



Freddie Mac Multifamily Green Bond Second Opinion

5 November, 2021

Freddie Mac is a US government-sponsored enterprise whose mission is to provide liquidity, stability, and affordability to the US housing market. It does this principally by purchasing mortgages and loans and securitizing them into bonds that are sold to investors.

Freddie Mac Multifamily's green bond framework outlines eligible investments in energy and water efficiency. These include the purchase of Green Up® and Green Up Plus® loans, which require borrowers to make energy and water efficiency improvements in multifamily and workforce housing that result in at least 30% projected reductions in energy or water consumption, with at least 15% coming from energy, over the loan term. Borrowers are only required to make the improvements and do not have to achieve the projected reductions, however historic sampling showed projected reductions were achieved.

The framework supports important steps for emissions reductions and climate resilience in the US housing market, although ambition level falls short of being aligned with the Paris Agreement target. Further, the framework allows for investments in efficiency improvements of fossil fuel-based equipment such as water heaters and boilers. These represent necessary and significant short-term emissions reductions but may extend the lifetime of fossil fuel technology. Rebound effects from utility bill savings are also a pitfall. More transparency on baseline consumption levels would improve reporting.

The project selection criteria and proceeds management processes are transparent and robust, but as with many other issuers, physical climate risk management remains a challenge. Projected savings and baselines are established by third party consultants through Green Assessments. Borrowers must place funds for the improvements into escrow, which are only released following their verified completion. The required improvements are also written into the loan agreement. Freddie Mac is still developing its climate risk framework, and climate risk mitigation is currently limited to flood and windstorm insurance requirements for exposed properties; it has also shared that it is working on its approach to addressing climate resiliency.

Freddie Mac Multifamily's future green bond reporting will include actual as well as projected consumption and emissions reduction data. This is supported by the requirement for borrowers to report energy and water consumption and spending data via third-party data consultants.

Based on the overall assessment of the projects that will be financed under this framework, and governance and transparency considerations, Freddie Mac Multifamily's green bond framework receives a **CICERO Light Green** shading and a governance score of **Good**.

SHADES OF GREEN

Based on our review, we rate Freddie Mac Multifamily's green bond framework **CICERO Light Green**.

Included in the overall shading is an assessment of the governance structure of the green bond framework. CICERO Shades of Green finds the governance procedures in Freddie Mac Multifamily's framework to be **Good**.



GREEN BOND PRINCIPLES

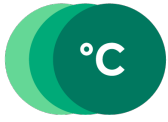
Based on this review, the framework is found in alignment with the principles.





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1 Terms and methodology

This note provides CICERO Shades of Green's (CICERO Green) second opinion of the client's framework dated October 2021. This second opinion remains relevant to all green bonds and/or loans issued under this framework for the duration of three years from publication of this second opinion, as long as the framework remains unchanged. Any amendments or updates to the framework require a revised second opinion. CICERO Green encourages the client to make this second opinion publicly available. If any part of the second opinion is quoted, the full report must be made available.

The second opinion is based on a review of the framework and documentation of the client's policies and processes, as well as information gathered during meetings, teleconferences and email correspondence.

Expressing concerns with 'Shades of Green'

CICERO Green second opinions are graded dark green, medium green or light green, reflecting a broad, qualitative review of the climate and environmental risks and ambitions. The shading methodology aims to provide transparency to investors that seek to understand and act upon potential exposure to climate risks and impacts. Investments in all shades of green projects are necessary in order to successfully implement the ambition of the Paris agreement. The shades are intended to communicate the following:

CICERO Shades of Green



Dark green is allocated to projects and solutions that correspond to the long-term vision of a low carbon and climate resilient future. Fossil-fueled technologies that lock in long-term emissions do not qualify for financing. Ideally, exposure to transitional and physical climate risk is considered or mitigated.



Medium green is allocated to projects and solutions that represent steps towards the long-term vision, but are not quite there yet. Fossil-fueled technologies that lock in long-term emissions do not qualify for financing. Physical and transition climate risks might be considered.



Light green is allocated to projects and solutions that are climate friendly but do not represent or contribute to the long-term vision. These represent necessary and potentially significant short-term GHG emission reductions, but need to be managed to avoid extension of equipment lifetime that can lock-in fossil fuel elements. Projects may be exposed to the physical and transitional climate risk without appropriate strategies in place to protect them.

Examples



Wind energy projects with a strong governance structure that integrates environmental concerns



Bridging technologies such as plug-in hybrid buses



Efficiency investments for fossil fuel technologies where clean alternatives are not available

Sound governance and transparency processes facilitate delivery of the client's climate and environmental ambitions laid out in the framework. Hence, key governance aspects that can influence the implementation of the green bond are carefully considered and reflected in the overall shading. CICERO Green considers four factors in its review of the client's governance processes: 1) the policies and goals of relevance to the green bond framework; 2) the selection process used to identify and approve eligible projects under the framework, 3) the management of proceeds and 4) the reporting on the projects to investors. Based on these factors, we assign an overall governance grade: Fair, Good or Excellent. Please note this is not a substitute for a full evaluation of the governance of the issuing institution, and does not cover, e.g., corruption.



