



SAHF Carbon Roadmap User Guide

Version 1.0, July 27, 2023

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Stewards of Affordable Housing for the Future

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Disclaimer for the SAHF Carbon Roadmap

This Multifamily Portfolio Carbon Emissions Roadmap (the “Carbon Roadmap”) and any reports generated therefrom is being provided to you free of charge to conduct portfolio-level scenario planning for achieving a time-bound measurable carbon emissions reduction goal. The Roadmap, where possible, aligns with the GHG Protocol Corporate Accounting and Reporting Standard (the “Standard”), established by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). However, the Roadmap is not designed to provide or replace GHG Protocol Compliant Emissions Disclosure Reports and cannot be used to confirm that the scenarios produced through the Roadmap will fully comply with the Standard. The Roadmap is meant to provide high level information at a portfolio-level and does not provide property level specific planning detail.

By continuing to access the Roadmap you acknowledge and understand that the Roadmap and its reports are for informational purposes only. Use of the Roadmap is at your risk. We make no claims, promises, representations, assurances or guarantees about the accuracy, completeness or adequacy of this Roadmap or its reports.

Further, you understand and acknowledge that by using the Roadmap, you have not engaged Stewards of Affordable Housing for the Future (SAHF), Bright Power, VEIC or its respective employees as consultants or technical assistance providers to your organization.

Before taking any action based on the Roadmap, you are strongly encouraged to consult with a competent, licensed professional, including but not limited to engineers and architects, for a formal evaluation of your particular needs as the Roadmap is not a substitute for professional advice nor is it tailored specifically to the facts and circumstances of your portfolio.

Acknowledgements

SAHF would like to thank the Wells Fargo Foundation for their generous support in the development of the Roadmap, Calculator, and accompanying resources.

About SAHF

Stewards of Affordable Housing for the Future (SAHF) is a nonprofit collaborative of 12 multi-state nonprofit affordable housing providers who own more than 145,000 affordable rental homes. SAHF’s mission is to advance the creation and preservation of healthy, sustainable affordable rental homes that foster equity, opportunity, and wellness for people of limited economic resources.

SAHF developed the Carbon Roadmap in partnership with Bright Power and VEIC.

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Overview

The Multifamily Portfolio Carbon Emissions Roadmap Tool ("the Carbon Roadmap") is a tool designed for the multifamily sector. It allows national multifamily portfolio owners to use the results from the SAHF Multifamily Portfolio Carbon Emissions Calculator ("the Calculator"), to set portfolio targets for decarbonization, like the DOE Better Climate Challenge, and then develop a list of prioritized portfolio segments and decarbonization strategies to accomplish a goal by a target date. The Roadmap's results are intended for strategic, high-level planning purposes only. These results can be used as a guide for property-level planning, but it is recommended to work with experts to develop a full scope of work for individual properties.

The Carbon Roadmap calculates Scope 1 and Scope 2 emissions of individual properties in larger portfolios and then provides overall carbon emissions results for the current year. After applying different types of decarbonization strategies to different segments, the Roadmap then provides carbon emissions (in absolute emissions and emissions intensity) and energy savings results based on the selected target year. For Scope 2 emissions from purchased grid electricity, the tool uses historic information from the EPA eGRID database and future projections from the National Renewable Energy Lab (NREL) Cambium tool.

The Roadmap is designed to be used most effectively for portfolio owners that have used the Calculator. However, if users have all data fields required in **2. Property Data - IMPORT**, it can be completed through manual entry.

This tool is designed to be used exclusively for multifamily buildings and is not recommended for other commercial or residential portfolios.

Getting Started

The SAHF Roadmap can be located on our website, and it is recommended to download the most recent version for best results. This Getting Started section along with instructions in the Roadmap can serve as a guide to navigate the steps to completing a portfolio decarbonization plan. If additional information is needed, please refer to Detailed Tab Descriptions or reach out to SAHF directly.

The Roadmap contains macros, a series of commands used to automate a repeated task. In order to enable macros, please follow the appropriate steps on [this Microsoft Support webpage](#).

