Underwriting Standards for Low-Carbon Housing

FUTURE HOUSING INITIATIVE

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BRIGHT POWER + be ex building energy exchange

Underwriting Standards
for Low-Carbon Housing

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Executive Summary

This Guidebook captures key insights and recommendations from the "Future Housing Initiative: Underwriting Standards for Low-Carbon Housing" project, supported by NYSERDA. Over the course of this project, Bright Power compiled a database of measured energy performance data from 30 recently built, low-carbon, multifamily properties in the Northeast and developed new utility cost benchmarks based on this dataset that can be used for underwriting such properties. These results demonstrate the viability and importance of using real building data to inform underwriting and financing decisions, as traditional underwriting practices often lack accurate data from high-performance buildings. It is important to note, however, that the data set is still small and must continue to expand over time.

Through this project, Bright Power engaged with NY State Lenders and Housing Agencies to develop tailored Action Plans to improve underwriting practices for low-carbon multifamily properties. These engagements included workshops to identify the necessary steps and key stakeholders to institutionalize changes to underwriting practices at each organization.

Based on this experience, the Future Housing team distilled a "New Business as Usual" approach to underwriting low-carbon, multifamily properties—a process that includes four steps:

1. Determine the specific building typology using a set of simple questions
2. Select the utility expense level based on real energy performance data of buildings matching the building typology
3. Determine loan size based on all expenses and income, with utilities based on updated M&O standards and data sets
4. Review performance data against new and low-carbon property comps

The Guidebook also presents the Future Housing utility cost benchmarks for NY State for 2024, comparing them against the current NYC HDC M&O standard for Passive House buildings, the New York State 2023 CPC M&O standards, and a larger peer building set from the Bright Power's EnergyScoreCards database. This comparison revealed several key findings:

The Future Housing low-carbon cost benchmarks show lower electric cooling, gas heat, gas water heating, and common area electricity costs when compared to the HDC M&O standards.

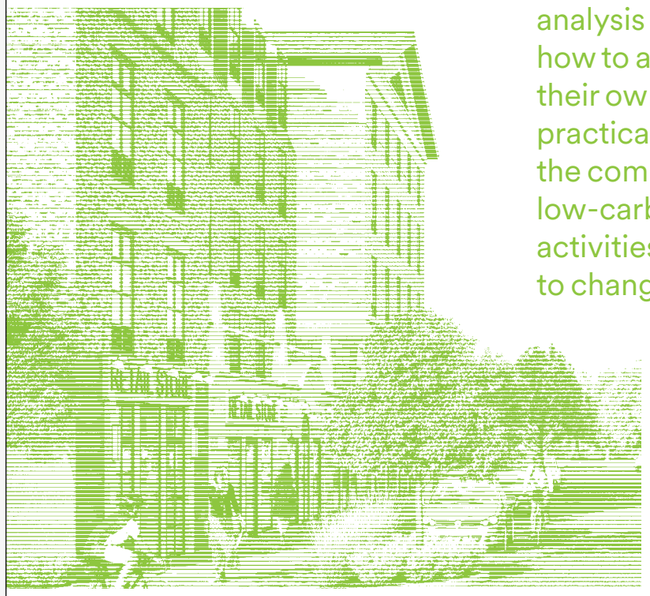
Future Housing cost benchmarks for electric heating are somewhat higher than those based on modeled data in the 2024 HDC M&O Standard for Passive House projects.

Future Housing includes benchmarks for a wider range of energy use components than existing M&O standards, allowing for accurate underwriting for a more diverse set of building types.

Improving underwriting for low-carbon multifamily properties requires not just better data, but changing organizational practices. While there is no universal recipe for this change, the Guidebook shares practical steps identified by NY State Lenders and Agencies to make progress towards the "New Business As Usual." Specifically, considering the characteristics of low-carbon multifamily properties in underwriting, incorporating actual data sources, such as Future Housing, and institutionalizing these new practices can all support more fluid and accurate underwriting for high-performance, low-carbon buildings. The Toolkit used to guide these engagements is included in this Guidebook and may be used by other organizations pursuing process changes related to underwriting low-carbon buildings.

Using this Guidebook

The purpose of this Guidebook is to disseminate key findings from the NYSERDA-supported "Future Housing Initiative: Underwriting Standards for Low-Carbon Housing project." This includes sharing analysis of data from 30 recently built, low-carbon multifamily properties in the Northeast, and utility cost benchmarks for low-carbon multifamily buildings in New York State derived from this dataset for 2024. This Guidebook serves as a resource for lenders, housing finance agencies, and related organizations that finance new construction multifamily projects. It can support these lenders to more accurately underwrite and finance new construction, low-carbon, multifamily projects. Lenders can use this Guidebook to access analysis of the Future Housing data set and learn how to apply Future Housing benchmarks to their own projects. This Guidebook serves as a practical resource for readers seeking to navigate the complexities of financing high-performance, low-carbon housing, with specific suggested activities to take within their sphere of influence to change traditional underwriting practices.



Introduction

The building industry is moving away from inefficient, fossil fuel buildings, toward high-performance, low-carbon structures.

High-performance homes are comfortable, efficient, and healthy, using less energy and emitting less greenhouse gasses than conventional buildings. Creating high-performance, low-carbon buildings requires changes in both construction and operations. Technologies, like better walls and windows, and heat pumps for space heating and water heating, improve efficiency. Switching from fossil fuel energy sources to clean electricity from the grid or from onsite solar panels lowers carbon. However, these changes also affect the financing of the building, both at construction and during operations. Accelerating the transition to climate-friendly buildings will require lending practices to shift, too. Lenders who want to adopt climate-friendly practices need to justify changes. Today, the real-world performance data they need are missing. In response, Bright Power and Building Energy Exchange (BE-Ex) launched the Future Housing Initiative. The Initiative provides data and analysis on the performance of low-carbon, multifamily buildings. This builds on the conclusions from BE-Ex's Multifamily Passive House: Connecting Performance to Financing report, which illustrates the importance of integrating building performance data into financing decisions.

The Future Housing Initiative and the Underwriting Standards for Low-Carbon Housing Project

The Future Housing Initiative intends to help drive (or ease) the transition to low-carbon, multifamily housing. Building industry stakeholders often lack the performance data needed to decarbonize the sector. The Future Housing Initiative aims to build a robust database of building performance data, concentrating on ensuring the data are accessible and understandable to users.

The Underwriting Standards for Low-Carbon Housing project is part of the Future Housing Initiative. This two-year effort, sponsored by NYSERDA, aims to increase underwriting of low-carbon, multifamily projects in New York State. Bright Power has built a dataset of energy performance data from low-carbon multifamily properties. Analysis of this data set guided the creation of low-carbon utility cost benchmarks. Lenders and agencies can use these benchmarks to more accurately underwrite low-carbon buildings.

Changing Underwriting Business as Usual

Changing traditional underwriting practices is imperative for advancing low-carbon, multifamily housing initiatives. Historically, NY State Maintenance and Operations (M&O) standards used metrics from conventional buildings with fossil fuel for heating and hot water. While this approach reflected past building norms, it is not accurate for financing new and high-performance buildings. This "business as usual" approach misaligns first-costs and operating costs, and it results in missed opportunities. Using conventional building data risks undervaluing lower long-term operating costs in high-performance buildings. Underwriting new building systems, however, requires extra work that can slow down the financing process, adding more barriers for high performance projects. Accurately underwriting low-carbon housing at scale requires redefining M&O standards. They must be calculated based on real utility costs from similar buildings. The new M&O standards can include data on new building systems to eliminate the need for extra research and delay. The Future Housing Initiative provides these benchmarks, expanding lenders' data set, grouping buildings logically, and using actual performance data where available.