2 Brief description of Freddie Mac Multifamily's green bond framework and related policies

Freddie Mac is a US government-sponsored enterprise that supports the US housing market by providing liquidity, stability, and affordability through the secondary market for residential mortgages. Specifically, Freddie Mac purchases mortgage loans originated by approved lenders and packages them into mortgage-backed securities (MBS) that carry Freddie Mac's guarantee. These MBS are then sold in the global capital markets to investors who receive timely payments of principal and interest from the underlying mortgages in each MBS. Freddie Mac does not originate loans or lend money directly to mortgage borrowers. With this model, Freddie Mac increases the willingness of lenders to offer mortgages to both individual and commercial buyers, thereby increasing the affordability of housing to homeowners and renters.

Sourcing from approved lenders in its Optigo Network, Freddie Mac's Multifamily business purchases mortgages for apartment buildings with five or more units; supports the purchase, refinancing and rehabilitation of older buildings; and provides permanent financing for recently built apartments. Since 1993, Freddie Mac's Multifamily business has provided over USD 790 billion in financing for approximately 98,000 multifamily properties, representing over 11.7 million apartment units.

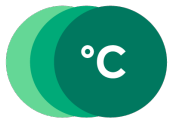
In 2009, Freddie Mac Multifamily introduced its K-Series platform, which aggregates and securitizes newly originated multifamily loans. The K-series platform includes the K-Deal structure, which is a regularly issued, structured pass-through security backed by a pool of multifamily mortgage loans. More information regarding the terms of K-Deal series transactions is available in the K-Deal Program Term Sheet. Freddie Mac Multifamily leverages the K-Deal structure to issue securities ("green bonds" for the purposes of this document), which are designated through its K-G Deal program and may be included in other K-Deals, Multifamily Participation Certificates ("Multi PCs") or similar transactions.

Environmental Strategies and Policies

Freddie Mac does not yet disclose in line with recommendations of the Task Force on Climate-Related Financial Disclosure (TCFD) but has shared that it is in the process of implementing the recommendations and setting up its climate risk management framework. It has further shared that owing to its charter mission and obligations, it is unable to implement certain measures to mitigate against climate risk, e.g. by excluding properties in regions with high physical climate risk exposure.

Freddie Mac leverages its MBS programs to incentivize investments that improve the climate performance of the US housing stock, such as certified green construction and retrofits that improve water and energy efficiency. This began with Freddie Mac Multifamily's Green Advantage[®] program in 2016, which has the objective of shifting investment behaviour of property owners towards water and energy efficiency measures.

The Green Advantage[®] program was developed by Freddie Mac's Multifamily Green Committee, comprising representatives from various Multifamily divisions: production, underwriting, credit policy, asset management, capital markets and legal. Members of this committee have expertise in financing multifamily development and experience with energy and water efficiency retrofits, energy and water audits, industry standards and property benchmarking. In 2021, Freddie Mac Multifamily created a dedicated ESG team to oversee the green bonds. The



ESG team sits within Freddie Mac Multifamily’s capital markets team and oversees all green bond issuances, including the development and implementation of the program’s sustainability criteria. The team also leads initiatives to address ESG issues that affect Freddie Mac Multifamily’s bond issuance and securities.

The Green Advantage[®] program includes the Green Up[®] and Green Up Plus[®] loan offerings (included in this green bond framework), which offer financing incentives for energy and water efficiency retrofits in the US multifamily rental housing market. Under the Green Up[®] and Green Up Plus[®] loan offerings, borrowers commit to reducing their energy or water consumption by a minimum required savings threshold. In return, they receive financing incentives in the form of fee reimbursements for Green Assessments and better loan pricing. These loans serve as collateral for Freddie Mac Multifamily’s green bonds, i.e. Green Up[®] or Green Up Plus[®] loans securitized through Freddie Mac’s K-G Deal or Multi PCs. This program has been in place since 2019. Since inception through 30 September 2021, over 37,000 units in over 140 properties were financed with green bonds totaling over USD 4 billion in loans.

The energy and water performance of properties under the Green Up[®] and Green Up Plus[®] loan offerings is assessed annually, and Freddie Mac has progressively tightened savings threshold requirements to increase energy and water savings. Initially, the savings threshold was set at 15% of partial or whole property consumption to match Federal Housing Finance Agency (FHFA) requirements for uncapped volume treatment. In 2018, the savings threshold requirement was increased to 25% of the whole property consumption, again to match FHFA scorecard requirements for uncapping volume. Since 2019, the savings threshold has been set at 30%, with a requirement for at least 15% to come from energy savings.

Although Freddie Mac does not yet disclose in line with the TCFD recommendations, Freddie Mac Multifamily’s standard due diligence includes elements of climate risk mitigation by requiring that all borrowers have property damage and liability insurance coverage for the underlying properties, which includes insurance for windstorms, floods, and earthquakes, depending on exposure. Windstorm insurance is required for properties located in a Tier 1 Windstorm Risk Area or state designated high-risk wind county. Flood insurance is required for any properties that are fully or partially located in a Special Flood Hazard Area (SFHA) “A” or “V” Zones, as defined by the Federal Emergency Management Agency (FEMA).¹

As part of its efforts to improve borrowers’ resiliency to physical climate risks, Freddie Mac Multifamily is considering the development of loan products that support borrowers with making resiliency improvements, while working on leading the industry in terms of reporting on climate resilience in its securitized portfolio.

