Energy Factors in Commercial Building Finance
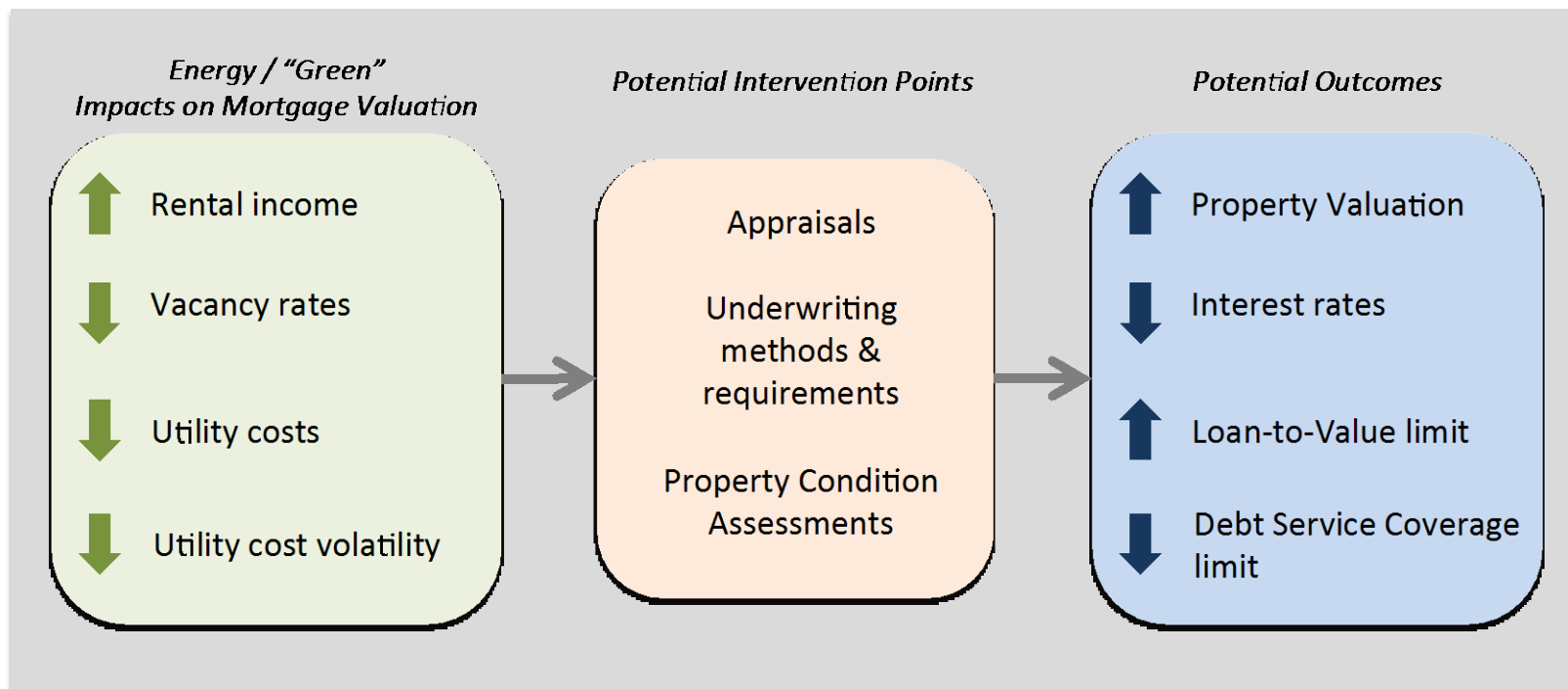

Lawrence Berkeley National Laboratory

Paul Mathew, Staff Scientist

(510) 486 5116 ; pamathew@lbl.gov

Project Summary

Timeline:

Start date: October 2015

Planned end date: September 2018

Key Milestones

1. Complete new analysis based on additional data for specific sectors. 6/30/18
2. Development of prototype energy risk ratio for lenders. 6/30/18

Budget:

Total Project $ to Date:

- DOE: $800,000
- Cost Share: $0

Total Project $:

- DOE: FY18 TBD
- Cost Share: $0

Key Partners:

UC Berkeley Haas School of Business	Institute for Market Transformation
Silicon Valley Bank	Colorado Lending Source
Northmarq	Wegowise
Community Preservation Corporation	

Project Outcome:

Ensure that commercial mortgages fully account for energy factors in underwriting and valuation and thereby serve as a scalable channel for energy efficiency.