Underwriting Low-Carbon Multifamily Buildings: A New Business as Usual

Change is Needed

Estimating a property's future income and expenses is part of underwriting. This step determines the loan size the property can support. With some affordable housing, underwriting also determines what size subsidy a project needs. Expenses include utilities, taxes, property staff salaries, insurance, and regular repairs and maintenance. The standard practice uses data from similar properties—or "comps"—and from the lender's own loan portfolio to estimate utility costs. In some cases, lenders and housing agencies update these estimates based on their experience and information about the project.

NY State Lenders regularly publish utility cost benchmarks in their M&O standards. For utility expenses, the M&O standards in New York State have historically included four energy options, two for fossil fuels and two for electricity. The underwriter could choose the most appropriate two:

- Heat and water heating – gas
- Heat and water heating – oil
- Electricity (common area) – no elevator
- Electricity (common area) – elevator

These limited options for owner utility expenses worked when nearly all properties had central, owner-paid heat and water heating systems running on natural gas or oil.

New and low-carbon multifamily buildings no longer follow that historic pattern of energy use, building systems, and metering. New multifamily properties are more efficient, with more varied HVAC systems, with more variations on who pays for heat, water heating, additional equipment and building amenities. For these new and high efficiency buildings, the old data and M&O standards are inadequate. The options do not match the buildings, and the historic cost estimates are irrelevant.

Recently, NYC Housing Preservation & Development (HPD) and NYC Housing Development Corporation (HDC), with support from NYSERDA, used energy modeling to estimate utility expenses for newer buildings types. The models include conventional buildings with electric heat pumps, Passive House-certified buildings, buildings with central heat pump water heaters, and buildings with central electric cooling. These expanded M&O standards, based on energy modeling, are a significant step forward. Community Preservation Corporation (CPC) has also made adjustments to their M&O standards, adding an electric heat pump building heating category and the option to reduce all utility use by 10% for properties pursuing Enterprise Green Communities certification.

The New Business as Usual

As multifamily building design and construction norms evolve, how should lenders underwrite new, high-performance buildings? Future Housing proposes a new business as usual (BAU) approach based on this research and conversations with multifamily lenders and housing agencies in NY State. This New BAU approach has four steps, contrasted here with the old BAU:

	Old Business as Usual	New Business as Usual
Step 1:	Determine building typology by asking these questions:	
	Is the heating and water heating fueled by gas or oil? Is there an elevator in the building?	Which utilities does the owner pay for? • Common area baseload electricity, cooling, heating[1] • Apartment electricity • Apartment cooling • Apartment heating • Apartment water heating Is heating provided by electricity or gas? Is water heating provided by electricity or gas? What level of efficiency is the building designed to? • Conventional • Light green (e.g. Enterprise Green Communities, LEED) • Low-carbon (e.g. Passive House) Is there certification or building energy design verification? Is the property affordable?
Step 2:	Select the relevant utility expense level[2]	
	Use expense levels based on a set of older properties with different technologies and usage profiles than new, low-carbon buildings.	Use expense levels based on real energy performance data from a set of buildings that match the building typology.
Step 3:	Determine loan size	
	Base loan size on all expenses, including utilities, based on an updated set of standards and data. Follow credit rules and calculations approved by each lender.	Base loan size on all expenses, including utilities, informed by an updated set of standards and data that considers ever-changing energy prices and regional variation. Follow credit rules and calculations approved by each lender.
Step 4:	Review performance data against "comps"	
	The lender, appraiser, or developer may offer comps from their own data sets, which may not include similar low-carbon properties.	Review performance data against comps from new and low-carbon properties, alongside other provided comps.

The Low-Carbon Future Housing Benchmarks

The Future Housing Initiative has collected owner and whole building utility data from 30 new construction, low-carbon,[3] multifamily properties in the Northeast. The Initiative analyzed the data set to calculate a first-of-its-kind utility cost benchmark set for low-carbon, multifamily buildings in NY State. These benchmarks were tailored to complement and fill in gaps in existing M&O standards. Lenders, housing agencies, and appraisers can reference these benchmarks to underwrite low-carbon multifamily projects. As the Future Housing data set grows, lenders may adopt M&O standards based on actual data, following the approach described here.

NYC Future Housing Utility Cost Benchmarks

The following table shows the Future Housing NYC+[4] low-carbon benchmarks for 2024 alongside two other benchmarks: the NYC HDC 2024 new construction passive house M&O standard[5] and a comparison dataset from Bright Power's EnergyScoreCards (ESC) database. These represent the utility expenses for the building owner, which are used for underwriting.[6] The HDC M&O 2024 standards are derived primarily from models with historic utility expenses used for some components. The Future Housing benchmarks are derived from actual median consumption from the 30 new construction, low-carbon, multifamily properties in the Northeast. The comparison benchmarks ("Peer post-2000") are derived from median consumption from all Northeast properties built since 2000 in the EnergyScoreCards database, excluding properties in the Future Housing database. The EnergyScoreCards database includes a range of building design and construction types, including conventional projects and some projects certified under Enterprise Green Communities or LEED. Typical 2024 NYC energy prices were used for both the Future Housing and low-carbon benchmarks to calculate costs based on consumption. In most cases, the Future Housing dataset calculates the same energy components as the HDC M&O standard, enabling a direct comparison. In a few cases there are metrics calculated with one approach that are not included in the other:

- Future Housing adds expense benchmarks for whole building electric baseload (including apartments) with and without electric domestic hot water.
- Future Housing and comparison benchmarks cannot replicate the M&O Standard for electric water heating due to the limitations of analyzing utility data.[7]

See Appendix for a detailed methodology, including low-carbon, multifamily definitions, analysis steps, and the source for typical 2024 energy prices.

