



U.S. DEPARTMENT OF
ENERGY

PICKING UP THE PACE

TEAM GREEN DINOSAURS

YUNG NGUYEN

INTRODUCTION

- P.A.C.E. programs facilitate financing for energy efficiency projects
 - Long term and low interest loan
 - Loan associates with property, not individual

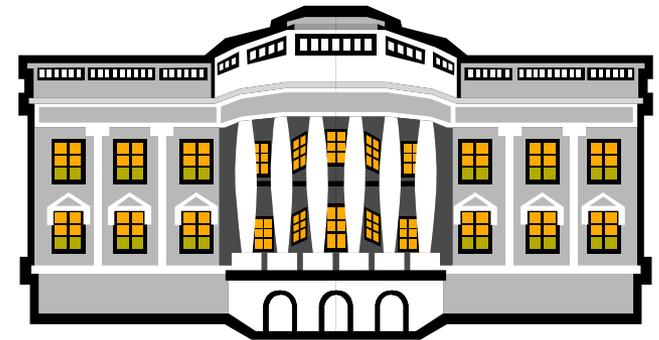


PROPERTY

**CHOOSE CONTRACTOR
& APPLY**



PROVIDE UPFRONT \$



PACE PROGRAM



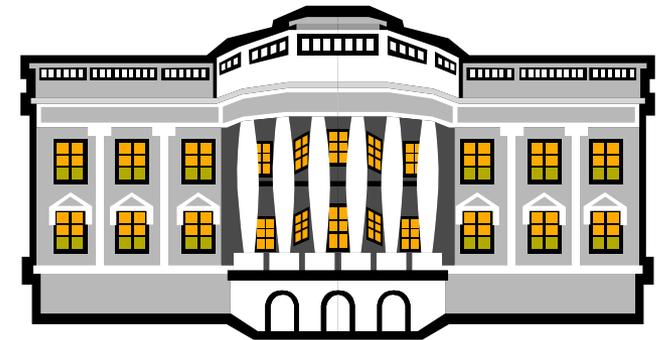
INTRODUCTION

- P.A.C.E. programs facilitate financing for energy efficiency projects
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PROPERTY

