



Demand Side Solutions Inc.

the un-utility people

**Energy Retrofit Finance:
A Win-Win-Win Solution
for the GSEs, Property Owners, and the Environment**

Submission for FHFA RFI: Proposed Single Security Structure

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PREAMBLE

With a view to the possible re-emergence of the Government-Sponsored Enterprises (GSEs) from conservatorship, and the desire for a single security structure, there is an opportunity for the GSEs to add value to property markets and reduce lending risk by proactively incorporating green energy retrofits and resiliency. At the time of purchase or refinancing, the financial interests of property owners and the GSEs are aligned, and the creation of a single security structure provides the natural opportunity to incorporate some new features to support energy retrofit financing and value creation.

These suggestions propose the inclusion in the mortgage lending process of efficient and effective integral financing options for energy retrofits, which will support property-appreciation, hand in hand with a reduction in GHG-emissions. No exhaustive treatment of these options is attempted here.

Understood properly, this confluence of on-site renewable energy technology, which moves energy from liabilities to assets, with financing based on energy savings, can simultaneously maximize GHG-reductions and property values. It is thus a tool for energy policy as much as a support for property values (i.e. collateral values), implying a reduction of mortgage risk. As an integral part of this paper, we will look at how the industry has focused on supply-oriented lending solutions, typically in some form of asset backed finance—including Property Assessed Clean Energy (PACE) and other prevalent models—and assess the limits of their effectiveness and long-term desirability.

Superior alternatives are conceivable, particularly by focusing on property values and the demand side, including an important constructive role for the GSEs—the special focus of this paper. Today utility regulation is changing to enable more co-investment. Such a role would support the overall GSE mission, and ultimately would add to shareholder value by reducing risk. At the same time it supports both property owners and national energy policy, while also enabling municipalities to benefit from property enhancements and better living standards.

In general, it should be noted that **the market for financing energy retrofits is dominated by supply-driven solutions, and vendor-driven financing and sales until now**, and focused on what is easy to sell and finance, not what adds the most value to a property. With only slight exaggeration, the current spate of incentives and programs are to the benefit of **hardware vendors and energy companies, not property owners**. Clean energy will be a dominant value determinant in the real estate market, driven by the need for resiliency and lower GHG-emissions. It is time that serious financing options become available for upgrading the housing stock, allowing property owners to rebuild wealth. Increased lender risk to the GSEs will accrue from a failure to address these issues at this time. The development of a single security structure provides the right opportunity. Well-designed financing options would ensure rising collateral values hand-in-hand with energy upgrades. It should also be noted,

with a view to climate change, that resiliency increases with clean energy conversions.

Analytical Foundation

Energy efficiency has been the most popular approach, but the resulting programs benefit the utility industry more than property owners. Energy efficiency cannot and will not eliminate GHG-emissions in a meaningful and sustained way. At best it can achieve a temporary abatement, but at the cost of prolonging the use of fossil fuels, if not increasing it (lowering the cost), thus it increasing GHG-emissions in the long-run. **Energy efficiency is also self-defeating financially, because it is a limit-function, producing diminishing returns.** Successive energy efficiency investments become exponentially less productive until at some point no amount of money will increase efficiency. Financially, the pursuit of energy efficiency is an incremental approach that constantly seeks the most 'savings' for the lowest cost, which literally does not add up because of diminishing returns. The preoccupation with energy efficiency may have diverted the attention from serious investment in renewable energy, because it never sees the long tail of (near-)zero energy bills that would be readily apparent if people prepared a 30-year NPV of their energy decisions. In current programs, short-term savings have trumped long-term investment returns, and asset appreciation. The demand side is a very good place for renewable energy investment, one property at a time.

Renewable energy on the other hand does directly replace fossil fuel and reduce GHG-emissions, by switching from carbon-energy to on-site generation of clean, renewable energy, be it solar, wind, geothermal, or water. Financially, it moves energy from liabilities to assets, because it becomes part of permanent building infrastructure.

1. **Changes to the energy infrastructure of a property require life-cycle planning, because of engineering interdependencies.** The current vogue of technology-level incentives tends to invite sub-optimal implementations—typically better energy efficiency 'mouse traps.' Various government-sponsored incentive programs tend to undermine good planning because they aim for a one-time goal at a single point in

time, while a property has a long useful life, including several replacement cycles of energy infrastructure.

