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Citi, one of the world's largest financial institutions, was focused on solving a large problem: how to "crack the code" on energy efficiency financing at scale for retrofitting buildings - homes, office buildings and schools, among others. Doing so would deliver environmental benefits, generate cost savings for homeowners and building owners, create local jobs that can't be exported, and lead to a new line of business for the bank.

On the surface, energy efficiency appeared as a market opportunity that was ready to go: a perfect investment for homeowners and building owners -- producing immediate savings and paying for itself twice over, on average. McKinsey has identified energy efficiency as "the single most attractive and affordable component of the necessary shift in energy consumption," with the potential to enable the U.S. to cut consumption by up to 23% while advancing national strategies "to obtain an affordable, secure energy supply while controlling climate change."[1]

And the potential was huge, with investment needs in the U.S. of roughly $500 billion generating savings in excess of $1 trillion.[2]

So why was this opportunity sitting there? Was it not the proverbial low-hanging fruit? Perhaps so, but Bruce Schlein of Citi recognized it was "a watermelon -- low-hanging, but a very heavy lift," and cracking the code would mean resolving issues that had precluded capital market involvement.

These included some of the typical hurdles facing securitizations, such as:

- Transaction size, and the need to aggregate hundreds and even thousands of energy efficiency loans to attract capital market attention and create a cost-effective transaction; and
- Credit quality, with property owners or "hosts" of varying financial strength and unsecured improvements – energy efficiency improvements, such as better insulation, generally have no resale value and can't be removed and sold to recoup loan losses.

Aggregation and credit quality, including lack of collateral, are not trivial problems, but the markets have bundled and sold billions of dollars of unsecured loans in other sectors with tiers of credit quality. Energy efficiency lending, though, carried some new twists:

- A need for much longer tenors than the credit market generally accepts for unsecured loans; and
- Because it represented a new asset class, a lack of performance data, with regard to both the performance of the loans, but also the performance of energy efficiency measures at scale in live settings (vs. the ideal conditions of a lab).

With regard to tenor, unsecured loans most typically have terms of one to three-years, as compared to, say, 30 years for loans secured by homes or buildings and 7 years for those secured

by removable equipment. Energy efficiency loans, although typically unsecured, needed to be stretched out over the useful life of the improvements -- 10, 15 or 20 years -- to achieve immediate savings for borrowers (i.e., to reduce borrowers' monthly utility payments by an amount exceeding their new debt service payments).

So there was something of a conundrum. Without immediate savings, few people were likely to take a loan. But the only way to create those savings was to provide stretched out terms that the credit markets had historically chosen not to offer. And if lenders didn't have performance data on this specific type of loan, they certainly had plenty of data telling them that the longer a loan was outstanding, the greater the likelihood something would go wrong. It boiled down to these two questions:

- If a building was going to be retrofitted with energy efficiency improvements, how do you guarantee it will be occupied (and therefore capable of paying its bills) and that the proposed savings will be realized?
- Or, if homeowners were to borrow money to make their homes energy efficient, how do you ensure that the homeowners won't default on their loans since the loan is unsecured?

The extended repayment period, which is necessary to produce immediate savings and is therefore a critical inducement for borrowers, created yet one more complication – based on historical data, about half of all homeowners would sell their home before they could fully recoup the cost of energy efficiency improvements.[3] And many owners of commercial or rental buildings had similar considerations. Why would they make an investment that may not have time to pay off?

And recouping the investment was not only a matter of holding on long enough. It was also subject to the quality of the improvements and installations. A US Department of Commerce study found that heating and cooling systems were "typically" installed improperly, wiping out most of the efficiency gains[4] and utility bill savings.

So Mr. Schlein's "watermelon" description appeared quite apt. But McKinsey's description was also accurate -- energy efficiency held great promise as a strategy to address urgent national priorities of adequate energy supplies, environmental remediation, job creation and savings to homeowners and building owners.