Lastly, Freddie Mac is conducting and reviewing research on both the climate risks to its portfolio and the wider linkages between climate change and the housing market. In 2020, it published a research note linking greater reductions in home sales prices to higher perception and awareness of flood risks resulting from 2017’s Hurricane Harvey.² Freddie Mac’s research has also identified how energy efficiency efforts translate into better financial performance, for instance in a 2019 white paper showing how homes with better energy efficiency ratings sold for 3-5% more than those with lesser ratings.³ The white paper also found that mortgages backed by homes with better energy efficiency ratings tended to have better mortgage profiles and lower delinquency rates than those backed by unrated homes.⁴

¹ During a 30-year mortgage, homes in these zones have a 25% or higher risk of flooding. See <https://rrnm.gov/DocumentCenter/View/66104/FEMAInfo-LearnAboutSFHAs>

² <http://www.freddiemac.com/fmac-resources/research/pdf/202006-Note-16.pdf>

³ https://sf.freddiemac.com/content/assets/resources/pdf/fact-sheet/energy_efficiency_white_paper.pdf

⁴ Ibid.



Use of proceeds

The proceeds from issuances of green bonds under Freddie Mac Multifamily’s green bond framework will be used to finance Green Up[®] and Green Up Plus[®] loans that serve as collateral in its Green Bonds. Green Bonds can be either K-G Deals or green Multi PCs. Examples of projects funded by Green Up[®] and Green Up Plus[®] loans include: water efficient shower heads, faucet aerators, low-flow toilets, LED lightbulbs for private or common areas, ENERGY STAR[®] appliances, improved insulation and window sealant.

Only newly originated Green Up[®] and Green Up Plus[®] loans are eligible for securitization.⁵ Additionally, properties that already qualify as green, manufactured housing communities, loans under Freddie Mac’s Small Balance Loan program and loans originated under forward commitments are not eligible for program funding under the Green Up[®] and Green Up Plus[®] loan offerings.

Selection

The selection process is a key governance factor to consider in CICERO Green’s assessment. CICERO Green typically looks at how climate and environmental considerations are considered when evaluating whether projects can qualify for green finance funding. The broader the project categories, the more importance CICERO Green places on the governance process.

Green Up[®] and Green Up Plus[®] loans are those that produce projected reductions in energy and water consumption of at least 30%, with a minimum of 15% coming from energy, from the historical baseline, over the life of the loan. The loans are also conditional upon securing a Green Assessment or Green Assessment Plus report and the completion of the funded improvements within two years from the loan funding date, as well as requirements pertaining to escrow and the collection of benchmarking data (see table below). Additionally, the loans must satisfy the underwriting criteria described in the Green Advantage[®] Term Sheet published on Freddie Mac’s website, and the requirements documented in the Freddie Mac Multifamily Seller/Service Guide.

	Green Up [®]	Green Up Plus [®]
Minimum Projected Consumption Reduction	30% of energy or water/sewer consumption for the whole property, with a minimum of 15% from energy, based on baseline established in the Green Assessment	30% of energy or water/sewer consumption for the whole property, with a minimum of 15% from energy, based on baseline established in the Green Assessment Plus
Underwriting Approach	Recognize up to 50% of projected owner-paid energy and/or water/sewer savings based on Green Assessment	Recognize up to 75% of projected owner-paid energy and/or water/sewer savings based on Green Assessment Plus
Time to Complete Green Improvements	2 years to complete	
Escrow Requirements	Funds for energy/water efficiency work will be escrowed at 125% of cost and released as work is completed. Freddie Mac has clarified that while the default is to escrow funds, it is possible that in lieu of an escrow, a guarantee of completion may be provided.	
Required Third-Party Reports	Green Assessment	Green Assessment Plus

⁵ Green Up[®] and Green Up Plus[®] loans originated in 2018 required borrowers to commit to a 25% reduction in energy or water use, with no minimum requirement for energy or a third-party benchmarking data consultant. These are no longer eligible under the framework for securitization into green bonds.



Benchmarking Data collection	Green Up [®] and Green Up Plus [®] loans require borrowers to engage a qualified third-party data collection consultant, prior to the origination of the loan, to collect, input and monitor actual energy and water usage through the term of the loan.
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The Green Assessment and Green Assessment Plus require American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Level 1 and Level II audits respectively, which must be conducted by qualified Green Consultants.⁶ The assessments provide detailed property analysis, including of potential energy and cost savings, and recommended property improvements for water and energy efficiency. Borrowers must select improvements that meet the required savings thresholds. Further information about Green Assessment and Green Assessment Plus is summarized below.

Green Assessment	<p>An energy savings and cost analysis for a property based on the ASHRAE Level 1 standard plus additional specific and rigorous inspection and consumption data requirements.</p> <p>ASHRAE Level 1 property reviews consists of a “walk-through audit,” an initial review of the property’s utility bills, and a brief site survey of the building, its systems and modes of operations. It also proposes improvements to promote utility consumption efficiency.</p>
Green Assessment Plus	<p>A detailed energy savings and cost analysis for a property based on the ASHRAE Level 2 standard.</p> <p>ASHRAE Level 2 audits include detailed fuel use analysis by end use and utility rates, and the building is benchmarked to gauge overall performance. All key building representatives (owners, managers, operators and occupants) are interviewed to gain a thorough understanding of the operational characteristics of the building, explore potential problem areas, and clarify financial and non-financial goals of the assessment. The site assessment may include diagnostic testing (e.g. duct leakage, water flow and temperature measures, solar shading analysis, humidity testing). The result of the analysis is an energy model for the building that creates a cost-effective scope of work for building improvements.</p>

Borrowers have up to two years to complete the Green Improvements and must submit a certification that the improvements were made in accordance with Green Consultant recommendations. As part of a property’s annual inspection, the Optigo lender that originated the loan also checks the completed work to ensure compliance with the terms of the loan documents.