Once you have downloaded the most recent version and enabled macros, there are the six steps required to complete the SAHF Carbon Roadmap. Additional information can be found under the Detailed Tabs Descriptions of this document.

Step 0

Recommended: Gather the most current annual energy usage for all properties in the portfolio and import information into the SAHF Carbon Calculator. The Carbon Calculator will allow the user to ensure that all property level data is accurate and is within the typical ranges expected for multifamily buildings.

Step 1

Enter the most current property level information into the **2. Property Data - IMPORT** tab. Recommended: Click on the Import SAHF Carbon Calculator button and select the appropriate Calculator file. Alternative: copy and paste required information directly into the tab.

Step 2

Enter high-level portfolio information and set carbon emissions and energy efficiency targets in **3. Baseline & Target** tab. Set the target date. Note: The default targets populated in the Carbon Roadmap are the targets set by the Department of Energy's Better Climate Challenge.

Step 3

Group properties according to desired grouping criteria in **4a. Portfolio Segmentation** tab. Groups should include approximately 3-10 properties or 10-30% of the full portfolio. There are two options for grouping properties. Users can select one grouping or multiple groupings. Recommended: If your portfolio will be acquiring or disposing of properties after the Current Year but prior to the Target Year, see Column K to include this information in the appropriate portfolio segment.

- **Option 1:** Assign segments according to available grouping categories. These categories are geographical or attributes of buildings, such as fuels used in the building.
- **Option 2:** Create and assign custom groupings in the **2. Property Data - IMPORT** tab, columns X-Z. Custom grouping examples include resident population (e.g. family housing, senior housing), financial information (likely to refinance and renovate before target year), etc.

Step 4

Use the Existing Properties Work Plan in the 4b. Roadmap tab to assign decarbonization strategies to portfolio segments and see their effect on portfolio-level emissions.

Decarbonization strategies are categorized into three types:

- **Energy Efficiency:** Select from light energy retrofits, moderate energy retrofits and deep energy retrofits and apply to portfolio segments. Adjust retrofit energy savings by selecting low, medium or high. This will increase or decrease the energy savings associated with the energy retrofit.
- **Electrification:** Select from hybrid heat pump domestic hot water (DHW), heat pump DHW, hybrid heat pump space heating and heat pump space heating.
- **Renewables:** Select from on-site solar and offsite emissions reductions (RECs, solar). Additional information, such as percentage of renewable energy certificates (RECs) maintained will be required.

Step 5

Use the New Construction Work Plan in the 4b. Roadmap tab to account for new construction that is not yet complete but will be completed prior to the target date. Users can apply renewables to any or all of the new construction portfolio segment but cannot apply any additional decarbonization strategies.

Step 6

Track high-level overall progress towards in the 4b. Roadmap tab. Track, review and share overall and more detailed progress in the 5. Data Visualization tab, which includes detailed information on the impacts of decarbonization strategies on portfolio segments for both carbon emissions and energy. Also, users can view the impact of decarbonization strategies on current and future market energy prices.