Citi decided to step in.

Background in energy efficiency financing

Buildings are the largest consumers of energy in the United States, accounting for about 41% of use -- roughly evenly divided between residential and commercial uses -- as compared to 31% used for manufacturing and 28% for transportation.[5] Historically, most energy efficiency improvements have been performed on public buildings and financed with lease structures where savings cover lease costs. The actual work largely consists of replacements or improvements to heating and cooling systems, as well as improved insulation, including new windows with better insulation properties and new insulation pumped into cavities within exterior walls.

Public buildings have been attractive because public agencies stay in properties long enough to fully realize savings on the investment. The investment model often involves an energy services company (ESCO) that audits a property and quantifies and guarantees savings associated with the implementation of energy efficiency upgrades. The property owner finds financing that is structured based on the expected savings, but underwritten based on the credit worthiness of the owner (the host). The loan payments usually are designed to be less than the resulting savings to the property owner. If the savings don't materialize, the property owner can pursue remedies under the guarantee from the ESCO, but payments must be made to the lender regardless.

Citi's early experience in energy efficiency

Citi began its journey in energy efficiency financing by focusing first on its own operations. Citi worked with its corporate real estate group as well as NGOs, including the World Resource Institute (WRI) and the Clinton Climate Initiative (CCI), to design its own emission reduction benchmarking and targets, achieving a 22% reduction in greenhouse gases (GHGs) by 2013.

Citi also had experience in financing energy efficiency retrofits for MUSH properties (municipalities, universities, schools and hospitals). Like the public entities described above, universities, schools and hospitals are long-term property owners and tenants, typically with good credit histories.

Working with stakeholders

In 2009, Citi assembled a group of internal and external stakeholders with a goal of identifying how best to situate the development of new energy efficiency finance products and services within the bank. Citi's internal groups included Municipal Securities, Corporate, Investment Banking, Operations and Technology and Community Capital (multifamily affordable), and CitiMortgage (single-family residential) as well as a number of external players including the US Department of Energy, the City of New York, the State of Delaware, the Environmental Defense Fund (EDF), the Natural Resources Defense Council, CCI, WRI, Price Waterhouse, Ceres, Living Cities and Johnson Controls.

The group determined that the key needs were aggregation, standardization and replicability, and data on loan repayment and energy savings.

While working on initial transactions, Citi continued to convene its stakeholder group through 2013, which served as a platform for organizing a series of industry conferences focused on catalyzing the energy efficiency market. Citi co-hosted these conferences with EDF, with participants from within the bank, banking industry partners, NGOs and government bodies. The last conference focused on energy efficiency for low and middle-income housing.

What did Citi do?

Citi secured its position in energy efficiency financing with three transactions in the Municipal Securities (public finance) division, plus an internal financing:

- In 2011, a $67 million bond issue for the Delaware Sustainable Energy Utility to help Delaware state agencies conserve energy. With the agencies largely funded via state appropriations, the financing risk in this transaction lay in the state's presumed willingness to continue making adequate appropriations each year.[6] But the logic of the transaction conforms to classic energy efficiency terms, as described by Trenton Allen, then of Citi, "The deal allows agencies to take their less efficient buildings, make improvements, and then use the savings to cover the cost of the investment."
- In 2012, a $50 million warehouse facility for Green Campus Partners, essentially a line of credit, to be used for energy efficiency and alternative energy projects in the public sector.[7]
- In 2013, a $24 million revenue bond issue to finance over 3,000 loans for consumers across NY State to make residential energy improvements. The bonds were rated AAA and secured by payments from the loans, and additionally backed by funds from the state's Green Jobs Green NY program plus a guarantee from a NY State revolving fund.[8]
- In 2013, the internal transaction, of approximately $10 million, was done as a result of the collaboration between Citi's banking and Operation & Technology divisions. It financed retrofits for Citi's data center in London and was funded with lease services payments rather than capital expense so that it wasn't carried on the balance sheet. This transaction was unique in that Citi was both the host and the lender.

