Appendix A – TM 24-01 – Technical Guidance and Calculation Methodologies to Comply with Building Energy Performance Standards, July 2024

TM 24-01 Technical Guidance and Calculation Methodologies to Comply with Building Energy Performance Standards, July 2024

Maryland Department of the Environment
July 2024

TABLE OF CONTENTS

Appendix A: Introduction

Appendix A: Technical Guidance and Calculation Methodologies to Comply with Building Energy Performance Standards has been developed to serve as the Maryland Department of the Environment's (the Department) initial Implementation Guidelines for covered building owners. The information provided offers background, clarification, and details to support the requirements outlined in the Maryland Building Energy Performance Standards (BEPS) and addresses stakeholder comments and questions received in June 2023 in response to the initial draft regulation shared for stakeholder feedback and in January 2024. The information presented here was developed in consultation with the following technical assistance partners:

U.S. Department of Energy
U.S. Environmental Protection Agency
Lawrence Berkeley National Laboratory
Pacific Northwest National Laboratory
Institute for Market Transformation
Northeast Energy Efficiency Partnerships

The Department will continue to add additional resources and guidance documents to support covered buildings in their compliance with BEPS via the Department's dedicated webpage: https://mde.maryland.gov/programs/air/ClimateChange/Pages/BEPS.aspx and updates to this Technical Memorandum as needed. The contents in this Technical Memorandum will be continuously reviewed, improved, and updated as the Department works closely with covered building owners, gas and electric companies, district energy providers, technical experts, local governments, other State agencies, and other stakeholders on Maryland's BEPS implementation.

Throughout 2024, the Department has and will continue to convene a series of working groups to further refine and develop processes discussed in this *Technical Guidance and Calculation Methodologies to Comply with Building Energy Performance Standards.* As an outcome of these working group processes, the Department will publish subsequent supplemental resources, white papers, and instructional tools to support BEPS implementation and the guidelines presented here. Topics to be included in the 2024 working group processes may include:

- Benchmarking and report submission
- Third party verification
- Electric and gas company reporting requirements
- District energy systems
- Campus compliance
- Affordable housing providers
- Exemption request process

Throughout 2024 and 2025, the Department will conduct stakeholder outreach and education to reach covered building owners and provide training and support to assist them in meeting the

first benchmarking requirement for their covered buildings. Building owners are required to submit their Initial Benchmarking Report by June 1, 2025 with data from January 1, 2024 - December 31, 2024. The Initial Benchmarking Report will establish the building's participation in BEPS and confirm key reporting details about the building such as property type, gross floor area, and more. The Baseline Benchmarking Report will be due to the Department by June 1, 2026 with data from January 1, 2025 - December 31, 2025. The Baseline Benchmarking Report will establish the baseline metrics for covered buildings to inform BEPS standards and compliance into the future.

Interim and final BEPS standards are set in the regulation. MDE will conduct an updated analysis after the 2025 Baseline Benchmarking Report data are submitted in 2026 to determine if the interim standards need to be modified based on actual 2025 benchmarked building energy performance. The Department may convene an additional series of working groups in 2026 to address sector-specific issues associated with compliance for the 2030-2034 and 2035-2039 interim standards.

A. Benchmarking and Reporting

A. 1 Benchmarking Background

Benchmarking refers to the process of measuring and reporting energy usage data. The reporting will be done through a software platform called ENERGY STAR Portfolio Manager. Maryland's gas and electric companies are required to provide whole building energy consumption data to building owners through either the ENERGY STAR Portfolio Manager web services application programming interface (API) or through a spreadsheet based on the number of customers they serve. To check the status of a gas or electric company's ability to automate the benchmarking process, refer to the EPA's list of utilities[1] that provide benchmarking data to ENERGY STAR Portfolio Manager.

Building owners are required to input data into ENERGY STAR Portfolio Manager and review the data prior to the annual reporting deadline beginning in 2025. Benchmarking reports are due to the Department on June 1st every year and must contain all energy usage data from the previous calendar year. For example, the deadline to report data for calendar year 2025 is June 1, 2026. Benchmarking requirements are discussed in more detail in the Benchmarking Requirements section.

Building owners are required to submit their Initial Benchmarking Report by June 1, 2025 with data from January 1, 2024 - December 31, 2024. The Initial Benchmarking Report will establish the building's participation in BEPS and confirm key reporting details about the building such as property type, gross floor area, and energy use data. The Baseline Benchmarking Report will be due to the Department by June 1, 2026 with data from January 1, 2025 - December 31, 2025. The Baseline Benchmarking Report will establish the baseline metrics for covered buildings to inform BEPS standards and compliance into the future.

A. 1.1 Reporting Responsibility - Who is Responsible for Collecting and Reporting Data?

It is the responsibility of the owner of a covered building to collect and report the energy usage data into ENERGY STAR Portfolio Manager.[2] A building owner may designate an authorized representative to submit data on their behalf. Any representation, action, inaction, or submission by the alternate representative shall be deemed to be a representation, action, inaction, or submission by the building owner.

[1] https://www.energystar.gov/buildings/tools-and-resources/utilities_increase_access_energy_data_help_commercial_customers_benchmark.
[2] https://www.energystar.gov/buildings/benchmark.

A. 1.2 Covered Buildings - Who Needs to Benchmark?

A “Covered building” is a building that:

(a) Is a commercial or multifamily residential building in the State of Maryland or is owned by the State of Maryland; and has a gross floor area of 35,000 square feet or more, excluding the parking garage area; and is:

(i) A single building;

(ii) One or more buildings held in the condominium form of ownership with a combined gross floor areas of 35,000 square feet or more (excluding the parking garage area) and governed by a single board of managers; or

(iii) Two or more buildings with a combined gross floor area of 35,000 square feet or more (excluding the parking garage area) that are served in whole or in part by the same electric or gas meter or are served by the same heating or cooling system(s), which is not a district energy system.

(b) A building that meets the criteria for a covered building as described in this section and is located in a historic district but where the building is not individually designated as a historic property under federal, state, or local law is a covered building.

(c) A “Covered building” does not include:

(i) A building, or space within a building, individually designated as a historic property under federal, state, or local law, separate and apart from a building’s inclusion in a historic district;
(ii) A public or nonpublic elementary or secondary school building;
(iii) A manufacturing building;
(iv) An agricultural building; or
(v) A building owned by the Federal government.

The exemption of these buildings from the regulation is discussed in A.1.2.2.

NOTE: Owners of multiple covered buildings that are located on a campus have the option to benchmark and comply with the performance standards at the campus level instead of the individual building level. For more information see section D. 2 about campus level compliance.

A. 1.2.1 Notification by the Department.

The Department will try to assist owners with compliance by updating and publicly sharing a list of potentially covered buildings or a covered buildings list based on known gross floor area. The list will be found on the Department’s BEPS website.

The Department will try to assist owners with compliance by notifying covered building owners via direct mail, electronically via email, or through a public posting on a web site of their obligation to benchmark.

NOTE: Failure of the Department to notify any owner shall not affect the obligation of such owner to comply with this regulation.

Failure of the Department to list a building on the covered building list shall not affect the obligation of the owner to comply with this regulation

Contact MDE if you do not see your building listed and you believe it is a covered building. See the section below if you believe your building is exempt.