- **Demonstrate impact** of energy factors on commercial mortgage valuation;
- **Develop interventions** to fully incorporate energy in commercial mortgage valuation;
- **Disseminate best practices** within the commercial mortgage community.

This project directly addresses CBI strategy #3 in the BTO MYPP.
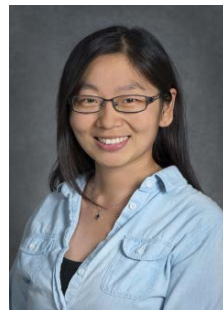
Team

Phil Coleman

Paul Mathew

Baptiste Ravache

Kelly Sun

Nancy Wallace

Paulo Issler

Emily McLaughlin

DOE Managers: Holly Carr, Cindy Zhu

Challenge

Energy directly affects Net Operating Income (NOI) used in mortgage valuation.

Current practice does not fully account for energy factors in calculation of NOI

- Usually based on historical average cost data, if available
- Does not account for energy use and price volatility during mortgage term

Energy efficiency is not properly valued and energy risks are not properly assessed and mitigated.

NOI = gross rents – gross expenses (insurance, energy, water, etc.)

Energy Use Volume
Electricity kWh/kW, fuel therms, etc.
Driven by bldg. features, operations, climate

Energy Price
$/kWh, $/kW, $/therm
Set by rate structure

Energy Use Volatility
+/- change over mortgage term
Driven by bldg operations, weather variation

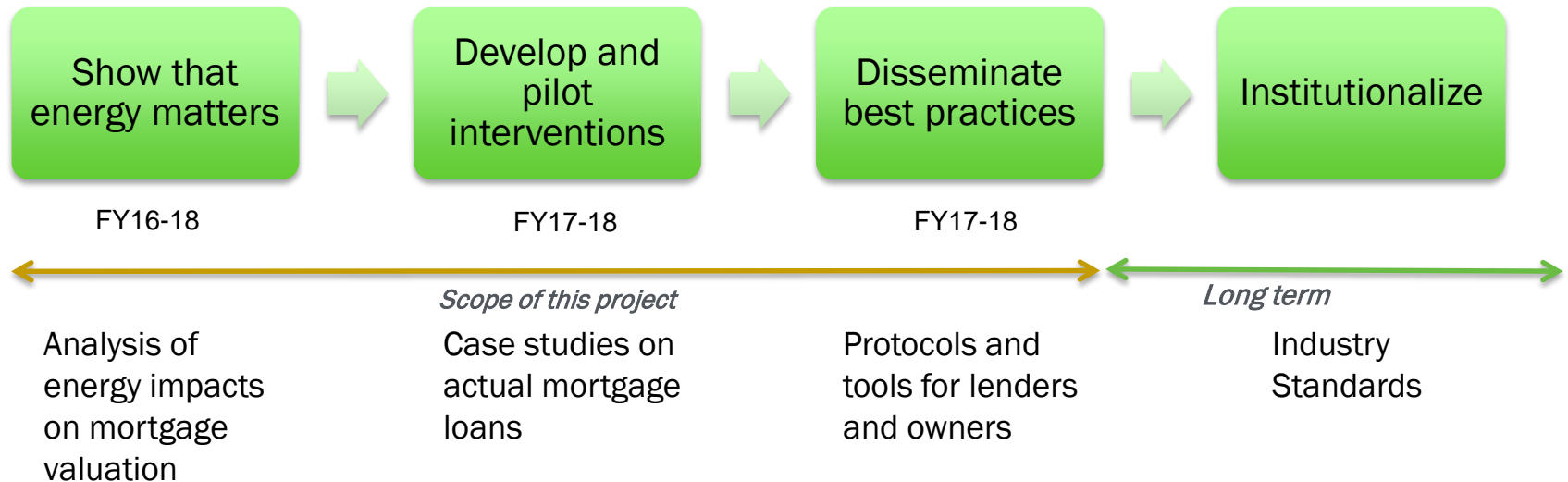**Energy Price Volatility**
+/- change over mortgage term
Driven by rate structure, forward prices

Commercial mortgages are a $2.5+ Trillion market and could be a significant channel for scaling energy efficiency.