Besides the specific criteria outlined above, there no additional sustainability criteria for mortgages to be eligible for purchase, such as climate resiliency and life cycle considerations, e.g. the sustainability of building construction materials or impacts from the manufacturing, distribution, installation, operation and end of life of equipment associated with the improvements.

⁶ Freddie Mac’s general qualification requirements for a Green Consultant include experience completing energy and water audits, understanding of the ASHRAE standards, and familiarity with energy and water benchmarking. Green Consultants must also have an industry-recognized professional certification that demonstrates their proficiency in energy and water audits and analysis.



Management of proceeds

CICERO Green finds the management of proceeds of Freddie Mac Multifamily to be in line with the Green Bond Principles.

Green bond proceeds issued under the green bond framework will be designated through Freddie Mac Multifamily's K-G Deal program, part of Freddie Mac's K-series platform, or through their Multi PC program. For each pool of loans to be securitized, a separate trust is created, the purchased loans are placed in this trust and a green bond backed by the trust is issued. Loans cannot be added to a trust once the loans have been securitized into a green bond. This process ensures that green bond issuances can only be associated with Green Up[®] and Green Up Plus[®] loans that have been securitized. The process differs from the typical use and management of proceeds associated with green bond issuances, in that Freddie Mac has already made the eligible investments prior to green bond issuance – i.e. purchased the eligible loans – and uses green bond proceeds to recoup the funds.

For Green Up[®] and Green Up Plus[®] loans, the borrower establishes a repair reserve account with the Optigo lender and deposits funds into such account to be used for the purpose of implementing energy and/or water efficiency improvements meeting the required savings thresholds at the property. Optigo lenders escrow the funds at 125 percent and only disburse them upon receiving evidence that the specific work has been completed. Such evidence could include lien waivers, copies of canceled checks, receipts, paid invoices, color photographs, etc. As part of a property's annual inspection, Optigo lenders' servicing teams also check the completed work to ensure compliance with the terms of the loan documents.

Failure to make the improvements within the two-year timeframe is considered an event of default. In instances of default, the loan is removed from the trust. There is no recourse for replacing defaulted loans in the pool of securitized loans.

Reporting

Transparency, reporting, and verification of impacts are key to enable investors to follow the implementation of green finance programs. Procedures for reporting and disclosure of green finance investments are also vital to build confidence that green finance is contributing towards a sustainable and climate-friendly future, both among investors and in society.

Each green bond issued will have its own disclosure documents that will include disclosure related to the mortgage loans and mortgaged properties in each such green bond. Freddie Mac Multifamily has reported since 2020 and will continue to report on the impacts of its green bond issuance via its annual impact reports, which summarize the environmental and social impacts of its green, social and sustainability bond offerings. The ESG team is responsible for this process.

Reporting is expected to be similar to its 2020 impact report, which provides information on Freddie Mac Multifamily's green bond issuances and the allocations of proceeds to different investment types. This includes projected environmental impacts, including reductions in energy and water usage and avoided emissions, aggregated across all of Freddie Mac Multifamily's green bond issuances. The report also includes mappings of underlying properties' locations against the energy supply carbon intensity and drought intensity of US states. In 2021, Freddie Mac will also begin disclosing actual efficiency improvements and cost savings data in its reports. The reports are intended to be consistent with the core principles and recommendations in the World Bank's "Green Bonds - Working Towards a Harmonized Framework for Impact Reporting (December 2015)."

Freddie Mac's impact reporting is supported by the requirement for Green Up[®] and Green Up Plus[®] loan recipients to monitor and report on energy and water consumption of the whole property during the life of the loan, using a



qualified third party. Additionally, the underlying properties' historical baseline water and energy consumption data, which were collected by Green Consultants during the Green Assessment and Green Assessment Plus processes, are shared with Freddie Mac via the ENERGY STAR® Portfolio Manager, a free online tool maintained by the US Environmental Protection Agency (EPA). The data include the following:

- Type of savings pursued (energy, water or both)
- Green improvement measures recommended to and selected by borrowers
- Projected savings at portfolio level
- Estimated costs of measures
- Performance metrics (ENERGY STAR® Score, EPA 1-100 Water Score (Water Score), Energy Use Intensity, Water Use Intensity)

As of 2019, Freddie Mac has been engaging a third-party analytics firm, WegoWise by AppFolio, to evaluate the quality of the reported data and compare the benchmarking data with the baseline to better understand the realized efficiencies at the property in relation to the upfront projections. Initial reviews have found the data quality to be acceptable for ongoing analysis.

Collection of these data enables Freddie Mac Multifamily to release a supplemental loan-level dataset on its website, including property-level projected energy and water consumption reductions, ENERGY STAR® scores, EPA Water scores, and energy and water use intensities.



3 Assessment of Freddie Mac Multifamily’s green bond framework and policies

The framework and procedures for Freddie Mac Multifamily’s green bond investments are assessed and their strengths and weaknesses are discussed in this section. The strengths of an investment framework with respect to environmental impact are areas where it clearly supports low-carbon projects; weaknesses are typically areas that are unclear or too general. Pitfalls are also raised in this section to note areas where Freddie Mac Multifamily should be aware of potential macro-level impacts of investment projects.