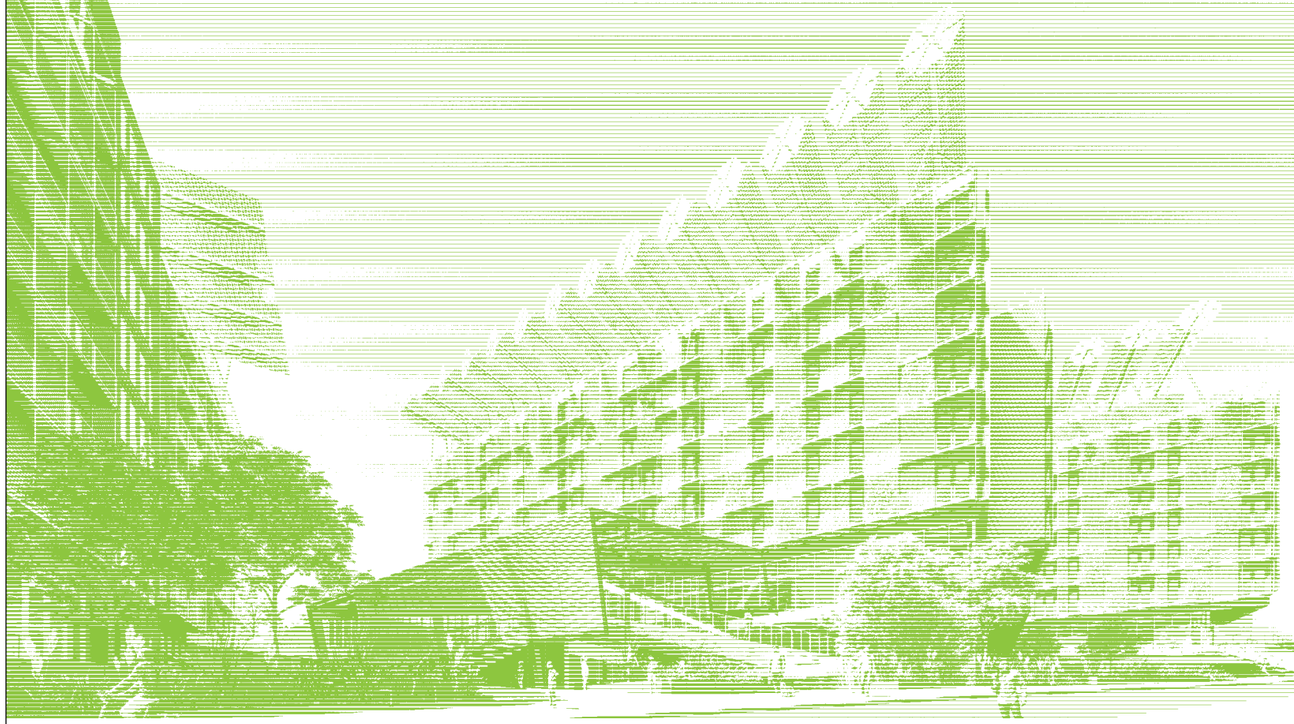


Table 1: Future Housing NYC+ Utility Cost Benchmarks compared to 2024 HDC M&O for Passive House and Peer post-2000 group Benchmarks

Owner-paid utilities			Dollars per room per year		
Building Coverage	Energy Component	Fuel	HDC M&O 2024 Passive House NYC	Peer post-2000 NYC+[8]	Future Housing NYC+
Whole Building (common area and apartments)	Cooling	Electric	$68	$63	$60
	Heating	Electric	$100 (VRF) / $117 (PTHP)	$160	$147
		Gas	$221[9]	$144	$87
	Water heating[7]	Electric	$185	n/a	n/a
		Gas	$112	$83	$38
	Apartment baseload *including water heating*	Electric	n/a	$570	$559
	Apartment baseload *excluding water heating*	Electric	n/a	$451	$321
Common Area	Baseload[10]	Electric	$200	$152	$141

Key takeaways comparing the Future Housing low-carbon utility expense benchmarks to HDC M&O standards are:

- Electric cooling costs for both the Peer post-2000 data set and Future Housing are lower than the Passive House M&O Standard, with Future Housing being the lowest. The Future Housing and Peer post-2000 benchmarks are higher than the M&O standard for Passive House but lower than the M&O standard for VRF heating in non-Passive House buildings ($185/room, not shown above). As the dataset expands, more nuanced analysis on the impact of system type in the Future Housing set may be warranted.

- For gas heat, gas water heating, and common area electricity, the Peer post-2000 data set and Future Housing are all noticeably lower than the M&O standard, with Future Housing significantly lower on heat and water heating.

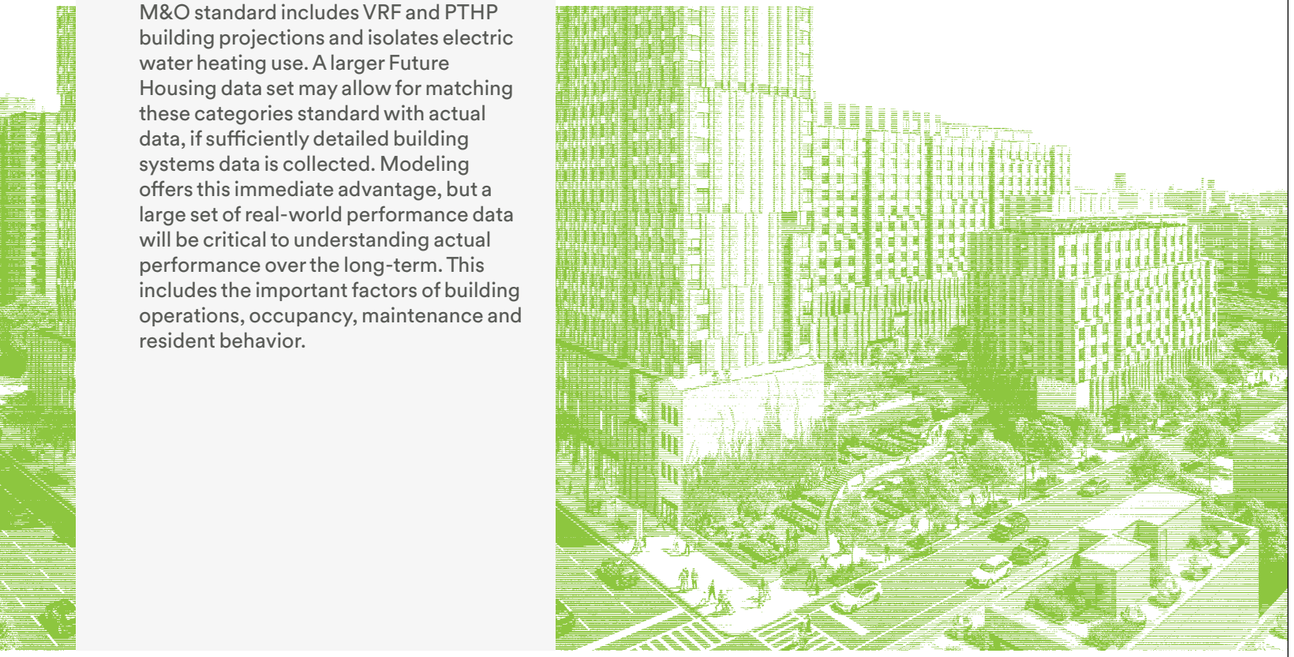
- The Future Housing benchmarks include options for all fuel and payment configurations in the data set. This is more specific than the existing M&O standards and allows more accurate underwriting for diverse building types. However, the modeling-based HDC M&O standard includes VRF and PTHP building projections and isolates electric water heating use. A larger Future Housing data set may allow for matching these categories standard with actual data, if sufficiently detailed building systems data is collected. Modeling offers this immediate advantage, but a large set of real-world performance data will be critical to understanding actual performance over the long-term. This includes the important factors of building operations, occupancy, maintenance and resident behavior.

How to use the Future Housing benchmarks

To demonstrate how to use the Future Housing benchmarks we can imagine property with the following characteristics:

- Owner-paid whole building electric cooling and heating with VRF
- Owner-paid whole building gas domestic water heating
- Resident-paid apartment baseload electricity
- Built to Passive House standards
- Located in NYC

The following table shows the Future Housing NYC+ and 2024 HDC passive house M&O utility cost benchmarks side by side with check “ ✓ ” marks to indicate which owner-paid utility cost components would apply to a property with the characteristics listed above. To determine the full owner energy costs, the underwriter would sum the expenses in rows with a “ ✓ ” shown in the “Total Projected Energy Expenses” row at the bottom of the table. The 2024 HDC M&O standard estimates a total of $480/room/year in energy expenses compared to $386/room/year using the low-carbon Future Housing standard. The Future Housing low-carbon expenses are lower for common area electricity, cooling and gas water heating. However, they are noticeably higher than the modeled cost for passive house electric heating in the 2024 HDC M&O standard.



