Introduction

In June 2015, the Warehouse for Energy Efficiency Loans (WHEEL) securitized its first portfolio of unsecured residential energy efficiency loans originated in the U.S. states of Pennsylvania, Kentucky and Ohio. The transaction was small—$12.58 million in securities (marketed as a “green bond”) backed by almost $16 million in loans—but the transaction was nonetheless a landmark, representing the debut of a new asset class on the international capital markets. Following that first successful securitization, U.S. states including New York, Florida, Virginia and Missouri committed to join the program, setting the stage for a larger and more geographically diverse second securitization.

WHEEL is not the only securitization-based energy finance model seeing significant success in the United States. Unlike these tools, however, WHEEL does not require any special legislative or tax mechanism. Instead, WHEEL might be thought of as most analogous to a credit card, except with significant efficiency requirements imposed by the public sector participants.

As countries around the globe begin working to implement the pledges made at COP21 in Paris and looking for approaches to bring in the significant private investment needed to accomplish their goals, WHEEL provides one public-private-philanthropic partnership model that may be replicable in other contexts.

This paper explores the feasibility of replicating the WHEEL model in the European Union (particularly the United Kingdom, Germany, France and Spain), India, Brazil and China. We review key conditions that would be needed to replicate the WHEEL model in its narrow sense (e.g., unsecured loans to single-family homeowners with credit-score based underwriting and public credit enhancement). The WHEEL model used in the United States requires adaptation to meet the goals and conditions present in the countries described. Nonetheless, we find that energy loan securitization is feasible in each of the countries studied and in fact represents an important and necessary step in the transition to a clean energy economy.

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Why aim to securitize energy efficiency loans?

Securitization of energy efficiency loans has many benefits. Perhaps most importantly, this approach creates liquidity needed to attract additional investors in the asset class. Banks no longer need hold the loans on their books, which allows them to make more loans than they could if they had to hold them and maintain associated capital coverage required by banking regulations.

Second, securitization often results in a lower cost of capital (lower interest rates to borrowers) because of the diversification benefit it provides to investors. Securitization allows investors to diversify their risk by taking a small piece of many loans rather than a large piece of a small number of loans.

Third, investors may generally choose which “piece” or “tranche” of the loans they wish to purchase based on their risk/reward profile. (More senior tranches...
generally provide investors less yield while mezzanine and subordinate tranches offer greater yield but greater risk since they absorb the first losses that may come on the underlying assets if borrowers default).

Securitization also over time creates a wealth of historical performance data that facilitates risk assessment. With greater supply of investors and greater familiarity with the performance of the asset class, the cost of capital should decrease.\footnote{i}

Decreased capital costs due to liquidity, diversification and greater familiarity with the asset class from an established performance track record, in turn means lower costs to borrowers to do energy efficiency work, which should mean more work done by more borrowers and more energy efficient buildings and systems.\footnote{ii} More energy efficient buildings and systems should reduce energy demand and use and concomitant greenhouse gas emissions.

**What is the potential for specialized energy efficiency financial products on the secondary market?**

The potential for specialized energy efficiency financial products on the secondary market is significant, around several hundred billion dollars in total.\footnote{iii} More than $1 billion in Property Assessed Clean Energy (PACE) loans have been securitized already in the United States and that represents just a small fraction of the market for clean energy improvements in the US, let alone globally. At the same time, more and more investors seek socially and environmentally responsible investments, including “green bonds”. In 2015, $41.8 billion in green bonds were issued.\footnote{iv} Notably, while the European Union ($18.5 billion) and US ($10 billion) accounted for over half of all issuances, India ($1.1 billion) and China ($1 billion) are becoming players in the labelled green bonds market.\footnote{v} Brazil entered the market in 2015 with $0.6 billion issued.\footnote{vi}