A. 1.2.2 Exemptions - Which buildings do not need to comply?

If your building falls into one of the following categories then you may apply for exemption status. To apply for an exemption, a building owner must submit an exemption request form to the Department along with supporting documentation. The Department will thoroughly evaluate each exemption request. Resubmissions for exemption status may be required by the Department. The form to apply for exemption will be listed on the Department's BEPS website.[3]

1. A building, or space within a building, individually designated as a historic property under federal, state, or local law, separate and apart from a building's inclusion in a historic district;
2. A public or nonpublic elementary or secondary school building;
3. A manufacturing building;
4. An agricultural building; or
5. A building owned by the Federal government.

Buildings that have been individually designated as historic buildings under federal, state, or local law are exempt from the requirements of this regulation. If a building meets the criteria of a covered building and has not been individually designated as a historic building, then it must comply with the regulations, even if it resides in a historic district.

A. 2 Benchmarking Requirements

For more information about benchmarking at the campus level see Section D. 2.

A. 2.1 Data Collection

Data must be collected annually. Each year by June 1st, the previous year of data must be collected, reviewed, and submitted to the Department. Data should be collected using the benchmarking tool: ENERGY STAR Portfolio Manager.[4]

[3] https://mde.maryland.gov/programs/air/ClimateChange/Pages/BEPS.aspx.
[4] https://www.energystar.gov/buildings/benchmark.

NOTE: If a building is newly constructed it will be required to begin reporting after the first full calendar year of occupancy. See the example in section A 3.1.

There are a few methods a building owner can use to obtain the data:

1. Obtain data from all electric and gas companies, fuel distributors, and district energy providers that provide service to the building;
2. Read meters that serve the building; or
3. Collect data from tenants.

NOTE: Electric and gas companies are required to provide data in a method that follows guidelines from EPA ENERGY STAR Portfolio Manager. See the EPA list for details on the status of electric and gas companies integrating with ENERGY STAR Portfolio Manager.

Delivered fuel oil, propane, diesel, and any other delivered fuels must be reported. Retain all bills and use your delivery bills to record the volume and dates of fuel deliveries made during the calendar year within ENERGY STAR Portfolio Manager.

If asked, tenants are required to provide the necessary information within 30 days of the request. Benchmarking in no way permits a building owner to use the energy usage data for purposes other than the evaluation of the performance of the building.

A. 2.1.1 Entering Data into ENERGY STAR Portfolio Manager

If you are new to ENERGY STAR Portfolio Manager, follow this quickstart guide[5] to creating an account and setting up your buildings. This guide[6] has more detailed instructions for adding buildings to your account. Follow EPA's guide on entering data into ENERGY STAR Portfolio Manager.[7] For other useful information on ENERGY STAR Portfolio Manager visit the training page.[8]

There are three ways to enter data for your property or portfolio:

1. Work with third-party providers that exchange data directly with Portfolio Manager via web services. A list of these providers can be found here.[9]

---

5 https://www.energystar.gov/sites/default/files/tools/Portfolio%20Manager%20Quick%20Start%20Guide_May%202022_final_508.pdf.

6 https://www.energystar.gov/buildings/tools-and-resources/how_set_your_property_portfolio_manager.

7 https://www.energystar.gov/sites/default/files/tools/HowtoGetUtilityDataIntoPortfolioManager_May%202022_Final_508.pdf.

8 https://www.energystar.gov/buildings/training/how_to_guides.

9 https://www.energystar.gov/buildings/benchmark/get_started/service_providers_exchange_data.

2. Connect your ENERGY STAR Portfolio Manager account directly to a participating electric or gas company that can upload energy data directly to your account. See this map[10] to identify the available services.
3. Enter data manually (create/update one meter at a time).
4. Upload data using spreadsheet templates (create/update multiple meters at once).

To check if your electric or gas company is able to automatically upload benchmarking data for your building or portfolio directly into ENERGY STAR Portfolio Manager, see this list.[11]

A. 2.1.2 What Data Is Collected?

The following data is required for all covered buildings.

- Unique Building Identifier (UBID), as provided by the Department to all covered buildings on the covered building list or at the request of a building owner through a "UBID request form,"
- Property Name;
- Property Address including ZIP code;
- Property Use Type(s);
- Total Gross Floor Area of Property;
  - If the building has multiple uses, for example a financial building with retail stores, offices, and restaurants, follow the instructions within the Quick Start Guide[12] to report the square footage for each of these uses.
  - If one or more of the building uses are for a food service facility(ies), refer to Section A. 2.1.4 on energy exclusions.
- Year Built;
- Occupancy;
- Number of Buildings;
- 12 months of energy data from January 1 - December 31 of the year being benchmarked;
  - Energy data includes: electricity, natural gas, delivered fuels such as fuel oil or propane, onsite- solar generation, steam, any other energy source including energy for backup generation.

NOTE: The information collected above will be used to generate the net direct emissions and site energy use intensity for the property. It will also be used to set your building's interim and final performance standards. The methodology for these calculations are outlined throughout this document.

---

10 https://www.energystar.gov/buildings/owners_and_managers/existing_buildings/use_portfolio_manager/find_utilities_provide_data_benchmarking.

11 https://www.energystar.gov/buildings/tools-and-resources/utilities_increase_access_energy_data_help_commercial_customers_benchmark.

12 https://www.energystar.gov/buildings/tools-and-resources/portfolio-manager-quick-start-guide.

A. 2.1.3 Data Usage

Some data that is collected as required by the BEPS regulation will be publicly available on the BEPS website.[13] No personally identifiable information will be included in these data sets. The Department may publish basic building information and energy performance metrics annually for all buildings reporting that year, including but not limited to the following fields:

- Property name;
- Address;
- Property type(s);
- Gross Floor Area;
- Year Built;
- Site EUI;
- Net direct greenhouse gas emissions;
- An indication if the building is or is not in compliance with BEPS.

A. 2.1.4 Energy and Emission Exclusions

Some energy uses can be excluded from a building's total energy consumption and greenhouse gas emissions reporting. If these energy uses are separately metered, these meters can be excluded from reporting. See the list below for energy uses that can be subtracted.

1. Food service facilities;
2. Electric vehicle charging;
3. Other electricity uses excluded by the benchmarking tool:
    a. Cell towers;
    b. Parking garages;
    c. Outdoor heated pools;
    d. A large billboard or projection screen on a building or its parking lot when the sign is not related to the use of the building. A sign displaying the company's name or anything related to the building itself MUST be counted);
    e. Trash compactors;
    f. Well pumps;
    g. Aeration Fountains in retention ponds (used to prevent algae growth); and
4. Emissions from required combustion equipment under the following conditions:
    a. A backup generator if federal or state regulation requires a covered building to use a backup generator or other equipment that must run on combustible fuels.

A. 2.1.4.1 Food Service Facilities

Buildings that contain food service facilities, as defined in COMAR 10.15.03.02B,[14] such as restaurants and cafeterias, can exclude the energy use and emissions associated with these spaces, by taking the following steps:

[13] https://mde.maryland.gov/programs/air/ClimateChange/Pages/BEPS.aspx.

[14] https://dsd.maryland.gov/regulations/Pages/10.15.03.02.aspx.