2. Overall, **the planning of energy retrofits should be done for the whole property, and with a 30-year planning horizon, on a net present value basis (NPV)**. The focus needs to be on creating asset value.
3. **Generating technologies should be planned carefully, as property appreciation will critically depend on successful on-site generation.**
Note: Passive improvements directly reduce installed capacity (capital requirements) in the case of renewable energy, whereas in the case of fossil fuels, the savings from passive measures will primarily come from reducing future energy bills.
4. In general, technology choices should balance appropriate generating choices with suitable conservation and passive solutions, including energy harvesting opportunities. On a performance basis, here are some guidelines:
 - Geothermal: 400% efficiency (one joule in, four joules out).
 - Solar thermal: Up to 98% efficiency (and there is value in cheap storage: hot water).
 - Wind: In the right locations more effective than solar PV.
 - Solar PV: Going from currently 15-20% efficiency to 22-25% efficiency in the next generation. It is also the easiest to install and sell, but that may preclude examination of better options.

Finance: In Search of Superior Solutions

After decades of energy efficiency programs, energy bills stubbornly remain a frequent object of scorn. The exception is a vibrant but still small marginal activity in net zero construction. However, by and large there are always more old buildings than new, and there is an opportunity for energy retrofits but insufficient support to making it happen on any significant scale. Notably there is also little or no support for approaching it as an investment opportunity that increases property values.

To summarize the problems, the combined effect of the current energy related programs and incentives leads us to miss the forest for the trees, and economically, the beneficiaries of these programs are primarily:

- Energy companies – The inducement of some energy savings achieves customer retention, while giving property owners sub-optimal outcomes.
- Equipment manufacturers – The typical ‘self-liquidating’ and ‘no money down’ offers are deceptive, because they cherry-pick the financial carrying capacity of property owners, and produce sub-optimal choices.

Finance companies - the easy solutions (such as solar PPAs) sell more financing faster than what would be the right solutions for property owners. Thus the financially counter-productive (for property owners) ‘solution selling’ of single technologies, driven always by the ‘zero-down’ self-liquidating finance model, that takes advantage of the property owner, resulting in widely sub-optimal solutions.

Specifically:

- **PACE (Property Assessed Clean Energy) finance**, was supposed to be a major part of the answer, but it has not lived up to its promise, even as it is gaining some traction in commercial markets. The name implies that it is about clean energy (i.e. renewable energy). The theory was that it would provide the long term financing for energy retrofits, and since it should add value to the property, it should improve collateral values and reduce lending risk. In theory also, lending risk would be reduced by collection through the property tax rolls, with a first lien that had priority over the first mortgage. However, the latter proviso ran afoul of risk aversion and the GSE guarantees.

The PACE camp contributed to the stalemate, because they promoted energy efficiency and not long-term capital improvements with renewable retrofits. In doing so, PACE had been co-opted by the energy efficiency movement, achieving mostly modest improvements, and **making the cardinal mistake of financing short-term improvements with long term money**. As a result, the majority of PACE financings are for energy efficiency projects, which would tend not to be supportive of building equity in the long term and thus collateral value—even if they provide a short term lift.

Note: In the dialog with Fannie Mae and Freddie Mac, at the height of the

mortgage meltdown, some evidence was produced of reduced default risk for more energy efficient properties. However, this may seem true in the short-term, in the long-term it is likely to be ineffective as a risk mitigant, because of diminishing returns, increasing net-zero construction, and greater prevalence of more drastic retrofits that are increasingly becoming economical. This should have been the purview of PACE, but with the mission drift from clean energy to energy efficiency, the movement failed to identify the true economic value of shifting energy from liabilities to assets as the proper object for its financings. **Typical energy efficiency financings are short-term fixes and achieve 15-25% reductions in energy bills (and GHG-emissions). They should not be financed with long-term money.** Well-planned renewable energy retrofits can achieve 50% and higher reductions in energy bills (and GHG-reductions!), and are appropriately financed with long-term money. **Because renewable energy moves energy from liabilities to assets, it permanently improves the value of properties.**

- Asset-backed equipment loans and leases (misabeled as 'green' if justified from energy savings) are programs that benefit technology providers (like solar PV), and not primarily property owners. These financing programs are growing in significance and treated favorably by the government (including allowing third party providers to capture tax incentives and renewable energy credits, which by rights should accrue to property owners). These forms of finance have undesirable side-effects that are rarely considered. Specifically, they are used by sellers to promote specific technologies (that are easiest to sell and install), not building-appropriate solutions, and in a great many cases produce sub-optimal results from the standpoint of maximizing property values by minimizing energy bills. The sales strategy is usually to deliver to property owners a self-liquidating ('zero-down') proposition, prioritizing what can easily be financed above what is optimal for the energy household of the property. This process cherry-picks the liquidity of the owners, and compromises their capacity to finance real solutions.
- Power Purchase Agreements (PPAs) have valid uses, but may have unintended consequences in residential markets. They pass on to the property owner a 20-year energy contract usually for a nominal savings,

when alternative solutions might be more appropriate and could eliminate 50-100% of energy consumption. Property owners also tend to get stuck with technology risks, such as with solar panels from 2014 that are 15-17% efficient, while the market is slated to move to 22-25% efficiency within the next two years.