Approach

Goal:

Energy factors are <u>fully and routinely</u> incorporated in commercial mortgage valuation, accelerating demand for buildings with lower energy risk.

Show that energy matters	→	Develop and pilot interventions	→	Disseminate best practices	→	Institutionalize
FY16-18		FY17-18		FY17-18		

Scope of this project   *Long term*

Analysis of energy impacts on mortgage valuation	Case studies on actual mortgage loans	Protocols and tools for lenders and owners	Industry Standards

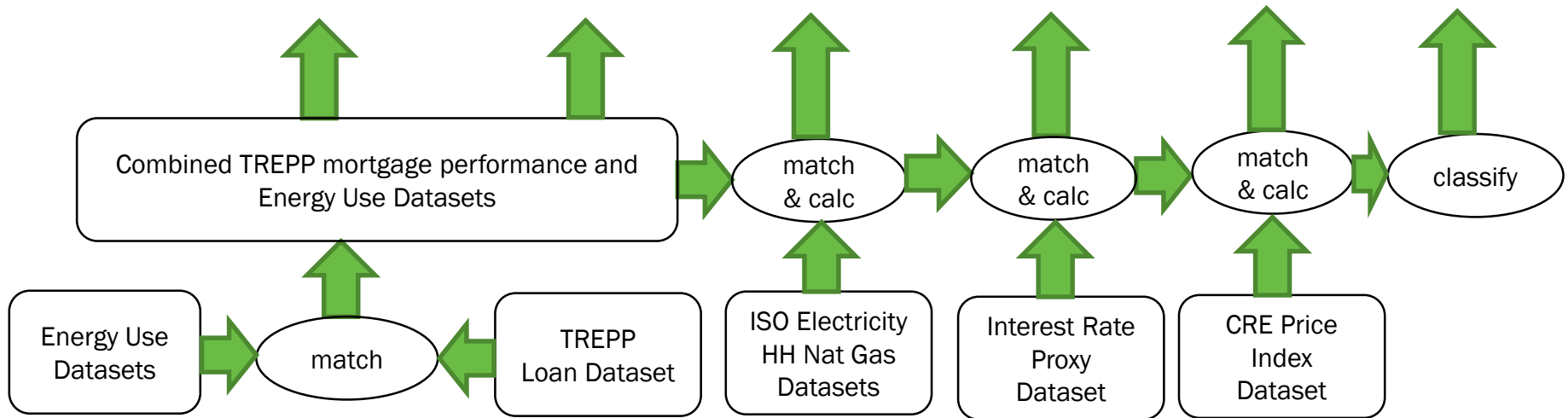Fully aligned with *CBI logic model:*
Objective: Accelerate market adoption
Short-term outcome: Market has tools and data to understand, manage and value EE
Mid-term outcome: Array of stakeholders incorporate EE into financial transactions

Approach: Analyze impact of energy on default rate

Mortgage Default Rate = f (EUI, ElecPriceGap, CouponSpread, LTV, Region)

Empirical analysis combining
- *Mortgage loan data (TREPP)*
- *Energy use data (Benchmarking disclosure, Wegowise)*

Approach: Case studies on specific loans

Collaborate with lenders to:

1. Demonstrate impact of energy use and price on <u>specific</u> mortgage loans

2. Develop recommendations

Approach

- Compile info from Appraisals, PCAs, other sources.
- Estimate source EUI variations.
  - Simulation and empirical approaches
- Compute elec price gap using forward curves.
- Compute default risk impact due to source EUI and elec price gap.