REPAY \$ BY
PROPERTY TAX BILLS

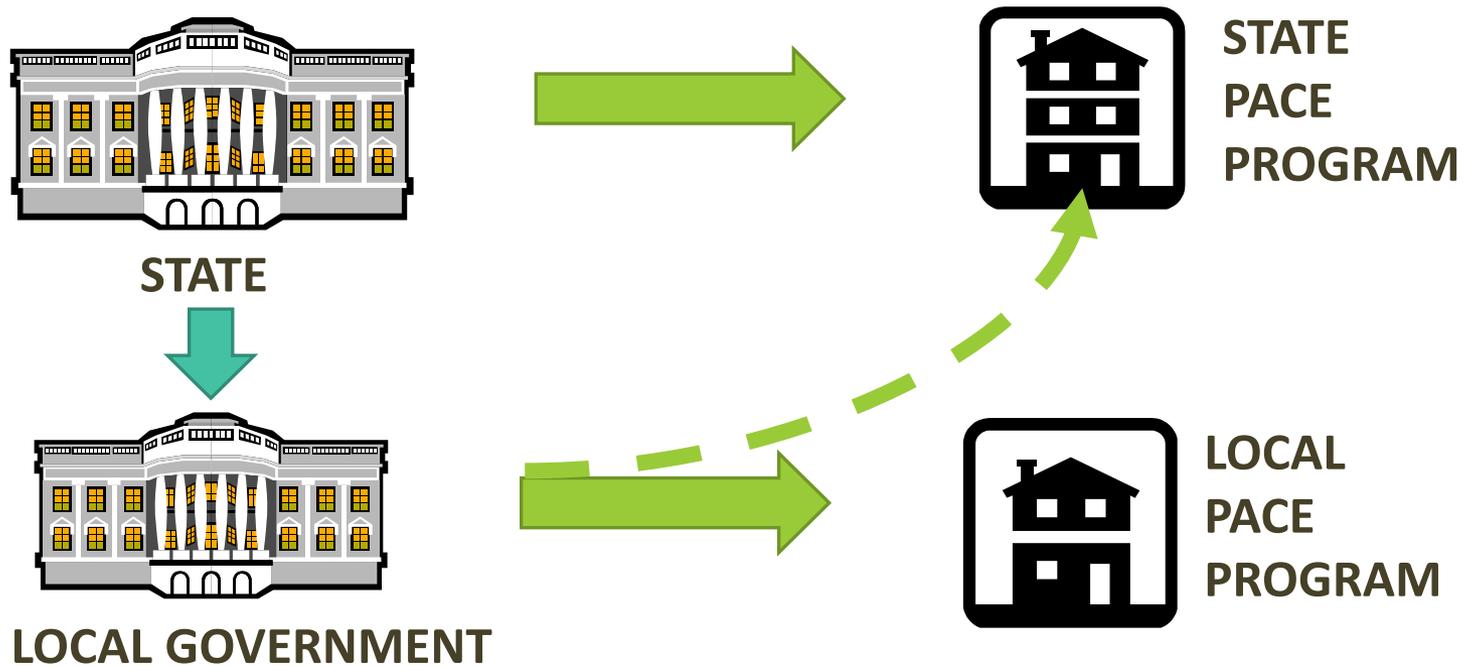


PACE PROGRAM



INTRODUCTION

- P.A.C.E. must be enacted by legislation



Develop a state commercial P.A.C.E. program to successfully achieve **scale** and **self-sustainability**.



CHALLENGES



PROPERTY OWNERS

- Difficult application process
- Expensive legal and admin services



INVESTORS

- Require high level of market uptake



MORTGAGE LENDERS

- Complicated to obtain lender consent



LOCAL GOVERNMENTS

- Need infrastructure for intrastate coordination



CONTRACTORS

- Unfamiliar with PACE program



STRATEGIES



PROPERTY OWNERS

CHALLENGES

- Difficult application process
- Expensive legal and administrative services

SOLUTIONS



IMPROVED WEB TOOLS

- Automated eligibility check
 - Decrease human cost
 - No initial app fee
- Interactive consultant
 - Recommend products
 - Educate owners



PROVIDE TECHNICAL ASSISTANCE

- Big projects (>\$50,000) : 50 hrs
- Small projects (<\$50,000) : 25 hrs



SET-UP COST

- Use ARRA funds available
- Issue municipal bonds
- Payback using % of loan



STRATEGIES



PROPERTY OWNERS

CHALLENGES

- Difficult application process
- Expensive legal and administrative services

SOLUTIONS

STREAMLINED APPLICATION MODEL



1. Automated Application



2. Match owner with energy auditors



3. Final Application (Technical + Financial Review)



4. Bidding Portal – Contractors bid on project



5. Final Agreements



STRATEGIES

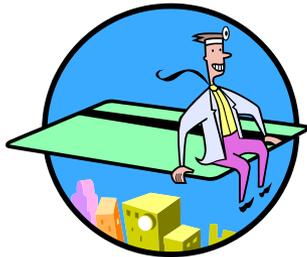


**MORTGAGE
LENDERS**

CHALLENGES

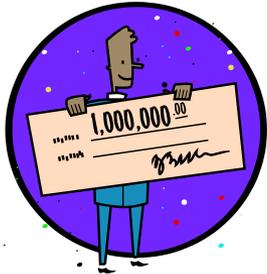
- Mortgage lenders fear risks of PACE loan as a senior lien
- Complicated lending structure makes it difficult to obtain consent

SOLUTIONS



STRENGTHENING UNDERWRITING CRITERIA

- Require 30%+ of mortgage lien already paid to adopt PACE Loan
- Loan capped at 10% of the property market price
- Perform credit and background check on property owners