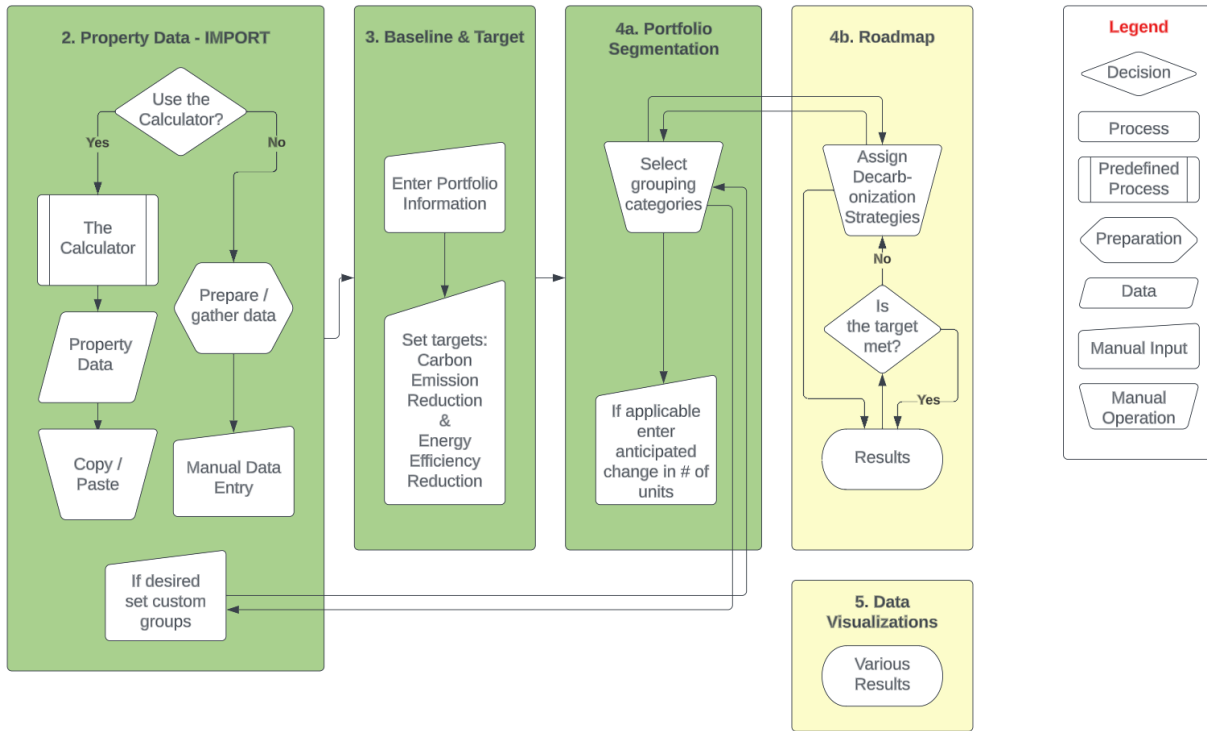


Figure 1: Visual Work Flow of SAHF Carbon Roadmap

Detailed Tab Descriptions

Users can find additional detailed information, including but not limited to detailed instructions, methodology documentation and examples, for each of the Roadmap tabs on the following pages.

2. Property Data - IMPORT

The Roadmap requires property-level data that can be found in ENERGY STAR Portfolio Manager or any other typical energy benchmarking database. This tab is set up for you, as a user, to easily provide the necessary and recommended information to develop your roadmap better and ensure it is based upon your most recently available data. The table in this tab is divided into three sections:

- Blue columns: Required property-level inputs
- Yellow columns: Optional custom inputs
- Green columns: Calculated and editable data

Blue columns: Property-level inputs

Below are detailed steps for importing data into the Roadmap:

1. For this tab, you will provide required information for properties that have at least one year's worth of actual, whole property energy use data. We recommend that all data is from the same year. However, if different property energy use data are from different years, the Roadmap will use the average year to calculate carbon emissions.
2. If you do not have a full year's energy usage for all properties in the portfolio, use the Calculator to apply an assumed baseline, which considers multiple characteristics of the building and location.
3. After you utilize the Calculator to complete your annual portfolio baseline, you can click on the "Click Here to Import SAHF Calculator" button at the top of the tab to select the appropriate Calculator file and automatically import necessary property-level data. To use this import tool, you must have macros enabled. **NOTE: When you click this button, it will remove and replace any data you have already entered into the Roadmap.**
4. If you choose not to utilize the Calculator, you can manually import data from ENERGY STAR Portfolio Manager. The titles of Columns A – V align with data points available in ENERGY STAR Portfolio Manager.
5. The Roadmap then highlights any cells where properties are missing required information. Enter appropriate data into any highlighted cells.

Yellow columns: Custom Group Designation

The Roadmap will automatically allow you to segment your portfolio into groups by a variety of build features and by geography. However, there may be other data points you would like to include for segmenting your portfolio into groups. The Roadmap has provided three separate columns for you to provide these data points. Some examples of potential data points could include, but are not limited to:

- Differentiating properties by age of building or date of the last renovation.
- For financed properties, differentiating between those that will be refinanced prior to the target year and those that will not.
- Categorizing properties by the resident population types.
- If pursuing solar strategies, differentiating between properties that are in dense urban areas with limited roof space and those with more dispersed low-rise buildings on the property.
- Differentiating between properties that will have to meet a building performance standard and those that currently do not.

