

# PROPERTY ASSESSED CLEAN ENERGY (“PACE”) PROGRAMS

## WHITE PAPER:

HELPING ACHIEVE ENVIRONMENTAL SUSTAINABILITY AND  
ENERGY INDEPENDENCE, IMPROVING HOMEOWNER CASH  
FLOW AND CREDIT PROFILE, PROTECTING MORTGAGE  
LENDERS, AND CREATING JOBS

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This paper is based upon the best available information at the time of  
publication. PACE program data will continuously be incorporated into this  
document as it becomes available. The most recent version is available at  
<http://www.renewfund.com/resources/resources>.



## EXECUTIVE SUMMARY

A Property Assessed Clean Energy (“PACE”) program is an innovative and cost effective method enabling local governments to finance renewable energy and energy efficiency projects on privately owned residential, commercial and industrial properties. It is a powerful tool to generate green jobs and economic activity at the local level while helping to achieve our national goals for carbon reduction and climate change action. The programs eliminate the chief barrier to clean energy installations: the large upfront cost. PACE utilizes the widely adopted structure of a “land-secured financing district” which results in property owners paying their assessment as part of their property tax bill. Payments are secured by a priority lien on the subject property. PACE can be used to finance a wide variety of clean energy installations from insulation to solar photovoltaic panels, including high efficiency furnaces and water heaters, energy efficient windows and in some programs water conservation related equipment.

**Benefits** -- The benefits that can be achieved via widespread adoption of PACE programs are substantial and multifold. There are environmental, economic, social, and energy policy benefits that are of high priority on the national and local level. While actual results will also depend on particular installations, locations, property types and other factors, there are some clear conclusions that can be drawn.

- **Substantial reduction in greenhouse gas emissions** -- A standard retrofit package in an individual home can reduce CO<sub>2</sub> emissions by 60 – 100 tons over its useful life. Multiplied by the millions of homes that can benefit and adding in industrial and commercial properties, PACE holds the potential for massive reductions of CO<sub>2</sub> as well as the ancillary pollution that comes with energy production. Capturing just 10% of the potential savings could result in PACE financed installations abating 220 megatons of GHG annually.
- **Significant job creation** -- Modest implementation nationally for PACE financing of solar PV and energy efficiency retrofits can create about 160,000 long-term, green jobs for our economy. Many of these jobs will reside in the communities that adopt PACE, as much of the retrofit work is site based.

- **Increases in disposable income across economic strata** -- PACE is designed to finance projects that are cash positive for participants over the useful life of the retrofit. This is achieved because lower utility bills offset the cost of the assessment. As a result, PACE financings work to improve the property owner's credit profile and lower the existing lender's risk of borrower default. Over the useful life of the retrofit, homeowners can generate cash savings of \$5,000 to \$14,000. Taken together, PACE programs could inject over \$120 billion into the national economy to fuel economic growth.
- **Accelerates US energy policy goals** -- Federal officials have stated national goals around clean energy production and the movement towards greater energy independence. PACE financed retrofits are clean energy focused, and by reducing reliance on fossil fuels of all types, directly and indirectly reduce our nation's dependence on energy imports.
- **Promotes equal access to clean energy** -- By prudently focusing on financing the project and the property, not the person, PACE can be a smart choice for homeowners of all income levels. Many segments of society that are underserved by traditional financial options have access to PACE financing and it is incumbent upon municipal officials who sponsor PACE to ensure that all members of their community are made aware of their ability to participate in the program. However, it is equally important that the conservative underwriting approach of the applicant acceptance process be adhered to, ensuring that only fiscally responsible homeowners with equity in the property be accepted.

**Minimizing Risk** -- The strength of the PACE program concept is that it is designed to maximize benefits while minimizing risks to participants and to mortgage lenders with existing liens on the property. Careful program design and diligent program execution ensures that risks are prudently managed.

- **Mortgage lenders and other investors (i.e., GSEs) are well protected against increased loss severity in the event of a default /foreclosure**
  - **PACE senior status immaterial** -- Mortgage lenders and other investors (i.e. GSE's) are well protected against increased loss severity in the event of default/foreclosure due to immateriality of senior lien status which is less than \$200 per home on a portfolio of PACE financed homes and

significantly less than 1% of home value for those homes that enter default/foreclosure.<sup>1</sup>

- **Non-acceleration feature** -- In most PACE programs, the assessment lien does not accelerate at default or foreclosure ensuring that only delinquent assessment payments are due. This reduces risk to lenders by 90% or more.
- **Increase in property value** -- Risks to lenders, already significantly reduced by the PACE structure, are further reduced by the increase in property value delivered by the energy efficiency retrofit project.
- **There is no moral hazard or adverse selection relating to program participants** -- Adverse selection would occur if, out of the pool of potential participants, only the weakest and most likely to go delinquent would apply. Moral hazard would occur if, either directly or indirectly, participation in the program would actually increase the likelihood of non-payment.
- **Upfront property valuation and loan-to-value screening** -- The application approval process involves a careful examination of the property to ensure that the property is not currently under stress nor likely to come under stress in the near term.
- **Energy cost savings improves homeowner cash position** -- Actually lowers the likelihood of default. This cash flow advantage improves over time as utility rates rise.
- **No cash out feature** -- Programs are designed to prevent fraud and windfall benefits.
- **Post bubble markets** -- Programs are launching in post-real estate bubble markets, reducing future volatility in home prices.
- **Processes are in place to help ensure that homeowners will realize anticipated energy reductions.**
  - **Certification of contractors and installed products** -- PACE programs have very specific requirements placed on participating contractors and

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<sup>1</sup> This value is based on a \$20,000 PACE assessment and 20 assessment term on a \$300,000 home, and assumes a 7% foreclosure rate.

restricted lists of approved measures that meet energy saving and warranty requirements.

- **Experience** -- Eligible energy efficiency and renewable energy technologies are well developed and continue to improve. There is little to no technology risk.
- **Home energy audits** -- These audits determine the most appropriate and economic measures to be utilized.

**Critical Next Steps to Enable the Growth of PACE** – The following steps are necessary to support the expansion of successful PACE programs across the country.

- **White House Issues Final PACE Best Practices Guidelines** -- The Department of Energy is currently working on additional guidance on PACE underwriting. This guidance will need to be reviewed and adapted as data from “live” PACE programs is gathered and analyzed. With stakeholder consensus, a final Best Practices document, based on the October 2009 Policy Framework, should be formally issued by the Executive Office of the President with sign off from appropriate federal agencies.
- **Regulators /GSEs Issue PACE Loan Underwriting Guidance that Incorporates White House Guidelines** -- Appropriate mortgage regulatory authorities, Fannie Mae, and Freddie Mac are expected to issue loan underwriting criteria that recognize the new Best Practices as government policy. Programs that substantially meet the criteria will not be subject to adverse action absent demonstrated performance data that indicates greater risk.