Specialized energy efficiency financial products may demonstrate better repayment rates than comparable financial products that are not used to finance energy efficiency improvements. For example, as of February 2016 the Green Jobs Green New York (GJGNY) Program had experienced a .38% annualized chargeoff rate for its off-bill unsecured energy loans to creditworthy borrowers. For comparison, credit card charge-off rates in recent years have ranged from 1.5% to 4.0%.\footnote{vii}

This better performance of specialized energy efficiency financial products may be because the home improvements they fund often reduce borrower’s expenses and create a stream of income that can pay back the financing. Borrowers who undertake energy efficiency improvements may be more conscientious than a comparable borrower that does not undertake such improvements. Whatever the reason, if the performance of GJGNY, WHEEL, PACE and other similar products bears out this hypothesis that specialized energy efficiency financial products will perform better than comparable general products, the creation of specialized asset classes will lead to reduced costs of capital for this type of work and help to further drive adoption.
What impact will the push for a “green bond” market have on energy efficiency financial products?

In recent years advocates such as the Climate Bond Initiative have encouraged financial products with positive environmental impact to obtain green bond labeling and differentiate themselves from more general investments. As of early 2015, as many as $13.5 billion in climate-themed bonds for buildings and industry had been identified (out of $502.6 billion total outstanding), with another $74.7 billion for energy. The vast majority of climate-themed bonds, however, were for transport, with energy efficiency a relatively small subcategory.

The push for a “green bond” market will encourage large market participants to invest in developing transactions that can qualify for the label and satisfy investor demand. That is important because new products take time and money to develop, as described below, and existing products require investments to increase market penetration and reach scale. The push may not initially have a great impact on price, however, as many investors report they are not willing to take less yield on an investment solely because it is a labeled green bond. Still, in September 2015, Barclays reported as much as a 20 basis point difference in yield for green bonds.

WHEEL Background; Methodology Notes and Explanation

The approach this paper takes to determine feasibility is heavily informed by the history of the WHEEL program in the United States. While each country studied presents its own unique set of opportunities and challenges and suggests modifications to the model that worked in the United States, we nonetheless believe it is helpful in assessing the feasibility of energy loan securitization in other countries to consider the US WHEEL experience.

The US WHEEL program was born because a state had an unusual problem: an energy efficiency loan program that was too successful. Pennsylvania Treasury had invested state funds in the program but it was outgrowing the diversification limits that were required in order for Treasury to fulfill its fiduciary role. Pennsylvania sought to sell its portfolio of loans but soon realized there was no market for this unfamiliar asset. Fannie Mae would buy the loans, and had bought similar assets for many years, but it would only do so at a significant discount that was not warranted by Pennsylvania’s loss experience with the assets. So Pennsylvania explored the possibility of securitizing its portfolio and tapping the secondary capital markets. It quickly realized that despite the size and success of the program, it was not large enough on its own to regularly generate the large volumes of loans needed to create a liquid asset class that would interest investors and make securitization cost-effective. It was at that point that the multi-state approach was launched.

This background is important not only as context but also to explain the methodological approach we take in this paper in determining the feasibility of a WHEEL-type program in other countries. For example, knowing that a state of 12 million people that has a mature program (i.e., Pennsylvania) can generate $18
million in residential energy efficiency loans per year through the WHEEL primary market model suggests that a demographically similar area would need at least 60 million people in order to achieve the minimum $100 million per year volume that is one benchmark of mature securitizable asset classes. An area with a lower percentage of homeowners with sufficient income and credit to undertake an energy project might need a larger total population to yield a securitizable program.

Similarly, we include statistics regarding the portion of single-family homeowners in the countries being studied because US WHEEL is currently limited primarily to that market. In the US, homeowners who do not live in single-family buildings are less likely to make purchasing decisions about heating and cooling systems as these tend to be centralized for the building. Since emergency replacement of heating and cooling is such a central aspect of WHEEL demand generation, this distinction may be significant. Homeowners in the US tend to have fewer financing options for these major purchases than they might for energy efficient appliances bought on a stand-alone basis, for which appliance stores often offer promotional rate credit cards. Our research suggests that this may also be the case in a number of the countries studied, particularly those within the EU.

