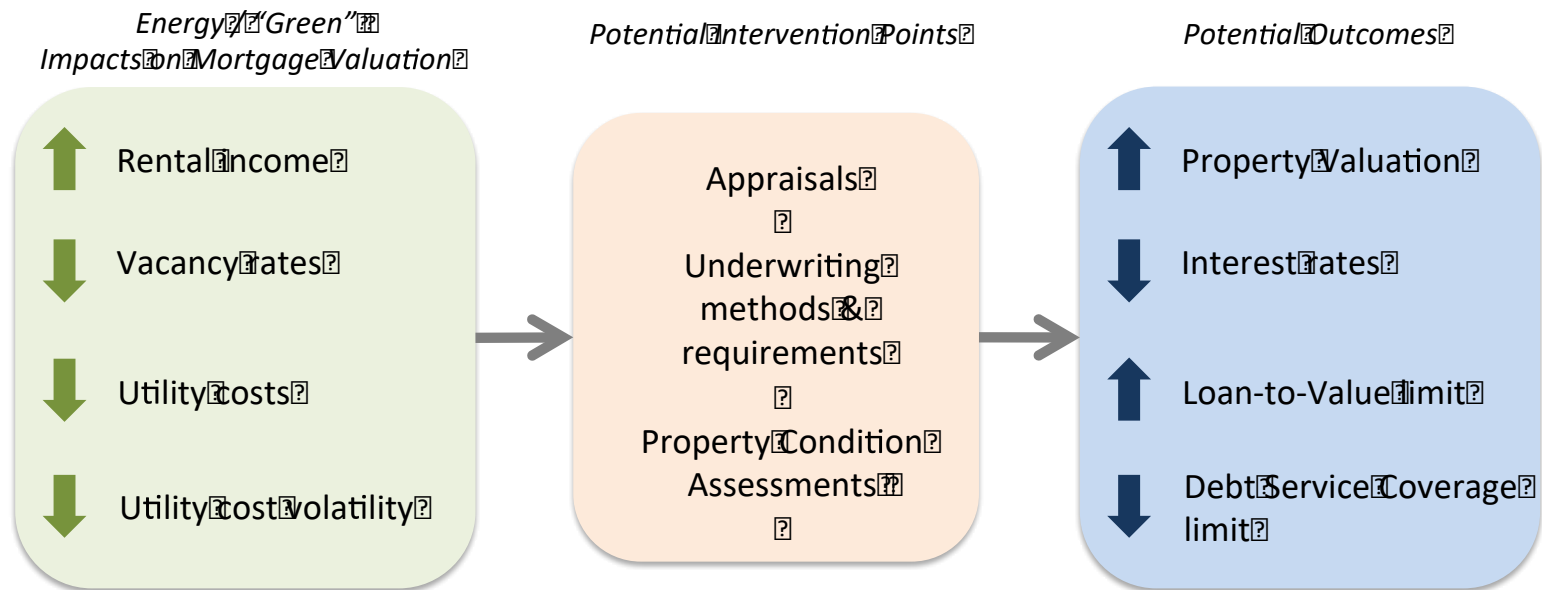


# Incorporating Energy Efficiency into Commercial Real Estate Transactions



Paul Mathew, Lawrence Berkeley National Laboratory

With: Nancy Wallace, UC Berkeley; Andrew White, ReTech; Cindy Zhu, DOE

# Energy Factors in Mortgage Valuation

# How are energy and valuation (un)linked?

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 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