Example: Projected utility expenses for property with owner paid electric cooling, heating and gas water heating

Owner-paid utilities			Dollars per room per year		
Building Coverage	Energy Component	Fuel	HDC M&O 2024 Passive House NYC	Future Housing NYC+	
Whole Building (common area and apartments)	Cooling	Electric	$68	$60	✓
	Heating	Electric	$100	$147	✓
		Gas	$221[9]	$87	
	Water heating[7]	Electric	$185	n/a	
		Gas	$112	$38	✓
	Apartment baseload *including water heating*	Electric	n/a	$559	
	Apartment baseload *excluding water heating*	Electric	n/a	$321	
Common Area	Baseload[10]	Electric	$200	$141	✓
Total Projected Energy Expenses ($/room/year)			**$480**	**$386**	

Similar comparisons can be made for other building types. In some cases, direct comparisons are not possible, as the categories and energy cost components do not fully align.

Future Housing has also developed low-carbon benchmarks for other New York State regions. These used the same data set and consumption analysis, but typical electric and gas prices for 2024 for multifamily properties in these regions. These tables show the low-carbon benchmarks for the Hudson Valley and Upstate regions. See Appendix for methodology, including region definitions.

Table 2: Low-Carbon Future Housing and Peer post-2000 utility expense benchmarks for Hudson Valley

Owner-paid utilities			Dollars per room per year	
Building Coverage	Energy Component	Fuel	Peer post-2000 Hudson Valley	Future Housing Hudson Valley
Whole Building (common area and apartments)	Cooling	Electric	$51	$49
	Heating	Electric	$130	$120
		Gas	$125	$76
	Water heating[7]	Electric	n/a	n/a
		Gas	$73	$33
	Apartment baseload *including water heating*	Electric	$464	$456
	Apartment baseload *excluding water heating*	Electric	$367	$261
Common Area	Baseload[10]	Electric	$124	$115

For comparison, the CPC 2023 M&O standard offers the following utility expense benchmarks for Hudson Valley and Upstate regions:

Common Area Electricity
$125 – 150 for Hudson Valley, $175 – 200 for Upstate

Gas (heat & water heating)
$175 – 200 for Hudson Valley and $225 Upstate

Table 3: Low-Carbon Future Housing and Peer post-2000 utility expense benchmarks for Upstate

Owner-paid utilities			Dollars per room per year	
Building Coverage	Energy Component	Fuel	Peer post-2000 Upstate	Future Housing Upstate
Whole Building (common area and apartments)	Cooling	Electric	$42	$40
	Heating	Electric	$107	$98
		Gas	$97	$58
	Water heating[7]	Electric	n/a	n/a
		Gas	$56	$26
	Apartment baseload *including water heating*	Electric	$380	$373
	Apartment baseload *excluding water heating*	Electric	$300	$214
Common Area	Baseload[10]	Electric	$101	$94

Key takeaways comparing the Future Housing low-carbon utility expense benchmarks to the CPC M&O standards are:

- The CPC M&O standard for Hudson Valley and Upstate properties include only two categories: Common Electric, and Gas (for both heating and hot water). EnergyScoreCards Peer post-2000 benchmarks for heat and water heating are similar to the CPC M&O standard. The Future Housing benchmarks are significantly lower.
- Common area electricity expenses from both the Peer post-2000 and Future Housing datasets are significantly lower than the CPC M&O standard.

Making the Change

For new data sources like Future Housing to improve underwriting, underwriting stakeholders must institutionalize new processes. This includes lenders and housing agencies and supporting organizations like appraisers, mortgage insurers, and developers. During the spring of 2024, the Bright Power team held workshops with NY State Lenders and Housing Agencies to develop Action Plans to improve low-carbon building underwriting at their organizations. Participating lenders set specific goals, and identified the key steps to achieving those goals. They also crafted a stakeholder strategy for groups who will approve process changes or implement new approaches.

These engagements used a set of planning tools that are included in the Appendix: Low-Carbon Underwriting Toolkit. The Toolkit can be useful for other lenders and housing agencies. See the Low-Carbon Underwriting Toolkit for step-by-step guidance on institutionalizing improved low-carbon underwriting practices at your organization.

Making organizational change takes time, and the structured approach of the Toolkit can help. Underwriting involves collaboration of internal and external stakeholders. These different groups are interdependent but bound by separate organizational rules and structures. Internally, it is critical to identify which teams create the M&O standard and who has the authority to institutionalize new practices for low-carbon buildings. Prepare for initial discussions by familiarizing yourself and other team members with the new BAU process and data presented in this Guidebook. While every organization is different, these strategies included in this project's lender Action Plans may be useful for others:

Lender Action Plan Strategies

- [ ] Use the publicly available Future Housing benchmarks in this Guidebook as a reference point alongside other comps or existing M&O Standards
- [ ] Develop a checklist that requires underwriters to consult the Future Housing data set
- [ ] Incorporate Future Housing data into your annual review of M&O standards
- [ ] Starting now, make plans to collect and analyze consumption data from your own loan portfolio to inform future M&O Standard updates

Conclusion

Rapidly evolving building design and construction norms calls for low-carbon underwriting. Low-carbon underwriting requires an accurate assessment of utility costs, necessitating a more sophisticated understanding of building typologies than required for traditional underwriting. Real performance data from low-carbon, multifamily properties provide critical insights that enable accurate financing and subsidies. The dataset and analysis presented here provide energy cost benchmarks for low-carbon, multifamily properties in New York State. NY State Lenders and Housing Agencies have been actively engaged in this project, reinforcing the value of these data and analysis. It also highlights the many steps required to integrate the data into lending practices.

Utility cost benchmarks need to be updated regularly to reflect changing building performance and energy prices. Future Housing plans to improve the benchmarks, both by growing the data set and adding other analysis elements. Detail on property affordability, unit size, and other factors may enable even more targeted estimates in future analysis. This may include pilot projects to test practical methods of capturing detailed data over the long-term.

Financing is critical to scaling up the production of low-carbon multifamily housing. Lenders, housing agencies, and appraisers play a pivotal role. Only these organizations can adopt the new BAU practices described here to mainstream financing for low-carbon projects. Incorporating low-carbon considerations into underwriting criteria supports sustainable real estate practices and enables innovative projects to move forward with standard types of financing.

With proactive engagement and a commitment to low-carbon underwriting, industry stakeholders can open the door to a greener, more resilient future.

What's next for the Future Housing Initiative?

The Future Housing Initiative aims to create a publicly-available holistic national database of real-world performance data on low-carbon, multifamily buildings.

This database will include data on resident quality of life, health, and affordability alongside energy performance, cost, and carbon emissions.

Future Housing aims to engage with specific stakeholder groups on an ongoing basis—similar to the lender engagement in this project—to help them use the data to accelerate decarbonization.

Reach out to the Future Housing team or check be-exchange.org/beexreport/future-housing to find out about the latest research and how to access the most up to date dataset.

Appendix

Low-Carbon Underwriting Toolkit

FUTURE HOUSING INITIATIVE

The Low-Carbon Underwriting Toolkit helps lenders evaluate and update their underwriting practices to better reflect the shift in the multifamily residential sector towards high-performance, low-carbon buildings.

The process of updating lending practices begins by convening key stakeholders and decision makers relevant to an organization's underwriting process to participate in a goal-setting workshop. The Action Plan included within this Toolkit outlines a step-by-step process that lender teams can utilize to think through their organization's underwriting practices and assess how the process can be revised to more accurately finance high-performance multifamily buildings.