In the course of our study, steering committee members noted to us that such limitations might not make sense in countries with higher rates of multifamily living or in which renters are required to provide their own appliances. Indeed, in some of the markets studied it may make sense to broaden the eligibility rules. However, we include information facilitating comparisons to the US and PA in order to highlight the extent to which such an expansion might be important in identifying a large enough market to support energy loan securitization.

We include information about energy prices and consumption and compare those to corresponding figures in Pennsylvania and the US because these determine the payback period for many home energy improvements. Energy bills are an important factor driving the average homeowner to undertake certain energy improvements such as insulation and weatherstripping. If energy bills are very low, individuals may still be motivated to choose the energy efficient appliances if the WHEEL financing makes them more attractive than non-efficient appliances (because, for example, financing is not available to them for those appliances or is comparatively expensive), but we cannot be as confident about the success of Pennsylvania’s model where both motivating factors are not present. Of course, in areas where WHEEL would be used to provide access to energy to homeowners who currently have none and are not connected to the grid, this is a less relevant consideration.

In addition, we provide information about credit scores and credit card utilization because WHEEL, like many consumer credit programs, relies heavily on consumer credit scores and debt-to-income ratios in underwriting loans and determining consumer creditworthiness. For example, the minimum credit score in WHEEL is 640, and the maximum debt-to-income ratio allowable is 50%. This underwriting facilitates securitization because secondary market investors have a reasonably good idea of how likely it is that consumers with specific credit scores and debt-to-income ratios will repay loans. It is also important for public sponsors who invest in these loans, since their funds are the first to be lost in covering
defaults due to borrower nonpayment. Notably, WHEEL is structured so that public investors receive a small return intended to offset the losses from such defaults, but if losses are higher than expected the program would not be able to recycle the full amount of public funds invested at the end of the loan term.

We do not believe that credit-score based underwriting is a necessary condition for a successful energy loan securitization, however. Indeed, for a WHEEL-type model to succeed in China or rural India or Brazil, an alternative underwriting mechanism may be needed.

KEY FINDINGS

Program Groundwork

*What key project components would need to be developed or built upon?*

Key project components for WHEEL include a sufficiently large population of creditworthy homeowners, an energy efficiency rating system to facilitate determination of appropriate measures for support, accessible networks of home improvement professionals with sufficient knowledge and expertise to make energy efficiency improvements, a credit system that facilitates simple underwriting and that covers a sufficient portion of the population, and (drawing on the above components) a pipeline of energy efficiency loans segregated from other home improvement financing that can be bundled for securitization. Partners to provide credit enhancement, senior capital, program administration, origination and servicing, and program development funding are also critical.

Likelihood of Program Success

*Could a WHEEL-type program succeed in one or more of the studied regions? What would success look like?*

A WHEEL-type program has the potential to succeed in all of the studied markets. Each of the countries studied has sufficiently high home ownership rates, residential energy burdens (average energy bills relative to incomes) similar to or greater than those in the United States, an established securitization market\(^1\), government-sponsored energy efficiency rating systems for identifying appropriate home improvements to support, and governments committed to mitigating the

\(^1\) Securitization volume data from Bloomberg demonstrates numerous securitizations in Brazil, China, India and Europe. In Brazil, mortgages are the most common type of securitized product. China has an existing infrastructure for consumer loan securitizations, including car loans. Approximately $8 billion in securitizations were completed in India in the fiscal year ending March 2014, but we found no consumer loan or credit card securitizations. US figures assume 2014 conversion rate of 1 INR = 0.0164 USD and 1 EUR = 1.33.
impacts of climate change through innovative financing programs. Few appear to have established active primary loan markets for home energy efficiency improvements segregated from other consumer debts, however, so a segregated market would need to be created in most of the countries studied to generate the pipeline for a WHEEL-type securitization.