In short, the financing choices that the market provides favor equipment vendors and/or energy companies, not to mention finance companies and not primarily the property owners. As a result there is an untapped potential to drive demand-side solutions that are supportive of property values, while helping the transition to lower GHG-emissions. We believe it is in the interest of the GSEs to actively support this process, by playing a constructive role and regulating it, instead of ignoring it or resisting it. The result would be an all around “win-win-win” solution for the GSEs, property owners, and the environment.

Financing Alternatives: Evolving Landscape

The emergence of a more holistic approach that may take shape in the future came in the form of the recent energy tax overhaul proposed by then Senator Max Baucus. The proposal fell short in that it only addressed the supply side of the grid: utility scale projects. Also, it ignored the demand side, where with today’s technology the greatest changes are possible. However, the central concept was right: to stop subsidizing specific technologies, but simply to set overall goals for GHG-reduction. Increasingly, the dialog is about GHG-emissions reduction. The current mishmash of incentives simply sets people up to make at least partially self-defeating decisions. Only an integral retrofit for the whole property can ensure increases in collateral values.

GSE Opportunity

As green finance must move to a more holistic—whole property—approach and shift away from supply-side, energy-efficiency approaches and address demand-side, onsite energy generation, there appears to be an unprecedented opportunity for the GSEs that could be transformative for environmental and energy policies, while creating value for property owners, and reducing risk for the mortgage industry. This potential could be realized if the GSEs would actively include energy retrofits in the options for long-term mortgages that qualify for inclusion in the single securitization structure.

- More **homeowners** would be able to participate in on-site energy generation as well as enjoy greater market value for their homes.
- **Mortgage lenders** would benefit from more robust portfolios in which the credit of the underlying assets will be stronger.
 - As the loans for homes with energy retrofits season, financial risk will decrease at an accelerated rate compared with traditional mortgages. The net operating expenses for energy will decrease more quickly over time (if not turn revenue positive) resulting in faster, more robust debt service coverage ratios. Similarly, the loan-to-value ratios will decline more quickly, since the value of the total home will increase due to the energy retrofit per se.
- **GSEs** would benefit from an increased pipeline of mortgages with an enhanced underlying credit that would be eligible for securitization.
 - This in turn could help strengthen investor confidence in the secondary market and bolster additional liquidity to the housing and green energy market.
- The **environment** would benefit from the greater and more rapid deployment of green infrastructure.

Suggested Approaches

Historically, there has been a missed opportunity for the GSEs and PACE to work hand-in-hand with financing green energy retrofits. A major show stopper has been the requirement by PACE to hold a first lien on the property – terms unacceptable to the GSEs, but predicated on a concept of PACE that did not include lending standards to ensure asset appreciation. Since then, PACE has primarily financed energy efficiency for commercial properties.

Looking forward, there are several ways the GSEs could be constructive to property owners and the interests of their shareholders alike, such as the approaches suggested above. Here are some more suggestions:

1. For new mortgages or refinancings on existing properties, create an option or incentive for energy retrofits and resilience. When an existing property passes hands is the right time for a retrofit. What matters is the right underwriting criteria, which should include a minimum of 50% GHG-reduction, and appropriate resilience considering updated FEMA flood

maps, or the evolving national flood insurance program parameters and the project should be based on a positive 30-year NPV of the contemplated investment in SDRE (Site Derived Renewable Energy), taking into account any available incentives.

2. Note that the need for SDRE is generic, wherever it is economical.
 - The need for resilience is closely related, as dictated by location, and lends additional urgency to achieving a measure of energy independence, and possibly needs to include water and/or sewer infrastructure, particularly in flood prone communities.
 - **As long as there is not a reasonable finance option in play that supports equity building, property owners will be limited to supposedly 'green' finance options, that have sub-optimal results for their properties, and impair repayment ability and wealth building.**
3. Regulate retrofit refinancings, again, if a proper SDRE retrofit and refinancing can increase collateral value, by replacing the long-term liability of energy bills, with renewable energy assets, and associated energy efficiency measures, this is constructive.
4. Supporting an upgrade to PACE may be an option. The GSEs could allow PACE on the condition of an effective underwriting policy as suggested above (minimum 50% GHG reductions and 30-year positive NPV). Doing so does not remove the issue of the priority of the lien altogether, but it does ensure that collateral values increase, and since the PACE finance will typically be self-liquidating, it will enhance liquidity for the owners. Note that the 50% GHG reduction minimum will effectively exclude all energy efficiency lending from the mix, and support long-term capital improvements with SDRE and other resilience measures as needed.
5. Supporting second mortgage retrofits. Creating standardization of second mortgages for SDRE retrofits.
6. There may be other options. In general, we should recognize that on the margin, markets are moving to net-zero construction, and California is even mandating it for new construction by 2020. New York is pursuing massive GHG-reductions also, and more and more states are establishing clear goals, while economically the tipping point has been reached, not for all applications, but a growing number. This means that there will be a

potential for a tremendous overhang of bad properties that cannot make an effective energy conversion, and that will end up slowly becoming unsalable. In short, doing nothing increases risk.