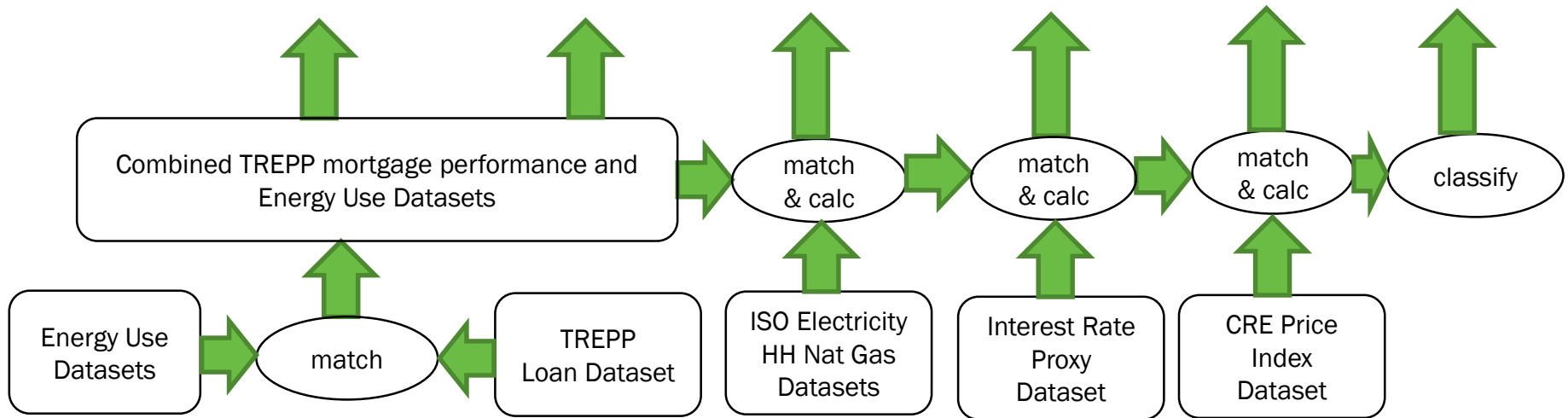
*Driven by rate structure, forward prices*

**Energy risks are not properly assess and energy efficiency is not properly valued.**

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

# Analyzing the 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)*

# 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.

# What are the impacts on specific loans?

Collaborate with lenders to:

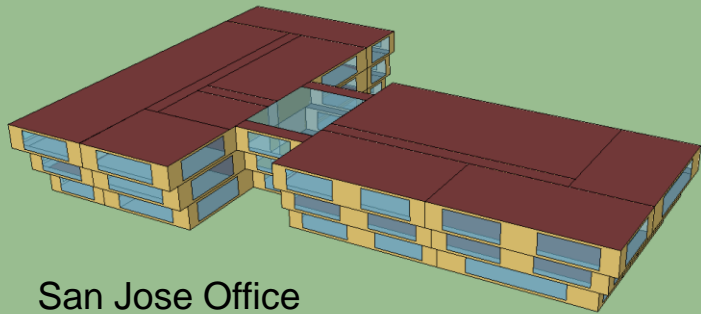
1. Demonstrate impact of energy use and price on specific mortgage loans
2. Develop recommendations



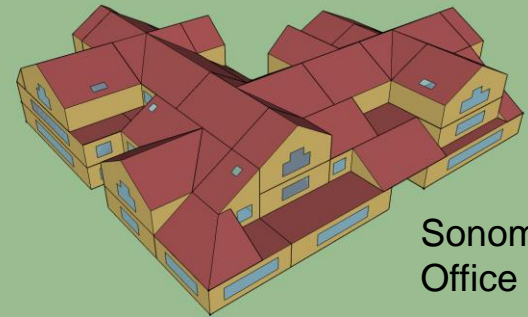
**Silicon Valley Bank**

## Approach

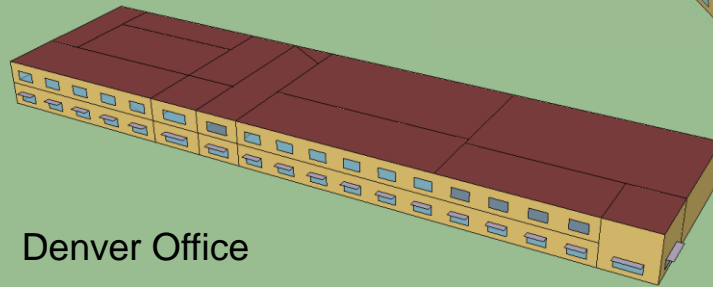
- Compile info from Appraisals, PCAs, other sources.
- Estimate source EUI variations.
  - Simulation and empirical approaches
- Compute elec price gap using forward curves.
- Compute default risk impact due to source EUI and elec price gap.