Overall shading

Based on the project category shadings detailed below, and consideration of environmental ambitions and governance structure reflected in Freddie Mac Multifamily’s green bond framework, we rate the framework **CICERO Light Green**.

Eligible projects under the Freddie Mac Multifamily’s green bond framework

At the basic level, the selection of eligible project categories is the primary mechanism to ensure that projects deliver environmental benefits. Through selection of project categories with clear environmental benefits, green bonds aim to provide investors with certainty that their investments deliver environmental returns as well as financial returns. The Green Bonds Principles (GBP) state that the “overall environmental profile” of a project should be assessed and that the selection process should be “well defined”.

Category	Eligible project types	Green Shading and some concerns
Green Up [®] and Green Up Plus [®] loans (GBP categories: energy efficiency and sustainable water management)	Investments in existing, qualified multifamily properties that deliver 30% energy or water / sewer consumption savings, with a minimum of 15% from energy. Common examples include: <ul style="list-style-type: none"> • LED lighting for interiors, exteriors, common areas and HVAC thermostats • Water-saving shower heads, bathroom aerators, kitchen aerators, and low-flow toilets. 	<p>Light Green</p> <ul style="list-style-type: none"> ✓ These measures are important for the climate and the environment, but much deeper efforts are required to be on track with the Paris Agreement target. ✓ The 15-30% requirement refers to the minimum total reduction in energy and/or water consumptions projected over the lifetime of the loan. ✓ Additionally, there is no actual requirement for borrowers to achieve the projected reductions, only to implement the improvements, although a historical sample showed projected savings were met. <p>Energy notes</p> <ul style="list-style-type: none"> ✓ The selection criterion implies a level of energy efficiency improvement that





falls far short of the Paris Agreement aligned decarbonization pathway for US multifamily residential buildings; a 2-degree pathway for the sector requires energy intensity to fall by 3% annually between 2021 and 2030, and even faster thereafter.⁷

- ✓ The full list of eligible measures may include some fossil fuel elements, e.g. efficiency improvements for existing boilers and hot water heaters. These represent important short-term emission reductions for existing infrastructure. However, they do not facilitate a transition to renewable fuel sources and could extend the useful life of fossil fuel-based equipment and associated GHG emissions.
- ✓ Efficiency improvements may lead to rebound effects. When the cost of an activity is reduced, the savings generated may be used to increase the same activity or fund other unsustainable activities.
- ✓ Consider the emissions factor for district heating and electricity when calculating emissions reductions impact.

Water notes

- ✓ Water efficiency measures contribute to climate adaptation and resilience, with impacts depending on the geographic context. In areas with high levels of water scarcity, initiatives that reduce loss of water along distribution pipes, reduce water use, and that increase access to potable water are a strength. Freddie Mac is mapping trends in investments by location and drought in the US and has identified a clear correlation between investment in water efficiency measures and regions with water scarcity.

⁷ Based on the Carbon Risk Real Estate Monitor (CRREM) decarbonization pathway for US multifamily residential buildings. See <https://www.crem.eu/>



- ✓ Water efficiency measures can reduce energy use and thereby reduce associated GHGs.

Table 1. Eligible project categories

Background

Decarbonizing the building sector

The August 2021 report from the Intergovernmental Panel on Climate Change (IPCC)'s Working Group I⁸ has found it “unequivocal” that climate change is human driven and warns that climate change is the main driver of extreme weather events including heatwaves, storms, floods and droughts. This century will see global warming exceed both the 1.5 and 2-degree targets, with total temperature rise of 3.6 to 4.4 degrees in high and very high emission scenarios, unless deep emissions reductions are made.

The buildings and building construction sectors combined are responsible for over one-third of global final energy consumption and nearly 40% of total direct and indirect CO₂ emissions.⁹ Appliances (excluding heating, cooking and cooling appliances) are responsible for one quarter of final electricity use by buildings.¹⁰ The potential for energy and emissions savings remains largely untapped because of continued use of less efficient technologies, lack of effective policies and inadequate investments in sustainable buildings. Alongside electrification, energy efficiency improvements will be the most important measure for decarbonizing the building sector. In IEA's Net Zero by 2050 scenario (NZE), 29% of the emissions reductions needed in the building sector over 2020-2030 come from energy efficiency improvements. On-site renewable energy capacity also needs to increase exponentially in the NZE scenario, with a further 13% of building sector emissions reductions over 2020-2030 coming from use of renewable energy other than bioenergy and hydrogen.¹¹ This includes a nearly seven-fold increase in distributed solar panel electricity generation, from 320 TWh to 2,200 TWh globally.