Case studies

San Jose Office

Sonoma Office

Denver Office

San Francisco Multi-family

Denver Hotel
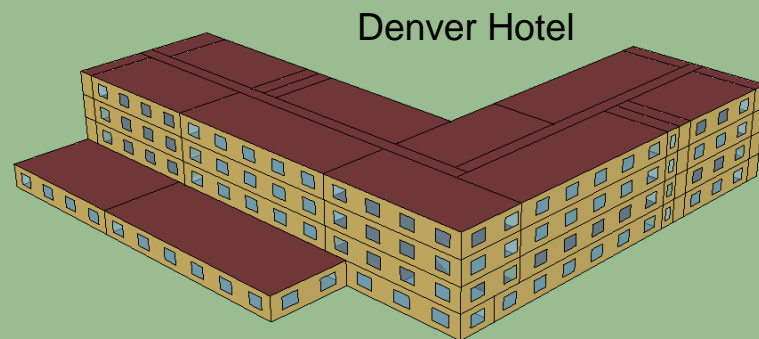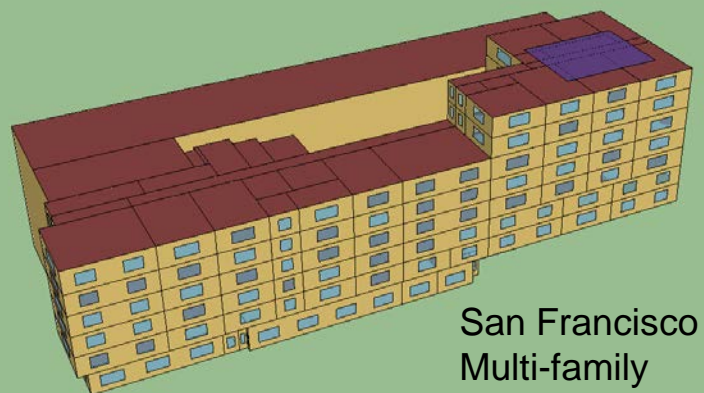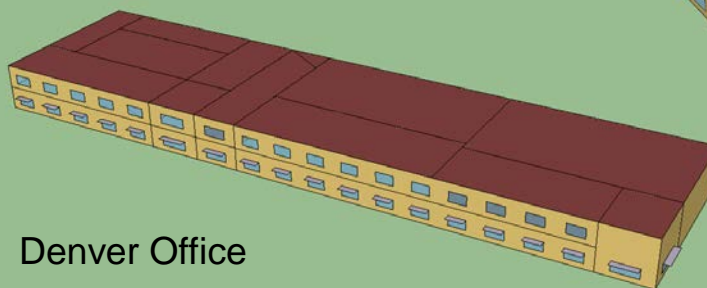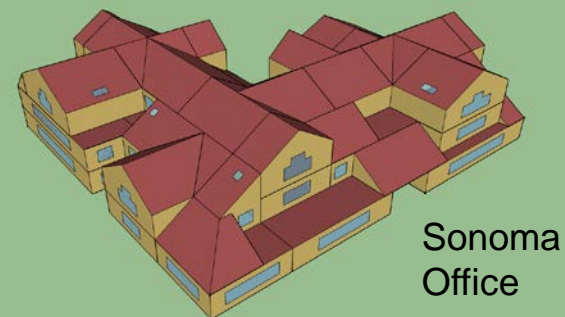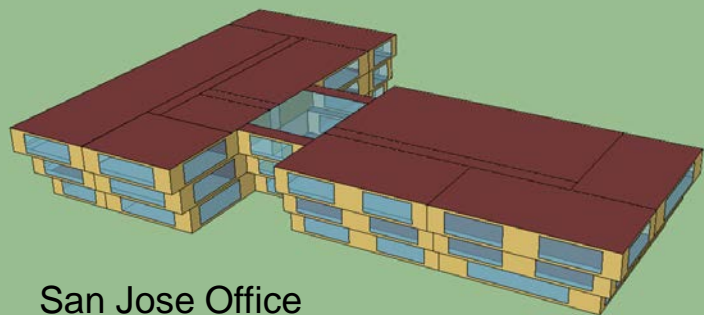
Impacts: The link between energy and default

- **The coefficient estimates for BOTH the *Electricity Price Gap* and *Source EUI* are significant at better than the .05 level of statistical significance.**

  - The higher the *Source EUI* (the more energy usage per square foot) the higher the likelihood of default.

  - The higher the *Electricity Price Gap*, (the larger the difference between the actual and the expected electricity prices since the loan origination), the higher the likelihood of default.