Upon completing each step of the Action Plan, lenders will summarize the results of their discussions into a Low-Carbon Underwriting Roadmap that distills the results of the workshop discussions into a resource, which can then be used as part of "Step 5: Identify Stakeholders and their Requirements."

Low-Carbon Underwriting Toolkit Contents:

Action Plan

Step 1 Build Your Team
Step 2 Set Goals and Timelines
Step 3 Examine Current Underwriting Practices
Step 4 Establish Process for Adopting Change
Step 5 Identify Stakeholders and their Requirements
Step 6 Determine Next Steps

Lender Roadmap

Low-Carbon Underwriting Action Plan

The Low-Carbon Underwriting Action Plan is a step-by-step framework for evaluating your organization's underwriting practices to assess how the process can be revised to finance high-performance multifamily buildings more accurately.

FUTURE HOUSING INITIATIVE

1 Build Your Team

The first step in evaluating your organization's underwriting process is identifying the individuals who should be involved. Each person will have a different role, but can generally be placed in one of three categories:

Champions are individuals who have significant internal and external influence within the organization. They often have the ability to present the team's work to decision-makers.

Core team members are individuals who will be the most involved, working on day-to-day tasks and moving the project efforts forward.

Allies are individuals who will be affected by the changes and agree with the project's mission, but are not directly involved. They can share project information with their team, and in turn, identify concerns their team may have.

Action:

Identify those at your organization who are dedicated to improving low-carbon underwriting. List their names/titles in Box 1. Would they fall in the champion, core, or ally category?

2 Set Goals and Timelines

In a workshop setting with the team members identified above, describe what your target success looks like, using clear, actionable SMART goal(s), ranked by priority. (SMART goals are Specific, Measurable, Achievable, Realistic, and Timely.)

Next, set a timeline with a specific deadline for achieving each goal. Discuss timeline expectations as a team, talk through differences, and make sure it's achievable.

Action:

Write your SMART goals and their corresponding deadlines in Box 2.

3 Examine Current Underwriting Practices

In order to change the underwriting process to prioritize low-carbon buildings, you must first define it. In Box 3, outline the critical steps of your organization's underwriting process, focusing on key steps that might not currently account for the unique performance of low-carbon buildings. Put a star (*) by any step that uses assumptions, formulas, or decision-making flexibility not designed for a low-carbon building.

Next, identify which steps of the underwriting process need to change to achieve the goals. For each one, ask how, if at all, does it need to change to provide favorable underwriting to low-carbon buildings?

Action:

List the critical steps of your organization's underwriting process and the necessary changes in Box 3.

4 Establish Process for Adopting Change

Outline a process to adopt the changes suggested above. Map out the steps for implementation, the people needed to assist or sign off on each step, and list the resources needed (e.g. talking points or educational materials, relevant data, key findings, meetings, etc.). Be sure to note processes with dependencies or due dates.

Action:

Take the action steps from the change column of Box 3 and add them to the "Proposed Change" column for Box 4. Then, list the actions needed to make that change, people needed to sign off, and if there are any necessary resources in the subsequent columns.

5 Identify Stakeholders and their Requirements

Review the process to adopt the suggested changes in Box 4. Who are the key stakeholders involved? Stakeholders may be decision-makers, reviewers, advisors, or implementors. For each person, list the stakeholder's name or role. If you do not have a specific point of contact, please list the department or organization. Next, focus on those you think will take some persuading to get on board, and fill in what you think they will need to support the proposal.

Action:

List the key stakeholders, whether they are internal or external to your organization, and what they need to sign off on the proposed changes in Box 5.

6 Determine Next Steps

Review the goal(s) outlined in Step 2 and the process in Step 4. What are the immediate and critical next steps to be taken to work toward the goal(s)?

Action:

List the immediate next steps in Box 6.

Low-Carbon Underwriting Roadmap

Organization

This document captures key information from the [Entity's] efforts to evaluate and update their underwriting practices to more accurately underwrite and finance low-carbon multifamily projects.

FUTURE HOUSING INITIATIVE

1 Build Your Team

Champions

Core Team

Allies

2 Set Goals and Timelines

Goal	Target Completion Date(s)

3 Examine Current Underwriting Practices

Current Underwriting Step	Proposed Changes

4 Establish Process for Adopting Change

Proposed Change

Steps Needed to Implement Change

Responsible Party

Resources Required

Proposed Change

Steps Needed to Implement Change

Responsible Party

Resources Required

5 Identify Stakeholders

Stakeholder

☐ Internal
☐ External

What do they need to sign off?

Stakeholder

☐ Internal
☐ External

What do they need to sign off?

6 Determine Next Steps

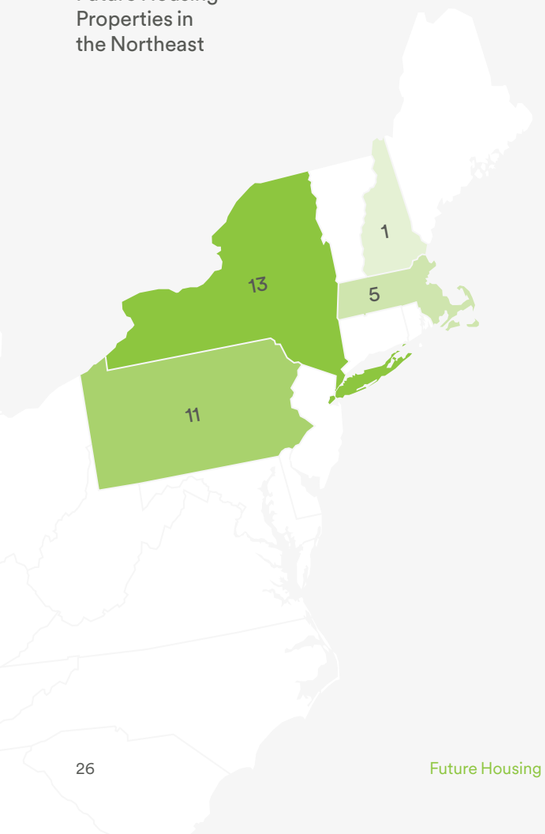
Where do we go from here?

Overview of the Future Housing Dataset

The 2023 Future Housing dataset contains at least one year of fully-occupied whole building and owner-paid utility consumption and cost data for each of 30 low-carbon, new construction, multifamily properties in the Northeast. Characteristics of the properties analyzed are shown below.

State, building type, eligibility type

Future Housing Properties in the Northeast



State	Count
Massachusetts	5
New Hampshire	1
New York	13
Pennsylvania	11

Building type	Count
Garden Apts	1
Low-Rise (up to 4 stories with hallways)	16
Mid-Rise (5 – 8 stories)	10
High-Rise (9 – 29 stories)	3

Eligibility type[11]	Count
Certification	11
Modeled Performance	4
Prescriptive	14

Fuel and owner-paid configuration

In order to group properties to analyze owner energy expenses, multifamily building energy is categorized into four main end uses: apartment electricity, cooling, heating and water heating. For each end use, the primary fuel can be either electricity or gas. The following table shows the number of properties in the Future Housing dataset with each combination of owner-paid energy uses. In all cases, the owner pays for common area energy use, but this can only be separated from apartment consumption if metering configuration allows.