1. From the property's Details tab in ENERGY STAR Portfolio Manager, enter a property use of "Restaurant" for the food service facility(ies) at the property, specifying the associated gross floor area.
2. From the property's Energy tab, enter a meter for each fuel/energy type used in the building's food service facility(ies). For each meter, enter consumption values based on either:
    a. actual metered consumption (in at least monthly intervals); or
    b. calculated consumption (divided by twelve and entered in monthly intervals), per the formulas below.

    In order for ENERGY STAR Portfolio Manager to calculate weather-normalized values, all meters must cover periods no longer than 65 days, hence the requirement for monthly data. All consumption values should be marked with a (-) so that the meter(s) function **as negative meters**. The meter(s) should be labeled as "Food Service Excluded Energy." This will subtract the food service facility energy use—and resulting ENERGY STAR Portfolio Manager emissions calculations—from the building's total.

    NOTE: If the consumption values are estimated using the formulas below, mark the values as "Estimated" when entering them in ENERGY STAR Portfolio Manager.

All-Electric Food Service facilities should use the following equation:

$$Meter\ for\ Monthly\ Excluded\ Food\ Service\ Facility\ Electricity\ Consumption = -(ED \times GFA)/12$$

Key: ED = Electricity Deduction = **67.2 kWh/sqft**
GFA = Gross Floor Area of the Food Service Facility

Example:
A 40,000 square feet (ft^2) building has a 3,000 ft^2 food service facility without submetering in it. The total electricity consumption for the utility bill will be modified by entering a negative meter into ENERGY STAR Portfolio Manager for the food service facility exclusion. Since the food service facility is not submetered, the monthly negative meter value is calculated using the standard electricity deduction of 67.2 kWh/sqft. The modified monthly electricity consumption is:

$-(67.2\ \text{kWh/ft}^2 \times 3{,}000\ \text{ft}^2)/12$
(Electricity Deduction x GFA of the Food Service Facility)/12 months
201,600 kWh / 12 months
= 16,800 kWh/month

Mixed-Fuel Food Service Facilities should use the following two equations:

$$Meter\ for\ Monthly\ Excluded\ Food\ Service\ Facility\ Natural\ Gas\ Consumption = -(GD \times GFA)/12$$

Key: GD = Natural Gas Deduction = **0.376 therms/sqft**
GFA = Gross Floor Area of the Food Service Facility

$$Meter\ for\ Monthly\ Excluded\ Food\ Service\ Facility\ Electricity\ Consumption = -(ED \times GFA)/12$$

Key: ED = Electricity Deduction = **70 kWh/sqft**
GFA = Gross Floor Area of the Food Service Facility

A. 2.1.4.2 Electric Vehicle Charging

Energy use from Electric Vehicle Charging Stations can be excluded. If the Electric Vehicle Charging Stations are separately metered (not submetered), then it can be left out of the data entered into Portfolio Manager. Otherwise, it can be excluded following the steps below:

1. Enter the number of chargers by type, by adding the Electric Vehicle Charging Station property use from the property's Details tab in Portfolio Manager:
    a. Number of Level 1 EV Charging Stations;
    b. Number of Level 2 EV Charging Stations; and
    c. Number of DC Fast EV Charging Stations.
2. Create an electric meter for the EV charger energy use. Enter consumption values for the EV charging station(s), based on:
    a. metered consumption (in at least monthly intervals); or
    b. calculation consumption (divided by twelve and entered in monthly intervals), following a forthcoming methodology to be developed by EPA.

    In order for ENERGY STAR Portfolio Manager to calculate weather-normalized values, all meters must cover periods no longer than 65 days, hence the requirement for monthly data. All consumption values should be marked with a (-) so that the meter(s) function as negative meters. The meter(s) should be labeled as "Electric Vehicle Charging Station Excluded Energy." If the consumption values are calculated using the EPA methodology, mark the values as "Estimated" when entering them in Portfolio Manager.

A. 2.1.4.3 Emissions From Required Combustion Equipment

If federal or state regulation requires a covered building to use a backup generator or other equipment that must run on combustible fuels, these can be excluded. Energy usage from backup generators or other combustion equipment that are not required by federal or state regulation must be included.

1. If the combustion equipment is on the main meter but there is a submeter, then this submeter should be entered as an additional meter with negative entries (More information here).[15]
2. If the combustion equipment is from delivered fuels or separately metered (not submetered), then it can be left out of the data entered into Portfolio Manager.
3. If the combustion equipment is on the main meter and not submetered, then contact the Department regarding how to quantify emissions and energy usage from the equipment.

A. 3 Reporting

A. 3.1 Reporting Deadline

Once the data has been collected, the building owner must ensure it has been correctly entered into ENERGY STAR Portfolio Manager by June 1st beginning in 2025. By June 1st, building owners must report data from the previous calendar year which is defined as January 1 to December 31. The Department will determine compliance based on the data shared as of this deadline.

Owners of newly constructed buildings will be required to begin reporting after the first full year of occupancy of the newly constructed building.

Example:
A building that is newly constructed and occupied beginning on March 1, 2025 would be required to comply with the June 1, 2027 deadline with data from January 1 - December 31 of 2026. This is because 2026 is the first full calendar year of building occupancy.

Reporting Deadline: June 1st

What: Data from January 1 - December 31 of previous year

A. 3.1.1 Sharing Benchmarking Data via ENERGY STAR Web Services

The Department uses ENERGY STAR Portfolio Manager's Web Services capabilities to facilitate automatic annual benchmarking. This process only needs to be set up once and allows the Department to read data in your ENERGY STAR Portfolio Manager account and run basic

[15] https://energystar-mesa.force.com/PortfolioManager/s/article/Can-I-add-a-negative-meter-to-subtract-parking-cell-towers-EV-charging-stations-etc-1600088527076.

data checks. Once your ENERGY STAR Portfolio Manager account has been created and you have added properties there are five basic steps to sharing your data with the Department.

1. Add the Maryland Department of the Environment as a contact.
2. Send the Department a connection request.
3. Select the properties for which you want to share data.
4. Allow the Exchange of Data READ ONLY Access.
5. View shared properties from the “Sharing” tab.

For a more detailed explanation of this process, see the EPA Guide.[16] The Department will create a specific Maryland Data Exchange Guide for this process prior to the first benchmarking period.

A. 3.2 Verification

Prior to the June 1 benchmarking deadline, a building owner must check their benchmarking data. ENERGY STAR Portfolio Manager has built-in data quality tools that must be used annually. Every five years, a building owner must have their data verified by a third party.