## **Why PACE?**

PACE programs were developed on well established legal principles, applied to the unique challenges that must be met to promote widespread adoption of energy efficiency measures and to meaningfully reduce carbon dioxide emissions and provide for economic security. They are based on sound constitutional principles as laid out over the years by the courts. They rely on a building block of the municipal finance system – the land-secured financing district. The hallmark of a consumer loan is the borrower’s personal promise to repay the principal amount advanced by the lender. In contrast, PACE programs involve an assessment on property that is improved with funds provided by the governmental body.

PACE programs can constitute an important building block in our nation’s overall policy for clean energy and energy independence. Simultaneously, they create green job growth and increased economic activity at the local level. This all occurs without impacting municipal budgets and individual program participants can expect to see a positive cash flow on their involvement on a total and net present value basis. However, the full benefits of PACE can only be realized with the input and cooperation of the appropriate agencies at the federal level, the mortgage lending sector, local government, and the contractor/construction trades.

### **I. PROGRAM ACTIVITY**

Property Assessed Clean Energy (“PACE”) is an innovative and cost effective approach to allow property owners to finance renewable energy and energy efficient retrofits to existing properties. PACE programs utilize the widely adopted structure of a “land-secured financing district” to fund the retrofit projects and have the property owners pay via a line item on their property tax bill. Payment is secured by a senior lien against the property.

To date there are six active PACE programs in place, Berkeley, CA (completed); Sonoma County, CA; San Francisco, CA; Palm Desert, CA; Yucaipa, CA; Boulder County, CO; and Babylon, NY. Berkeley was the first program and as such was structured as a pilot. Partly due to its limited size, participation slots in the program were filled nine minutes after registration opened. The program focused solely on solar PV installations and ultimately 13 projects were funded at a net program size of about \$325,000. Berkeley is joining the rest of Alameda County in the new statewide California program launching in summer 2010.

Boulder is a more ambitious program, which has thus far financed about \$10 million in projects. There are over 550 participants with approximately 37% of proceeds funding solar PV installations and 16% of proceeds funding replacement exterior windows and doors. The remaining 47% funded various projects, including insulation, high efficiency furnaces, and roofing. Over 2,300 people have attended sessions to learn about PACE in the Boulder area.

Through March 2010, the PACE program in Sonoma had contracted for more than \$24 million in energy efficient retrofits, with another \$6 million approved for a total program size of \$30 million. The Sonoma program continues to grow. As will be discussed later in the paper, county officials have subsequently determined that this has had an appreciable positive effect on the number of quality construction related jobs in their county.

The success of these programs coupled with the education of municipal officials on the benefits of PACE has created an opportunity to see substantial growth in the energy retrofiting of existing buildings. Programs in Santa Fe, Annapolis, Los Angeles and hundreds of other locations are being prepared for launch. As of March 2010, PACE legislation has been enacted in 17 states and the District of Columbia; bills are being considered in 15 others. They are listed below:

**States with Enacted PACE Legislation**

California  
Colorado  
Illinois  
Louisiana  
Maine  
Maryland  
Minnesota  
Nevada  
New Mexico  
New York  
North Carolina  
Ohio  
Oklahoma  
Oregon  
Texas  
Vermont  
Virginia  
Washington, D.C.  
Wisconsin

**States Considering PACE Legislation**

Alaska  
Arizona  
Florida  
Georgia  
Hawaii  
Iowa  
Kansas  
Massachusetts  
Michigan  
Missouri  
Nebraska  
New Hampshire  
New Jersey  
South Carolina

It is clear that the benefits of PACE programs are well understood by lawmakers. It is important that all stakeholders understand how PACE works, the benefits it provides, and the potential it has to spur economic growth while combating greenhouse gas emissions and climate change.

Recognizing the potential for PACE to gain acceptance at the municipal level, the federal government has set to work to speed up this process. The White House led an inter-agency working group to develop the Federal Policy Framework for PACE Financing Programs (“Federal Policy Framework”). The goal of the Federal Policy Framework was to establish clear guidelines to protect program participants and minimize risk for lenders, and newly launching programs are largely adopting these guidelines. The Federal Policy Framework was released alongside the 'Recovery Through Retrofit' report issued by the Middle Class Task Force through the Office of the Vice President and the Council on Environmental Quality ("CEQ Report"). The CEQ Report developed recommendations for creating a sustained home energy efficiency retrofit industry.

## **II. PACE PROGRAM STRUCTURE**

PACE programs are initiated and designed at the local government level. As the CEQ report points out, “Making American homes and buildings more energy efficient presents an unprecedented opportunity for communities throughout the country” (October 2009). While policies and programs to combat GHG emissions and climate change continue to be discussed at the national and international levels, many state and local governments have begun to act. PACE programs can be a major driver towards accomplishing the GHG reduction targets that many communities have set. PACE programs clearly serve a public purpose. In addition to the environmental benefits, a community that institutes a PACE program will see increased economic activity as jobs are created and program participants enjoy the economic advantages of lower energy bills. Sonoma County, for example, carefully tracks the economic benefits of its program and benchmarks against neighboring counties. While the results and analysis are preliminary, Sonoma’s data indicates that PACE has had a positive impact on construction related jobs and spending on existing residential construction, even during this period of declining economic activity, particularly in the real estate sector (Sonoma Report – Nov 18, 2009). As more programs are launched and as existing programs mature, additional data will emerge to help further analyze the economic impact of PACE.

A well designed PACE program, adhering to the best practices that have been developed, provides substantial disclosure and protections for participants and incorporates a sound approval process.