Distributed renewable energy and energy efficiency measures, alongside decarbonized grid and heating systems, reductions in buildings' embodied emissions, and implementation of smart grid solutions, are core features of zero-carbon-ready buildings. Accordingly, the IEA's NZE scenario calls for the implementation of zero-carbon-ready buildings codes by 2030 at the latest. The US Department of Energy has developed a Zero Energy Ready certification for a zero energy home, defined as “an energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy.”¹² Depending on home size and geography, Zero Energy Ready Homes are at least 40-50% more energy efficient than typical new homes.¹³

Physical climate risks in the US housing market

Unabated climate change will accelerate physical climate impacts, including more extreme storms, accelerated sea level rise, droughts, wildfires and flooding.¹⁴ These risks are already being experienced due to historical emissions, which have already contributed to average global temperature rise of around 1 degree since the pre-industrial era.¹⁵ For near-term physical risk, investors and companies must consider the probabilities of physical events and

⁸ https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf

⁹ <https://www.iea.org/topics/buildings>

¹⁰ <https://www.iea.org/reports/tracking-buildings-2020/appliances-and-equipment>

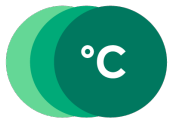
¹¹ <https://www.iea.org/reports/net-zero-by-2050>

¹² https://www.energy.gov/sites/prod/files/2015/09/f26/bto_common_definition_zero_energy_buildings_093015.pdf

¹³ <https://www.energy.gov/eere/buildings/guidelines-participating-doe-zero-energy-ready-home-program>

¹⁴ https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf

¹⁵ Ibid.



resiliency measures to plan for and protect against the worst impacts. Research on physical climate risks to the US mortgage market suggests that extreme weather events, including floods, storms and wildfires, can increase delinquency, forbearance and prepayment rates, as well as increase the number of risky mortgages being sold into the secondary market.¹⁶ A lack of information about property exposure to such risks is a contributing factor to their likely mispricing, evidenced for example by research showing that three times more Americans live in 100-year flood areas (SFHAs “A” Zones) than estimated by FEMA. This suggests many Americans are underinsured against floods.

The Federal Housing Finance Agency (FHFA), which regulates Freddie Mac, Fannie Mae and the Federal Home Loan Banks, launched a request for input in January 2021 to better identify and assess physical climate and natural disaster risks and improve its supervisory and regulatory approach.¹⁷ The FHFA Office of Inspector General also released a white paper in March 2021 outlining how Freddie Mac and Fannie Mae manage climate and natural disaster risks through instruments such as mortgage insurance, property insurance (including flood and earthquake coverage), and credit risk transfers.¹⁸ The paper concludes that other market participants, i.e. insurers and reinsurers, bear some of the climate and natural disaster risk associated with Freddie Mac and Fannie Mae’s mortgages. In this context, it is important to note that insurance premiums for coverage against climate-related weather events will continue rising, with the possibility that high-risk properties will become uninsurable in the near future.¹⁹

Impacts of Freddie Mac Multifamily’s Green Up/Plus® loan program

Freddie Mac has been able to assess the impacts of its Green Up/Plus® loan program by requiring these loans’ recipients to report both water and energy data for the whole property – regardless of the improvement supported by the loan – to build a more complete picture of utility consumption trends across its portfolio. Based on this historic utility consumption data, Freddie Mac has published annual *Green Improvements in Workforce Housing* reports since December 2018.

The latest report, published in December 2020, analyzes these data to understand the nature of the energy or water efficiency investments supported and the aggregate impacts and benefits of its green loan program. The report also puts these investments in the context of climate mitigation and adaptation by mapping asset locations against water stress, grid carbon intensity and energy costs. It should be noted that the report includes all Green Up/Plus® loans issued since 2016, not just those securitized through its green bonds program. Also, as noted earlier Freddie Mac Multifamily has strengthened its requirements over time to the level indicated in this framework. Nonetheless, certain findings from the report are useful context for understanding future potential impacts of Freddie Mac Multifamily’s green bonds.

Notably, aggregated physical energy consumption savings for a sample of 101 properties were 0.5% less than the projected amount, and aggregated physical water consumption savings for a sample of 232 properties were 5% less than the projected amount. Unfortunately, the report does not provide information on the average baseline consumption levels or the average percentage reductions these savings entailed. The small sample size should also be noted, as Freddie Mac Multifamily has purchased over 2,000 loans under its Green Up/Plus® program since its inception. It is also of interest that the top three energy improvements selected across all loans were exterior LED lighting (28% of all loans), interior LED lighting (26%) and thermostats (14%). For water improvements, the top

¹⁶ <https://sites.law.duke.edu/thefinregblog/2021/02/11/burning-down-the-house-how-inadequate-climate-risk-disclosures-and-information-asymmetries-threaten-to-disrupt-the-u-s-mortgage-market/>

¹⁷ <https://www.fhfa.gov/Media/PublicAffairs/Documents/Climate-and-Natural-Disaster-RFI.pdf>

¹⁸ <https://www.fhfaoig.gov/sites/default/files/WPR-2021-004.pdf>

¹⁹ https://minerva-access.unimelb.edu.au/bitstream/handle/11343/243218/WarrenMyersHurlimann_2020_PropertyClimateChangeRisk_Minerva.pdf



three water improvements selected were showerheads (87%) and aerators/faucets for kitchens (75%) and bathrooms (75%).

The report also examines trends in borrower preferences between water or energy efficiency investments by cost, savings, and geographic locations and provides visual representations of asset locations and water stress. The analysis notes a correlation between regions with water scarcity and investments in water conservation projects.

Governance Assessment

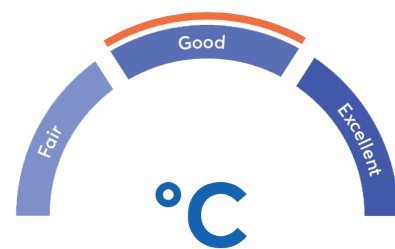
Four aspects are studied when assessing the Freddie Mac Multifamily's governance procedures: 1) the policies and goals of relevance to the green bond framework; 2) the selection process used to identify eligible projects under the framework; 3) the management of proceeds; and 4) the reporting on the projects to investors. Based on these aspects, an overall grading is given on governance strength falling into one of three classes: Fair, Good or Excellent. Please note this is not a substitute for a full evaluation of the governance of the issuing institution, and does not cover, e.g., corruption.