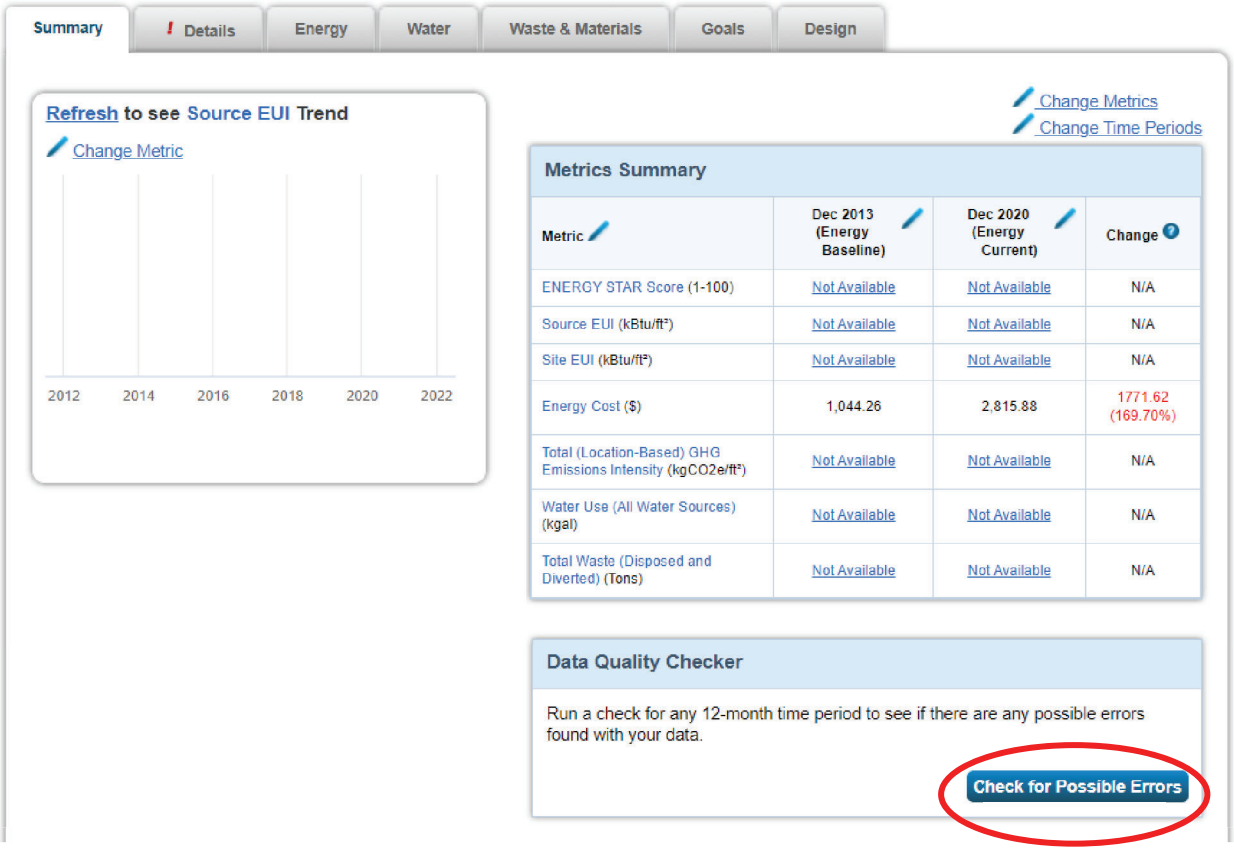
A. 3.2.1 Data Quality Check

Prior to the June 1 benchmarking deadline each year, the building owner must check the accuracy of the data using the data quality checker built into ENERGY STAR Portfolio Manager. These checks will identify errors in the data such as missing information. If data is missing or inaccurate, then the building owner is required to fix it prior to the reporting deadline. If the building owner is notified of an error by the Department, then the building owner must correct the error within 30 days.

The data quality check can be run from the summary page of an individual building within ENERGY STAR Portfolio Manager. See the screenshot below. See this list[17] of possible alert messages.

[16] https://portfoliomanager.energystar.gov/pdf/reference/Connection_and_Sharing_for_Data_Exchange_en_US.pdf.

[17] https://www.energystar.gov/buildings/tools-and-resources/list_portfolio_manager_alerts.



A. 3.2.2 Third Party Verification

To ensure quality of data, building owners must also have their data verified by a third party every five years. Third party verification will begin in 2026 with the benchmarking submission which covers calendar year 2025. The following is a schedule of third party verification dates.

Calendar Year Data Being Verified	Verification deadline MDE
2025	June 1, 2026
2030	June 1, 2031
2035	June 1, 2036
2040	June 1, 2041
Every 5 years following this pattern	

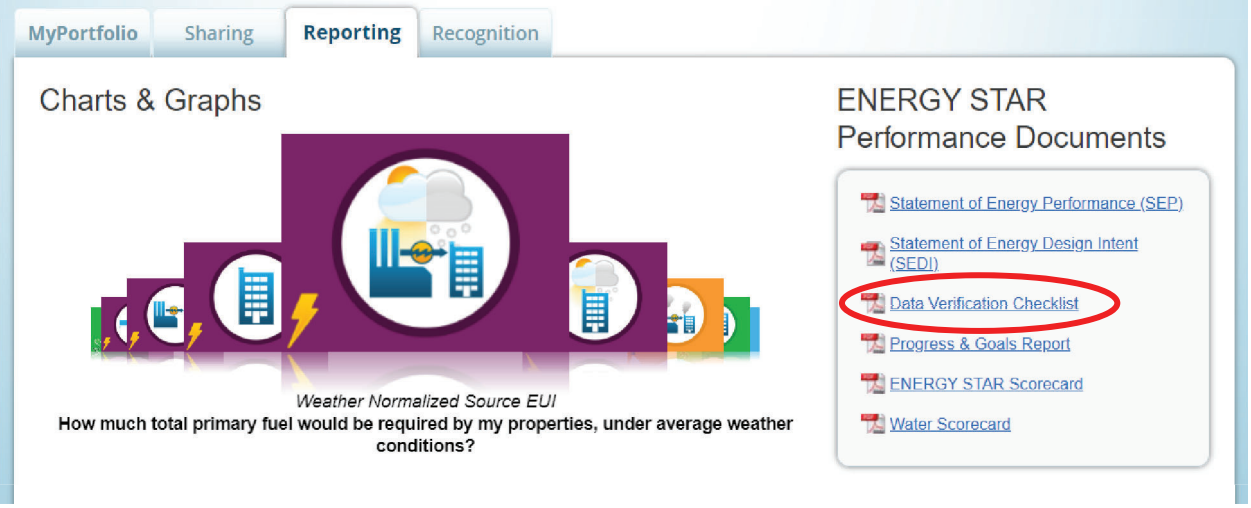
The third party verifier must have access to the building data to accurately verify the information. To accomplish this, follow the guide on sharing Portfolio Manager Properties.[18] It is the

18 https://www.energystar.gov/sites/default/files/tools/How%20to%20Share%20Properties%20with%20Other%20Portfolio%20Manager

responsibility of the certified third party verifier to: generate, review and sign an ENERGY STAR Data Verification Checklist. The Department will develop and publish a verification guide for instructions on how to complete a third party verification. At a minimum, the following information will be required as part of the third-party verification process:

1. Basic Property Information
    a. All
2. Review of Property Use Details
    a. Accurate Gross Floor Area and allocation to appropriate property types
    b. Building Occupancy
3. Review of Energy Consumption
    a. Total Energy Use
    b. Additional Fuels
    c. Total Energy Consumption meters
4. Signature of Verifier
    a. Name
    b. Verifier Title
    c. Verifier Organization
    d. Signature
    e. Date

A Data Verification Checklist can be created from the Reports tab within ENERGY STAR Portfolio Manager. View a sample report here.[19]



