

ENERGY STAR® Condensed Course: Assignments

Give your students practical experience in building energy efficiency.

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The assignments listed below correspond with each unit of the [ENERGY STAR condensed course](#). Instructors can use the assignments to offer students additional opportunities for applied, experiential learning. This sheet is intended for instructor direction. These assignments are also outlined within each course presentation and can be utilized as take-home assignments and modified as instructors see fit.

Unit 1 Assignment

Identify Potential Barriers and Solutions to Efficiency in Example Buildings

Students break into groups of 3-4, depending on class size, and the instructor assigns each group *Building 1*, *Building 2*, or *Building 3* from the list below. Each group should discuss their building and use the lesson on *Barriers and Solutions to Energy Efficiency* in Unit 1 to identify possible barriers to implementing energy efficiency projects in their example building. Once students have created a list of barriers, each group should discuss possible solutions to those barriers. At the end of the assignment, if multiple groups were assigned the same building, the groups with the same building should discuss their ideas.

Use the following cost quotes¹ to help inform decisions:

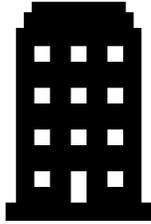
Energy Efficient Upgrade	Estimated Quote (\$/sq. ft)
<i>Replace HVAC system</i>	\$3.00
<i>Lighting retrofit</i>	\$2.00
<i>Replace office equipment with ENERGY STAR certified equipment</i>	\$1.75
<i>Install variable frequency drives (VFDs) and energy-efficient motors</i>	\$1.75
<i>Install new windows</i>	\$1.50
<i>Fix air leaks</i>	\$.50
<i>Adjust start/stop times for building systems</i>	\$.25
<i>Adjust thermostats for seasonal changes</i>	\$.25

¹ These fictional cost quotes are not based on actual quotes for this type of energy efficiency work, and are intended for classroom use only, to inform discussion and decisions.

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Building 1

Year Built: 1912

Capital investment available for energy efficiency projects: \$100,000

Size: 150,000 square feet

Building attributes:

- Warehouse converted to office building
- Inefficient base building systems
- Will need significant capital for efficiency retrofits and historic preservation
- Multiple tenants – all sustainability-focused or corporate responsibility companies

(For instructors) Possible barriers to Building 1 Project:

- Older building that may not meet current building efficiency code
- Preserving historic nature may mean no structural changes—might be more tedious to refurbish windows or exterior rather than replace
- Multiple tenants may mean difficulties in decision making
- Do not have enough capital investment – need some other investment vehicles

(For instructors) Possible opportunities for Building 1 Project:

- Can focus on interior space upgrades like a partial lighting retrofit or installation of occupancy sensors
- Tenants have sustainability focused missions so may be more supportive or open to green leases
- Opportunity to look for grants or other outside investments
- Energy efficiency savings could produce the additional money needed for retrofits

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Building 2

Year Built: 1999

Capital investment available for energy efficiency projects: \$50,000

Size: 150,000 square feet

Building attributes:

- Multi-family building in a growing neighborhood with newer apartments
- Need to quickly increase competitiveness
- Low-occupancy and high tenant turn-over
- Focus on reducing occupancy costs

(For instructors) Possible barriers to Building 2 Project:

- Need to stay competitive with growing neighborhood by keeping costs and project-related disruptions to tenants low
- Need quick retrofits with quick turnaround times to pass savings on to occupants
- Newer building so replacing some systems may not give a very high return on investment
- Energy cost is included in the lease, so tenants do not pay for or pay attention to energy efficiency

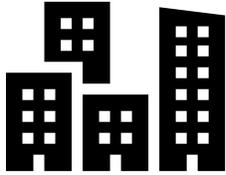
(For instructors) Possible opportunities for Building 2 Project:

- Only one building owner to make decisions
- High tenant turnover provides owner with the opportunity to implement efficiency measures in vacant units
- Improving efficiency and marketing the property as a sustainable home gives the owner an edge in their competitive market

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Building 3

Year Built: 1975

Capital investment available for energy efficiency projects: \$250,000

Size: 150,000 square feet

Building attributes:

- Main office headquarters of growing firm with multiple branches
- Focus is on occupancy comfort
- In a city offering tax credits for efficiency projects
- Will not be occupied during renovation

(For instructors) Possible barriers to Building 3 Project:

- Depending on involvement of company's other branches, may have multiple stakeholders
- Not enough capital investment for a full building renovation

(For instructors) Possible opportunities for Building 3 Project:

- One tenant may make decision making easier
- Opportunity to pursue tax credits or draw a public/private partnership
- Have enough capital investment to take on high energy-use projects like a partial HVAC retrofit and a lighting retrofit
- Can focus on both interior and exterior projects since building will not be occupied

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Unit 2 Assignment

Design a Competition

Students will develop a proposal for an efficiency competition between local buildings and summarize it using the template below. Students should first review the [ENERGY STAR Guide to Energy & Water Efficiency Competitions in Buildings & Plants](#) and [Competition Data Management Guide](#) and consider key decisions involved in designing a successful competition. When creating their proposal, students should recommend specific roles for organizations in the community, such as the local government, community colleges, associations, utilities, and businesses.

Set Goals. (Goals should be reasonable and measurable, e.g., percent reduction in Energy Use Intensity (EUI) metric)

- 1.
- 2.
- 3.

Describe the geographic and organizational boundaries of the competition. (E.g., specific building type(s) or sector(s) the competition might focus on)

Identify key information.

Baseline and competition performance periods:

Start/finish dates:

Evaluation metric(s):

Recognition type:

Recognition event:

Incentive prizes:

Eligible building types:

Dedicate resources.

Primary competition manager and host:

Potential source of funding:

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Unit 3 Assignment

Benchmark a Property and Verify Accuracy

For this assignment, students will [create a Portfolio Manager account](#) and use ENERGY STAR's *Sample Utility Bills* – provided to the instructor along with the other course resources – to create and benchmark a property in Portfolio Manager. Students can then compare their benchmarked building to a **sample property** in Portfolio Manager. The *Sample Utility Bills* show energy, water, and waste consumption data that is the same as the consumption data found in a Portfolio Manager **sample property during calendar year 2016** (sample properties are a built-in feature of Portfolio Manager). As such, at the end of the assignment, students will load a sample property into their account and compare their work to verify that they completed the benchmarking process correctly, making any needed edits.

Step-by-Step Instructions for Students:

Navigate to www.energystar.gov/portfoliomanager and [create a Portfolio Manager account](#), if you do not already have one. Once you log in, you will begin on the **MyPortfolio tab**. Select “Add a Property”.

The screenshot shows the MyPortfolio dashboard interface. At the top, there are navigation tabs for 'MyPortfolio', 'Sharing', 'Reporting', and 'Recognition'. Below the tabs, a green message box from 'Michelle' states: 'Your account has been created. Here is how to get started:' followed by two links: 'Set up your first building' and 'Learn about using Portfolio Manager and about ENERGY STAR recognition'. A red box highlights the 'Properties (0)' section, which contains an 'Add a Property' button. To the right of this section, a text box explains that the user currently has no properties and offers two options: 'Set up your first property' and 'Add up to five sample properties'. Below the 'Add a Property' button, there is a 'Manage Portfolio' section with four options: 'Upload and/or update multiple properties', 'Download your entire portfolio to Excel', 'Set a portfolio baseline and/or target', and 'Add sample properties'.

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You will have the option to choose the property type you want to benchmark. Choose either **Office** or **Library** with a single building. Choose “*Test property in operation.*”



Your Property Type

We'll get into the details later. For now, overall, what main purpose does your property serve?

Office

[Learn more about Property Types.](#)



Your Property's Buildings

How many physical buildings do you consider part of your property?

- None:** My property is part of a building
- One:** My property is a single building
- More than One:** My property includes multiple buildings ([Campus Guidance](#))

How many?



Your Property's Construction Status

Is your property already built or are you entering this property as a construction project that has not yet been completed?

- Existing:** My property is built, occupied and/or being used. I will be using Portfolio Manager to track energy/water consumption and, perhaps, pursue recognition.
- Design Project:** My property is in the conceptual design phase (pre-construction); I will be using Portfolio Manager to evaluate the energy efficiency of the design project.
- Test Property:** This is not a real property. I am entering it to test features, or for other purposes such as training.
- I would like to enter data as if this property is in operation.
 - I would like to enter data as if this property is in the design phase.

Get Started!