NON-ACCELERATED REPAYMENT

- PACE loan will be same priority as mortgage loan
- Additional interest rates for non-repayment period



STRATEGIES



CONTRACTORS

CHALLENGES

- Local contractors are not familiar with PACE

SOLUTIONS



EDUCATIONAL OUTREACH

- Public workshops, webinars & online courses free of charge
- Free materials about PACE financing



REGISTERED CONTRACTOR

- Encourage familiarity and association with PACE program
- Increase exposure on PACE website to reach future customers
- Access to Bidding Portal and online forum to share success



STRATEGIES



INVESTORS

CHALLENGES

- Attracting investors require high level of market uptake

SOLUTIONS



INCREASE CONFIDENCE

- Showcase program's success through PACE Building Profile Database
- Offer competitive interest rates and certainty



STRATEGIES



**LOCAL
GOVERNMENT**

CHALLENGES

- Encourage state-wide coordination

SOLUTIONS



LOCAL GOVERNMENT WITH THEIR OWN PACE PROGRAM

- Guide local PACE program to maintain state-wide consistency
- Exchange networks and supports from existing partners



LOCAL GOVERNMENT PARTICIPATING IN STATE PACE PROGRAM

- Simple agreement with the State PACE program
- Responsibilities only include marketing to local contractors and investors
- Decrease property tax % for PACE properties that met high saving goals up until a certain threshold



STRATEGIES



PROPERTY OWNERS

- Improved web tools
- Technical assistance
- Set up cost from bonds & funds



MORTGAGE LENDERS

- Strengthening underwriting criteria
- Non-accelerated repayment



CONTRACTORS

- Education outreach
- Registered Contractors



INVESTORS

- Increase confidence through scale uptake

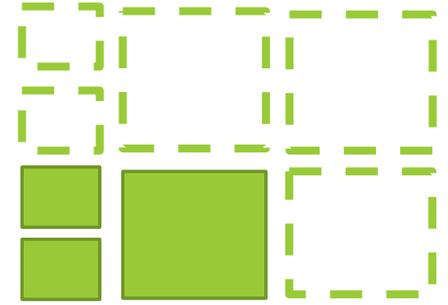


LOCAL GOVERNMENTS

- Provide guidance
- Simple agreements
- Negotiate tax abatement incentive



SCALE UPTAKE



PHASE I

PHASE II

PHASE III

Establish Foundation



Targeting Big Buildings



Branding State Program



SCALE UPTAKE



CONTRACTORS



LOCAL GOV



BONDS



SMALL PROJECTS



PHASE I. ESTABLISH FOUNDATION

- Market to Contractors
- Partner with existing successful local PACE program
- Depend on municipal bonds



SCALE UPTAKE



CONTRACTORS



LOCAL GOV



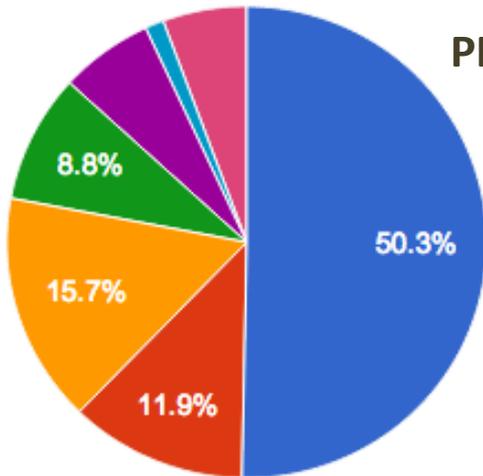
BONDS



SMALL PROJECTS

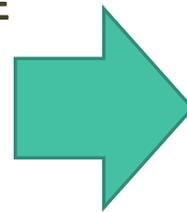


PHASE I. ESTABLISH FOUNDATION



PROJECTS BY SIZE

- < \$50K
- \$50-\$100K
- \$100-\$200K
- \$200-\$300K
- \$300-\$400K
- \$400-\$500K
- >\$500K



Separates projects into 2 types:

- Small Projects (<\$50,000)
- Big Projects (>\$50,000)

Estimated Loan Volume: \$4 MIL

Source: PACENow Dashboard



SCALE UPTAKE



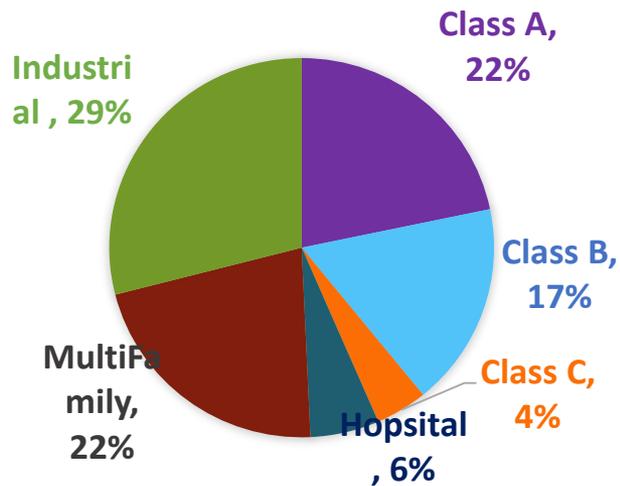
BIG PROJECTS



INVESTORS

PHASE II. TARGET BIG BUILDINGS

COMMERCIAL BUILDINGS BY TYPES
BASED ON SF

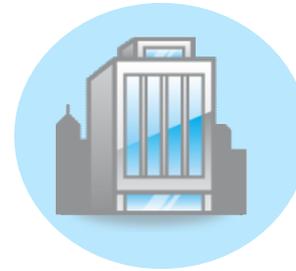


TARGETING CLASS A & CLASS B
OFFICE BUILDINGS

- **37%** of the total portfolio
- Tenants are more likely to support energy efficiency



SCALE UPTAKE



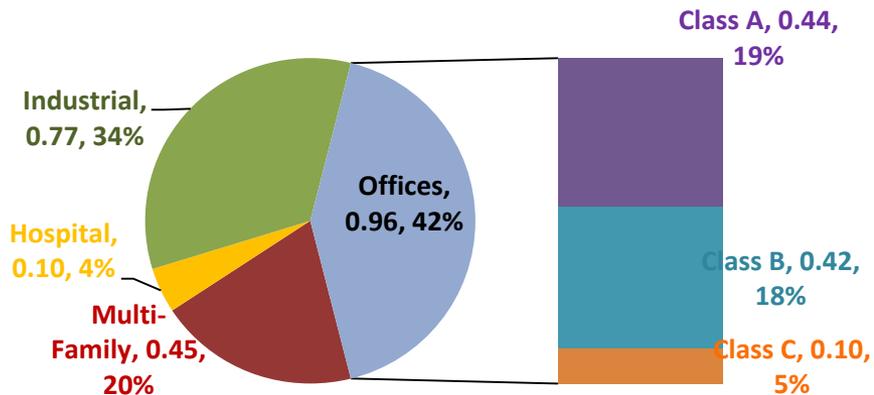
BIG PROJECTS



INVESTORS

PHASE II. TARGET BIG BUILDINGS

Total Investment Capacity of Deep & Quick Retrofits (\$ BIL)