An example of a well-structured program:

Process Step	Description
Eligibility	<p>Potential participants are provided with information that allows them to initially determine their eligibility and desire to begin the process before they have to begin the work of filling out the application. Key pieces of information for participants include:</p> <ul style="list-style-type: none"> <li>• Property must be within the given jurisdiction</li> <li>• List of eligible retrofit projects</li> <li>• Their obligations, including applying for rebates and having energy audits performed</li> <li>• Repayment terms, including lien creation and disclosure that this program may not be the optimal funding choice for them</li> <li>• Consequences for failure to make scheduled payments</li> <li>• All other program terms and requirements</li> </ul>
Application	<p>Potential participants who wish to proceed must now complete an application. Critical components of the application are:</p> <ul style="list-style-type: none"> <li>• Application Form which gives information on the property, mortgages and the proposed retrofits to be funded</li> <li>• Recent mortgage statements to confirm outstanding balances and the non-delinquent status of the mortgage</li> <li>• Lender notification ensuring that mortgage lenders are aware of the pending PACE assessment and can escrow for it post-closing</li> <li>• Contractor bids specifying the cost of the projects. Bids would come from approved contractors only.</li> <li>• Energy audits could be included to ensure target savings will be achieved by the retrofit</li> <li>• Application Fee which can be waived or lowered for low-income applicants</li> </ul>
Initial Approval	<p>The administrators of the PACE program are now in a position to approve or deny. They will make this decision by analyzing the data provided against the program goals and requirements. If needed, the administrator can ask for additional information. The analysis that could lead to denial entails:</p> <ul style="list-style-type: none"> <li>• Delinquent status of taxes on property</li> <li>• Delinquent status of any mortgages on property</li> <li>• Existence of tax liens or other involuntary liens on property</li> <li>• Recent default or foreclosure history</li> <li>• Recent bankruptcy history of homeowner</li> <li>• PACE assessment lien greater than x% of property value (ex. 10%)</li> </ul>

	<ul style="list-style-type: none"> <li>• Total debt is greater than property value (property is “underwater”)</li> <li>• Unacceptable projects or contractors</li> </ul> <p>In order to determine the value of the property, the administrator has the assessed value and comparable valuation. In situations where there is a significant discrepancy between those two values, an AVM or desktop appraisal can be used to determine value.</p>
Installation	<p>An approved applicant can now proceed with the installation. The interaction between the participant and the contractor(s) is purely the responsibility of the participant. The municipality sponsoring the PACE program or its administrator will not be recommending contractors nor negotiating prices or terms. However, participants should have access to the following information from the program sponsor:</p> <ul style="list-style-type: none"> <li>• A list of qualified contractors for the program</li> <li>• A list of certification organizations, such as BPI and Energy Star</li> <li>• Special requirements for specialty work such as solar PV</li> </ul>
Funding	<p>After the contractor completes the installation work to the satisfaction of the homeowner, the program will fund the retrofit. As a protection against fraud and other risks, there are several conditions precedent that must be fulfilled before any funds are released. These include:</p> <ul style="list-style-type: none"> <li>• Signed final permit from the municipality’s building inspector for the retrofit projects</li> <li>• Final invoice and lien waiver from the contractor(s)</li> <li>• State or utility confirmation/approval letters, if applicable, for projects receiving rebates or other incentives</li> <li>• Verification that applicable rebates were received or confirmed</li> <li>• Project verification from a BPI or other appropriately certified building analyst</li> <li>• Signed versions of all remaining required program documentation, including all forms required by law or regulation</li> </ul> <p>Only after the conditions precedent have been satisfied in the program administrator’s judgment will funds be dispersed.</p>
Recordation and Repayment	<p>Along with the disbursement of funds, the municipality will record an assessment upon the property. The current homeowner as well as any future homeowners will make remittances along with their regular property tax bills. The amount of the payments over the life of the assessment is sufficient to fully amortize the amount disbursed and cover all interest and program costs.</p>

PACE programs are generally financed with revenue bonds, which unlike general obligation or moral obligation bonds, are secured solely by the senior assessment on participating properties. The issued bonds may or may not be tax-exempt at the state and federal level depending upon applicable laws and regulations. Information is disclosed to bondholders stating that the bonds are not debt of the issuing municipality and the debt will be serviced with payments on the PACE assessments (additionally there may be reserve funds for added bond security).

PACE participants are generally required to authorize their local utilities to provide ongoing information about their energy usage to the PACE program administrator. In this way, valuable data is collected which will allow for more accurate estimates of energy savings for future programs and expansion of existing programs.

### **III. HOMEOWNER CONSIDERATIONS**

PACE allows homeowners to take advantage of the economic benefits of energy efficient retrofits by eliminating many of barriers associated with financing these projects. On an annual basis, the amount of money saved on utility costs should be roughly equal to or greater than the assessment payments required. This is discussed in greater detail later in this report.

Due to PACE's primary underpinning of financing the property versus financing the person, PACE allows the homeowner to finance a clean energy capital expenditure without having to rely on traditional consumer financing methods. In fact, the lack of non-traditional consumer financing for such projects was cited by the CEQ Report as a major barrier to substantive adoption of energy efficiency retrofits. The cost of these projects, in the range of \$5,000 to \$50,000, would prohibit a cash purchase for all but the wealthiest of program participants.

Therefore, a home equity loan ("HELOC") is the most commonly considered consumer financing alternative to a PACE program. However, there are myriad reasons why HELOCs are not always a viable alternative for clean energy retrofits. First, HELOCs are generally underwritten without regard to borrowing purpose. Therefore, a homeowner can view the borrowing power associated with the accumulated equity in the property as a cushion or insurance policy against major future expenses. Funding a child's college education, paying for unexpected significant medical expenses, or covering periods of income interruption are typical HELOC uses. Using HELOC borrowing capacity for energy retrofits reduces or eliminates capacity for these other potential needs.

Second, HELOCs are not structured to fit borrower needs associated with an energy efficiency retrofit. PACE program payments tenors can be designed to match the useful life of the project (15 – 20 years), while HELOC tenors generally range from 5 – 15 years. Also, PACE payments are level for the life of the program, so the homeowner can clearly match his costs against savings, with or without considering the inevitable rise in energy costs over time. HELOCs are generally floating rate, subjecting the homeowner to uncertainty as to the net savings (if any!) of the project, particularly in a rising rate environment. Fixed rate HELOCs are available, but they generally carry higher interest rates.

Finally, HELOCs are “due on sale,” like all mortgages. Therefore, homeowners selling their homes will have to pay off the HELOC before they realize the full, long-term economic benefits of the retrofit. Only homeowners who feel absolutely certain that they won’t be moving over the subsequent 10 or 15 year period or those who take the time and effort to educate themselves about the potential home value appreciation associated with the installation would consider a retrofit, eliminating a huge part of the market. PACE is specifically designed to eliminate this problem as the payment obligation stays with the property, not with the person.

Property owners will continue to have multiple financing options for energy efficiency and renewable energy projects, including others not noted here. PACE is designed to provide a financing option that overcomes certain barriers inherent in current approaches.

#### **IV. BENEFITS ASSOCIATED WITH PACE PROGRAMS**

##### **i. Energy and Environmental Benefits**

The energy and environmental benefits of the energy efficiency retrofits that are financed by PACE projects are obvious. By reducing energy usage from the electric grid or the direct use of fossil fuels for heating, GHG emissions are reduced as well as the ancillary pollution associated with energy production. PACE financed retrofits also reduce the potential environmental degradation from having to build new power plants.