	Owner pays			
Fuel for end uses	All energy end uses	Cooling, heating and water heating	Heating and water heating	Water heating
All electric	6	0	0	0
Electric cooling and heating with gas water heating	9	6	3	4
Electric cooling with gas heating and water heating	0	0	2	0

To calculate Future Housing utility benchmarks for each building energy component, the sample consisted of properties where owners paid for that energy component using the appropriate fuel source, and consumption applicable to the energy component. For instance, only properties with owner-paid electric heating can be included in analysis to determine typical costs for owner-paid electric heating. Properties with gas heating or with tenant-paid electric heating must be excluded from the analysis for owner-paid electric heating. The following table shows the count of Future Housing properties included in the analysis for each utility cost benchmark.

	Owner-paid utilities		
Building Coverage	Energy Component	Fuel	Future Housing Dataset Property Count
Whole Building (common area and apartments)	Cooling	Electric	17
	Heating	Electric	22
		Gas	2
	Water heating[7]	Electric	n/a
		Gas	23
	Apartment baseload including water heating	Electric	5
	Apartment baseload excluding water heating	Electric	9
Common Area	Baseload[10]	Electric	13

Methodology

Defining low-carbon multifamily properties

To be eligible for the Future Housing dataset, properties must be:

A. Multifamily properties with five or more apartment units[12]
B. Built after 2003
C. Located in the Northeast (CT, DC, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT)
D. Have had at least 12 months of full (or stable) occupancy
E. Meet one or more of the three low-carbon criteria pathways:

Path 1:
Certification

Property must provide documentation to demonstrate it has achieved or is anticipating certification from a low-carbon certification, such as Green Building Initiatives Net Zero, Passive House (PHIUS or PHI), and USGBC LEED Zero Energy.

Path 2:
Modeled Performance

Property must provide documentation to demonstrate that it was designed to achieve a source EUI of < 38 kBTU/ft2/yr pre-renewable source energy. Typically this will be documented with an energy model.

Path 3:
Prescriptive

Projects that are not pursuing an accepted certification and do not have an energy model projecting an accepted EUI can be included if they can confirm the use of the following design strategies:

A. Heat pumps for primary heating and domestic water heating service
B. Air leakage, prove either:
- Whole building: 0.6 ACH @ 50 Pascals or 0.08 CFM/SF of envelop area @ 50 Pascals
- Compartmentalization: 0.13 CFM50/SF envelope area

C. Use of ERVs for whole building ventilation
D. LED lighting + lighting controls
E. Window-to-wall ratio below 30%[13]
F. Form factor below 3

Analysis approach

Step 1:
Data collection, transfer, and quality control

At least one year of whole building utility data was collected for each property. Data were accessed through logins to utility websites, bill scans, spreadsheets, and Energy Star Portfolio Manager data sharing. The data were uploaded into the EnergyScoreCards (ESC) platform. In EnergyScoreCards, a Bright Power Energy Analyst took the following steps:

1. Set up an account for each individual utility account
2. Loaded the cost and consumption history from the data source
3. Appropriately, designated the account as either owner-paid or tenant-paid, verifying metering with owners
4. Quality checked that the ESC account information (i.e., usage, cost, and service period) showed at least a full year of data, matched the data source, appeared reasonable, and was allocated to the correct payer (owner or tenant)

Step 2:
Use the EnergyScoreCards (ESC) platform

EnergyScoreCards was used to calculate standard metrics such as total consumption and cost, whole building, and owner-paid EUIs. EnergyScoreCards also performed weather regression analysis (which looks for a correlation of monthly consumption to Heating Degree Days, HDD, and Cooling Degree Days, CDD,) to separate annual consumption into heating, cooling, and baseload (i.e., non-seasonal) components. The results of this analysis in EnergyScoreCards included annualized energy consumption totals for the owner-paid portions and whole building usage broken down by fuel and end-use (heating, cooling, baseload). These results were exported to an Excel spreadsheet and combined with general property information (such as number of units and location) to allow further analysis.

Step 3:
Group for analysis

Primary fuel for end use
The properties were grouped by the primary fuel for each end use — end uses being electric baseload, in unit cooling, in-unit heating and in-unit domestic water heating — and who pays for each (the owner or tenant). This method allows data for properties with appropriate configurations to be analyzed for benchmarking different energy use components.

Comparison dataset
The Future Housing data set was then compared to all multifamily properties in the Northeast region[14] in Bright Power's EnergyScoreCards (ESC) database, this includes the properties in the Future Housing dataset. The most recent full year of available data are extracted for analysis. This dataset is referred to as "All ESC" in the analysis and intended as a benchmark for typical multifamily consumption regardless of property age or design.

The Future Housing analysis is also compared to the "Peer post-2000" subgroup, which includes all properties built since 2000 in the ESC Northeast data set *excluding* the Future Housing properties. The Peer post-2000 set is intended as a benchmark for similar, recently built properties which were not designed as low-carbon.

Both All ESC and Peer post-2000 comparison sets are grouped and analyzed in the same way as the Future Housing set to determine energy consumption benchmarks by energy component.

Step 4:
Remove outliers

Once the properties were grouped appropriately, outliers were removed from both the comparison and Future Housing datasets for each of the end use analysis groups. Properties were removed from the analysis if they met the following criteria:

- Showed as invalid Owner ScoreCards in ESC, which indicates that utility data is incomplete for the Most Recent Year of available data for one or more energy accounts at the property
- Energy use per square foot for the given component (e.g., building electric heating, common area baseload electricity) was above the 95th percentile or below the 5th percentile for that group of properties in EnergyScoreCards

Step 5:
Analyze consumption for energy-use components

Once properties were grouped and outliers removed, median energy use for each energy component, per square foot, per unit, and per room were calculated for each group. Where possible, benchmarks were calculated with each component included in the HDC 2024 M&O standard. Most, but not all of these could be reproduced with the Future Housing and EnergyScoreCards data sets. Notably, electric domestic water heating cannot be separated from other year-round (baseload) electricity uses from utility data alone. In other words, the cost and

consumption associated with electric water heating could not be isolated.

Per room consumption is used to calculate cost metrics following the practice of NY State Lenders which generally use $/room benchmarks for calculating expenses in underwriting. Studios are considered to have 2 rooms (1 bathroom + 1 living room/bedroom); one-bedrooms are considered to have 3 rooms (1 bedroom + 1 living room + 1 bathroom), etc.

Analyzing consumption first allows us to use a larger data set and avoid results skewed by the variability in energy prices across the Northeast or by property-specific energy cost differences (such as variance between providers, late fees, taxes, tariffs, etc.).

Step 6:
Calculate typical energy costs based on consumption and applicable prices

Once typical consumption values were determined for each component, the utility cost benchmarks were calculated using the equation:

Energy consumption x energy price = energy cost

Typical electricity and gas prices for 2024 for NY State multifamily properties were estimated using the EnergyScoreCards database. The properties were grouped into one of the three NY State regions shown in the table below: NYC+ (NYC and Long Island), Hudson Valley, and Upstate. The median owner blended rate for electricity ($/kWh) and gas ($/therm) was calculated for all properties with complete 2023 owner-paid data in EnergyScoreCards (as of May 2024) in each region for electricity, and for gas in NYC+. Given small data sets in EnergyScoreCards for Upstate and Hudson Valley in 2023, gas prices were estimated applying a discount from the median NYC+ gas price for 2023. The discounts used (13% lower than NYC for Hudson Valley and 33% lower than NYC for Upstate) were based on the historical price difference between properties in those regions in EnergyScoreCards. In order to account for price increases from 2023 to 2024, electric prices were escalated by 8% and gas prices by 6% based on the increase observed between 2022 and 2023 in the EnergyScoreCards data set.