TARGETING CLASS A & CLASS B OFFICE BUILDINGS

\$860 MIL

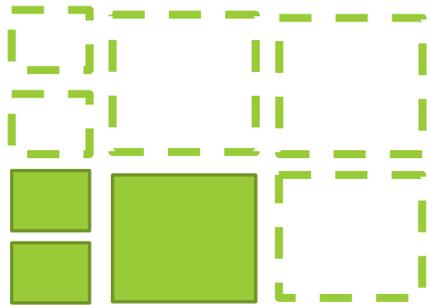
Attract Investors

- Largest Market Capacity
- Higher loan amount

Estimated Loan Volume: \$20 MIL



SCALE UPTAKE



INVESTORS



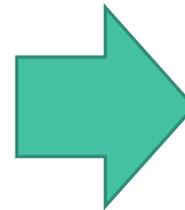
LOCAL GOV



ALL TYPES

PHASE III. BRANDING STATE PROGRAM

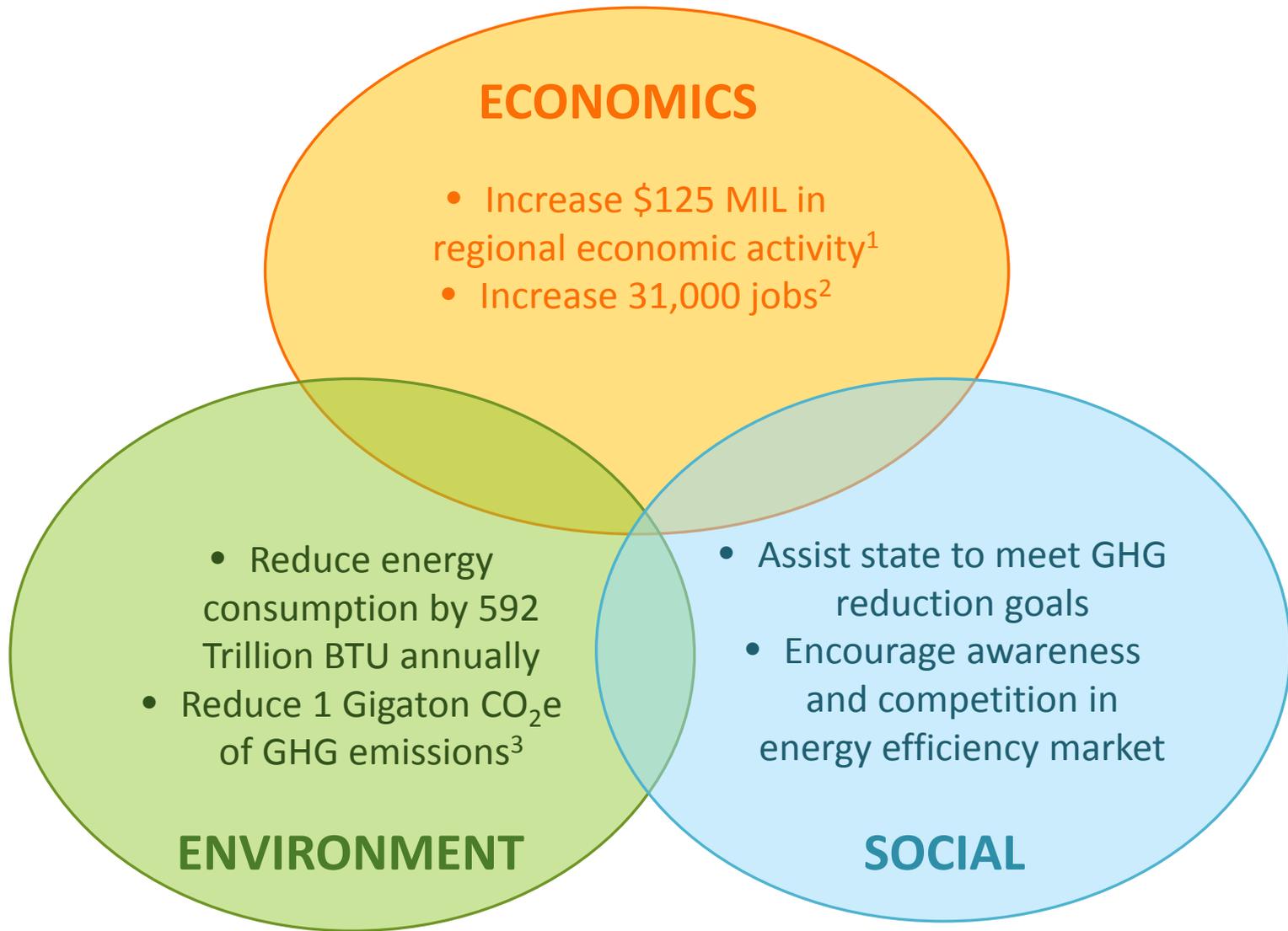
- Gain publicity and confidence among different stakeholders
- Target investors & local governments
- Obtain high volume of available funds
- Complete a wide range of projects



ACHIEVE SELF SUSTAINABILITY
Estimated Loan Volume: \$50 MIL



POTENTIAL IMPACTS



THANK YOU.