For portfolios located in one state or locality, these additional custom data points will likely be necessary to complete the portfolio segmentation.

Green columns: Calculated and editable data

The Roadmap will automatically calculate all data points in columns AB – AD based on data provided in the blue columns. We recommend that you review these green columns to ensure that they are correct. If they are not, you can modify them. All columns feature a drop-down menu that allows you to select an alternate choice.

3. Baseline & Target

The Roadmap requires you to identify targets for decarbonization. You will need to identify the portfolio-wide goal for carbon emissions and energy usage reduction; you will also need to provide a target date by which you aim to hit those targets. The Roadmap is designed to support the DOE Better Climate Challenge, and the default targets mirror those set by that voluntary program, i.e. 50% carbon emissions reduction, 20% energy reduction within 10 years of joining the Better Climate Challenge.

If your goals are different than the DOE Better Climate Challenge, you can modify them to align. The Roadmap does not limit the target year; however, it is recommended to set a target less than 15 years from the date that you are completing the Roadmap. The Roadmap utilizes projected carbon emission rates for electricity grids from the National Renewable Energy Laboratory (NREL) Cambium data, and like any data projections, the further into the future, the more likely that there is decreasing probability and confidence in the carbon emissions rates.

Portfolio Baseline

The Roadmap recognizes that your most current year of data may be different than your baseline year for your target setting. For instance, the DOE Better Climate Challenge allows partners to select a baseline year up to five years before the join date. Therefore, the Roadmap provides a place on the **Baseline & Target** tab to provide high-level information on your portfolio. This information can be found in the SAHF Calculator and is typical data required for any reporting.

By providing both your most current year's worth of data and your baseline year's data, the Roadmap will be able to account for any carbon emissions and energy savings already achieved between these two dates, decreasing the target appropriately.

Note: The Baseline & Target tab will alert you if your current portfolio year and your baseline portfolio year have total square footage values that are greater than +/- 5%. The DOE Better Climate Challenge and the GHG Protocol Corporate Accounting and Reporting Standard required that if +/- 5% is exceeded, the baseline year must be recalculated. The Roadmap does not require this baseline adjustment and allows users to continue to use the Roadmap and calculate results.

4a. Portfolio Segmentation

The Roadmap Portfolio Segmentation tab allows the user to select categories that create groups smaller than the full portfolio, but larger than individual properties. As each user's portfolio will look different, the Roadmap allows the user a variety of different ways to create segments. For those who have geographically diverse portfolios, it may be appropriate to segment by location. For others, it may be appropriate to segment by building features, or even by custom features (for more information and examples on custom grouping, [read more here](#)).

Prior to selecting the categories for segmentation, it may be helpful to click the Portfolio View button, where you can see graphs that share your current portfolio data.

Portfolio Segmentation Details

The Roadmap allows users to select any combination of grouping options listed below. Users must select at least one of the following, but can select more as necessary:

- Custom Groups 1, 2, and 3: based on data included in 2. Property Data – IMPORT.
- Climate Region: based on Bright Power's EnergyScoreCards map, which is included in Portfolio View
- State
- Heating Fuel
- Hot Water Fuel
- All-Electric
- Has Solar

The Roadmap is defaulted to have Climate Region, All-Electric, and Has Solar all checked, but these can be unchecked as needed.

It is recommended that groups include approximately 3-10 properties or 10-30% of total housing units in the portfolio. As the Roadmap is for strategic scenario planning and is not a property-level tool, it is important to create segments greater than 1-2 properties.