PACE programs generally look to achieve 20-40% energy savings on participating properties. The actual results achieved depend on a myriad of factors. To examine the energy and environmental impact of a PACE retrofit, we look at a location appropriate standard retrofit package that a PACE program might finance installed in an “average” home in four different markets. The standard retrofit would cost \$4000 and might include measures like programmable thermostats, insulation, air sealing, energy star windows, or other cost effective measures, as well as a 2 kilowatt solar PV system.

Over the useful lives of the retrofit (25 years with an assumed 1% annual degradation) the following CO<sub>2</sub> benefit would be achieved:

<b>Location</b>	<b>Reduction in Short Tons of CO<sub>2</sub></b>
Santa Barbara	39
San Antonio	70
Columbus	88
New York	58

As the above analysis shows, each retrofitted home can make significant progress toward fighting GHG emissions and climate change. A study by McKinsey & Co. analyzed the potential for cost and GHG emission savings from applying energy efficiency measures to the existing building sector. If PACE can finance 10% of that potential, PACE can be responsible for the abatement of 110 megatons of GHG annually. Assuming an equal benefit from solar PV, total GHG reduction associated with PACE can reach 220 megatons annually. Widespread adoption of PACE programs both geographically and within the residential and commercial building sectors would have a tremendous positive impact on reaching our national carbon reduction goals.

## **ii. Economic Benefits**

One of the economic benefits of PACE is the creation of high quality, U.S based, green jobs. Much of the work associated with PACE programs, in particular project installation and inspection, is site based, and therefore cannot be shipped overseas. Retrofitting of buildings to increase energy efficiency is labor intensive. Cutting electricity use through efficiency creates nearly 3.5 times more direct jobs than are produced by generating that electricity from fossil fuels like natural gas and coal. Furthermore, most of the jobs created directly through retrofits are in the construction industry. Since the collapse of the housing market, the construction sector has experienced dramatic job losses, but fortunately many of these displaced workers already possess the skills required for PACE financed projects. They can quickly transition to “green collar” professions with minimal retraining and retooling. As the CEQ Report points out, “By encouraging nationwide weatherization of homes, workers of all skill levels will be trained, engaged, and will participate in ramping up a national home retrofit market” (October 2009). PACE programs finance projects beyond simple weatherization, adding more momentum to the potential recovery in the job market.

Looking at various economic models, including ones developed by the Department of Commerce, we calculate that for every million dollars spent on energy efficiency, 2 jobs (for purposes of this report, a job is defined as one person working full time for 10 years) are created. A study by McKinsey & Co. estimated the need to spend over \$500 billion in upfront costs to fully capture the potential of energy efficiency (and save \$1.2 trillion

in energy costs in the process) (McKinsey July 2009). If PACE programs can enable 10% of the potential opportunity, 100,000 green jobs would be created.

In the solar photovoltaic market, models estimate that for every megawatt installed, 3.6 jobs are created(Wei et al 2010). Assuming a net cost of \$6 million for each megawatt installed, \$100 billion financed by PACE in this sector could create another 60,000 green jobs. This \$100 billion would represent about 16 gigawatts of capacity, or roughly 2% of the US 2007 capacity of 813 gigawatts. (GENI) PACE, financing both solar installations and energy efficiency projects, can create about 160,000 long-term, green jobs for our economy.

Importantly, while PACE can grow our economy from a macroeconomic basis, PACE financed retrofits also have a positive economic impact at the household level. Again, analysis is performed on four sample homes in different parts of the country. Cost savings are clearly impacted by energy usage patterns, but also by the cost of electricity, which can vary greatly from state to state. For analytical purposes, we assume energy costs to rise 3% annually, the effectiveness of the retrofit to degrade 1% annually, and the tax deductibility of the interest component of the assessment. The table below shows the impact on each household of the standard retrofit package described above:

	<b>Santa Barbara</b>	<b>San Antonio</b>	<b>Columbus</b>	<b>New York</b>
Year 1 Savings (Cost)	\$265	\$150	(\$10)	\$80
Year 10 Savings	\$377	\$228	\$48	\$171
Year 20 Savings	\$511	\$325	\$110	\$266
Cumulative Savings	\$14,388	\$9,518	\$5,440	\$9,984
Net Present Value	\$7,726	\$4,315	\$1,951	\$4,100

As the table above shows, homeowners across the country can save thousands of dollars over the useful life of the retrofit project, while being less vulnerable to spikes in energy prices. In all the above cases, participation in the program creates a positive net present value for the participant, while increasing the comfort and health level of the home. On an aggregate basis, over \$120 billion can be cycled into the economy from energy cost savings to fuel future economic growth.

### **iii. Social Benefits**

A very important aspect of PACE is its accessibility to most members of the sponsoring municipality. By removing the large upfront costs associated with energy efficient retrofits and by aligning payments to the property, not the person, PACE will be attractive to individuals who are well served by the existing financial institutions as well

as those who are not being well served. By only financing projects from approved contractors and the relatively narrow scope of the projects being financed, members of the community who do not have access to quality information, and who may fall victim to scams in other home renovation scenarios, have a much higher level of protection. Sponsoring municipalities will be marketing their PACE programs to all of the communities within their jurisdictions, making certain that there is equal opportunity to participate. This achieves the very important policy goal of bringing clean energy, energy efficiency, and the economic benefits thereof to individuals of all economic strata. In fact, to the extent lower income homeowners reside in older, less efficient housing stock, they may stand the most to gain from a return on investment perspective.

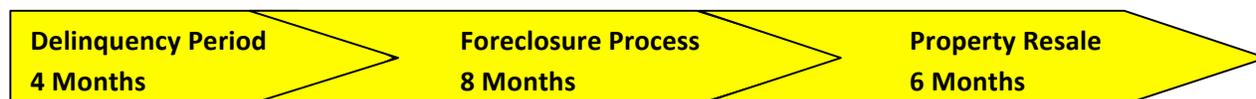
The integrity of the PACE program is maintained by the structured approval process, which ensures that properties in the program are not currently distressed. This is discussed in more detail below.

## V. RISKS AND MITIGANTS ASSOCIATED WITH PACE PROGRAMS

### Potential Risk Factor #1: Creation of the senior lien exposes mortgage lenders and other investors (i.e., GSEs) to increased loss severity in a default /foreclosure.

In a standard mortgage analysis, a lender will factor in any liens that prime his lien in a determination of expected loss severity given a default. A first mortgage lender who has a \$150,000 mortgage balance against a property that nets \$125,000 in a foreclosure would suffer a loss of \$25,000 (\$125,000 received - \$150,000 owed = \$ -25,000 or a \$25,000 loss). If however, there was a \$20,000 priming lien on that property, the lender would now suffer a \$45,000 loss (\$125,000 received - \$20,000 to priming lien holder - \$150,000 owed = \$ -45,000 or a \$45,000 loss). PACE programs are specifically designed to mitigate this risk.