The way forward is to enable financings along the lines of what PACE could have been but is not doing, namely support equity building by owners.

Joint Interests

There are numerous areas of joint interest, starting with overall economic improvement, and progress in environmental and climate change dimensions. Specifically the following should be noted:

- The GSEs and their shareholders have a joint interest with property owners in increasing asset values.
- Municipalities have an interest in environmental (air quality), and economic improvements, as well as real estate appreciation, even if they agree to exemptions from real estate tax appraisals for the finance period.
- Politically, it is appropriate that the GSEs play a role in regulating the finance of energy retrofits in a way that supports national energy policy and climate change priorities. DOE, EPA, FEMA and other agencies at a state and federal level should be part of the discussion, but do not have the specialist perspective of housing finance and its potential to serve energy policy. The beauty is, that if it is done right we are building asset value in the nations housing stock hand in hand with effective environmental improvement and climate change policies.

Policy Discussion Points

Ultimately, the decisions are policy-oriented and will likely begin at the GSE executive level. High-level questions as an initial basis for discussion include:

- If the GSEs consider working with PACE,
 - Would the GSEs consider a financial bridge product? And offer a roll-up in the outer years.¹

¹ The GSE-PACE tension appears to lie primarily at the initial transaction level, in which the GSEs diverging concern is more that of affordability (e.g., fulfilling maximum debt-to-equity

- Would the GSEs, PACE consider a pari passu lien status?
- Would the GSEs consider going it alone and include “green” retrofits directly in its portfolio? Under what conditions?
- How could the GSEs work directly with FEMA to create resiliency investment incentives for renewable energy?

requirements) while PACE's diverging concern is more of the lien position. Over time, as the loan seasons, the asset value will increase and the loan-to-value would decrease, and those initial transaction concerns would diminish. Moreover if the loan was self liquidating compared to energy costs, the concern is moot from the outset. Other possibilities include mandatory accelerated principal reductions after the energy upgrades are paid for, perhaps on a fifty/fifty basis.

References/Resources

1. Steve Hallett, *The Efficiency Trap* – explains from an economic and environmental systems point of view why energy efficiency is largely counter productive. <http://www.stevehallett.com>
2. David Owen, *The Conundrum* – explains from a broad economic point of view, modeled on biological systems, shows why energy efficiency achieves the opposite of what we think and has the unintended consequence of making the problem worse. <http://www.davidowen.net>
3. My blog, at www.vliscony.com explores economic, financial, environmental and engineering standpoint why energy efficiency benefits only the shareholders of energy companies and equipment vendors, not property owners, and what to do about it. Answer: create property appreciation with SDRE (Site Derived Renewable Energy). Generally the blog is a complete inventory of the whys and hows and wherefores of energy retrofits to existing properties.
4. The EPA's Energy Star Portfolio Manager is the best tool for life-cycle planning of energy upgrades, even though it presents information in terms of "energy efficiency," however it's framework can simply be extended with a 30 year NPV, in order to capture the effect of the long tail of "no energy bills." Unfortunately also, it is not currently useful for single family residences.
5. A parallel program, which is aimed at the residential market, the Home Energy Yardstick, is more "user friendly" but utterly counterproductive financially, because it encourages helter-skelter spending on incremental "energy efficiency" without taking into account the diminishing returns of such an approach, nor capturing the potential value enhancement of long term capital improvements. It would be worthwhile to work with EPA to provide an extension to the program that could help model the potential for value creation, and therefore a better evaluation of financing options and subsidies.

The EPA's Home Energy Yardstick is an example of how the traditional recommendation for energy efficiency above all is dangerous to your financial health as a property owner, as discussed here:

<http://www.vliscony.com/2014/07/26/energy-star-home-energy-yardstick-dangerous-toy/>

6. Incentives. It should be noted that the entire current framework of technology-level incentives is counter productive, in the sense that it has accountants designing energy systems, driven by tax incentives. The Energy Star label and the tax incentives associated with it are disruptive to sound retrofit planning, and lead to sub-optimal designs. It is to be hoped that in future a single objective can be set: overall GHG-reduction, which can be accompanied with incentives for over 50% reductions, in order to stimulate serious upgrades. **Finance programs can be designed now to shift the focus from equipment finance to property finance.**