Acquisitions and Dispossessions

The Roadmap allows you to include any anticipated acquisitions or dispossessions of existing properties (i.e., properties that are constructed prior to the current year used in the Roadmap, but not included within the data). Column K allows you to account for upcoming changes to the portfolio by housing units. Example, if you are anticipating acquiring a property in the Southeast with 100 housing units, you would put 100 in Column K for the Southeast portfolio segment. These units will then be included in portfolio emissions and also can have decarbonization strategies applied to them. To note, for all acquired or disposed housing units, the Roadmap assumes that the typical characteristics of these units, like square footage and heating fuel, will mirror the existing portfolio segment's typical characteristics.

Do not include any anticipated new construction in this column. For information on where to include new construction properties, please [read more here](#).

Group Information Graphs

The Roadmap provides visual aids to help you better understand key information about the portfolio segments. The Roadmap displays graphs in the categories listed below for each portfolio segment:

- Heating Fuel
- Hot Water Fuel
- Policy Category: State-level policy level (low, medium, high) is determined by the State Policy Score. An explainer of these scores can be found in the Appendices. [Read more here](#).

Each graph will provide a breakdown of the properties within that portfolio segment that can be used as a guide for selecting the appropriate decarbonization strategy. As an example, if majority of a portfolio segment uses fossil fuels for heating and hot water, you as a user will then know that electrification of this portfolio segment would reduce carbon emissions more than a portfolio segment that uses electricity for heating and hot water.

4b. Roadmap

The Roadmap tab is designed to consolidate information provided across the previous tabs and give the user a tool to test out different decarbonization strategies for different portfolio segments. The user is provided with real-time feedback on how these strategies are impacting the progress towards the carbon emissions and energy savings targets. The tab is divided into three different sections:

1. Results Tracker
2. Existing Buildings Work Plan
3. New Construction Work Plan

Results Tracker

The Roadmap Results Tracker allows for dynamic, real-time feedback to understand how selected decarbonization strategies are impacting progress towards targets. The total progress towards the target represents all actual savings achieved between the baseline year and the current year. It then projects carbon emissions and energy savings for all proposed decarbonization strategies, and it also includes carbon emissions savings that are projected to occur to the electric grid.

For electric grid projections, the Roadmap utilizes future projections from the National Renewable Energy Lab (NREL) Cambium tool. It is important to note that the Cambium tool does not provide future carbon emissions projections for the noncontiguous areas of the United States. The Roadmap provides estimates based on current emissions rates, but this tool may not be appropriate for portfolios mostly or exclusively located outside the contiguous United States.

The Results Tracker provides information on two types of measurement: absolute carbon emissions and energy reductions, and carbon intensity (carbon emissions (CO₂e) per square foot) and energy intensity reductions (energy (kBtu) per square foot). To note: in some cases, targets may be achieved for one measurement, but not the other, due to other changes in the portfolio, like acquisitions, dispossessions, and new construction. Currently, the DOE Better Climate Challenge allows for targets to be set using either measurement choice.

Existing Building Work Plan

This section of the Roadmap is where the user will assign decarbonization strategies to portfolio segments and see their effect on emissions. Decarbonization strategies are categorized into three types: energy efficiency, electrification, and renewable energy. For more information about the assumptions for carbon emissions and energy savings, see Appendix 1. To apply decarbonization strategies to your portfolio, complete the following steps in the Existing Building Work Plan:

1. Select the appropriate decarbonization strategy in Column B: Decarbonization Strategy.

2. Adjust the strategy savings adjustment to low, medium, or high in Column C: Strategy Savings Adjustment. This slightly modifies the energy savings associated with the strategy. The default is medium. Note: not applicable to renewable energy strategies.
3. Select the portfolio segment in Column D: Portfolio Segment.
4. Enter the percentage of the portfolio segment to which you would like to apply the strategy in Column E: % of Segment. Columns F & G will provide information to help you understand the number of properties and units impacted.
5. If the decarbonization strategy is on-site solar, provide the percentage of RECs retained.
6. If the decarbonization strategy is off-site emissions reductions, provide the carbon emissions rate of the renewable energy or cleaner electricity purchased and the percentage of RECs retained. If you are unsure of the carbon emissions rate to enter, leave this field blank.
7. (Optional) Include the implementation year and any potential incentives for the decarbonization strategies.