**Mitigant – Non-acceleration feature:** Since the structural underpinning of the PACE program ties the obligation to make payments to the property which benefits from the retrofit and not the individual property owner like a standard loan would, the economic analysis is dramatically different. The diagram below shows a timeline for delinquency, foreclosure, and resale process.



During the four months after the first missed mortgage payments, servicers are attempting to work with the borrower on a plan to cure the delinquency. After four months, foreclosure is initiated. The amount of time to foreclose varies by jurisdiction, with eight months being used as the example here. Finally, after the home has been foreclosed upon, the servicer will list the property with a broker who must find a buyer and complete the closing process. This timeframe will vary by jurisdiction and market conditions.

A reasonable estimate of the total time the PACE assessment is not being paid by a homeowner is 18 months. In the vast majority of PACE enabled jurisdictions, the mortgage lender is only at risk for the amount owed over this period of time, not for the entire unpaid balance of the assessment. The table below shows the analysis assuming a \$20,000 retrofit financed by a PACE program with a 6% interest rate that goes delinquent two years post-origination.

	<b>PACE Program</b>	<b>Assessment with Acceleration</b>
Initial Balance	\$20,000	\$20,000
Seasoning	2 Years	2 Years
Current Balance	18,880	18,880
Total Liquidation Period	1.5 Years	1.5 Years
Lender/Servicer Advances	\$2,615	\$1,699
Remaining Balance	N/A	18,880
Loss to Lender	\$2,615	\$20,579

As the above example shows, the risk posed to lenders is substantially mitigated by the repayment structure of the PACE program. In the small number of jurisdictions that do require lien acceleration in the event of default or foreclosure, other protections, such as tighter lien-to-value ratios should be put in place to compensate for the acceleration.

**Mitigant – Increase in property value:** Risks to lenders, already significantly reduced by the PACE structure, are further reduced by the increase in property value delivered by the energy efficiency retrofit project. While it is difficult to precisely determine the increased value of property associated with a home improvement project, several valuation methodologies suggest that the increase in property value resulting from a clean energy retrofit will more than offset the outstanding assessment amount, resulting in a significant net increase in an existing lender’s collateral value.

In summary, PACE-financed clean energy improvements will improve the position of existing lenders by decreasing the risk of borrower default while improving the value of the underlying collateral.

## **Potential Risk Factor #2: Moral hazard and adverse selection relating to program participants.**

Like any well constructed financing program, the PACE structure is designed to take into account the potential for moral hazard and adverse selection on the part of the participant. Adverse selection would occur if, out of the pool of potential participants, only the weakest and most likely to go delinquent would apply. Moral hazard would occur if, either directly or indirectly, participation in the program would actually increase the likelihood of non-payment.

Specific to the PACE program and the energy efficient projects it finances, certain concerns have been raised. It has been thought that homeowners whose properties are underwater would gravitate to the program. There is a concern that the obligation to pay the assessments when due would create added stress to participant finances such that there would be a rise in mortgage delinquencies for PACE properties. Also, some have viewed the PACE structure as a way for distressed homeowners to cash out on the property. There are structural safeguards in PACE to guard against all of these situations.

**Mitigant – Upfront property valuation and loan-to-value screening:** The application approval process involves a careful examination of the property to ensure that the property is not currently under stress nor likely to come under stress in the near term. The status of mortgage payments and tax payments are checked to make sure that there are no delinquencies. The value of the property is compared to outstanding debt on the property to make sure it is not underwater, which can be a leading indicator of a potential default. Additionally, the cost of the retrofits cannot exceed a percentage of property value, often 10%. These procedures are put in place to screen out applicants who would present a clear risk of near term default.

**Mitigant – Energy cost savings improves homeowner cash position, particularly as time goes on:** Traditional debt obligations create additional strains on borrower finances and credit issuers will often deny the issuance of additional debt without a corresponding increase in borrower income. The PACE program is designed such that there is a direct correlation between the investment in the retrofit and utility bill savings. The programs are designed to produce net cash savings to the homeowner on an absolute and present value basis over the useful life of the retrofit. Therefore, energy efficiency retrofits would work to lessen the likelihood of mortgage defaults as the homeowner has more cash available on a post-mortgage payment, post-utility payment basis. These benefits will likely increase over time as the PACE assessment remains fixed while the cost of energy continues its virtually uninterrupted march upward.

For instance, between 1997 and 2008, the average cost of a kWh of electricity for residential customers went from 8.43 cents to 11.26 cents, a 33.5% increase. (EIA January 21, 2010)

**Mitigant – There is no cash out feature to the program:** Acceptable PACE projects are very narrowly defined in each program and diligence is exercised to make certain the retrofit work was completed and inspected before funds are disbursed. Funds can be sent directly to the contractor at the option of the homeowner. There is no option to take any cash out. Homeowners are required to apply for any federal or state rebates associated with the installation, therefore only the post-rebate cost is covered by the PACE financing. Contractors generally handle the rebate paperwork so there is no homeowner inconvenience. There may be an investment tax credit (ITC) available depending on the nature of the retrofit. For many energy efficiency measures, the credit is capped at \$1,500. For solar PV, the ITC can be up to 30% of the cost. In either case, the mechanism works through the standard IRS tax collection / refund process. A homeowner would apply for the ITC in the year after the retrofit was installed (i.e. April 2010 for work done in 2009). The ITC is subject to income so that a lower income filer may have to wait several years to get the full amount. In total, it is likely to be 18 months or more between the time the homeowner applies to the PACE program until he receives the benefit of the ITC. This, coupled with the fact of the relatively small overall dollar value of the ITC, effectively screens out participation by anyone wanting cash-back on the ITC before an anticipated default.

**Mitigant – Programs are launching in post-real estate bubble markets, reducing future volatility in home prices:** As discussed above, care is taken to ensure that underwater properties are screened out of the program. Nevertheless, like any secured financing, further declines in the value of the collateral can cause a property to flip to underwater status. While no representation can be made as to the future direction of home prices, as the launch of PACE programs occurs after significant declines in property values, one expects lower volatility going forward. This certainly contrasts to launching at the top of the market.

**Potential Risk Factor #3: Homeowners will not realize anticipated utility cost savings.**

While payment of the PACE assessment is mandatory regardless of the actual performance of the retrofit, it is still important to make every effort to ensure that performance meets or exceeds expectations. Poor results of the retrofit negate the

environmental and economic benefits for which the PACE programs were established in the first place. Therefore, there are several mitigants to this risk.