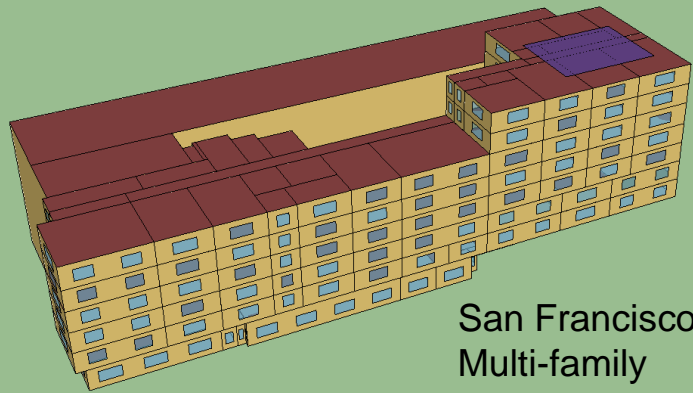
San Jose Office



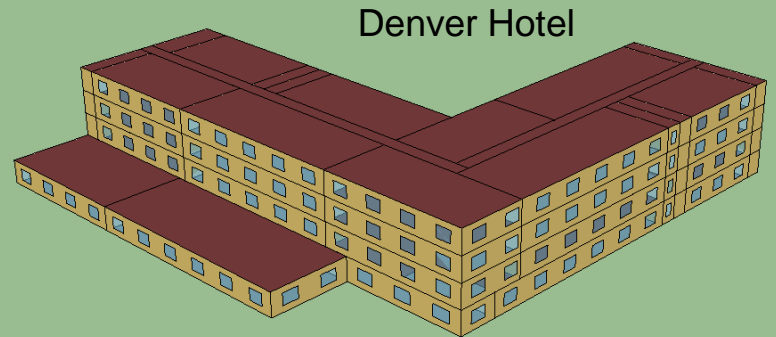
Sonoma Office



Denver Office



San Francisco Multi-family



Denver Hotel

# Impact of energy use variations: Denver office

Compare to TREPP average default rate of 800bp

## 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:

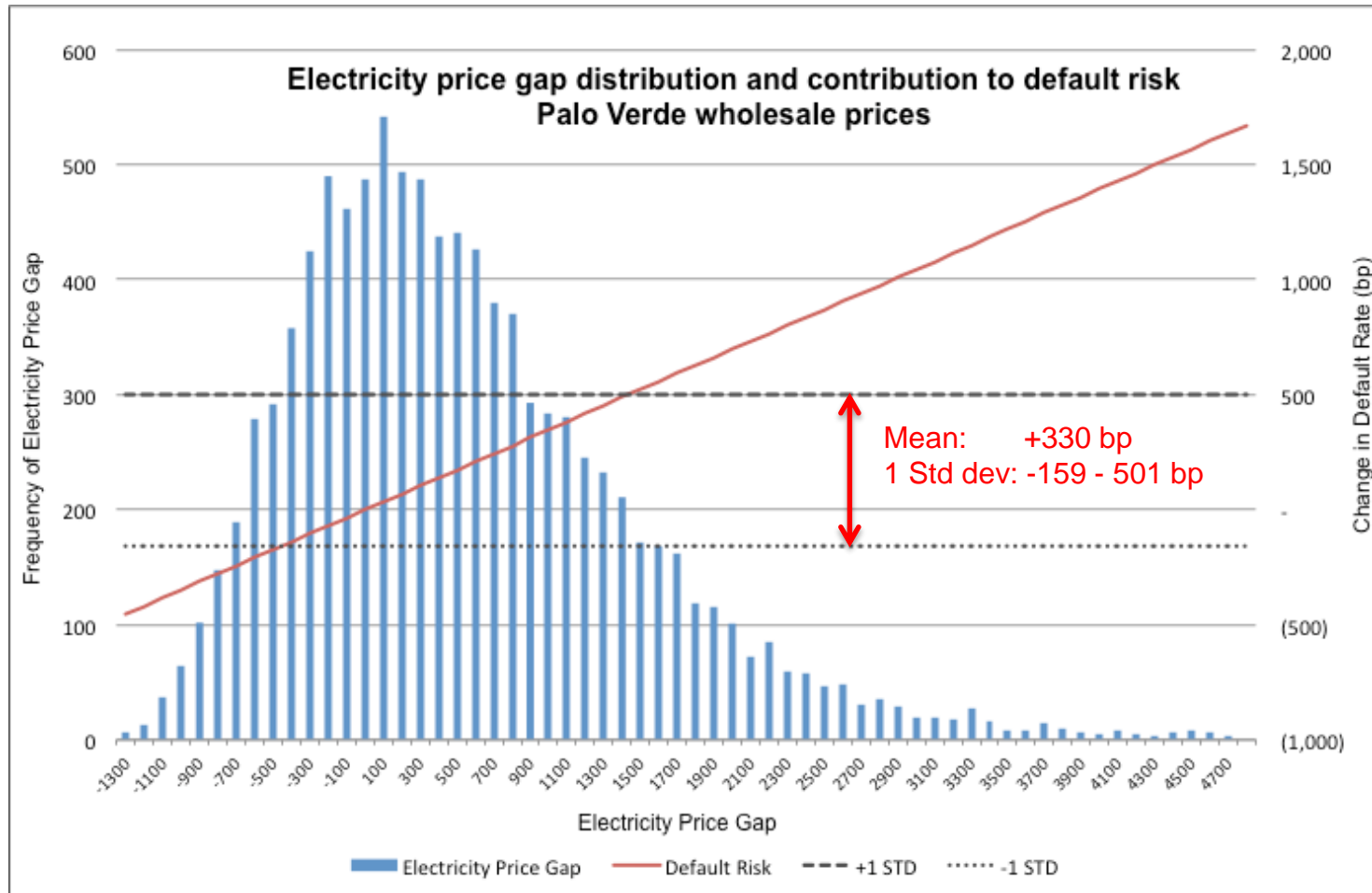
- Occupant density
- Occupant schedule
- Plug load density
- Plug load controls