New Construction Work Plan

This section of the Roadmap allows new construction to be added to the portfolio that will be constructed after the current year, but prior to the target year. As new construction is likely to be more efficient than the existing buildings in the portfolio, it is accounted for separately in the Roadmap. To include new construction in the Roadmap, complete the following steps in the New Construction Work Plan:

1. Select the energy code that is most prevalent where new construction is occurring in the portfolio. To determine the appropriate energy code, navigate to [the DOE Building Energy Codes Program maps](#) that provides up-to-date information on state energy code adoptions.
2. Estimate the number of new housing units that will be constructed between the current year and target year.
3. Estimate the typical square footage of new housing units in the portfolio. The Roadmap provides the average unit size of the existing portfolio for reference.
4. assign percentages of the expected new units to the six categories provided. There are three levels of energy savings, and then each level has an option to include solar as an additional decarbonization strategy:
 - a. Baseline code.
 - b. 15% better than code, which aligns with the ENERGY STAR program.
 - c. 50% better than code, which aligns with Passive House, Phius, DOE Zero Energy Ready Home and other advanced energy efficiency programs.
5. For each category with a percentage of new units, select whether the units will be all electric or if they will use fossil fuels.

6. For housing units with solar, provide the percentage by which total electricity usage will be provided by renewable energy generation. For reference, typical community solar programs provide ranges between 10-20%.

To note, new construction will increase the absolute carbon emissions and energy usage of the portfolio; however, it is highly likely to decrease the carbon emissions intensity and energy intensity of the portfolio.

5. Roadmap Results

The Roadmap Results tab is designed to provide information that can be used for reporting, presentations and discussions. The layout of this tab is formatted to be printed or exported as a PDF. There are four ways to review the Roadmap results:

1. Overall change
2. Change by geography
3. Change by custom groupings
4. Change by decarbonization strategies implemented

When viewing each of the four results listed above, you can select to view:

- Absolute carbon emissions (GHG Emissions)
- Carbon emission intensity
- Total energy consumption

The last result is Future Energy Prices. In this section, results can be viewed based on EIA projections of energy costs, or a scenario where fossil fuel energy costs increase more dramatically.

Appendix 1: Decarbonization Strategy Details

The table below provides descriptions of each decarbonization strategy and the level of carbon and energy savings to expect when applied:

Decarbonization Strategy	Strategy Savings Adjustment	Energy Savings	Description
Light efficiency retrofits	low	5%	Overall energy decrease for all energy usage types
	med	8%	
	high	10%	
Moderate efficiency retrofits	low	10%	
	med	15%	
	high	20%	
Deep efficiency retrofits	low	25%	
	med	38%	
	high	50%	
Hybrid heat pump DHW	low	Varies based on fuels currently used onsite	If properties within selected portfolio segment use fossil fuels, 85% of domestic hot water usage is switched to electricity use and all fuels decrease to account for energy savings. For properties with electric domestic hot water, minor decrease in electricity usage to account for energy savings.
	med		
	high		
Hybrid heat pump space heating	low	Varies based on fuels currently used onsite	If properties within selected portfolio segment use fossil fuels, 85% of space heating usage is switched to electricity use and all fuels decrease to account for energy savings. For properties with electric space heating, minor decrease in electricity usage to account for energy savings.
	med		
	high		
Heat pump DHW	low	Varies based on fuels	If properties within selected portfolio segment use fossil fuels, 100% of domestic hot water usage is switched to electricity use and electricity usage decreases to account for
	med		

	high	currently used onsite	energy savings. For properties with electric domestic hot water, minor decrease in electricity usage to account for energy savings.
Heat pump space heating	low	Varies based on fuels currently used onsite	If properties within selected portfolio segment use fossil fuels, 100% of space heating usage is switched to electricity use and electricity usage decreases to account for energy savings. For properties with electric space heating, minor to moderate decrease in electricity usage to account for energy savings.
	med		
	high		
On-site solar	N/A	0	Carbon emissions reductions only
Offsite emissions reductions (RECs, solar)	N/A	0	Carbon emissions reductions only

