

Exhibit G:
Annual Loan Products Narrative Reporting Template

FREDDIE MAC

AFFORDABLE HOUSING PRESERVATION

2018

LOAN PRODUCT

ACTIVITY:

Activity 7 – Financing of Energy or Water Efficiency Improvements on Single-Family Properties; Regulatory Activity

OBJECTIVE:

Objective A: Research the Relationship of Energy-Efficient Homes to Property Values and Mortgage Performance.

ACTIONS:

We met this objective and set the foundation to meet future objectives, which include publishing our research findings and updating our products. We reviewed existing research, conducted additional research, gathered relevant data, and investigated house price premiums associated with energy efficiency improvements or better home energy ratings. We then compared the default risk for mortgages secured by energy-efficient homes to the default risk associated with other mortgages.

2018 highlights:

- *To inform our research approach, we analyzed the report published by the University of North Carolina’s Center for Community Capital, “Home Energy Efficiency and Mortgage Risks,”¹ a broadly cited study on this topic. We also spoke with the authors about the study’s lessons learned and data limitations.*
- *We purchased data on energy ratings of homes rated between 2013 and 2018. Following a lengthy negotiation process to address privacy and copyright concerns, we also bought Home Energy Score data from the U.S. Department of Energy and Home Energy Rating System (HERS) data from RESNET.*
- *We created the Energy Efficiency Task Force, solicited feedback from them and incorporated it into our research strategy and sample dataset.*
- *We selected more recent data from the data we purchased and, to address a market need, included data on new and existing construction; loan performance for existing construction has not been analyzed as extensively as new construction. We matched each address to a property record database and restricted the matches to single-family, owner-occupied properties. We then identified unrated single-family, owner-occupied properties (or homes not in the database) within the same census tract of each matched property and with a sales transaction between 2013 and 2018. We then compared the summary statistics of the two groups.*
- *We calculated the likelihood that a property would have been rated, using available factors, including year built, square footage, location, and income. To compare the house values and loan performance of rated and unrated properties, we used regression analysis and empirical methods to make the randomization of both groups more similar.*
- *The analyses accounted for differences in geographic conditions, home characteristics, loan characteristics, and homebuyer credit attributes. We compared properties with values above a threshold (e.g., with scores consistent with Energy Star Label) to those with no rating or a lower rating using the techniques just described.*
- *We determined whether the rating value, in addition to a label or threshold, matters to property values or measuring loan performance.*

¹ https://www.imt.org/wp-content/uploads/2018/02/IMT_UNC_HomeEEMortgageRisksfinal.pdf

All these actions set the groundwork to reach preliminary conclusions on the data points that are critical to trend for future analyses, as well as determining the impact of energy efficiency improvements on loan performance and property values.

Activity	2018 Actions
<p>1. Procure external data and leverage internal data on energy efficiency ratings, property values, and property attributes. Data to be procured includes the following:</p> <ul style="list-style-type: none"> a. Energy efficiency rating data from various home energy rating entities b. Parcel data c. Property level information, including heating/cooling system types d. Appraisal data e. Home sales data f. Real estate datasets 	<ul style="list-style-type: none"> • We purchased data of homes rated between 2013 and 2018 from the HERs Index from RESNET and Home Energy Score (HES) from the Department of Energy (DOE). • We received data on 789,000 RESNET rated homes and 65,000 DOE rated homes in total. • Based on our internal research and feedback from our Energy Efficiency Task Force, we changed the scope of the property attributes we wanted to obtain. We obtained information for 450,000 properties, which included their latest sale price and other property attributes such as number of bedrooms and bathrooms, square feet, acres, year built, location in terms of census tract and year of sale.
<p>2. Design new, or leverage existing, internal models and define control group and independent variables needed to complete data analysis. Freddie Mac will seek input from our Energy Efficiency Task Force as these are developed.</p>	<ul style="list-style-type: none"> • To assess the house price premium that energy efficiency added to properties, a standard hedonic model was used to compare the sale price of rated homes to unrated homes, as well as more energy efficient homes to less energy efficient homes. Hedonic models are statistical models used to study the impact a number of factors may have on housing prices. This model allowed us to break down the properties being researched into its property attributes and allows us to obtain estimates of the contributory value of each attribute to the house price. • To assess the loan performance associated with energy efficient homes, a default risk model was used to compare the delinquency rate between rated and unrated homes, as well as between more energy efficient and less energy efficient homes. The default risk model allowed us to estimate the probability of default based on a set of mortgage origination factors associated with the borrower and loan, as well as housing price trends and macro-economic conditions such as unemployment rate and interest rate. • We collaborated with our Energy Efficiency Task Force members to determine the models and variables we used in our research.
<p>3. Construct final sample dataset of statistically appropriate significance. We plan to obtain feedback on the size and characteristics of our final sample from our Energy Efficiency Task Force.</p>	<ul style="list-style-type: none"> • We designed sample methodologies and collaborated with our Energy Efficiency Task Force members to finetune it. • As an initial sample setup, we used all unrated homes as the comparison group. All the unrated homes were randomly selected in the same census tract as the rated homes. This helped minimize the differences in neighborhood characteristics and essentially excluded geographic outliers that would otherwise be less appropriate comparable homes for rated properties. • We then focused on rated homes, which have energy rating scores that indicate how energy efficient a home is. In this setup, the comparison group includes other rated homes. The goal was to test whether and how much different efficient levels matter among all rated homes.
<p>4. Conduct research on how house prices respond to energy efficiency improvements or better energy efficiency ratings by comparing sales prices and property values for energy rated or more energy-efficient homes to less energy-efficient homes, with considerations for property characteristics. Freddie Mac will build upon existing studies done to-date.</p>	<p>We conducted analyses to explore the extent to which:</p> <ul style="list-style-type: none"> • Properties that have been rated are systematically different from those without ratings. • Properties that have been rated are associated with higher values or better loan performance than those that have not been rated. • Properties with an Energy Star label or values above a threshold are associated with higher property values or better loan performance. • The value of the rating, in addition to a label or threshold, matters for property values or measuring loan performance.