For these early transactions, Citi addressed the key credit considerations – "guaranteeing" the buildings will be occupied and "ensuring" the homeowners won't default – by sticking with public properties for the first two transactions and bringing in public credit enhancements for the third. As for the internal financing, Citi was, of course, comfortable with its own credit profile.

What's Happened Since?

These transactions helped lay the groundwork for additional financial innovations for private sector property owners led by Citi's Alternative Energy Finance group.

In particular, Citi saw a unique opportunity to create a secondary market for unsecured single-family energy efficiency loans. There are some 80 million occupied single-family homes in the United States, most of which are more than 35 years old[9] and, by virtue of age, potential candidates for efficiency upgrades. Although each individual loan in this market is small, there is enormous potential for aggregation – leading to climate, jobs and energy impacts at scale, as well as a robust business opportunity. Citi and its partners projected a $200 billion market in unmet financing need.[10]

To meet that need, Citi created a secondary market model for unsecured single-family energy efficiency loans through two initiatives.

The first is Citi's participation in the creation of the WHEEL (Warehouse for Energy Efficiency Loans) program. WHEEL is a public-private program dedicated to bringing large-scale capital to state and local governments and utilities to facilitate low cost loans for energy efficiency home improvements. WHEEL was launched in 2014 with the specific intention of creating a secondary

market for unsecured energy efficiency loans. It was an outgrowth of an earlier Pennsylvania residential energy efficiency program whose success led to funding shortages and the realization that continued financing needed ongoing infusions of private capital, funded via asset-backed securities (ABS).

In 2015, Citi and Renew Financial issued $12.6 million in ABS backed by loans from the WHEEL program, creating the first ABS program backed by unsecured consumer energy efficiency loans. With this successful take-out financing, Citi and Renew created a scalable and sustainable source of secondary market financing for state programs enabling single-family residents to make energy efficiency home improvements. This transaction was named the energy efficiency deal of the year by the Environmental Finance news service.

How does WHEEL work? As its name suggests, WHEEL functions as a revolving financing facility. It is capitalized by a $50 million loan from Citi, with a layer of subordinated public funds. As a warehouse, it is a funding source for loan origination as well as an aggregator of the originated loans. When the originated loans reach a sufficient volume, cash flow from the loans can be pledged to the repayment of a newly issued ABS. In return for the cash flow pledge, WHEEL receives the proceeds of the sale of the ABS, which refills the warehouse facility and enables the process to start up again.

Under the Pennsylvania program, WHEEL provides unsecured loans of up to $20,000, with no money down, for single-family homeowners with FICO scores of 640 or higher. The loans are up to 10 years, with no prepayment penalties and rates currently fixed at 7.99%, a low rate for loans with these features. And as hoped, WHEEL has become more efficient over time, with the interest rate dropping following the first securitization. Participating contractors are vetted and registered.

The second significant transaction for Citi and the single-family residential energy efficiency loan market was with Spruce (previously known as Kilowatt) Financial. Unlike WHEEL, which is a state government sponsored program, the Citi-Spruce program is delivered through a contractor network. This $83.8 million deal, which closed in June 2016, was the biggest securitization for unsecured residential energy efficiency to date. It consisted of two tranches, $73.5 million of A-rated notes at 4.32% and the remainder BBB-rated at 6.9%. Ten investor groups, comprised of asset managers and insurance companies, picked up both tranches.

For Citi, these two programs allowed the firm to take a leadership position in creating a secondary market for residential single-family energy efficiency loans. But the programs have yet to take off. As of May 2017, the first two transactions remain the only securitizations of unsecured energy efficiency residential loans. For WHEEL, where Citi and Renew have aimed to build a national program, growth has stalled due to inconsistent availability of the subordinated layer of public funds, as well as complications and expense associated with various federal and state-by-state lending regulations. The program is currently available in Pennsylvania and New York.[11]

What's Next and Lessons Learned

So what does the future hold? Citi has set an Environmental Finance Goal to lend, invest, and facilitate $100 billion over ten years to sustainable activities that reduce the impact of climate change and create environmental solutions that benefit people and communities.