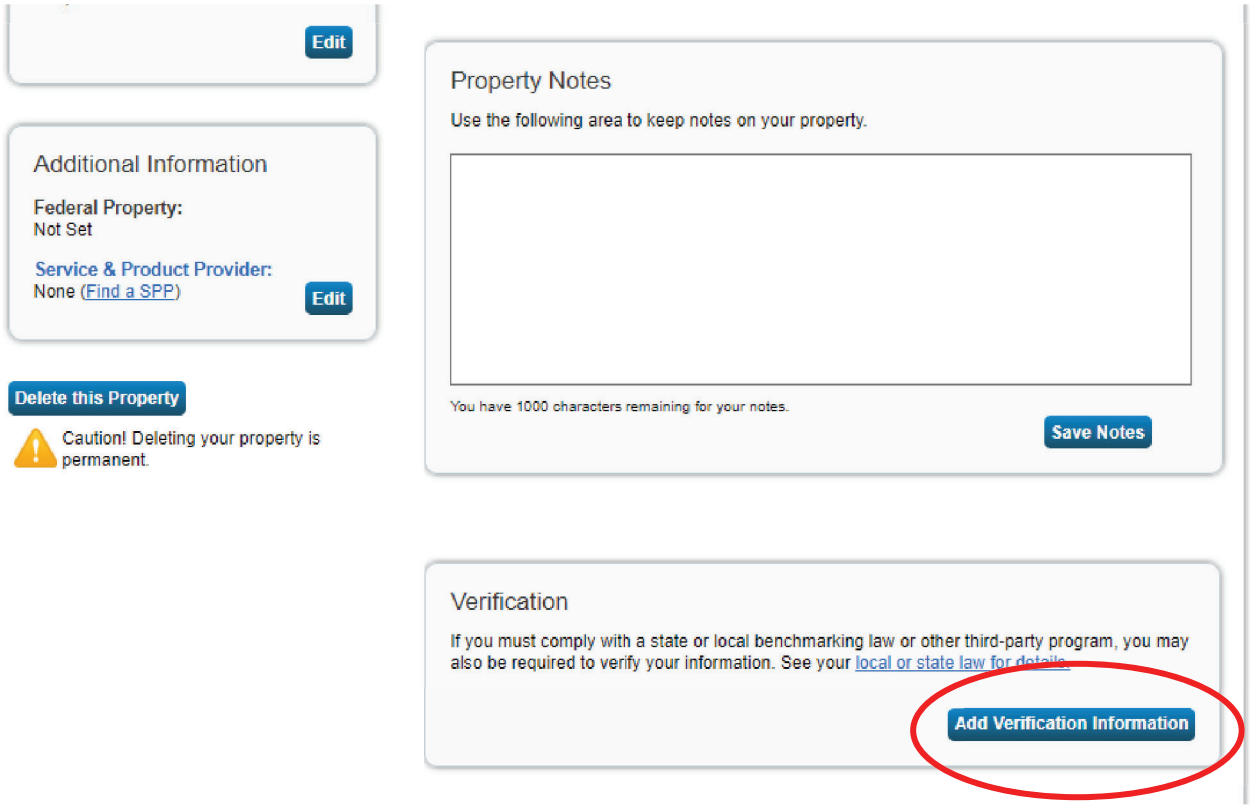
Once the verifier is finished, they should email a digital copy of the report to the building owner who must save it and keep it in their records. To complete the verification process, the verifier

%20Users_May%202021_FINAL.pdf#:~:text=To%20start%20sharing%2C%20go%20to%20the%20Sharing%20tab.,select%20properties by%20using%20filters%20by%20primary%20function%20orstate%2Fprovince.

[19] https://www.energystar.gov/buildings/tools-and-resources/sample_energy_star_data_verification_checklist.

must navigate to the property details of the building and mark the building as verified in the following steps:

1. While viewing the Property navigate to the “Details” tab.
2. Click “add verification information” located at the bottom right.
3. The form will ask for the year for which the data was verified, the date of verification, the name of the verifier, and their professional designation.



Below are the qualifications for a third party verifier.

1. Professional Engineer (PE) issued within the United States;
2. Licensed Architect issued within the United States;
3. Certified Energy Manager (CEM);
4. Building Energy Assessment Professional;
5. Any other additional data verifier license or training program credentials recognized by the Department and posted to the website.

B. Performance Standards and Compliance Demonstration

B. 1 Building Energy Performance Standards Background

Building Energy Performance Standards (BEPS) are mandatory performance standards that a covered building must achieve over time. The Climate Solutions Now Act of 2022 required Maryland BEPS to include two metrics to evaluate the performance of a building: net direct greenhouse gas emissions and site energy use intensity (Site EUI). The net direct greenhouse gas emissions standards were promulgated in the accompanying regulation. MDE will analyze benchmarking data and set Site EUI standards in the future. The standards become more stringent every five years until 2040. See below for the compliance timeline.

Compliance with the standards will be determined based on data submitted during the benchmarking process.

Compliance year	Deadline to Input Verified Data into ENERGY STAR Portfolio Manager
2025	June 1, 2026
2030	June 1, 2031
2035	June 1, 2036
2040	June 1, 2041

B. 1.1 Metrics

Maryland BEPS uses net direct greenhouse gas emissions to measure building energy performance. Net direct greenhouse gas emissions are measured in kilograms of CO2 equivalent per square foot.

B. 1.1.1 Net Direct Greenhouse Gas Emissions (kg/CO2e/ Sq Ft)

Net direct greenhouse gas emissions or net direct emissions are the sum of all direct greenhouse gas emissions. For a covered building connected to a district energy system, direct greenhouse gas emissions plus the greenhouse gas emissions attributable to thermal energy inputs from the district energy system used by the covered building, as calculated using the methodology provided in this regulation. Net direct emissions does not include direct emissions

from a food service facility located within a covered building. See Section A. .2.1.4 on Energy and Emission Exclusions.

B. 1.1 Reserved

B. 1.2 Compliance Responsibility - Who is Responsible for Achieving Compliance?

The building owner is responsible for making the necessary improvements to the building to comply with the building energy performance standards. Annual benchmarking will help the building owner track performance.

B. 1.3 Covered Buildings - Who Needs to Comply with the Building Energy Performance Standards?

The same buildings that are required to submit benchmarking data are also required to comply with the performance standards. Buildings that are exempt from benchmarking are also exempt from the building energy performance standards. See Section A. 1.2 on Covered Buildings.

B. 2 Determining Interim and Final Standards

The information below pertains both to individual buildings and campuses. Each building or campus will need to comply with a **final standard** that must be achieved by 2040 and **interim standards** in 2030 through 2039. The Department will assess interim and final standards for each covered building based on the weather-normalized benchmarking data submitted through ENERGY STAR Portfolio Manager. ENERGY STAR Portfolio Manager weather-normalizes the submitted energy data. Methodology on how the Department will compute the standards per building can be found in the sections below.

B. 2.1 Final Net Direct Emissions Standard

The final net direct emissions standard is the same for every covered building or campus: 0 (zero) kg CO2e per square foot. See below for more information about determining the Interim Standards.

B. 2.2 Reserved

B. 2.3 Interim Net Direct Emissions Standards

Interim net direct emissions standards are listed in the regulation by property type in kg CO2e per square foot.