Appendix 2: State Policy Score Explainer

Part 1: Composite Policy Score

Introduction

The Carbon Roadmap tool assigns properties a composite policy score of low, medium, or high based on the policy environment of the state where it is located. The score for each property is listed in the Property Data sheet and is a composite of several factors. In the Portfolio Segmentation sheet, the tool provides a breakdown of what share of the properties fall in different policy score categories for the overall portfolio and for each segment defined on that sheet. On the Roadmap sheet, the policy score does not directly affect any of the calculations performed but can inform user inputs such as the share of a group to which a particular strategy applies. (E.g., if properties are grouped by region, and 33% of the properties in that region are located in states with a 'high' policy score, a user might decide that it is appropriate to apply the strategy 'deep efficiency retrofits' to 33% of that region.)

The score is intended as guidance as to where you are likely to encounter policy environments more conducive to decarbonizing affordable housing. The policy environment is one among many factors to take into consideration when prioritizing decarbonization strategies and is not meant to imply that states with a high policy score are the only places where decarbonization measures are possible or recommended.

What policy factors are analyzed in the policy score?

The composite policy score factors in the follow policy elements:

- Level of state support for healthy, affordable, decarbonized housing (incorporates utility, weatherization and bill assistance, affordable housing, and healthy homes and communities policies as well as cross-agency coordination and statewide standards). Source: [ACEEE 2022 Pathways to Healthy, Affordable, Decarbonized Housing: A State Scorecard](#)
- Utility policies (e.g., presence of low-income programs, electricity program spending and savings). Source: [ACEEE 2020 State Energy Efficiency Scorecard](#)
- Building policies (e.g., benchmarking requirements, existing building standards, zero-energy buildings). Source: [ACEEE 2020 State Energy Efficiency Scorecard](#)
- Government-led initiatives (e.g., financial incentives, carbon pricing policies). Source: [ACEEE 2020 State Energy Efficiency Scorecard](#)
- State policies (e.g., GHG emissions targets, climate action plans). Source: [Center for Climate and Energy Solutions State Policy Maps](#) (Accessed August 2022)
- Distributed solar (e.g., community solar score, distributed solar watts per person). Source: Institute for Local Self-Reliance [2021 State\(s\) of Distributed Solar](#) report and [Community Power Map](#)

How were these factors developed into a low, medium, or high ranking?

The sources listed above provide numeric scores for U.S. states and the District of Columbia or provide information that the team was able to convert to a numeric score. The policy score used in the Carbon Roadmap is a composite of these metrics, weighted for their relevance to decarbonizing multifamily affordable housing. This resulted in a unique numeric value for each state. To distribute the states into low, medium, or high rankings, the range of scores was divided into three equal buckets, with states assigned a category based on the range with which their score aligned.

Won't state policy environments change over time?

Yes! We expect that state-level policy environments will change, and hopefully improve, over time. However, to assess the extent to which the *relative* policy environments change over time, we reviewed the ACEEE State Energy Scorecard rankings from 2010-2020 and found that although overall scores do change, states' position in the rankings has shown modest change across years.

Part 2: Detail on Components of the Composite Score

Introduction

While the composite policy score listed in the Carbon Roadmap tool is helpful for identifying which states will be most conducive to decarbonization efforts overall, you may wish to consider states' rankings for certain subcomponents of the policy score when selecting portions of the housing portfolio most favorable for certain decarbonization strategies. For example, a state's ranking for Distributed Solar may be more relevant than its composite ranking when deciding the share of the housing portfolio where on-site solar will be a promising strategy. The additional state rankings provided on the follow page are offered as a reference when developing roadmap strategies. Please note that the composite score was developed by weighting the raw scores for the different components, and so may not reflect a straight averaging of the scores for those components.