5. Evaluate the default risk of mortgages for energy efficiency improvements or on more energy efficient homes compared to other mortgages by analyzing the likelihood of delinquency or default, with considerations for borrower, loan, and property characteristics. Freddie Mac will build upon existing studies done to-date.

SELF-ASSESSMENT RATING OF PROGRESS:

Select the category that best describes progress on this objective for the year.

- Objective met
- Objective exceeded
- Objective partially completed:
 - 75-99% (substantial amount)
 - 50-74% (limited amount)
 - 25-49% (minimal amount)
 - 1-24% (less than a minimal amount)
- No milestones achieved

PARTIAL CREDIT JUSTIFICATION:

If the self-assessment above indicated that the objective was partially completed, briefly explain the basis for the share of the objective that was completed. In the explanation, include a discussion of the level of effort expended for the completed actions compared to the level of effort required to complete the entire objective.

(Character limit: 3,000 characters, including spaces)

IMPACT:

Provide a self-assessment of the level of impact that actions under the objective have accomplished.

- 50 – Substantial Impact
- 40
- 30 – Meaningful Impact
- 20
- 10 – Minimal Impact
- 0 – No Impact

IMPACT EXPLANATION:

Answer the following questions.

1. How and to what extent were actions under this objective impactful in addressing underserved market needs or laying the foundation for future impact in addressing underserved market needs? (Character limit: 3,000 characters, including spaces)

We demonstrated market leadership by taking on research that the market, and specifically our Energy Efficiency Task Force, had been looking for. This research was extremely challenging given the complexities of gathering enough data to conduct it. Particularly, we led the conversation to identify gaps with data and existing studies done to date. Our effort is innovative because our dataset includes

information on existing properties, which has not been included in prior research studies. This effort was ambitious given the lack of available market data and also privacy concerns with multiple data sets.

A key obstacle to broadening available financing of home energy-efficiency improvements, according to lenders and other industry stakeholders, is the lack of property level information and loan performance data. These critical gaps translate into limited aggregate data for properly assessing mortgage risks and modeling performance of loans secured by properties with energy efficiency features, limited empirical data on the impact of energy-efficiency improvements on property values, and inadequate information about property features. The results of our research will set the foundation for future impact by closing these gaps and providing more transparency to lenders about default risk and property values associated with energy efficiency improvements. Also, our findings could assist in creating and promoting a consistent approach to account for the impact of energy-efficiency improvements on property values in future products. The results of our efforts will show whether rated properties are systematically different from those without ratings and whether they have higher property values or better loan performance. The results also will reveal whether Energy Star labels or ratings above a threshold drive higher property values or better loan performance as well as whether the value of the rating, in addition to a label or threshold, matters for property values or measuring loan performance. The various datasets that we constructed contain data points that allowed us to analyze impacts on property values. Our conclusions on the most useful data points could be used in future designs of collateral valuation approaches and methodologies. Lastly, according to our research and information from our Energy Efficiency Task Force, homebuyers and homeowners have little understanding of the benefits of energy-efficient homes. Our findings will help us—and others—in designing and executing outreach campaigns intended to raise public understanding of and interest in how they might benefit from energy-efficient homes, including potentially higher property values, utility cost savings, and more sustainable homeownership, in addition to more environmentally conscious use of resources.

2. **Optional:** How do actions under this objective support future actions detailed in the Plan for the underserved market? If there have been any changes in the planned next steps or timeline for work under or related to this objective, describe the changes and provide a brief explanation. (Character limit: 1,500 characters, including spaces)

Our research and analysis will bring to light previously unavailable aggregated data that will allow for innovation in how homes with energy-efficiency features are valued and appraised; it will be instrumental in informing our future product design activities, under other objectives in our Plan, to develop collateral valuation guidelines and data collection requirements to support the appraisal process in a way that would provide more transparency and guidance for lenders to underwrite loans secured by energy efficient homes.

Our research findings will also allow us to bring our conclusions, especially on which data points we used to reach our findings, to the UMDP project, which would spur the conversation about which energy efficiency data points would be useful in future versions of the Uniform Residential Appraisal Report form and, therefore, helping us meet our objectives under Objective B to develop valuation guidelines and data collection requirements.