**Mitigant – Certification of contractors and installed products:** Well-structured PACE programs only finance retrofits of specified energy efficient or other environmentally beneficial projects. Homeowners are given a list of qualified contractors to choose from. The sponsoring municipalities are not recommending certain contractors over others, but are simply compiling a list based on certification criteria. This makes the process of contractor selection much simpler for the homeowner. In situations where there are state rebate programs, contractors must also be eligible to perform the given retrofit under those programs. When appropriate, the equipment being installed is also certified by organizations such as Energy Star. The combination of certified contractors installing certified equipment maximizes the likelihood of performance meeting expectations.

**Mitigant – Energy Audits:** Most PACE programs will require or encourage the performance of a home energy audit prior to application acceptance or funding. These audits are performed by certified professionals and depending on the requirements of the given PACE program, very specific tests may need to be conducted relating to specific retrofit projects. The audits will determine the areas of weakness in the property's current energy usage and make recommendations for specific upgrades along with estimates of the associated energy savings.

**Mitigant – Equipment warranties:** Homeowners will have the benefit of the warranties associated with the installed equipment. In the case of solar PV panels, these warranties can be quite long – 20-25 years. GE is offering a 10-year limited-warranty on its energy efficient tankless electric water heater. These warranties will keep repair costs, if any, down overall for most of the PACE assessment period.

**Mitigant – Experience:** The PACE model is an important and relatively recent innovation in the *financing* of energy efficient retrofits, but the projects and equipment being financed often have substantial histories. PG&E installed its first small scale solar PV system in 1993, and President Bill Clinton launched the “Million Solar Roofs” program in 1997 ([www.gosolarcalifornia.org](http://www.gosolarcalifornia.org)). Energy efficient windows started production in the mid-1970s, with continual enhancements in the '80s and '90s ([www.life123.com](http://www.life123.com)). These are dynamic markets with constant technical innovation, but the continued growth in demand for energy efficiency products is testament to their ability to deliver results.

#### **Potential Risk Factor #4: Fraud**

Fraud can take many forms in financing transactions, and has been attributed as one of the causes of the mortgage crisis and by extension the real estate crisis. Fortunately, the narrow scope and controlled nature of the PACE program greatly reduces the likelihood of fraudulent transactions.

**Mitigant – Direct Origination:** PACE program participants apply directly to the sponsoring municipality or the program administrator and all applications are approved by these parties. Unlike many other financing mechanisms, there are no agents, brokers, correspondents, contractors, or other middlemen involved in the application and approval process. Often, these middlemen are paid on a production basis, so they are highly incentivized to get their customers' applications approved. Sometimes this results in fraudulent behavior. PACE has none of these issues since it is structured with direct originations overseen by the local or state government only.

**Mitigant – Participant Validation:** As previously discussed, there is no cash-out feature to the PACE program and only the post-rebate costs of the retrofit are financed. This in itself creates very little incentive for a participant to fraudulently submit an application. To guard against underwater properties entering the program, mortgage statements are required to confirm outstanding mortgage debt and the municipality makes its own determination of property value based on assessed value or another measure. No reliance is placed with the property owner. The participant is informed that public records can be reviewed to confirm the status of any liens on the property and any unpaid taxes. Also, the participant is warned in the application that providing false, misleading, or inaccurate information is punishable by law.

**Mitigant – Contractor Certification:** Only work performed by contractors on the approved list provided to the participant will be financed by the PACE program. Contractors who engage in unethical behavior can be dropped from the program, losing the ability to win new contracts. Additionally, the approved contractor lists will often be posted on the given PACE program website, thereby being available to non-program participants who may be interested in having work done. This is further incentive for contractors to maintain approved status.

**Mitigant- Quality Assurance Program:** PACE Programs use certified raters to conduct random verification of a specific percentage of projects. If retrofits do not meet quality standards, the contractor will be held accountable. Contractors that are not meeting predetermined standards of satisfactory work will be removed from the list of eligible contractors.

## VI. LEGAL CONSIDERATIONS

### i. Constitutionality of PACE Liens

Courts have long recognized that legislation making special assessment liens superior to prior mortgages or deeds of trust on the property assessed is not violative of either federal or state constitutional provisions. While the Federal Constitution provides that “No state shall ... pass any ... law impairing the obligation of contracts” (U.S. Const., art. 1, §10, cl. 1), the Federal Courts have long recognized that the prohibition on impairment is not absolute. The Supreme Court has set forth a three pronged test which PACE programs clearly satisfy: (Energy Reserves Group Inc. v. Kansas Power and Light Co., 459 U.S. 400, 41 1(1983))

- **The impairment must be “substantial”:** The PACE program does not substantially impair the contractual relationship between a pre-existing mortgage lender and the property owner. The mortgage holder still may foreclose upon the property in the event of default and may still protect its security interest in the property by paying any amount in default under the assessment. Furthermore, the PACE financing does not materially change the loan-to-value ratio with respect to the property, especially in light of the non-acceleration feature present in most PACE financings.
- **If the impairment is substantial, the state, in justification, must have a significant and legitimate public purpose behind its action:** In enabling PACE legislation, lawmakers have found that energy conservation efforts, including the promotion of energy efficiency improvements to residential, commercial, industrial, or other real property are necessary to address the issue of global climate change. The upfront costs of making these improvements prevent many property owners from acting and therefore legislatures recognized the necessity of authorizing PACE style programs.
- **Resulting adjustment of the rights and remedies of contracting parties must be appropriate to accomplish the public purpose:** Courts have generally deferred to legislative judgments as to the necessity and reasonableness of a particular act or regulation. PACE programs are narrowly focused so that only clean energy improvements affixed to the premises would be financed, thus enhancing the value of the property. PACE is a reasonable use of a governmental power to achieve a public purpose.

## **ii. Right of Municipalities to Establish Land Secured Financing Districts; Seniority of Lien**

For the most part, PACE programs are simply additions to existing state laws that already authorize the creation of “land secured” financing districts to pay for improvements in the public interest, whether publicly or privately owned.

Land secured financing districts – which are creatures of state law and are variously referred to as assessment districts, public improvement districts and community facilities districts, among other terms – are a building block of municipal finance and have been utilized for more than a century. They are used to finance projects that serve a public purpose, including street paving, parks, open space, water and sewer systems and street lighting, among others.

All land secured financing districts operate by placing a senior tax/assessment lien on properties that will receive a benefit from the financed improvement. The lien secures a tax/assessment payment that is levied on properties through the property tax bill. Tens of thousands of these districts already exist in this country and are a standard part of the property appraisal, underwriting and disclosure processes.

