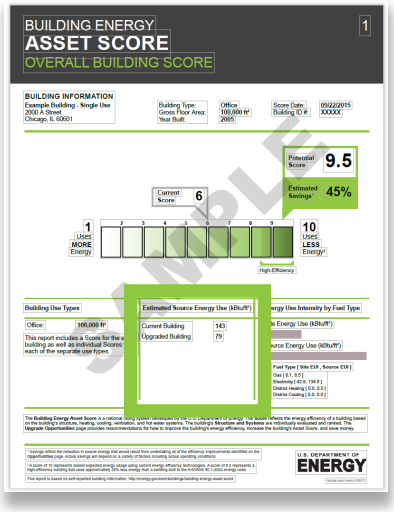
The Asset Scoring Tool applies standard temperature setpoints and setbacks linked to occupancy schedules. Temperature setpoint is the setting of the heating or cooling thermostat in the space when heating or cooling is required. Some buildings require a low level of heating or cooling during unoccupied periods to avoid condensation or frost damage and to prevent the building from becoming too cold or too hot in order to reduce startup load.

Table 2 – Temperature Setpoints[2]

Building Types	Heating Temperature Setpoints
All building types except Warehouse and Parking Garage	**70°F**
Warehouse (unrefrigerated)	**60°F**
Parking Garage	**NA**
Building Types	**Cooling Temperature Setpoints**
All building types except Warehouse and Parking Garage	**70°F**
Warehouse (unrefrigerated)	**60°F**
Parking Garage	**NA**

[1] A more detailed description of all assumptions used can be found in the Operational and Equipment Sizing Assumptions available at *https://buildingenergyscore.energy.gov/assets/energy_asset_score_assumptions.pdf.*

[2] ANSI/ASHRAE/IESNA Standard 90.1-2013. Energy Standard for Buildings Except Low-Rise Resident Buildings. American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. Atlanta, Georgia.



The Asset Scoring Tool applies standard assumptions about occupant density, operating schedules, temperature setpoints, and electric plug loads based on building type.

STANDARD OPERATING CONDITIONS (continued)

The Asset Scoring Tool applies standard electric plug loads to calculate your Asset Score. Electric plug loads include those devices in a building that are not hard-wired to the electrical system such as computers, printers, copiers, desk lighting, vending machines, and refrigerators. These plugs loads may change with tenant arrangements and are not regulated by building energy codes.

Table 3 – Standard Electric Plug Loads[3]

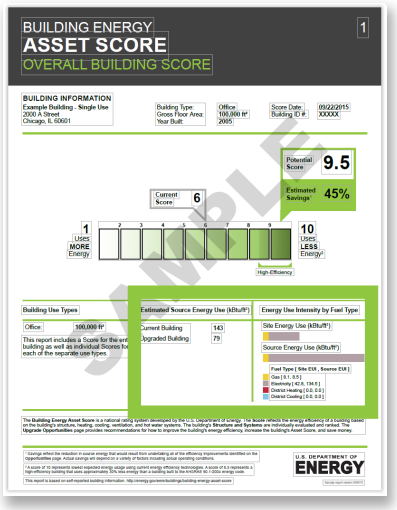
Building Types	Standard Electric Plug Loads *(W/ft²)*
Assisted Living Facility	**1.11**
City Hall	**1.00**
Community Center	**0.25**
Courthouse	**0.25**
Education	**1.39**
Library	**1.50**
Lodging	**1.11**
Medical Office	**2.00**
Multi-family	**0.62**
Office	**0.75**
Parking Garage	**NA**
Police Station	**1.50**
Post Office	**1.00**
Religious Building	**0.96**
Retail	**0.30**
Senior Center	**0.25**
Warehouse (unrefrigerated)	**0.66**

Your building is likely to function under different operational conditions than the ones assumed to generate the Asset Score. For example, you may have more people occupying the building for different hours. Or, your building operator may choose different setpoints and setback temperatures for heating and cooling. All of these choices and conditions contribute to how much energy is used in your buildings. For the purposes of the Asset Score, these factors are standardized to allow comparison between buildings and a focus on the building's assets, not operations.

Can I Override Standard Operating Conditions?

The Asset Scoring Tool applies standard operational assumptions in order to allow an apples-to-apples comparison of buildings' energy assets. While you cannot change the standard operating conditions used to calculate a building's Asset Score, you can provide operational data (e.g., actual number of occupants, building operating hours, thermostat settings, and electric plug loads) to receive a customized upgrade package.