Lastly, we will be able to use our research findings to create education and marketing materials about the benefits of energy efficiency and, because our research findings will be published, we expect the market and, in particular, lenders and real estate professionals will be able to leverage our findings to include information and research-backed data into their marketing materials or other consumer-focused education campaigns.

3. **Optional:** Are there any market factors that adversely impacted the actions under this objective? If so, describe. (Character limit: 3,000 characters, including spaces)

As previously discussed, the primary market factor making this objective more difficult was the lack of existing data and difficulty obtaining the scant data that does exist.

4. **Optional:** How did the actions under this objective contribute to increased or future loan purchases for the underserved market? (Character limit: 1,500 characters, including spaces)

Our research findings will allow us to design products that better address market gaps that currently prevent lending in this market such as lack of collateral valuation guidance and the limited understanding of mortgage risks associated with mortgages secured by energy efficient properties. Additionally, our findings will help us design education and marketing campaigns to help consumers and real estate professionals understand the benefits of energy efficiency which may help increase demand for energy efficient home improvements. More collateral valuation guidance, better information to help lenders assess mortgage risks and increase demand for energy efficient home improvements will spur more lender participation, which may contribute to increased loan purchases in the future. By providing information about the benefits of energy-efficient homes, we could see increases in consumer demand for energy efficient homes. As a result, the number of energy efficient homes could increase and the utility savings associated with them could help preserve housing affordability for more borrowers.

Attach the information detailed in the list of documentation specific to the objective that was provided by FHFA.

Exhibit C:
Second Quarter Loan Products Narrative Reporting Template

FREDDIE MAC
 AFFORDABLE HOUSING PRESERVATION
 Q2: JANUARY THROUGH JUNE 2018
 LOAN PRODUCT

ACTIVITY:

Activity 7 – Financing of Energy or Water Efficiency Improvements on Single-Family Properties: Regulatory Activity.

OBJECTIVE:

Objective A: Research the Relationship of Energy Efficiency Homes to Property Values and Mortgage Performance.

ACTIONS:

During the first half of 2018, Freddie Mac began researching the relationships between home energy-efficiency and property values and loan performance. We procured data from four leading providers of consumer, financial and property data, while constructing a sampling methodology to better examine loan performance. The data we obtained includes energy efficiency rating, appraisal, home sales, real estate and property-level data. We will be using the data to further investigate how house prices respond to energy efficiency improvements or better energy efficiency ratings associated with energy efficiency improvements and determine the relationship of default risk as compared to other mortgages. Through this exercise, we recognized that there was fragmentation of data, which may makes it challenging to properly assess risks and model performance of properties with energy efficiency features for a unified relationship assessment. We will continue to explore additional data sources and remain conversant with the market to calibrate the data so we can address such challenges accordingly. This work is foundational to our future efforts to align and better tailor our product offerings to meet market needs.

We also developed a research plan in consultation with market participants from our Energy Efficiency Task Force, members of which include The Rocky Mountain Institute, the Institute for Market Transformation and the National Resources Defense Council. We plan to continue to meet with these and other market participants to gather feedback on our proposed research approach.

During the second half of 2018, Freddie Mac will be designing an internal model to complete the data analysis and construct a final sample dataset. We plan to obtain feedback from our Energy Efficiency Task Force on both our internal model and final sample dataset. We are on track to complete research on the relationship of energy efficiency improvements on house prices and mortgage performance. Once complete, we plan to summarize the data used to evaluate the default risk for mortgages of energy-efficient homes as compared to traditional or standard home mortgages. The information derived from our research will be vital in facilitating the design of our product requirements and flexibilities to support our goal to preserve home affordability.

Activity	Action Reference; Activity 7; Objective A	Status
Procure external data and leverage internal data on energy efficiency ratings, property values and property attributes.	Action 1	<i>Completed</i> <ul style="list-style-type: none"> Procured data, including energy efficiency ratings, parcel data, property-level information, appraisal data, home sales data, real estate datasets
Design new or leverage existing internal models and define control group and independent variables to complete data analysis.	Action 2	<i>In Progress</i> <ul style="list-style-type: none"> Data analysis
Construct final sample dataset; obtain feedback on size and characteristic of final sample from Energy Efficiency Task Force.	Action 3	<i>In Progress</i> <ul style="list-style-type: none"> Data analysis

Evaluate house price response to energy efficiency improvements or ratings.	Action 4	<i>In Progress</i> • Data analysis
Evaluate risk of mortgages and likelihood of delinquency or default.	Action 5	<i>In Progress</i> • Data analysis

SELF-ASSESSMENT RATING OF PROGRESS:

Select the category that best describes progress on this objective for the reporting period.

- On-target to meet or exceed the objective
- Progress delayed and/or partial completion of the objective expected
- Unlikely to achieve any milestones of the objective

ADDITIONAL INFORMATION (IF APPLICABLE):

If the Enterprise is not on target to meet or exceed the objective, briefly explain why. (Character limit: 1,000 characters, including spaces)