Individual states generally need to update existing authority to provide for some of the specifics of PACE. This would include provisions that allow for the financing of energy efficiency and renewable energy improvements, and for an opt-in assessment feature whereby willing and interested property owners would voluntarily elect to receive financing and have assessments placed on their property.

## **iii. Applicability of Consumer Credit Laws**

Many PACE programs are choosing to provide disclosures and other consumer protection measures required by credit laws, however there are good legal and policy arguments that federal and state consumer lending laws should not apply to these programs. Consumer credit laws apply where a consumer obtains a loan for personal, family or household purposes; the hallmark of a loan is the borrower's personal promise to repay the principal amount advanced by the lender. In contrast, PACE programs involve a tax assessment on property that is improved with funds provided by the governmental body. The owner of the property is not personally obligated to repay the tax assessment, and the assessment generally continues against the property after it is sold to a new owner.

The Board of Governors of the Federal Reserve System has expressly ruled that ordinary tax liens and tax assessments are not "credit" transactions covered by the Truth in Lending Act (15 U.S.C. § 1601 et seq.) and Regulation Z (12 C.F.R. pt. 226).

See 12 C.F.R. pt. 226 Supp. I, cmt. 2(a)(14)-1. Similarly, the Third Circuit Court of Appeals has held that such tax assessments are not credit transactions subject to the Truth in Lending Act. See Pollice v. Capital Asset Research, 225 F.3d 379 (3d Cir. 2000). These authorities arguably recognize the fundamental distinction between a tax assessment against property and the debtor-creditor relationship between a consumer and lender arising from a consumer loan.

Finally, there are sound policy reasons why tax assessments should not be regulated in the same manner as consumer loans made by for profit businesses. Practically, consumer lending laws are poorly suited to these programs, and the underwriting and consumer protection procedures described previously in the risk mitigation section are generally more appropriate and effective. The authority to assess taxes is granted to specified governmental bodies to carry out public good and the government's exercise of that authority is subject to a variety of specific regulatory safeguards. In contrast, consumer credit laws are designed to regulate activities of for profit businesses that are not constrained to act for public good, but are conducted to make profits for their owners. For this reason, many state lending statutes exempt municipal and other governmental entities from the scope of licensing and other regulatory requirements.

## VII. OPPORTUNITIES

<b>Stakeholder</b>	<b>Opportunity</b>
Homeowner	Cash flow benefits due to reduced utility cost Insulation from future energy price spikes Increase property values “Green” home – be a part of the GHG solution Increased home comfort and health
Policy Makers	Promote clean energy initiatives across the board Meet GHG reduction goals Job creation Reduce dependence on foreign energy sources
Lenders	Increased cash flow to homeowner lowers borrower default risk Potentially better recoveries in a default Finance PACE programs – attractive risk adjusted returns
Small Businesses	Expand revenues Acquire valuable green job experience.

## VIII. OBJECTIVES TO INCREASE PROGRAM ACCEPTANCE

As discussed earlier, the PACE program concept is gaining wide acceptance in municipal jurisdictions across the country. The program features, as currently configured, offer an attractive product to homeowners. Nevertheless, there are opportunities to partner with government, lenders, and other private sector players to increase the attractiveness and applicability of PACE programs.

- **White House Issues Final PACE Best Practices Guidelines:** The Department of Energy is currently working on additional guidance on PACE underwriting. This guidance will need to be reviewed and adapted as data from “live” PACE programs is gathered and analyzed. With stakeholder consensus, a final Best Practices document, based on the October 2009 Policy Framework, should be formally issued by the Executive Office of the President with sign off from appropriate federal agencies.
- **Regulators/GSEs Issue PACE Loan Underwriting Guidance that Incorporates White House Guidelines:** Appropriate mortgage regulatory authorities, Fannie Mae, and Freddie Mac shall issue loan underwriting criteria that recognize the new Best Practices as government policy. Programs that substantially meet the criteria will not be subject to adverse action absent demonstrated performance data that indicates greater risk.
- **Incorporation of Energy Efficiency Factors into Mortgage Loan Underwriting:** A critical component of standard mortgage loan underwriting practices is the use of the Debt-to-Income Ratio (“DTI”). DTI measures the fixed obligations of the borrower as a percentage of his income. There are two DTI’s in use. The front-end DTI considers only mortgage related payments while the back-end DTI considers mortgage and other debt, such as auto loans and credit cards.

There are several components to the mortgage debt portion of the ratio. These are the debt service payment on the mortgage; the cost of homeowner’s insurance; mandatory condo or homeowner association fees; and importantly, taxes and other municipal assessments. Therefore, any PACE associated assessments on the property would be included in the calculation of DTI for a refinancing by the existing owner or a purchase money mortgage by a new owner.

However, since there is a direct connection between the energy efficient retrofit, which is driving the assessment in the first place, and the reduced level of utility fees that must be borne by the homeowner, a more accurate assessment of DTI should factor in these savings. While it is the goal and/or requirement of most PACE programs to have a savings to investment ratio greater than one (i.e. be cash flow

positive), this is not critical to the DTI analysis. As the table below shows, a savings to investment ratio greater than one creates a lower adjusted DTI versus the standard DTI.

	<b>Pre-PACE DTI</b>	<b>Post-PACE DTI</b>	<b>Adjusted DTI</b>
Income (Monthly)	\$6,000	\$6,000	\$6,000
Mortgage	1,500	1,500	1,500
Insurance	75	75	75
Taxes	300	300	300
Homeowners Fee	125	125	125
PACE Assessment	-	150	150
Monthly Payment	2,000	2,150	2,150
Other Debt	300	300	300
Utility Savings	-	180	180
<b>Back End DTI</b>	<b>38.3%</b>	<b>40.8%</b>	<b>37.8%</b>

In the above example, the post-PACE DTI is bumping up against DTI limits set by many private mortgage insurers and by the VA (activerain.com), while the pre-PACE loan falls comfortably below. In reality, it is the post-PACE loan that is less risky from a DTI perspective, as the \$180 in utility savings more than offsets the PACE assessment.

There is a level of precedent in the mortgage industry for this concept. Both FHA and Fannie Mae (greenmortgagecompany.com) have offered Energy Efficient Mortgages which allow home buyers to include 100% of the cost of an energy efficient installation into their mortgage and importantly, they make an allowance in the appraisal and DTI calculations to take into account the utility cost savings. Mortgage lenders and other mortgage investors should update underwriting protocols to take the utility cost savings associated with PACE funded retrofits into account in the calculation of DTI.