Freddie Mac is starting to implement the TCFD recommendations, beginning with the development of its climate risk management framework, but has not yet started disclosing according to the TCFD. It has also not measured and reported on its carbon footprint or set any emission or other climate-related targets for its portfolio. However, Freddie Mac Multifamily does require flood and windstorm insurance for properties in vulnerable areas and has provided a progressive analysis of the correlation between investments in water savings equipment and drought-prone areas.

The governance of green bond proceeds outlined in the framework is sound and transparent. There is a clear definition and process for selecting eligible investments, as well as for making sure that investments meet the selection criteria. This includes having lenders in Freddie Mac Multifamily's Optigo network hold funds for projects in escrow until project completion is verified, and by writing the required energy and water improvements into the loan agreement. Beyond the eligibility criteria and insurance requirements mentioned above, there are no further sustainability criteria required for loans to be eligible, e.g. pertaining to life-cycle impacts, supply chains, or climate resilience.

Freddie Mac Multifamily is already reporting on the projected energy and water savings across all its green bonds via its annual impact bond reports; it expects to continue this approach to reporting, as well as to start reporting actual savings data in the future. It will also continue to report loan-level data via a supplemental dataset.

The overall assessment of Freddie Mac Multifamily's governance structure and processes gives it a rating of **Good**.





Strengths

Freddie Mac Multifamily's Green Up[®] and Green Up Plus[®] loan offerings described in the green bond framework are supported by a clear and transparent selection process for eligibility: eligible loans are subject to ASHRAE audits conducted by certified Green Consultants, and as of 2019, borrowers are required to engage a qualified third-party benchmarking consultant to report energy and water performance data. Funds for qualifying improvements are not fully disbursed until completion of the project, as verified by the servicer of the applicable loan. Project completion within two years is part of the loan agreement and failure to do so constitutes a default. These measures help guarantee the delivery of projected impacts. The program is now five years old and is supported by the data collected by Freddie Mac Multifamily, which will help it tune its approach to improving program impacts and reporting moving forwards.

Freddie Mac's Green Up[®] and Green Up Plus[®] loan offerings are successfully mobilizing investments in energy and water efficiency in the US residential building sector at scale. To date, its green bonds have financed energy improvements that are projected to save 264 billion kBtu per year and water improvements that are projected to save over 370 million gallons per year. Further, actual physical energy and water consumption savings reported by borrowers for its wider pool of Green Up[®] and Green Up Plus[®] loans have been very close to projected savings, according to Freddie Mac Multifamily's 2020 *Green Improvements in Workforce Housing* report. Freddie Mac Multifamily has also noted that there have been zero defaults since the introduction of the program, as reported in the impact bonds performance data published on its website.

It is also positive that the framework supports investments in water efficiency, which improves climate resiliency in arid areas especially. As water use requires energy, improvements in water efficiency will also have benefits for climate mitigation.

Freddie Mac's Green Up[®] and Green Up Plus[®] loan offerings are building the breadth and depth of publicly accessible utility consumption data for the US residential market by requiring energy and water use data reporting for the whole building on all such loans. The resulting data is made publicly available on several platforms, both on an ongoing basis and aggregated in annual reports. Freddie Mac has indicated that it is collecting and aggregating this data to address the current lack of energy and water efficiency data for the U.S. building sector; to strengthen and improve green practices in the broader multifamily market; and to provide broad insights into the types of improvements that can cost-competitively reduce both consumption and tenant expenses.

Further, the analyses supported by these data and published in Freddie Mac Multifamily's annual *Green Improvements in Workforce Housing* report help to move the market towards greater climate resilience planning. As such they remain a forward-thinking step for the building sector and green bond market. Understanding the link between investments in water efficiency and drought-prone regions could inform future selection criteria or loan terms. Similarly, there are potential future opportunities to align financial incentives for investments in energy efficiency or renewable energy in regions with carbon-intensive grids or high energy costs.

Weaknesses

There are no material weaknesses in the framework perceived at this time.

Pitfalls

It should be noted that there is no actual requirement for borrowers to achieve the reductions in energy and water consumption that were projected at the time of loan issuance, and hence there is no guarantee that the improvements will actually reduce energy and water consumption. However, borrowers are required to report energy and water consumption data via a third-party data consultant, and these pitfalls are mitigated to an extent



by the historical data presented in the *Green Improvements in Workforce Housing* report, which indicate that actual physical energy and water consumption savings have been close to the projected amounts. However, it is not guaranteed that this trend will continue into the future.