Regional group per Future Housing	Areas of New York State Included	County
NYC+	New York City	Bronx, Kings, New York, Queens, Richmond
	Long Island	Nassau, Suffolk
Hudson Valley	Mid-Hudson	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester
Upstate	Capital Region	Albany, Columbia, Greene, Rensselaer, Saratoga, Schenectady, Warren, Washington
	Central New York	Cayuga, Cortland, Madison, Onondaga, Oswego
	Finger Lakes	Genesee, Livingston, Monroe, Ontario, Orleans, Seneca, Wayne, Wyoming, Yates
	Mohawk Valley	Fulton, Hamilton, Herkimer, Montgomery, Oneida, Schoharie
	North Country	Clinton, Essex, Franklin, Jefferson, Lewis, St. Lawrence
	Southern Tier	Broome, Chemung, Chenango, Delaware, Otsego, Schuyler, Steuben, Tioga, Tompkins
	Western New York	Allegany, Cattaraugus, Chautauqua, Erie, Niagara

The rates used to calculate 2024 energy cost benchmarks based on this approach are shown in the table below.

Median blended rate	NYC+	Hudson Valley	Upstate
Electric ($/kWh)	$0.27	$0.22	$0.18
Gas ($/therm)	$1.70	$1.48	$1.14

Limitations

Known limitations of this analysis include:

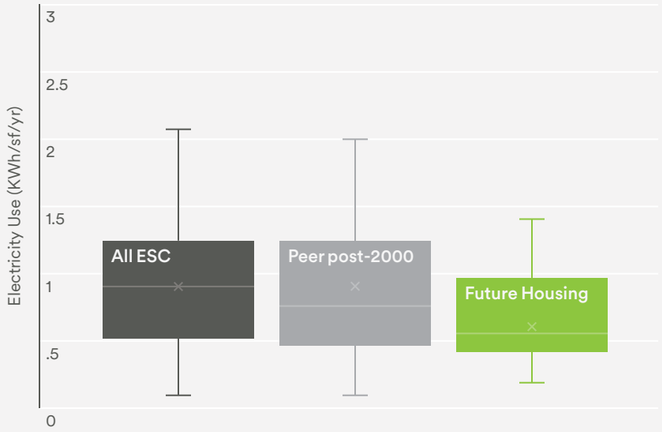
- Analysis consisted of small sample sizes for several metrics, in particular the baseload analysis which has fewer than 10 properties in each group.
- Properties in multiple Northeast geographies are included in the Future Housing dataset and combined in this analysis given small sample sizes. As the data set grows, it may be preferable to separate properties into smaller geographies for consumption as well as cost analysis. Smaller geographic groups can help capture regional and local design, operations and weather factors that may influence consumption.
- It is suspected that some energy use for heating or cooling may not be captured in the utility bill-based weather-regression analysis if it does not show a strong enough seasonal change. In particular, VRF buildings, which can heat and cool simultaneously, shifting heat from warmer to cooler parts of the building, may show flatter heating/cooling loads, which might reduce heating and cooling estimates while inflating baseload numbers. Pumps, motors or ventilation equipment associated with HVAC systems that operate year-round will be grouped into baseload metrics in utility bill analysis.
- Using blended electric rates from a sampling of utility bill data does not specifically account for differences in demand charges for properties with electric heating and/or electric water heating. Preliminary analysis of EnergyScoreCards data did not reveal significantly different electric blended rates for properties with electric vs. gas heat. However, further analysis of rates, including updates for future years, may be worthwhile.

Consumption Analysis Results

This section presents energy consumption analysis comparing the Future Housing low-carbon dataset to two comparison datasets from EnergyScoreCards. The *All ESC*[15] group considers all multifamily properties in the Northeast with available data, the *Peer post-2000* group, is a subset of the *All ESC* group, considering properties built after 2000 but excluding Future Housing properties.

Owner-paid | Whole building | Electric cooling

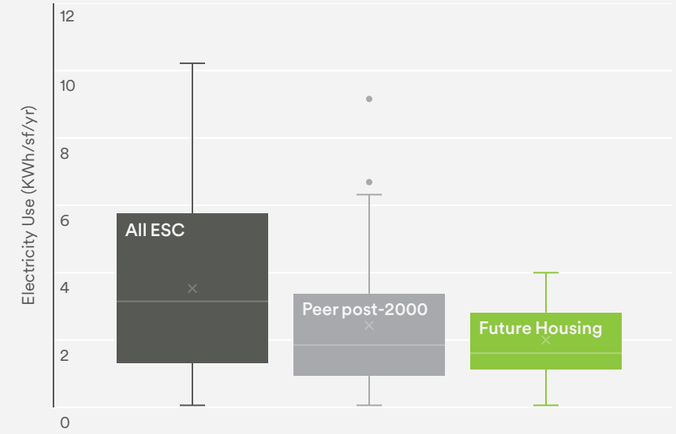
Recently built properties use less energy than buildings of all ages for cooling, and the Future Housing properties use less energy than both comparison groups. For owner-paid, whole building electric cooling, properties in the Northeast All ESC group used a median of 0.9 kWh/sqft/year, the post-2000 set used 0.8, and Future Housing set used 0.6.



Dataset	Property Count	kWh /SF/yr	kWh /unit/yr	kWh /room/yr
All ESC	1,201	0.9	834	261
Peer post 2000	270	0.8	730	233
Future Housing	17	0.6	566	221

Owner-paid | Whole building | Electric heating

Across all groups, buildings in the Northeast also use substantially more energy for heating than for cooling. For owner-paid, whole building electric heating, properties in the Northeast All ESC group used a median of 3.1 kWh/sqft/year, the post-2000 set used 1.8, and Future Housing set used 1.4. In addition to using less energy for heating, the Future Housing properties show less variation.



Dataset	Property Count	kWh /SF/yr	kWh /unit/yr	kWh /room/yr
All ESC	273	3.1	2,915	914
Peer post 2000	83	1.8	1,922	592
Future Housing	22	1.4	1,638	545

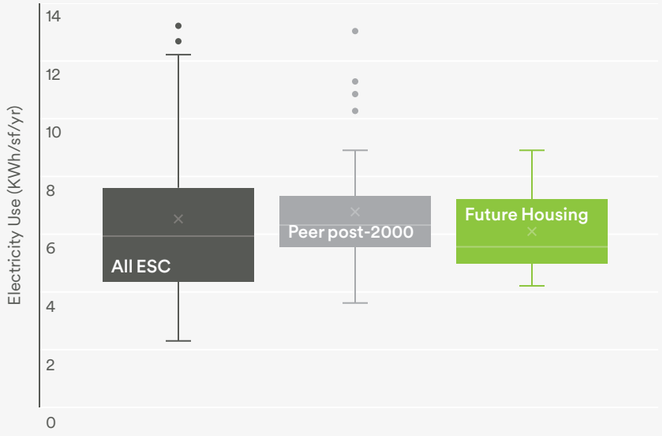
Owner-paid | Whole building | Gas heating

Only two properties in the Future Housing data set had owner-paid, whole building gas heat. This is not surprising, given the industry focuses on using electric heat pumps for heating to enable zero-carbon buildings in the future as the electric grid decarbonizes. Median heating energy use is lower for the Future Housing set than for the comparison groups, but the sample size is too small to draw meaningful conclusions.