Team Members

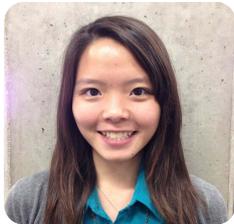
Bharathan Balaji, Wan Ying Cheung, Sandeep Dey, Dung (Yung) Nguyen, Michelle Tang, Sze Wun Wong

Presenters



Yung Nguyen

B.S. Environmental Engineer '14



Wan Yin Cheung

B.S. Environmental Engineer '14



Michelle Tang

B.S. Environmental Engineer '14



Sandeep Dey

B.S. Environmental Engineer '14



Sze Wun Wong

B.S. Environmental Engineer '14



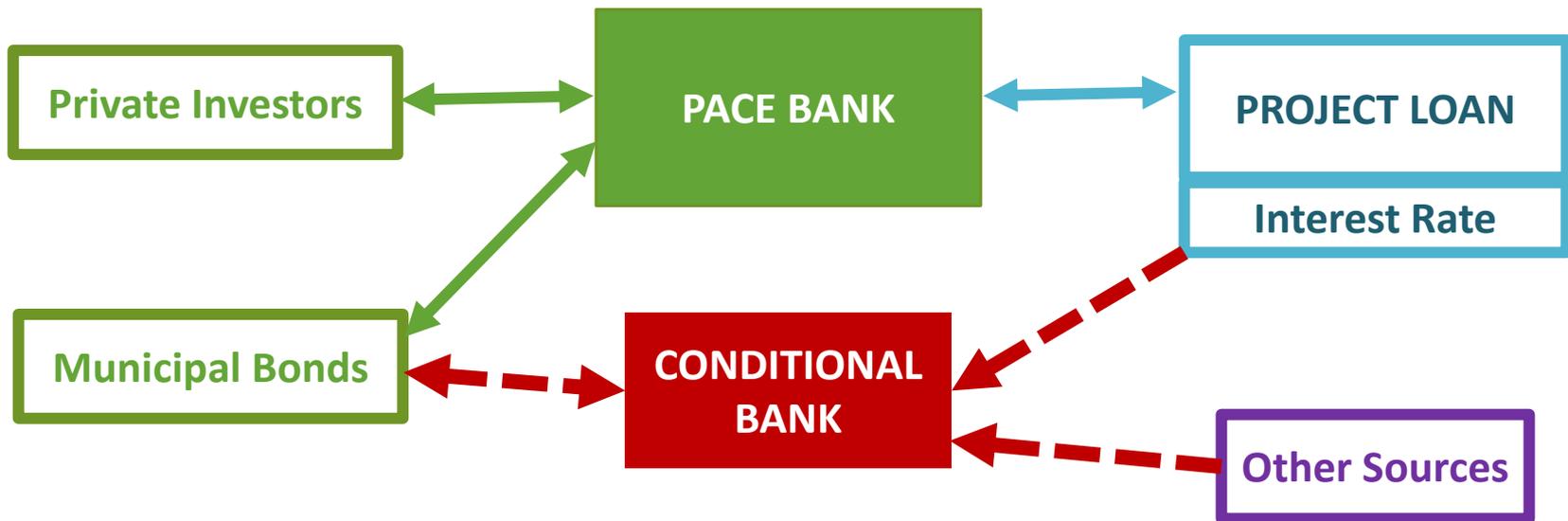
FINANCIAL MODEL

- **PACE bank**

- Official bank of the State PACE Program for projects

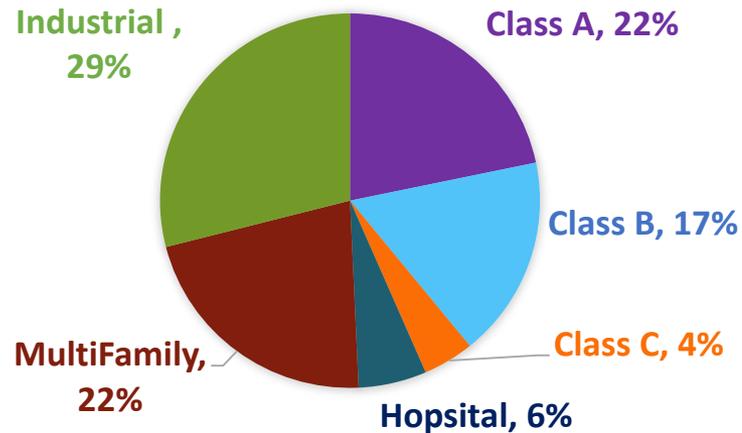
- **Conditional Bank**

- Use for emergency and expansion of the PACE program
- In case of foreclosures or failure of repayments



MARKET SIZING ASSUMPTIONS & RESULTS

COMMERCIAL BUILDINGS BY TYPES BASED ON SF



Total Investment capacity² =

of pre 1980 building * Average Square Feet * Cost of Retrofit per SF

Office type	Type A	Type B	Type C	Total
Total potential Quick Retrofit	\$141.9 million	\$134.2 million	\$33.5 million	\$310 million
Total potential Deep Retrofit	\$742.5 million	\$702 million	\$175.5 million	\$1.6 billion



MARKET SIZING ASSUMPTIONS & RESULTS

Total Investment capacity² =

of pre 1980 building * Average Square Feet * Cost of Retrofit per SF

Quick Retrofit Potential	Total Office	Hospital	Multi-Family	Industrial	Total
Total Investment	\$310 million	\$33 million	\$144 million	\$243 million	\$731 million
Cost/ unit	\$234,545.45	\$344,000.00	\$129,000.00	\$344,000.00	

Deep Retrofit Potential	Total Office	Hospital	Multi-Family	Industrial	Total
Total Investment	\$1.6 billion	\$172 million	\$756 million	\$1.3 billion	\$3.8 billion
Cost/ unit	\$1.2 million	\$1.8 million	\$675,000	\$1.8 million	