If a covered building or campus produces net direct emissions and is a mixed-use building or campus, then its interim net direct emissions standard in 2030 and 2035 will be calculated by the Department using an area-weighted approach. In this situation, the following formula can be used to calculate the area-weighted maximum net direct emissions in 2030 and 2035.

$$GHG_{AW} = \left(\left(\frac{GSF_A}{GSF_S}\right) \times GHG_A\right) + \left(\left(\frac{GSF_B}{GSF_S}\right) \times GHG_B\right) + \left(\left(\frac{GSF_C}{GSF_S}\right) \times GHG_C\right) + etc.$$

Key: GHG_{AW} is the area-weighted maximum net direct emissions standard for 2030
GSF_A is the gross square footage of one property type within the covered building
GSF_B is the gross square footage of a second property type within the covered building
GSF_C is the gross square footage of a third property type within the covered building
GSF_S is the sum of the gross square footage of a GSF_A , GSF_B , and GSF_C
GHG_A is the 2030 emissions standard for the property type group corresponding to GSF_A
GHG_B is the 2030 emissions standard for the property type group corresponding to GSF_B
GHG_C is the 2030 emissions standard for the property type group corresponding to GSF_C

If a covered building includes more than three property types, then the formula above can be modified to replace "etc." with "((GSF_D / GSF_S) x GHG_D)" and so to include additional property types.

Submetered area within a covered building that is a parking garage or a food service facility can be excluded from area-weighted calculations.

Example:
A 45,000 square foot mixed use building where 20,000 square feet are used for Office space, 15,000 square feet are used for retail and 10,000 square feet are used for restaurants.

At the time of this writing, the 2030 interim net direct emissions standards for these property types are: 0.22 kgCO2e/sf for offices, 0.60 kgCO2e/sf for retail stores, and restaurants are exempt. The 10,000 square feet of restaurant space should be removed from this equation so the "total building area" in the case of determining the interim net direct emissions standard is 35,000 square feet. The calculation to find the mixed 2030 interim net direct emissions standard is as follows:

$$0.38\frac{kgCO2e}{sf} = \left(\left(\frac{20{,}000}{45{,}000 - 10{,}000}\right) \times 0.22\ kgCO2e/sf\right) + \left(\left(\frac{15000}{45{,}000 - 10{,}000}\right) \times 0.60\ kgCO2e/sf\right)$$

Office Space Retail Space

B. 2.4 Reserved

C. Alternative Compliance

C. 1 Alternative Compliance Pathway

If a building owner chooses to meet the net direct emissions standard via the alternative compliance pathway for one or more of their buildings, the building owner shall pay an alternative compliance fee for each metric ton of carbon dioxide equivalent (CO2e) that is emitted over the standard.

The alternative compliance pathway fee can be determined by:

1. Identifying the building's interim or final net direct emissions intensity standard from the regulation's "Performance Standards and Compliance Demonstration" (26.28.03.03) Table 1 (in kg of CO2e per square foot)
2. Multiplying this standard by the building's square footage to get the net direct emissions interim or final standard (in kg of CO2e)
3. Dividing this value by 1,000 to get the building's net direct emissions standard in Metric Tons of CO2e
4. Subtracting the building's net direct emissions reported by ENERGY STAR Portfolio Manager (in Metric Tons of CO2e) from this calculated interim or final net direct emissions standard (Metric Tons of CO2e)
5. Multiplying this difference by the cost per metric ton of CO2e for the given year. If the number is positive, then this is the alternative compliance fee. If the number is negative, then the building is complying through the standard pathway.

The alternative compliance fee will begin in 2030 at $230 per metric ton in 2020 dollars, adjusted for inflation and will increase $4 in 2020 dollars, adjusted for inflation, every year as written in Chapter 04 Alternative Compliance and Special Provisions of the regulation.

Example:
If, for calendar year 2030, a covered building's interim standard multiplied by the building's square footage is 200 metric tons of CO2e, but it emits 100 metric tons of CO2e, then its owner can be in compliance with the standard by taking the alternative compliance pathway and paying the fee for the 100 metric tons of CO2e in excess of the 2030 net direct emissions standard. Therefore, the owner of the covered building would pay the alternative compliance fee of: 100 metric tons x $230 per metric ton = $23,000 (in 2020 dollars, adjusted for inflation to 2030).

Building owners choosing to take the alternative compliance pathway will indicate this in their annual reporting submission. Using the calculation described above, the Department will invoice the building owner at the address listed as the primary contact and the email listed as the primary contact. Upon receipt of the invoice, a building owner has 30 days to pay and fulfill their requirement to meet the standards under the alternative compliance pathway.

Failure to pay in a timely manner will bring the building(s) out of compliance with the standard and may result in referral to the central collections unit of the Department of Budget and Management, in which case a 17% collection fee will be added.

The alternative compliance fee can be paid in two ways:

1. A check for the compliance fee can be written to “Maryland Department of the Environment/Clean Air Fund” and directed to P.O. Box 2037, Baltimore, MD 21203-2037; or
2. An online portal www.egov.maryland.gov/mde/invoice can be used to make credit card payments. A processing fee is added.

C. 2 Exemptions

There are some instances where the owner of a building that would otherwise be required to comply with the performance standard can apply to be exempt for one or more calendar years.

C. 2.1 Exemption From Benchmarking and Performance Standard Requirements

A building owner may apply for their building to be exempt from complying with the building energy performance standard for the following reasons:

1. Financial distress;
2. The covered building was not occupied during the calendar year being reported; or
3. The covered building was demolished during the calendar year for which benchmarking is required

To apply for an exemption, a building owner must submit an exemption request form to MDE and provide any documentation to substantiate the request. A building owner may request an exemption at any point prior to the reporting deadline of June 1 of each year for the previous year of reporting. Any exemption approved by MDE will be limited to the benchmarking and performance standard year for which the request was made and shall not extend to past or future submissions.

C. 2.2 Exemption From Establishing Baseline Performance

A building owner may apply for an exemption from the requirement to establish baseline performance when, during the year that would have been the baseline year, less than 50% of the covered building was occupied for at least 180 days. A covered building may not receive an exemption from the requirement to establish baseline performance for more than three years.

To apply for an exemption, a building owner must submit an exemption request form to MDE and provide any documentation to substantiate the request. A building owner may request an exemption at any point prior to the reporting deadline of June 1 of each year for the previous year of reporting. Any exemption approved by MDE shall be limited to the benchmarking and performance standard data for the year for which the request was made and shall not extend to past or future years.

C. 2.3 Exemptions for Affordable Housing Providers

An affordable housing provider may apply for reduced alternative compliance fees to meet the standard via the alternative compliance pathway when the building owner submits in writing such a request by June 1st of each calendar year, beginning in 2031.

To apply, an affordable housing provider must submit an exemption request to MDE and submit a copy of the application to a Federal or Maryland administered program that would make the building(s) more energy efficient and/or reduces greenhouse gas emissions. The submission must also include the benchmark report, intended scope of work, and estimated greenhouse gas reductions expected from the intended scope of work to achieve at least the applicable Interim or Final Standard.

Any exemption approved by MDE shall be limited to the alternative compliance fee for the year for which the request was made and shall not extend to past or future years. A project that has applied to a program but has not yet completed the improvements, can submit a confirmation received from the program administrator to the Department with their exemption request, verifying the project's active participation status to satisfy the good faith effort for another year.