Utility Costs

An additional factor that may be relevant to prioritizing decarbonization strategies across a portfolio is the relative costs of electricity and fossil fuel alternatives. This ratio is difficult to assess with precision due to variations at a given time by utility territory and rate class as well fluctuations over time. It is also complicated to assess due to the fact that property level utility costs reflect both energy prices and equipment efficiencies. Despite these limitations, guidance based on typical costs and equipment efficiencies may be useful in setting strategies. An available resource comes from the Advanced Building Construction Collaborative's July 2021 report, *Market Opportunities and Challenges for Decarbonizing US Buildings: An Assessment of Possibilities and Barriers for Transforming the National Buildings Sector with*

Advanced Building Construction, available here: https://advancedbuildingconstruction.org/wp-content/uploads/2022/02/decarbonizing_us_buildings.pdf. Please refer to the 'energy costs' column in Exhibit 3.2.2.3, *States versus Complete Metric Rankings*. This metric reflects a combination of retail prices for energy and gas and their ratio with certain assumptions about gas versus electric heating efficiencies.

	Composite	Healthy, Affordable, Decarbonized	Utility Policies	Building Policies	Government- led Initiatives	State Policies	Distributed Solar
Alabama	Low	Low	Low	Low	Med	Low	Low
Alaska	Low	Med	Med	Low	High	Low	Low
Arizona	Med	Med	Med	Low	Low	Med	Low
Arkansas	Low	Low	Med	Low	Med	Med	Low
California	High	High	High	Med	High	High	High
Colorado	Med	Med	Med	Low	High	High	Med
Connecticut	High	High	High	Low	High	High	Med
Delaware	Med	Med	Med	Low	High	High	Low
District of Columbia	High	High	High	High	Med	High	Med
Florida	Low	Med	Low	Low	High	Med	Low
Georgia	Low	Low	Low	Low	Low	Low	Low
Hawaii	High	Med	High	Med	Low	High	High
Idaho	Low	Med	Med	Low	Med	Low	Low
Illinois	Med	High	High	Low	Med	Med	Med
Indiana	Low	Med	Med	Low	Low	Low	Low
Iowa	Low	Med	Med	Low	Low	Med	Low
Kansas	Low	Med	Low	Low	Low	Low	Low
Kentucky	Low	Low	Low	Low	High	Med	Low
Louisiana	Low	Low	Low	Low	Low	High	Low
Maine	High	Med	High	Med	High	High	Med
Maryland	High	High	High	Low	High	High	Med
Massachusetts	High	High	High	Low	High	High	High
Michigan	Med	Med	High	Low	High	High	Low
Minnesota	High	High	High	Low	High	High	Med
Mississippi	Low	Low	Low	Low	Med	Low	Low
Missouri	Low	Med	Med	Low	High	Low	Low
Montana	Med	Med	Med	Low	Med	High	Low
Nebraska	Low	Low	Low	Low	Med	Low	Low
Nevada	High	Med	Med	Low	High	High	Med
New Hampshire	Med	Med	High	Low	High	Med	Med

New Jersey	High	Med	Med	Low	Low	High	Med
New Mexico	Med	Med	Med	Low	Med	High	Low
New York	High	High	High	Low	High	High	High
North Carolina	Med	Med	Med	Low	Med	High	Low
North Dakota	Low	Low	Low	Low	Low	Low	Low
Ohio	Low	Med	Med	Low	High	Low	Low
Oklahoma	Low	Low	Med	Low	Low	Low	Low
Oregon	High	High	High	Low	High	High	Med
Pennsylvania	Med	High	Med	Low	High	High	Low
Rhode Island	High	High	High	Low	High	High	High
South Carolina	Low	Low	Med	Low	High	Med	Low
South Dakota	Low	Low	Low	Low	Low	Low	Low
Tennessee	Low	Low	Low	Low	High	Low	Low
Texas	Low	Med	Med	Low	Med	Low	Low
Utah	Low	Low	Med	Low	Med	Low	Low
Vermont	High	High	High	Low	High	High	Med
Virginia	Med	Med	Med	Low	High	High	Low
Washington	High	High	Med	Med	High	High	Low
West Virginia	Low	Low	Low	Low	Med	Low	Low
Wisconsin	Med	Med	Med	Low	Med	High	Low
Wyoming	Low	Low	Low	Low	Med	Low	Low