- **Implementation of the Recovery Through Retrofit Stated Objectives** -- On behalf of the Middle Class Task Force the Council on Environment Quality ‘Recovery Through Retrofit’ report (“CEQ Report”) made a series of recommendations designed to overcome the barriers to the formation of a self-sustaining retrofit market. Clearly, all of their recommendations and objectives will enhance the widespread adoption of

energy retrofit projects and their resultant environmental and economic benefits. There are two objectives in particular, that if implemented in a speedy and thorough basis, would promote greater use of PACE programs and strengthen several of the mitigants to some of PACE's risks.

- **National Building Label:** The CEQ Report called for the establishment of a certification label relating to the energy efficiency of existing homes. The analogy was drawn to the Energy Star label that can be affixed to new homes. The DOE and EPA are working on this objective. As this report has shown, the risk to mortgage lenders of the superior lien status of the PACE assessment is significantly, if not entirely mitigated by both the non-acceleration feature of the assessment and/or by the rise in home value associated with the retrofit. Any nationally recognized energy efficiency certification that can be attached to the PACE retrofitted home would only serve to enhance the resale value of the home, benefitting all PACE stakeholders.
- **National Contractor and Equipment Standards:** The CEQ Report also called for a national workforce certification and training program. This would be immensely helpful for homeowners participating in PACE. Certifications and approved contractor lists do exist at the state and/or local level, but a national program with strong standards would significantly reduce concerns about contractor quality. Also, widespread adoption of PACE cannot fully deliver on its benefits if there are an insufficient number of trained worker to perform the installation and inspection related work. DOL, DOE, HUD and the EPA are working on this objective. Speedy implementation would be a win for all parties involved.
- **Capturing the Public Good of the ITC into PACE** --The government has granted Investment Tax Credits to businesses and individuals to promote the purchase and use of clean energy and energy efficient equipment. For individuals, solar PV and thermal installations may be eligible for a 30% ITC while many other energy efficient items are eligible for the same tax credit, capped at \$1,500. Naturally the dollar amounts and lists of eligible items can change over time.

To maximize the environmental and economic benefit of each dollar of PACE funds, as well as eliminate a potential source of moral hazard, PACE programs are designed to finance the net cost of the energy efficient retrofit. This translates into a financing of the post-rebate (if any) cost of the project.

As currently constructed, the structure of the ITC does not optimally align with the homeowner's cash flow or the PACE structure. The ability to more fully capture the public good of the ITC into the PACE program without materially changing the economics for the participant would be advantageous in advancing the widespread adoption of PACE.

## **CONCLUSION**

The PACE model is an innovative and cost effective method of financing energy efficient retrofits on existing residential, commercial, and industrial buildings. PACE provides a multitude of benefits to individual participants, sponsoring municipalities and our nation as a whole. Among these are substantial reduction in GHG emissions, progress towards energy independence, green job creation, increased economic activity and savings on utility bills.

PACE employs the well tested and widely adopted structure of a land-secured financing district. Retrofits on a given building are financed by the sponsoring municipality, and secured by an assessment on the property. The obligation to pay the assessment is attached to the property, and therefore transfers to the new owners as the property is sold. Financing terms are structured to match the useful life of the retrofit and to provide for positive cash flow to the property owner over the life of the assessment.

Well structured PACE programs are designed to minimize any risks to participants and to mortgage lenders who have an existing lien on the property. The combination of increased cash flow to the homeowner, the non-acceleration feature of the PACE assessment in most jurisdictions and the net increase in property value associated with the installation of the retrofit significantly protects mortgage lenders in the case of default or foreclosure. Homeowners are provided with lists of approved contractors and only a narrow range of projects are approved for financing. Additionally, PACE financings are centrally approved by the municipality and/or the given program administrator. There are no brokers or middlemen which in other finance settings have given rise to problems of fraud.

While existing PACE programs have been a success and many more are being prepared for launch, more can be done to accelerate the adoption of PACE across the country. Federal policymakers, state legislatures, and local governments have a unique opportunity to work together to further this progress and maximize the benefits that PACE can provide.

## **ADDENDUM Assumptions**

The avoided carbon emissions and utility savings were calculated for a basic \$4,000 energy efficiency package paired with a 2 kilowatt solar PV system. The energy efficiency package is assumed to result in a 5% reduction in electricity use and a 25% reduction in natural gas use. This package would consist of the most cost effective energy saving measures for a given home and could include air sealing, insulation, high efficiency windows or other measures. This model assumes that the property owner deducts the interest payments from their taxes, and does not include the value of the Federal Investment Tax Credit in the financed amount.

### **State Specific Assumptions**

	Santa Barbara, California	San Antonio, Texas	Columbus, Ohio	Albany, New York
Average Residential Natural Gas Consumption in therms (from Energy Information Administration (EIA))	530	533	945	892
Average Residential Electricity Consumption in kWhs (EIA)	7,044	13,560	10,920	7,104
Average Residential Price of Natural Gas in \$/therm (EIA)	\$1.24	\$1.33	\$1.24	\$1.57
Average Residential Price of Electricity in \$/kWh (EIA and SCE website)	Based on Southern California Edison (SCE) Rate Tiers for Santa Barbara	\$0.13	\$0.10	\$0.18
Energy Efficiency Incentives	\$1,000 Based on California Investor	No Incentives Assumed	No Incentives Assumed	No Incentives Assumed

	Owned Utility Incentive Program			
Solar PV Incentives	\$1.90/watt AC from California Solar Initiative	\$3/watt AC from CPS (Utility)	\$3/watt DC from Ohio Department of Development	\$1.75/watt DC from NYSERDA
Carbon Intensity of Natural Gas in Lbs CO <sub>2</sub> /therm (LBL Assumptions from Home Energy Saver Software)	11.68	11.68	11.68	11.68
Carbon Intensity of Electricity in Lbs CO <sub>2</sub> /kWh (LBNL Assumptions from Home Energy Saver Software)	0.63	1.37	1.84	0.98

### Other Assumptions

Pre-incentive Cost of PV	\$7/watt DC
Cost of Inverter (Replaced at Year 15)	\$0.2/watt DC
Value of Federal Investment Tax Credit	30% of the System Cost of PV
Annual Degradation of Measure Performance	1%
Annual Energy Price Increase	3%
Discount Rate	5%
Amortization Period	20 years
PACE Interest Rate	7%
Income Tax Rate	33%

## FOR FURTHER INFORMATION ON THE SPONSORING ORGANIZATIONS

Natural Resources Defense Council

[www.nrdc.org](http://www.nrdc.org)

PACENOW

[www.pacenow.org](http://www.pacenow.org)

Renewable Funding, LLC

[www.renewfund.com](http://www.renewfund.com)

The Vote Solar Initiative

[www.votesolar.org](http://www.votesolar.org)