Levels: good/low, avg, poor/high

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%



# Impact of energy price variations: Denver



# Five case studies show material impacts

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*

# Actions you can take now

## Lenders:

- **Ask owners to provide info on energy cost range.**
  - Could be done as part of Property Condition Assessment.
  - Can reference ASTM standard
- **Incorporate energy risk factor into underwriting and terms**
  - e.g. Interest rate discount for lower risk
- **Offer additional loan proceeds for EE investments**

## Borrowers:

- **Ask lenders to account for energy efficiency when setting mortgage terms.**
- **Provide data on energy costs to lender.**
  - Historical and anticipated
  - In appraisal and/or PCA

# Appraising High-Performance Buildings

# Context

- **Regulatory and market changes increasing commoditization of appraisals**
  - Little budget or reward for making “unusual” adjustments, even when warranted
  - Fragmented, aging, and skeptical appraisal workforce
  - Lack of confidence in addressing green buildings
- **Poor communication** of high-performance building features amongst owners, lenders, and appraisers
- **Lack of relevant education, training, and energy-related knowledge** amongst appraisers

# The Appraisal Foundation has released three advisories

*Intent: identify actions, skills, and knowledge appraisers need to competently value buildings with green or high-performance attributes*

- [Valuation Advisory #6](#): Valuation of Green and High-Performance Property: Background and Core Competency
- [Valuation Advisory #7](#): Valuation of Green and High-Performance Property: 1-4 Unit Residential
- [Valuation Advisory #9](#): Valuation of Green and High-Performance Property: Commercial, Multi-family, and Institutional Properties

# Appraisal Process

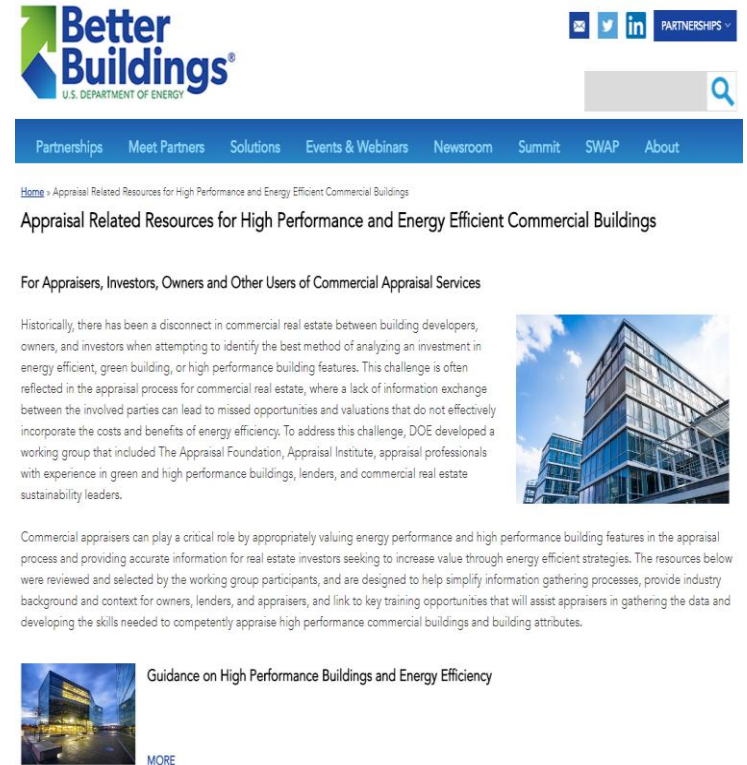


*Focus of  
DOE working  
group*



# DOE Appraisal Toolkit

- A comprehensive [toolkit](#) with links to case studies, reference resources, courses, and seminars
- [Guidance for Owners](#) ordering appraisals of high-performance, energy-efficient buildings
- [Sample Scope of Work Language for Appraisers](#) valuing high-performance, energy-efficient buildings