[Cancel](#)

Add your Basic Property Information:

- **Address:** can be found in the sample utility bills. **Note:** *You must use this exact address and postal code for your property for the performance metrics to be consistent with the EPA sample property. This is because weather normalized data is based on postal code.*
- **Gross Floor Area:**
 - Office – 275,000 square feet
 - Library – 120,000 square feet

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Note: You must use these exact gross floor area values for your property for the performance metrics to be consistent with the EPA sample building.

- Year Built, Irrigated Area, and Occupancy: can be made up values.

Add your Property Use details:

Building Attribute	Office	Library
Weekly Operating Hours	60	75
Number of Workers on Main Shift	650	18
Number of Computers	710	50
Percent That Can Be Heated	50% or more	N/A
Percent That Can Be Cooled	50% or more	N/A

Once the property is created, go to the **Energy tab**, and select “Add a meter.” Set up meters for each type of energy your building uses, based on the *Sample Utility Bills* provided by your instructor. Then, do the same for water use and waste consumption by going to the **Water tab** and **Waste tab**.

Next, add utility data. Open the Sample Utility Bills for the building type you chose. In Portfolio Manager, click on the **Energy tab** and then select the Meter Name ID to enter data. Under the Monthly Entries section, enter data as it aligns with the Sample Utility Bills. You will need to enter Start Date, End Date, Usage, and Total Cost for each entry. Complete this process for

twelve months of consumption data for electricity, natural gas, water, and waste data (as applicable from the Sample Utility Bills). Ensure that you use the “Save Bills” button as you enter the bills.

Once all the *Sample Utility Bills* data has been entered for your building, navigate back to the **MyPortfolio tab**. Under “Manage Portfolio,” choose “Add sample properties” to your account and follow the prompts. Choose the same building type as your test building.

The last step is to compare the data entered in your test building with the data that auto populates in the sample property. **The data between the two properties should be the same for calendar year 2016.**

To compare, go to the **Reporting tab**. Under the “Templates & Reports” section, generate an Energy Performance, Water Performance, and Waste Performance report using the following steps for each report:

1. In the row for Energy Performance, select “Generate New Report” from the Action column.
2. Timeframe: select Single Year, December 2016
3. Properties: Multiple Properties (select the name of your building and the sample building)
4. Select Generate Spreadsheet
5. Using the Action column for each report, select Download Current Report in Excel

Export the reports and compare the data (each property will have its own separate row of metrics). If the data is consistent between both reports, you’ve successfully benchmarked a test building! If the data is not consistent, note and investigate the inconsistencies. Revisit your test building to correct any errors.

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Community-Based Student Project

Assess the Energy Efficiency Opportunity of a Commercial Building

This project should be assigned at the beginning of the course. Students will be asked to apply what they are learning in class by benchmarking the energy use of an actual commercial building in the community, identifying potential energy efficiency opportunities, and writing a report to present during class (time permitting). This project can be completed individually or within groups.

The following is an example of three-unit project timeline. Please note, if this course is being delivered over three weeks, this project may realistically **take longer than three weeks to complete**. If this course is incorporated into longer course (i.e. quarter or semester), the milestones outlined below can be distributed across the full course to allow adequate time for each step.

Students will need time to do the following:

During Unit 1:

- Tour a building with a professional to learn firsthand how to identify energy efficiency opportunities.
 - Ask the building manager or professional giving the tour to see the penthouse or basement with base building equipment, HVAC systems, chillers or cooling towers, lighting and exit sign systems, and flush and flow fixtures in lavatories.
 - Remind students to observe the energy systems in the building and identify how the building uses energy.
 - If students are unsure of where to find a building to tour, here are a few possible options:
 - Tour a building on the school campus
 - Get in touch with a local building owner or manager association (for example a local chapter of BOMA (Building Owners and Managers Association))
 - Reach out to a local church, K-12 school, or government building
 - Contact local NGOs

By Unit 2:

- After touring the building, offer to share the results of benchmarking with the building manager/owner in exchange for access to property use details and consumption data.
- Gather energy bill data and building attributes needed to benchmark.
- Benchmark building in Portfolio Manager.

By Unit 3:

- Write a brief report of your findings and recommendations using the benchmarking results, information learned from visiting the building, and researched solutions.
- Write a brief letter to your building owner thanking them and include a summary of your experience and the benchmarking results and recommendations. Include a Portfolio Manager Energy Use report and other pertinent information.

After Unit 3:

- Depending on the class schedule, either submit the report or present the recommendations to the class using a visual presentation medium such as a slide or video presentation.