A WHEEL-type program in some countries outside of the US would likely require a modified underwriting approach since numeric credit scores are less common in many of the markets studied than they are in the United States. While most Europeans and Brazilians and a sizeable minority of Indians have established credit histories, most Chinese homeowners still lack credit coverage despite recent progress. Robust micro-lending networks in India present an alternative to traditional underwriting that may be helpful in reaching more rural and lower-income borrowers.

Are there interim milestones on the path to success? What key metrics might be utilized to measure success? How likely is such success?

The interim milestones in each market would be to:
(1) identify and engage with all of the needed partners (an originator, a servicer and servicing mechanism, a program administrator, source of capital and credit enhancement, a pipeline via home improvement contracting networks or other vendors, lawyers with familiarity with local consumer lending laws and securities regulations);
(2) work with rating agencies and financial institutions to identify an underwriting approach that can result in a rated securitization;
(3) work with public sponsors and vendors to identify appropriate improvements to finance in each market and an appropriate mechanism to screen installers;
(4) create the legal documentation needed to facilitate the public-private partnership and the initial lending, including interest rate swaps and currency swaps if necessary;
(5) begin marketing the program through the identified pipeline partners and aggregating and seasoning the loans;
(6) obtain a rating on a securitization of the aggregated pool;
(7) market the securities to investors; and
(8) complete the first securitization.

Key metrics to measure success would include successful completion of the above milestones. Success is very likely given a long enough time frame and sufficient support to cover the significant up-front development costs required for such a program. Without sufficient support from the public and philanthropic sectors, however, success is highly unlikely.
Program Development Time Frame

Within each region and across regions: How long might it take to realize full program success? Interim milestones? What factors might affect the time frame?

A WHEEL-type program could reach a milestone first securitization in the EU in two to five years with sufficient support from the public and philanthropic sectors. Many of the milestones above could be pursued simultaneously rather than sequentially. It may be necessary to provide very significant credit enhancement of the initial loan pool in order to achieve a rated securitization due to the lack of a long "track record" of the repayment performance of this type of loan in these countries. Once such a track record is established and a pipeline stimulated, however, a WHEEL-type program has great potential to improve energy and water efficiency in the countries studied.

Factors that might affect the time frame include: political and governmental changes (which impact credit enhancement support), legal changes (which may impact the primary loan market as well as the securitization structure and market, or which may drive demand for energy efficiency by imposing requirements on homeowners), centralization of contractors in networks (which impacts the resources needed to generate the pipeline and offer the financing to homeowners), energy prices (since very low energy prices reduce homeowner incentives to make energy efficiency improvements), and resources committed to project development (more people generally reduces the timeframe since many of the milestones can be pursued simultaneously by a well-coordinated team).

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i See, e.g., “Accessing Secondary Markets as a Capital Source for Energy Efficiency Finance Programs: Program Design Considerations for Policymakers and Administrators.” SEE Action Financing Solutions Working Group February 2015: “Mature secondary markets often rely on highly standardized loan products and involve the packaging of multiple loans into tradable instruments. In these markets, high volume, the standardization of underlying loans, and the tradable nature of secondary market instruments can lead investors to require lower returns, which translate to lower interest rates for primary borrowers.”

ii See Id. An efficient secondary market for energy efficiency products is more likely to develop if (1) investors become familiar with specialized energy efficiency loan products; (2) originators successfully create tradable energy efficiency-backed instruments; and (3) some degree of standardization occurs. This could make more, lower-cost capital available, which would translate into lower interest rates for consumers. If consumer demand increases in response to these lower interest rates, total energy efficiency investment and savings would increase, moving the market closer to the vision of energy efficiency “at scale.” If specialized energy efficiency loans outperform comparable loans over time, investors could view the loans as a distinct asset class and could reward energy efficiency products with even lower interest rates, which could further boost customer adoption.

iii See Id. (citing Choi Granade, et al., 2009 and Fulton & Brandenburg, 2012).

iv https://www.climatebonds.net

v http://cleantechnica.com/2016/01/15/record-41-8-billion-labelled-green-bonds-issued-2015/