Dataset	Property Count	kWh /SF/yr	kWh /unit/yr	kWh /room/yr
All ESC	3,818	0.4	414	126
Peer post 2000	718	0.3	265	85
Future Housing	2	0.2	199	51

Owner-paid | Whole building | Electric baseload *with* domestic water heating

Using utility data, we cannot isolate electricity use for domestic water heating from other baseload uses (e.g., lighting, appliances, plug loads, ventilation). Instead, we calculate the owner-paid whole building electric baseload. This metric includes electric domestic water heating for properties that have master metered electricity and electric water heating but does not include water heating for properties with gas water heating. We saw a wider interquartile range in building electric baseload for Future Housing properties with electric water heating, with a median kWh/sf/year lower than the comparison groups. Interestingly, the post-2000 comparison set shows greater median energy use per square foot as the All ESC group. This may be because newer buildings have more equipment and amenities even if they operate more efficiently.



Dataset	Property Count	kWh /SF/yr	kWh /unit/yr	kWh /room/yr
All ESC	97	5.9	5,881	1,963
Peer post 2000	32	6.2	6,936	2,110
Future Housing	5	5.7	5,982	2,071

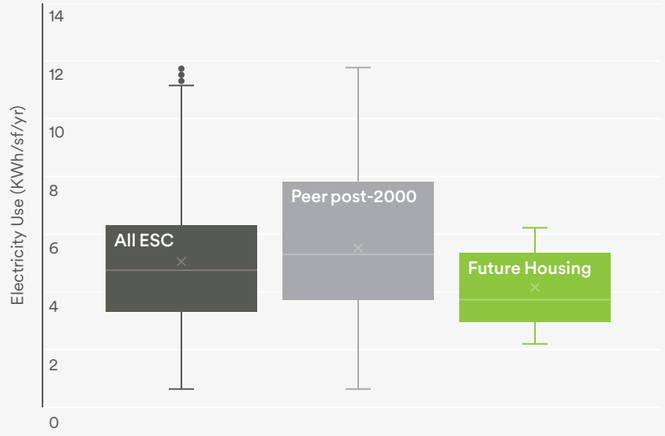
Owner-paid | Whole building | Electric baseload *without* domestic water heating

For properties without electric water heating, the building's baseload electricity is lower than buildings with electric water heating included in the baseload, as might be expected. The Future Housing set shows the lowest energy use. Among the comparison dataset, the newer buildings again show higher consumption than older buildings, perhaps reflecting the prevalence of more lighting, larger appliances, ventilation, common area amenities, and other electricity-consuming equipment in newer buildings.

Dataset	Property Count	kWh /SF/yr	kWh /unit/yr	kWh /room/yr
All ESC	1,240	4.7	4,287	1,335
Peer post 2000	244	5.5	4,792	1,669
Future Housing	9	3.6	3,735	1,187

Owner-paid | Whole building | Gas baseload *with* domestic water heating

Most properties in the Future Housing data set use gas for domestic water heating, reflecting that heat pump water heaters have not yet been commonplace in multifamily building design even for the projects targeting the highest levels of efficiency. For both the NY and Northeast data sets the Future Housing properties show the lowest energy use for gas domestic water heating.



Dataset	Property Count	kWh /SF/yr	kWh /unit/yr	kWh /room/yr
All ESC	4,342	0.2	189	57
Peer post 2000	842	0.2	158	49
Future Housing	23	0.1	80	23

Owner-paid | Common area | Baseload electricity *without* domestic water heating

The trend here is different than for other metrics: the All ESC group shows lower energy use, likely reflecting simpler and smaller common areas with few amenities. (Note: gross square footage for the building, and total building units and rooms is used for this metric even though energy use does not include the full building) Future Housing buildings across the Northeast show higher usage than the Peer post-2000 buildings, perhaps reflecting the use of ERVs in these buildings, which are not present in most new buildings. While the Future Housing energy penalty shown here for common area electric baseload does not outweigh the lower energy use in other metrics, it is worth further investigation to understand the factors behind this finding, and analysis of a larger sample as a dataset grows. Another possible factor here is that buildings with certain types of heating and cooling systems (e.g., VRF) may have smaller seasonal swings in energy, making it more difficult to isolate heating and cooling through utility bill analysis. If this is the case, then the baseload electricity may in fact include some heating and cooling, which could further skew this comparison.

Dataset	Property Count	kWh /SF/yr	kWh /unit/yr	kWh /room/yr
All ESC	3,709	1.2	1,220	353
Peer post 2000	824	1.7	1,816	562
Future Housing	13	1.9	1,753	521

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Design

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Disclaimer

List of Abbreviations

Acronym	Definition
BAU	Business as Usual
BE-Ex	Building Energy Exchange
CDD	Cooling degree days
CPC	Community Preservation Corporation
EUI	Energy use intensity
ESC	EnergyScoreCards
FHI	Future Housing Initiative
HCR	NYS Homes & Community Renewal
HDC	NYC Housing Development Corporation
HDD	Heating degree days
HPD	NYC Housing Preservation & Development
M&O	Maintenance & operation
VRF	Variable refrigerant flow

VRF	Variable refrigerant flow

1 Common area electricity (or other fuels) is almost always paid by the owner, with a possible exception of some townhouse style properties which may not have any common usage.
2 Due to lack of available performance data from actual projects, agencies like HPD currently use modeled data to inform utility cost benchmarks. Energy modeling can be an effective approach to estimating utility expense components when real world assumptions are used. It may be a necessary bridge until the actual performance data set reaches a size adequate for all building types and components.
3 Properties must demonstrate at least one of the following low-carbon criteria: (1) has achieved a low-carbon Certification such as Green Building Initiatives Net Zero, Passive House (PHIUS or PHI), or USGBC LEED Zero Energy, (2) demonstrate the property is designed to achieve a source EUI of < 38 kBTU/ft2/yr pre-renewable source energy, or (3) demonstrate the implementation specific design strategies. See methodology for more information.
4 The NYC+ region covers New York City and Long Island.
5 Source: NYC HDC 2024 Maintenance and Operating Expense Standards
6 The Future Housing can also be used to estimate resident utility expenses, which may help set utility allowance levels for affordable housing, though this is beyond the scope of this report.
7 The HDC M&O standard uses a model to estimate whole building electric water heating. The Future Housing data is sourced from utility data. With utility data alone, it is not possible to disaggregate electric water heating from other consistent year-round uses like lighting, appliances and ventilation. So there can be no direct comparison between the HDC M&O and Future Housing benchmarks for whole building electric water heating.
8 The Peer Post-2000 dataset comprises 1180 properties, the Future Housing dataset comprises 30 properties.
9 Gas heating is not allowed for new construction Passive House projects in the HDC M&O standard, but is included here for comparison to the Future Housing gas heating benchmarks.
10 The M&O standard is based on historic expense data which primarily consisted of owner-paid common area baseload electricity, though may have included some buildings with different metering or system configuration. Future Housing isolates common area baseload electricity (e.g. lights, elevator, pumps, fans) for this metric to be most comparable, but more detailed analysis of common area heating and cooling needs for buildings without central HVAC may be worthwhile in the future.
11 See Methodology for detailed definition of the eligibility criteria for the dataset, including an explanation of the 3 eligibility pathways: certification, modeled performance and prescriptive.
12 This requirement excludes townhouses
13 The project's envelope COMcheck can be used to document window-to-wall ratio for properties in New York State.
14 The Northeast region is comprised of the following states: CT, DC, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT
15 The All ESC group comprises 5251 properties, The Peer Post-2000 group comprises 1180, and the Future Housing dataset holds 30 properties.

The Future Housing Initiative is a new endeavor launched by Bright Power and Building Energy Exchange to help drive the transition to low-carbon, multifamily housing with real world data and analysis of building performance.

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