Impacts on specific loans: energy use

Example: Denver Office

Facilities Management factors:
- HVAC schedule
- Thermostat setback
- Supply air temp control
- VAV min flow control
- Economizer controls
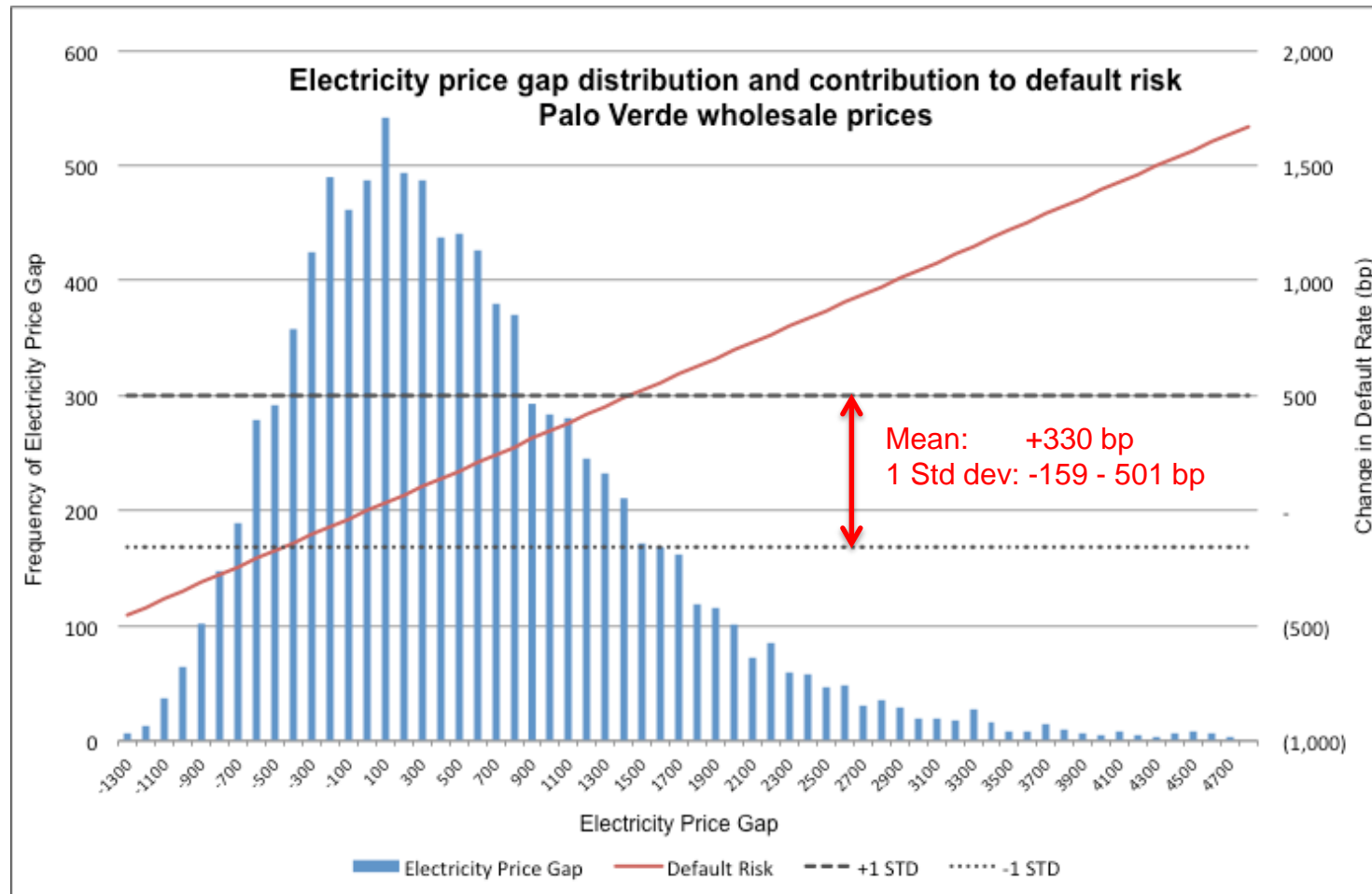- Lighting controls

Levels: good, avg, poor

Occupancy factors:
- Occupant density
- Occupant schedule
- Plug load density
- Plug load controls