The selection criterion of a minimum of 15% energy saving over the lifetime of the loan implies a level of energy efficiency improvement that falls far short of the annual reductions in energy intensity entailed by a Paris Agreement-aligned pathway for US multifamily residential buildings—in a 2-degree scenario, energy intensity declines by approximately 3% annually between 2021 and 2030, accelerating rapidly thereafter.²⁰

Freddie Mac Multifamily’s green bond reporting currently reports on projected energy and water consumption reductions in aggregated absolute terms, and the supplemental dataset includes loan-level data on the projected reductions, as well as properties’ ENERGY STAR® scores, EPA Water scores, and energy/water use intensities. Nonetheless, the reporting does not provide clarity around baseline consumption levels, although Freddie Mac Multifamily collects 12-month historical consumption data during the Green Assessment process. This makes it difficult to contextualize the targeted level of physical consumption savings and assess the ambition of the Green Up/Plus® program against the goals of the Paris Agreement. We encourage Freddie Mac Multifamily to provide baseline information in its impact reporting to the extent practicable.

The eligible project categories include investment in efficiency improvements involving fossil fuel-based technology, e.g. gas-fired water heaters. These investments represent important and much needed short-term emissions reduction for existing infrastructure in the US residential building sector. However, these investments may extend the useful life of fossil fuel-based equipment and technology and delay transition to cleaner, lower carbon technology. The likely unintended effect is locking in additional greenhouse gas emissions in the near to mid-term.

Further, rebound effects are always a risk for energy efficiency projects, as it is possible that tenants spend a portion of the savings delivered by these improvements to consume more water and energy, or by buying other goods and services with climate and environmental impacts.

The building sector is particularly vulnerable to the physical impacts of climate change, such as rising sea levels, more frequent and extreme storms, and flooding. Stronger hurricanes in combination with sea level rise in coastal areas, in addition to increases in heavy precipitation and flooding in urban areas, have already been observed and are expected to increase in the US by mid-century across the range of IPCC climate scenarios.²¹ In this respect we note that Freddie Mac is still in the process of developing its climate risk management framework and implementing the TCFD recommendations and acknowledge there may be challenges involved in balancing these issues against its mission and mandates. We nevertheless encourage additional transparency around how Freddie Mac is assessing and mitigating these risks to improve portfolio resilience and better protect its customers, assets, and investors.

Freddie Mac has indicated that it will explore potential impacts of loans in drought areas, energy constrained areas, and GHG emissions reduction / avoidance. However, at the time of this review, Freddie Mac has not measured or reported on greenhouse gas emissions nor set reduction targets for itself or its portfolio. We encourage Freddie Mac to consider including portfolio emissions as a reporting metric in its reporting to investors and to set ambitious emissions reductions targets that are in line with the Paris Agreement.

²⁰ Based on the Carbon Risk Real Estate Monitor (CRREM) decarbonization pathway for US multifamily residential buildings. See <https://www.crrem.eu/>

²¹ https://www.ipcc.ch/report/ar6/wg1/downloads/factsheets/IPCC_AR6_WGI_Regional_Fact_Sheet_North_and_Central_America.pdf



Appendix 1: Referenced Documents List

Document Number	Document Name	Description
1	Freddie Mac Green Bond Framework (Sept 2021)	Freddie Mac Multifamily's green bond framework
2	K-Deal Program Term Sheet	Outlines transaction specific terms and parties used in Freddie Mac routine business related to its K-series platform.
3	Green Advantage® Term Sheet	Overview of products offered through Green Advantage® program and criteria for eligibility.
4	Impact Bonds Report (2020)	Freddie Mac Multifamily's report on impacts from its green, social and sustainability bond issuances
5	Green Improvements in Workforce Housing (Dec 2020)	Review and analysis of Freddie Mac Multifamily Green Advantage® loan data detailing costs, pay back periods, reductions in energy and water
6	Freddie Mac Multifamily Seller / Servicer Guide Chapter 31 – Insurance Requirements	Insurance requirements for eligible Multifamily loans and insurance terms
7	Freddie Mac Multifamily Seller / Servicer Guide Chapter 65 – Green Report Requirements	Requirements, duties and responsibilities of the Optigo lender and the Green Consultant
8	Sample Green Assessment	Green Assessment form filled out by Green Consultant for a Pennsylvania property
9	Flood zone determination	Department of Homeland Security Federal Emergency Management Agency (FEMA) Standard Flood Hazard Determination Form



Appendix 2: About CICERO Shades of Green

CICERO Green is a subsidiary of the climate research institute CICERO. CICERO is Norway's foremost institute for interdisciplinary climate research. We deliver new insight that helps solve the climate challenge and strengthen international cooperation. CICERO has garnered attention for its work on the effects of manmade emissions on the climate and has played an active role in the UN's IPCC since 1995. CICERO staff provide quality control and methodological development for CICERO Green.

CICERO Green provides second opinions on institutions' frameworks and guidance for assessing and selecting eligible projects for green bond investments. CICERO Green is internationally recognized as a leading provider of independent reviews of green bonds, since the market's inception in 2008. CICERO Green is independent of the entity issuing the bond, its directors, senior management and advisers, and is remunerated in a way that prevents any conflicts of interests arising as a result of the fee structure. CICERO Green operates independently from the financial sector and other stakeholders to preserve the unbiased nature and high quality of second opinions.

We work with both international and domestic issuers, drawing on the global expertise of the Expert Network on Second Opinions (ENSO). Led by CICERO Green, ENSO contributes expertise to the second opinions, and is comprised of a network of trusted, independent research institutions and reputable experts on climate change and other environmental issues, including the Basque Center for Climate Change (BC3), the Stockholm Environment Institute, the Institute of Energy, Environment and Economy at Tsinghua University, the International Institute for Sustainable Development (IISD) and the School for Environment and Sustainability (SEAS) at the University of Michigan.