The screenshot shows the 'Better Buildings' website header with the U.S. Department of Energy logo and social media icons. The navigation bar includes links for Partnerships, Meet Partners, Solutions, Events & Webinars, Newsroom, Summit, SWAP, and About. The main content area is titled 'Appraisal Related Resources for High Performance and Energy Efficient Commercial Buildings'. Below the title, there is a sub-heading 'For Appraisers, Investors, Owners and Other Users of Commercial Appraisal Services'. The text discusses the disconnect in commercial real estate between building developers, owners, and investors when attempting to identify the best method of analyzing an investment in energy efficient, green building, or high performance building features. It mentions that DOE developed a working group that included The Appraisal Foundation, Appraisal Institute, appraisal professionals with experience in green and high performance buildings, lenders, and commercial real estate sustainability leaders. To the right of the text is a photograph of a modern, multi-story glass building. Below the text, there is a section titled 'Guidance on High Performance Buildings and Energy Efficiency' with a small image of a building at night and a 'MORE' link.

# Energy Matters! Training for Appraisers

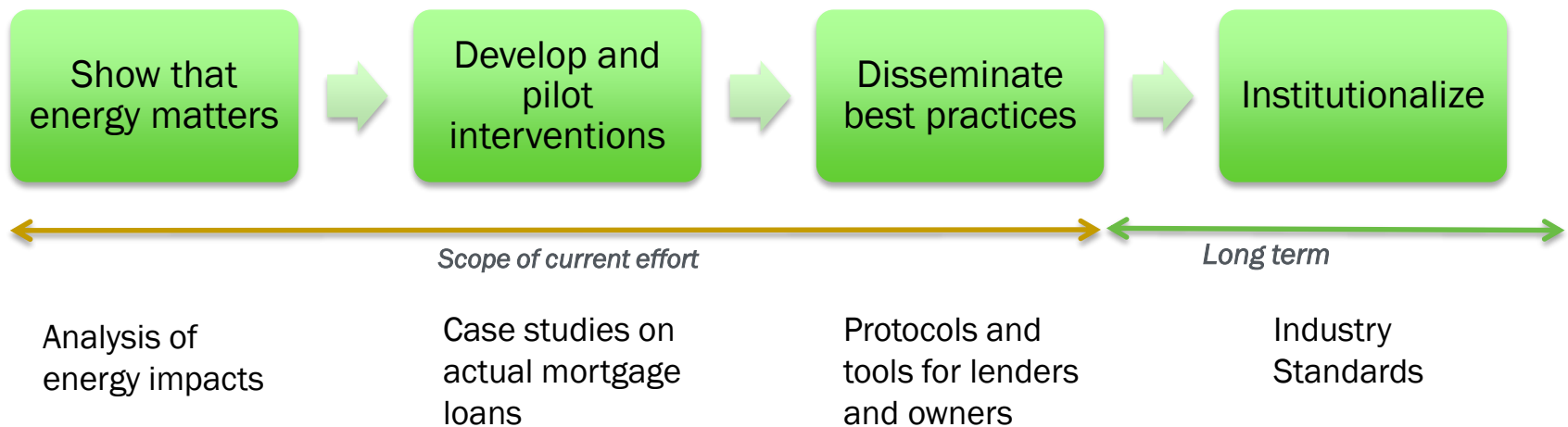
- **Provides appraisers with:**
  - Background on green buildings and real estate trends
  - Explanation of how energy efficiency and high-performance features can impact appraisal processes and property values
  - Overview of ENERGY STAR, DOE BPD, and DOE Asset Score and how data contained within each tool can be used by an appraiser
- **Available in three formats from [Earth Advantage](#)**
  - In-person, 7-hour course
  - Live online, 4-hour course
  - Recorded online, 4-hour course FREE

# Real Estate leaders taking action

- Providing energy information and requesting standard treatment of energy in appraisal process
- Leveraging DOE's Appraisal Toolkit to revise their own Appraisal RFPs
- Communicating with appraisers about TAF advisories
- Developing case studies on recent appraisals
- Increasing communication on valuation of high-performance properties

# Looking Ahead

*Vision: Energy factors are fully and routinely incorporated in commercial mortgage process, accelerating demand for buildings with lower energy risk.*



# Thank You

Paul Mathew

Lawrence Berkeley National Laboratory  
(510) 486 5116 [pamathew@lbl.gov](mailto:pamathew@lbl.gov)