Levels: good/low, avg, poor/high

Compare to TREPP average default rate of 800bp

Case	Fac mgmt factors	Occ Factors	Source EUI var (%)	Default risk var (bp)	Default risk var rel. to TREPP avg (%)
1	Good	Good/Low	-54%	-248	-31%
2	Good	Ave	-33%	-127	-16%
3	Ave	Ave	-	-	-
4	Good	Poor/High	+4%	+12	+2%
5	Poor	Good/Low	+64%	+158	+20%
6	Poor	Ave	+76%	+181	+23%
7	Poor	Poor/High	+132%	+268	+34%

Impacts on specific loans: energy price

Electricity price gap distribution and contribution to default risk
Palo Verde wholesale prices

Mean: +330 bp
1 Std dev: -159 - 501 bp

Impacts: Five case studies

Compare to TREPP average default rate of 800bp

Building	Source EUI variation (%)	Default rate variation (bp)	Default rate variation relative to TREPP avg (%)
Denver Office	-54% to +132%	-248 to +268	-31% to +34%
Sonoma Office	-40% to +183%	-161 to +331	-20% to +41%
San Jose Office	-62% to +119%	-308 to +249	-39% to +31%
Denver Hotel	-11% to +17%	-37 to +49	-5% to +6%
San Francisco Multi-family	-20% to +26%	-72 to +74	-9% to +9%

Wholesale price region	Default rate variation (bp)	Default rate variation relative to TREPP avg (%)
Denver area	+159 to +501	+20% to +63%
Northern California	-49 to +705	-6% to +88%

"These results showing the impact of energy on default risk are clearly meaningful. I don't currently consider energy efficiency when making a loan and seeing this makes me think I would want to ask about it"

"I would like to apply these findings but would want an easy way to use it. A simple score or ratio for energy risk would be good. In fact, I would be interested to pilot test it."

Keith Hanley, Silicon Valley Bank

Progress

Show that energy matters
- Demonstrated statistically significant link between energy and default, based on empirical data.
- Continuing to build evidence with new data sources

Develop and pilot interventions
- Developed method and analyzed impacts for five case studies.
- Confirmed interest in and initiated development of energy risk score.

Disseminate Best practices
- Extensive engagement with finance stakeholders – many new to energy efficiency. (see next slide)

Stakeholder Engagement

- Direct engagement with three lenders on actual loans
- Discussions with over 40 stakeholders since project inception
- Participation in new ASTM task force on property condition assessments (PCA)
  - Revising PCA standard to include energy performance
- Publications
  - Two technical reports
  - Articles in trade publications: TREPP, Scottsman Guide
  - ACEEE Summer study paper (forthcoming)

- Presentations

Remaining Project Work

Show that energy matters
- Extend default risk analysis with new data sources
  - Energy cost ratio for benchmarking dataset
  - Wegowise multi-family data (~45,000 records)

Develop and pilot interventions
- Complete development of energy risk score.
- Apply score to actual loans from project partners

Disseminate Best practices
- 1:1 discussions with 4-5 lenders
- Conferences: ACEEE Finance Forum, ACEEE Summer study, Better buildings Summit, Greenbuild
- ASTM PCA standard

Near term outcome:
- Enough evidence for lenders to take notice and consider energy risks
- A viable score-based method for assessing energy risk in underwriting

Thank You

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Paul Mathew, Staff Scientist

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REFERENCE SLIDES

Project Budget

Project Budget: Intended as 3-year project, FY16-18. $400K per year for FY16-17

Variances: No FY18 funds to date. FY17 carryover used for FY18 work to date

Cost to Date: 704K

Additional Funding: None

Budget History					
FY2016 – FY 2017 (past)		FY 2018 (current)		FY 2019 – TBD (planned)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
$800,000	$0	TBD	$0	TBD	$0

Project Plan and Schedule

Project Schedule

Project Start: Oct 2015		Completed Work
Projected End: Sep 2018		Active Task (in progress work)
	◆	Milestone/Deliverable (Originally Planned)
	◆	Milestone/Deliverable (Actual)

Task	FY2016				FY2017				FY2018			
	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)
Past Work												
Literature review	◆											
Scoping Report		◆										
Demonstrate impact of energy factors to lenders				◆								
Develop darft scope for EE module for PCAs				◆								
Identify pilots					◆							
Document underwriting pilot case studies								◆				
Document PCA pilot case studies								◆				
Current/Future Work												
Complete new analysis with additional data												◆
Development of prototype energy risk ratio for lenders												◆