D. Special Provisions

D. 1 Additional Reporting Requirements for Covered Buildings Connected to District Energy Systems

Emissions from district energy systems are included within the definition of net direct emissions. When assessing a building’s compliance with the standards, the Department will use a system-specific emission factor for the district energy system, instead of national default factors or customer-specific factors.

D 1.1 Reporting District Energy Emissions

District energy providers and building owners of covered buildings that are connected to district energy systems have reporting requirements to comply with Maryland BEPS.

D 1.1.1 Reporting Responsibilities of District Energy Providers

To the Department:
By March 1st of each calendar year, district energy providers must provide the Department with emissions factors and a full and detailed accounting of their calculation using the "Efficiency Method" in the World Resources Institute's "Calculation tool for direct emissions from stationary combustion: Allocation of greenhouse gas emissions from a Combined Heat and Power (CHP) Plant." A description of this method, with details specific to its application to systems in Maryland, can be found in Section D. 1.2 Efficiency Method below.

To the Building Owner:
District Energy Providers must provide covered building owners the greenhouse gas emissions factors per unit of district energy input (steam, hot water, chilled water, etc.). As ENERGY STAR Portfolio Manager does not support the addition of custom emission factors at this time, these data must be provided separately to the customer.

For the purpose of BEPS compliance, emission factors must be consistent for all products of the same district energy system. The individual purchase of "green" credits for district energy by a customer does not impact their emissions for the purpose of BEPS compliance.

D.1.1.2 Reporting Responsibilities of the Building Owner

Building owners must report all district energy use to the Department via the ENERGY STAR Portfolio Manager tool. The Department will develop and publish additional guidance on how to enter district energy use data into the ENERGY STAR Portfolio Manager tool.

Building owners must annually fill out a form, provided by the Department, to submit their system-specific emissions to the Department incorporating emissions factors provided by the building owner's district energy provider. These factors and data reported via ENERGY STAR Portfolio Manager will be used to determine final compliance with the posted standards.

D 1.2 Efficiency Method

If the district energy system has only one output, such as steam, and has only on-site combustion inputs, then the emissions intensity shall be defined as the carbon emissions of all combustion inputs divided by the total energy output.

If the district energy system has two or more inputs (e.g., natural gas and recovered waste heat), or two or more outputs (e.g., steam and electricity), then emissions shall be assigned to the respective energy sources based on the "efficiency method" defined for co-generation systems by the World Resources Institute GHG Protocol.[20] The efficiency method uses plant-

[20] Gillenwater, M., Woodfield, M., Simmons, T., McCormick, M., Camobreco, V., Hockstad, L. and Upton, B. 2006. Calculation tool for direct emissions from stationary combustion: Allocation of GHG Emissions from a Combined Heat and Power (CHP) Plant. World Resources Institute. Available at: https://ghgprotocol.org/sites/default/files/CHP_guidance_v1.0.pdf.

specific values for heat and power production efficiency, if available, or generic values when plant-specific information is missing. The following sections describe the steps to the Efficiency Method.

D 1.2.1 Step 1: Calculate the Total Direct Greenhouse Gas Emissions for All Combustion Sources Used in the Co-generation

Include all relevant greenhouse gases: carbon dioxide, methane, and nitrous oxide. Use emissions factors appropriate to each fuel consumed by the district energy plant. Sum the total for all greenhouse gases using the same emissions factors used in ENERGY STAR Portfolio Manager.[21]

D 1.2.2 Step 2: Calculate the Additional Energy and Emissions for Any Other Inputs Into the District Energy Network

If the district energy system receives additional energy inputs such as waste heat, emissions associated with those inputs must also be accounted for, as applicable. These inputs would add to both total emissions and total heat energy content of the system. Input sources may be considered to be emissions-free if no greenhouse gas emissions were used in the generation of the resource.

Examples of energy inputs into a district plant that are not emissions-free include: waste heat from industrial processes that use combustion and waste heat from electricity plants including those that burn solid waste.

Examples of non-fuel energy inputs into a district plant that can be considered to be emissions-free include: sewer/wastewater heat recovery; geothermal energy; ground-source, air-source or water-source energy; and electricity.

If the facility that produced the additional heat energy is itself a cogeneration facility, then the efficiency method must be applied a second time for that facility to calculate the emissions intensity of the heat input. For example, if a waste-to-energy incinerator or an industrial facility provides heat to a district energy plant, the efficiency method would be applied first at the incinerator to allocate its emissions between the power generation and the heat generation, and the emissions attributed to the exported heat would be added to the total emissions for the district energy system.

D 1.2.3 Step 3: Calculate the Energy Content of Each Output Stream for the District Energy System

Include each output stream of thermal energy (e.g., water/steam at various temperatures and pressures), electricity, and chilled water, if applicable. Convert all outputs to consistent units,

[21] ENERGY STAR. 2022. “Portfolio Manager Technical Reference: Greenhouse Gas Emissions.” U.S. Environmental Protection Agency. Available at: https://www.energystar.gov/buildings/tools-and-resources/portfolio-manager-technical-reference-greenhouse-gas-emissions.

such as MMBtu. Use enthalpy tables to determine the energy content (enthalpy) of water/steam at different temperatures and pressures.

D 1.2.4 Step 4: Identify the Efficiencies of Production of Each Output Stream From the District Energy System

The efficiencies determine the amount of fuel, and therefore the associated emissions, required to generate a unit of energy stream output. The calculations should use plant-specific efficiency factors if available. In absence of plant-specific data, default values can be used. EPA recommends default efficiency values of 0.80 for steam production and 0.35 for electricity production using natural gas or fuel oil, and 3.2 for chilled water production. The use of alternative input fuels, such as wood or solid waste, may result in different efficiencies; plant-specific factors will be needed in those cases. Delivered waste heat, after it leaves the generation source, should be assumed to subsequently have an efficiency of 1.0 at delivery into the district system.

D 1.2.5 Step 5: Allocate Total Emissions to Output Streams

Use the following formulas to allocate across multiple output streams, followed by the formula key. The example provided uses heat energy (steam), electricity, and chilled water, but the formulas can be generalized to any two or more output streams.

To calculate the emissions allocated to heat outputs such as steam or hot water (stream 1), use the following equation. Note that the total emissions (ET) and heat energy content (H) must include both energy generated onsite as well as any imported source, subject to the guidance in Section D. 1.2.2:

$$E_H = E_T * \frac{\frac{H}{e_H}}{\frac{H}{e_H} + \frac{P}{e_P} + \left(\frac{C}{e_C}\right)}$$

To calculate the emissions allocated to output electricity from a cogeneration facility (stream 2), use the following equation:

$$E_P = E_T * \frac{\frac{P}{e_P}}{\frac{H}{e_H} + \frac{P}{e_P} + \left(\frac{C}{e_C}\right)}$$

For trigeneration facilities that also generate chilled water, use the following formula to calculate the emissions attributable to the chilled water (stream 3). For separate generation of chilled water, see section D. 1.3.

$$E_C = E_T * \frac{\frac{C}{e_C}}{\frac{H}{e_H} + \frac{P}{e_P} + \frac{C}{e_C}}$$

Key: E_T = total district energy system greenhouse gas emissions from all energy inputs, including waste heat inputs

E_H = emissions allocated to steam or hot water production, in metric tons CO_2e

E_P = emissions allocated to electricity generation, in metric tons CO_2e

E_C = emissions allocated to chilled water production, in metric tons CO_2e, if applicable

H = energy content of steam or hot water outputs in MMBtu

P = delivered electricity generation in MMBtu

C = chilled water output in MMBtu, if applicable

e_H = assumed efficiency of the steam/hot water production

e_P = assumed efficiency of electricity generation

e_C = assumed efficiency of chilled water production, if applicable

D 1.2.5 Step 6: Calculate Emission Factors for Each Output Stream

Divide the total emissions from each output stream by the total quantity of that output stream. To the extent possible, divide by the total energy sales or total energy delivered to customers, as opposed to total output at the central plant. This approach is appropriate for building-level emission factors, and effectively assigns a pro-rata share of system-level transport and thermal losses to the buildings.