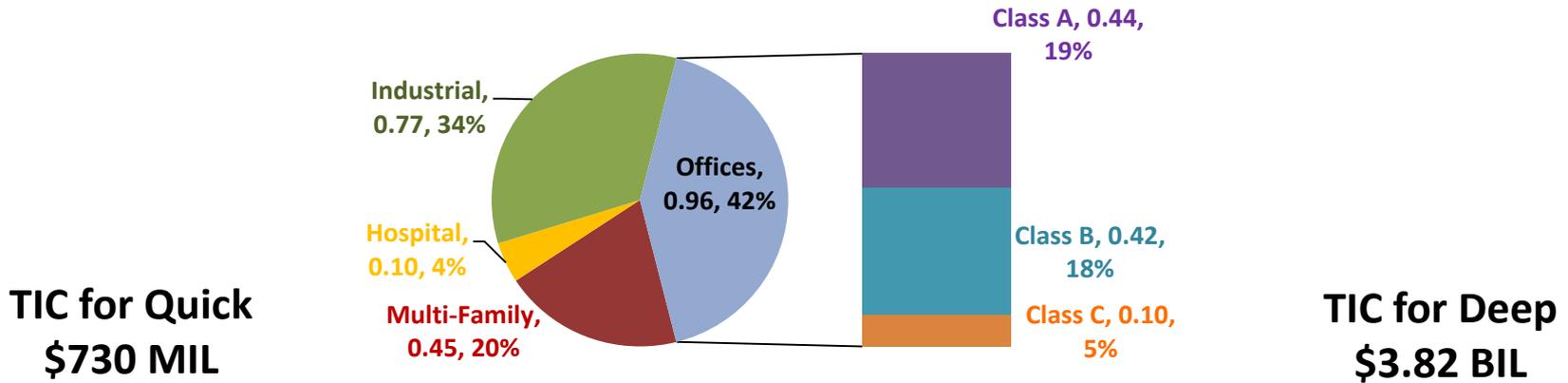


MARKET SIZING ASSUMPTIONS & RESULTS

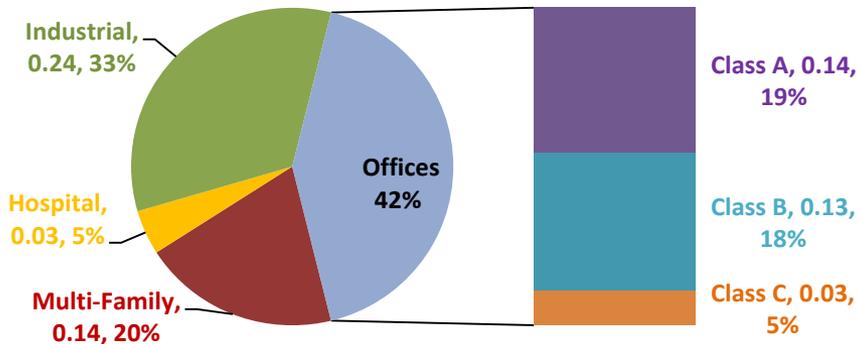
Total Investment capacity² = \$2.28 BIL for Both Deep & Quick Retrofits

of pre 1980 building * Average Square Feet * Cost of Retrofit per SF

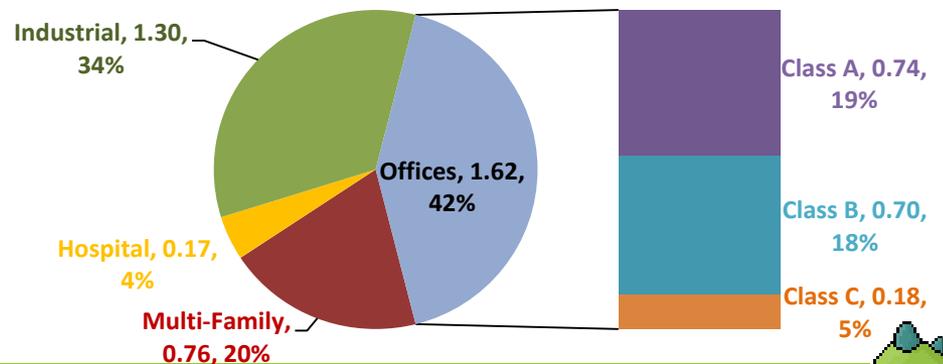
Total Investment Capacity of Deep & Quick Retrofits (\$ BIL)



TIC for Quick Retrofits (\$ BIL)



TIC for Deep Retrofits (\$ BIL)



MARKET SIZING ASSUMPTIONS & RESULTS

Job Created² =

Job Created = Total Investment (MIL) * Job created / Investment (Jobs/MIL)²

Energy Saving (Tbtu Annually) =

of buildings * Share of Pre-1980 * Targeted Reduction* Average BTU/SF

Assumptions

- 30% Energy Reductions
- Office: 78.9 BTU/SF
- Hospital: 234,100 BTU/SF
- Multifamily: 68.3 BTU/ SF
- Industrial (only accounted for Warehouse and storage): 32275 BTU/SF

CO2 equivalent of Greenhouse Gas Emission from energy saving³



CITATIONS

1. Economic Impact Analysis of Property Assessed Clean Energy Programs (PACE), PACENow
2. United States Building Energy Efficiency Retrofits, Rockefeller Foundation
3. US EPA Greenhouse Gas Equivalencies Calculator