[3] ANSI/ASHRAE/IESNA Standard 90.1-2013. Energy Standard for Buildings Except Low-Rise Resident Buildings. American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. Atlanta, Georgia.



*Modeled site energy use intensity is converted to **source energy use intensity** to calculate your Asset Score.*

ENERGY USE ESTIMATES

The Asset Score Report provides estimated EUI both in terms of source and site energy; however, the score is based on source EUI. It is important to note that the estimated site EUI is unlikely to correspond to your building's actual energy usage given that the Asset Scoring Tool applies standard assumptions about operations and weather, not actual operational and weather data.

A building's site energy use is the amount of energy consumed at the building's actual location. This is the amount shown on utility bills.

Source energy use is the total amount of raw fuel that is required to operate a building, including all generation, transmission, and delivery losses.

The Asset Scoring Tool applies national conversion factors listed in Table 4 to convert a building's estimated site EUI to estimated source EUI.

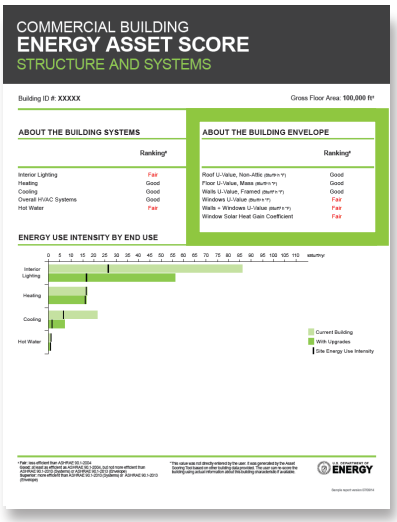
Table 4 – National Conversion Factors[4]

Source	Source-Site Ratio
Electricity	**3.14**
Gas	**1.05**
District Cooling	**1.00**
District Heating	**1.20**

[4] U.S. Environmental Protection Agency. 2013. Portfolio Manager Technical Reference: Source Energy. Available from ***http://www.energystar.gov/buildings/tools-and-resources/portfolio-manager-technical-reference-source-energy*** (July 2013).

BUILDING ENERGY ASSET SCORE

STRUCTURE AND SYSTEMS


COMMERCIAL BUILDING
ENERGY ASSET SCORE
STRUCTURE AND SYSTEMS

Building ID #: XXXXX

Gross Floor Area: 100,000 ft²

ABOUT THE BUILDING SYSTEMS

	Ranking*
Interior Lighting	Fair
Heating	Good
Cooling	Good
Overall HVAC Systems	Good
Hot Water	Fair

ABOUT THE BUILDING ENVELOPE

	Ranking*
Roof U-Value, Non-Attic (Btu/h·ft²·°F)	Good
Floor U-Value, Mass (Btu/h·ft²·°F)	Good
Walls U-Value, Framed (Btu/h·ft²·°F)	Good
Windows U-Value (Btu/h·ft²·°F)	Fair
Walls + Windows U-Value (Btu/h·ft²·°F)	Fair
Window Solar Heat Gain Coefficient	Fair

ENERGY USE INTENSITY BY END USE

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 site/mo/yr

Interior Lighting
Heating
Cooling
Hot Water

Current Building
With Upgrades
Site Energy Use Intensity

* Fair: less efficient than ASHRAE 90.1-2004
Good: at least as efficient as ASHRAE 90.1-2004, but not more efficient than ASHRAE 90.1-2013 (Lighting) or ASHRAE 90.1-2013 (Envelope)
Superior: more efficient than ASHRAE 90.1-2013 (Lighting) or ASHRAE 90.1-2013 (Envelope)

** No value was not directly entered by the user. It was generated by the Asset Scoring Tool based on other building data provided. The user can re-score the building using actual information about this building once details if available.

U.S. DEPARTMENT OF ENERGY

The building's envelope performance is ranked using a reference range based on ASHRAE 90.1-2004 and ASHRAE 90.1-2013 code. If the data provided indicates that the envelope is expected to perform below the 90.1-2004 level, it is ranked as "Fair." If the data provided indicates that the envelope is expected to perform better than the 90.1-2013 level, it is designated as "Superior." Envelope U-value performance in between these levels is considered to be "Good."