D 1.2.6 Further Guidance on the Use of the Efficiency Method

For further guidance on the use of the efficiency method, consult:

- Gillenwater, M., Woodfield, M., Simmons, T., McCormick, M., Camobreco, V., Hockstad, L. and Upton, B. 2006. “Calculation tool for direct emissions from stationary combustion: Allocation of GHG Emissions from a Combined Heat and Power (CHP) Plant.” *World Resources Institute*. https://ghgprotocol.org/sites/default/files/CHP_guidance_v1.0.pdf
- Eash-Gates, P. 2022. “Allocation of Emissions from District Energy Systems with Multiple Outputs - Building Performance Standards.” *Synapse Energy Economics.* https://www.synapse-energy.com/emissionsfactors

D 1.3 Calculation of Emissions for Chilled Water

When chilled water is generated from electricity in a building, it is exempt from the emissions standards of Maryland’s BEPS (though not from the EUI targets). However, especially in a district energy context, chilled water is not always purely generated from electricity, and may also have emissions associated with it:

- Chilled water loops that are powered by grid electricity can be treated as having no net direct emissions.
- Chilled water loops that use trigeneration should have an emissions factor based on the application of the efficiency method for that output, as laid out in Section D. 1.2.

- Chilled water loops that use gas-fired absorption chillers or gas-fired engine-driven chillers should have an emissions factor that accounts for the amount of gas burned in the chillers. If this data is not available, the EPA factors may be used, with absorption chillers having an emissions intensity of 73.89 kg/MBtu, and engine-driven chillers having an emissions intensity of 49.31 kg/MBtu.

D. 2 Campus-Level Compliance

The owner of a campus may choose to meet the net direct emissions standard, as specified in the regulation, at the campus level instead of the individual building level when two or more covered buildings are:

1. Connected to a district energy system;
2. Served by the same electric or gas meter; or
3. Served by the same heating or cooling system(s), which is not a district energy system.

The following buildings shall be excluded from campus-level calculations:

1. a building designated as a historic property under federal, state, or local law;
2. a public or nonpublic elementary or secondary school building;
3. a manufacturing building;
4. an agricultural building; or
5. a building owned by the Federal government.

If the owner of a campus chooses to meet the standards at the campus level as opposed to the individual building level, then the owner must notify the Department by completing the “Campus-Level Compliance Pathway Selection Form” and include a list and map of buildings. Completing this form will initiate a process to identify the covered buildings on the campus and develop campus-level BEPS standards. See Section D. 2.3 for more information.

Multifamily housing campuses and hospital campuses (as well as some hotel and senior living properties with multiple buildings) are customarily benchmarked in ENERGY STAR Portfolio Manager as single “properties,” where the property is already assumed to represent a campus by default. If such properties are not listed on the covered building list as a single property already, then the owner may submit a form requesting to benchmark and report as a campus. If the covered building list already lists them as single properties, then the form is not needed.

D. 2.1 Required Data: What Data Should be Included in a Campus-level Benchmarking Report?

If an owner chooses to report and comply at the campus level instead of at the individual building level, then the following data should be reported:

1. energy consumption and fuel use for all buildings;
2. energy consumption and fuel use for all stationary equipment including all central plants and district energy plants, even if those plants are combined heat and power facilities.

Campus-level reporting does not include energy consumption and fuel use from activities/sources that are excluded from the benchmarking report requirements in Chapter 2 of the regulation. See more in Section A. 2.1.4. These activities/sources are:

1. Food service facilities;
2. Electric vehicle charging;
3. Other electricity uses excluded by the benchmarking tool; and
4. Emissions from required combustion equipment if federal or state regulation requires a covered building to use a backup generator or other equipment that must run on combustible fuels.

By June 1 of each year, the owner of a campus must report changes to building footprint, usage, and occupancy. Reporting this information should be done through the “Changes to Campus Buildings Reporting Form.” Within the form, list each new building, change of building footprint, or change in the usage of a building and upload the permits that were issued for the changes. Changes to occupancy should be reported and the certificate of occupancy should be uploaded to the same “Changes to Campus Buildings Reporting Form.”

D. 2.1.1 Buildings on a Campus That Are Not Owned by the Principal Campus Owner

Buildings that are not owned by the principal campus owner can report and comply with the building energy performance standard as an individual building instead of being aggregated into the campus-level report. The principal owner of the campus should indicate this occurrence when submitting the “Campus-Level Compliance Pathway Selection Form.”

The Department may direct that:

1. Buildings located within a campus that are not owned by the principal owner of the campus may be excluded from campus-level calculations.
2. If such a building is a covered building, then the owner of such covered building must comply with this regulation.
3. If the owner of such a covered building located on a campus and the principal campus owner agree to include such building in campus-level compliance, then the owners may submit a written request to the Department to approve that arrangement.

D. 2.2 Reporting Data as a Campus

Campuses have the same reporting and compliance deadlines as described above. Benchmarking data must be input and verified into ENERGY STAR Portfolio Manager by June 1st every year. The report should have all data from the previous calendar year (January 1-December 31).

Campus owners will still report data through ENERGY STAR Portfolio Manager. Refer to the EPA's guidance on using ENERGY STAR to benchmark a campus.[22]

See Section A. 3.1.1 for information on how to set up automatic annual data exchange with the Department via ENERGY STAR Portfolio Manager's Web Services functionality.

D. 2.3 Performance Standards for Campus-Level Compliance

The Department shall, in consultation with the principal owner of a campus, determine whether the affected buildings will be included in campus-level compliance following the rules established in the regulation and whether and how to adjust the campus' interim and final performance standards. To initiate this process, the campus owner must first submit the "Campus-Level Compliance Pathway Selection Form" and the "Changes to Campus Buildings Reporting Form."

The process to determine the final and interim performance standards is the same for campus-level compliance as it is for individual buildings. Refer to B. 2 Determining Interim and Final Standards for detailed instructions.

D. 2.3.1 Additional Forms Required for Campus-Level Compliance

1. Campus-Level Compliance Pathway Selection Form
    a. Including a list and map of buildings
2. Changes to Campus Buildings Reporting Form
    a. Including a list and map of buildings
    b. Including permits for new buildings, changes in footprint to existing buildings, and changes of building usage
    c. Including certificates of occupancy

22 https://www.energystar.gov/sites/default/files/tools/How%20to%20Benchmark%20a%20Campus%20in%20Portfolio%20Manager_May%202022_Final_508.pdf.