Will energy efficiency financing be a material contributor towards that goal? It's too early to say. But Citi believes that their efforts to date represent the start of a market, with significant global opportunity, particularly in emerging markets, where they believe demand for energy efficiency outpaces supply. Citi would also like to see the full utilization of the capacity it developed to deliver single-family residential energy efficiency, with more states joining WHEEL and the opportunity fully maximized with current state members. Citi and its partners are also looking at applying the WHEEL model to multifamily, multifamily affordable, and corporate properties, with Citi providing a secondary market take-out for individual loans originated and aggregated by local partners.

One or more of these will need to happen, as, to date, Citi's credit products have remained smaller than optimal for efficient financing, with too much time between transactions.

But there are some important early lessons learned by Citi's engagement and leadership:

- Success requires the engagement of a broad range of internal and external stakeholders with deep and complementary energy efficiency knowledge and on-the-ground delivery capacity.
- With many potential market segments, it is critical to focus on markets or market subsets most ready for the capital markets. But that can be hard to determine, as unmet need and market demand are two different things.

As a related matter, Citi believes that more than sufficient demand exists in the capital markets for this asset class. But is there supply? That is, if lenders are willing to lend at scale, are property owners willing to borrow at scale? At the moment, it appears not. At least not under this model, and the lessons here are not entirely clear. Maybe the programs need more marketing to reach individual homeowners and property owners. Maybe they need more contractor buy-in, as some of the most successful retrofit programs seem to be contractor-driven. Contractors, that is, are finding the homeowners. Or maybe, with energy prices currently low, the savings are simply insufficient to be worth the trouble of turning your home into a construction zone for a time. When energy prices rise, however, as they inevitably will, the programs might just sell themselves.

Case Questions:

- How might Citi build more property owner demand for this product?
- Which segment of the market might they target?
- Are there stakeholders who might be interested in helping Citi promote the program?
- What factors do property owners consider in making energy efficiency investment decisions? Are there changes you can recommend to the program that might make it more popular with property owners?

- What are the pros and cons of such programs as On-Bill Repayment (OBR) and Property Assessed Clean Energy (PACE), and could those programs help Citi reach scale in single-family energy efficiency?

[1] http://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/us-energy-savings-opportunities-and-challenges

[2] ibid

[3] ibid

[4] https://www.nist.gov/news-events/news/2014/11/underperforming-energy-efficiency-hvac-equipment-suffers-due-poor

[5] http://www.eia.gov/totalenergy/data/annual/pdf/aer.pdf

[6] Citi Post-Pricing Commentary; August 1, 2011; Delaware Sustainable Energy Utility, Inc.; Energy Efficiency Revenue Bonds, Series 2011

[7] http://www.prnewswire.com/news-releases/green-campus-partners-and-citi-launch-financing-solution-to-fund-energy-efficiency-and-renewable-energy-projects-159455125.html

[8] Preliminary Offering Statement Dated July 23, 2013; NYS Energy Research and Development Authority; Residential Energy Efficiency Revenue Bonds, Series 2013A

[9] Figures from US Census Bureau, 2013 American Housing Survey (AHS). The figure given on the age of housing ("more than 35 years old") is an extrapolation from the AHS, which states that, in 2013, 57% of owner-occupied housing was more than 34 years old.

[10] http://www.patreasury.gov/assets/pdf/WHEEL-Announce-Release-FINAL2.pdf

[11] http://stateenergyreport.com/2015/02/12/wheel-what-do-new-york-florida-pennsylvania-and-kentucky-have-in-common-energy-efficiency-as-an-asset-class/

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