Although the Asset Score reflects the building's overall efficiency as an integrated system, it is also important to be able to understand the effect of individual building components on the whole building. For example, a building with a well-insulated envelope and low-efficiency HVAC equipment could, theoretically, use the same amount of energy as a building with a poorly insulated envelope and high-efficiency HVAC equipment. To clarify how individual components are playing a role in the overall building's energy performance, the Asset Score Report provides system evaluations for the building envelope (roof, walls, windows, floor), lighting, HVAC, and service hot water systems. Each system is ranked as "Fair", "Good", or "Superior" based on results of energy modeling described below. This information can help owners and operators identify the specific components of the building most in need of attention.

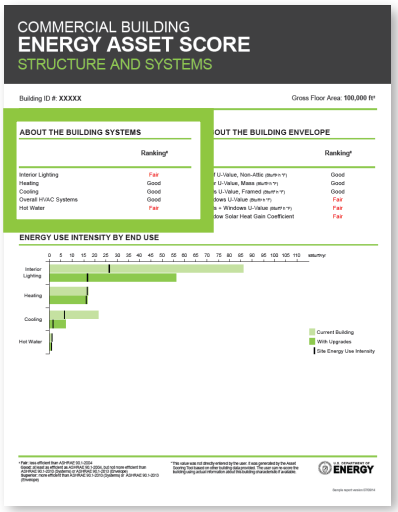
The Asset Scoring Tool applies a model-based performance approach to evaluate a building's envelope, lighting, HVAC, and service hot water systems. Rather than simply comparing a building's existing stand-alone system to a stand-alone reference system, a performance approach compares the energy use of the existing system with that of a reference system within the context of the overall building structure. In all cases, the evaluation reflects source rather than site energy to account for the production and transmission loss of different fuel types.

ABOUT THE BUILDING ENVELOPE

For the envelope assessment, thermal conductance properties (more commonly referred to as "U-values") for the building's walls, roof, floor and windows are compared to minimum values prescribed by building energy code. A combination of wall and window properties is analyzed to consider the window-wall ratio. Because thermal resistance is usually much lower for windows than it is for walls, a building envelope with a high window-to-wall ratio may not perform well even if the walls and windows are well insulated.

BUILDING ENERGY ASSET SCORE

STRUCTURE AND SYSTEMS *(continued)*



The systems performance is ranked using a reference range based on ASHRAE 90.1-2004 and ASHRAE 90.1-2010 code. If the energy model concludes that the system is expected to perform below the 90.1-2004 level, it is ranked as "Fair." If modeling estimates that the system is expected to perform at a level of efficiency at or greater than 90.1-2010, the system is designated as "Superior." System performance in between these levels is considered to be "Good."

ABOUT THE BUILDING SYSTEMS

Lighting System

For the lighting system assessment, the Asset Scoring Tool considers the EUI associated with the building's lighting. A higher value indicates more lighting energy use and therefore a less efficient lighting system. Compared to lighting power density (W/ft^2), which only considers installed lighting load, lighting EUI (kBtu/ft^2) includes the effects of lighting controls and daylighting in the building.

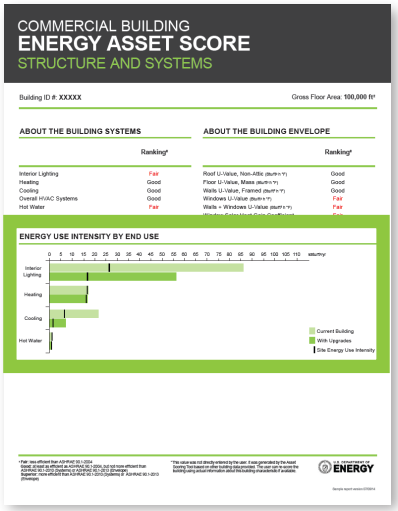
HVAC Systems

For the HVAC systems, annual system efficiency is used. Annual system efficiency is defined as a ratio of total heating and cooling energy load to total energy consumed by the HVAC system. A higher ratio indicates a more efficient system.

Annual cooling system efficiency, annual heating system efficiency, and annual HVAC system efficiency are separately calculated to provide individual evaluations of the heating, cooling, and integrated HVAC systems. Fan energy used to supply air is assigned to either cooling or heating energy use based on the mode of operation of the system.

Service Hot Water System

Service hot water systems are evaluated using the ratio of energy delivered in the form of hot water to energy consumed by the hot water system. A higher ratio indicates that less energy is used to deliver a unit of hot water, and therefore represents a more efficient hot water system.



ENERGY USE INTENSITY BY END USE

The graph illustrates the amount of energy (in both source and site energy use terms) associated with each end use in the current building as well as in the building with recommended upgrades. It provides a simple visual for understanding where the greatest potential for energy savings lie.