

# Tenant Engagement and Valuation to Reduce Building Energy Use

Owners, Operators and Occupants Platform  
Meeting

November 29th, 2012

**Susan Wachter**

**Professor of Real Estate and Finance and City and Regional Planning**

**Wharton Valuation Team**

# Objectives

---

- What do we know from research?
- Questions raised?
- How to overcome barriers to AERs?

# Outline of Presentation

---

- Findings from Research
- Market Data: Preliminary Results on Usage
- Valuing and Financing Energy Efficiency Retrofits
- Going Forward

# Energy Efficient Retrofits: Existing Research

---

- What does the literature find?
- Empirical research design
- Limitations and gaps

# What is the question(s) ?

---

## **Efficiency Definition:**

conceptual approach=> if NPV positive,  
energy investment is efficient=> value additive

## **Empirical Strategy:**

**Are Rents, Value Higher in Green Buildings?**

# Major Research: Key Studies

- Eichholtz, Piet M.A., Nils Kok, and John M. Quigley. 2010. "Doing Well by Doing Good: Green Office Buildings." *American Economic Review*, 100(5): 2494–511.  
[http://urbanpolicy.berkeley.edu/pdf/EKQ\\_Green\\_Buildings\\_040808.pdf](http://urbanpolicy.berkeley.edu/pdf/EKQ_Green_Buildings_040808.pdf)
- Ciochetti, Brian A. and Mark D. McGowan. 2010. "Energy efficiency Improvements: Do they Pay?" *Journal of Sustainable Real Estate*. V2 (1).  
[http://www.costar.com/uploadedFiles/JOSRE/JournalPdfs/14.305\\_334.pdf](http://www.costar.com/uploadedFiles/JOSRE/JournalPdfs/14.305_334.pdf)
- Fuerst, Franz and Patrick McAllister. 2011. "Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values," *Real Estate Economics*, V39 (1): 45-69.  
[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1140409](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1140409)
- Joskow, Paul. 2012. "Creating a Smarter U.S. Electricity Grid." *Journal of Economic Perspectives*, 26(1): 29–48.  
<http://www.aeaweb.org/articles.php?doi=10.1257/jep.26.1.29>
- Allcott, Hunt, and Michael Greenstone. 2012. "Is There an Energy Efficiency Gap?" *Journal of Economic Perspectives*, 26(1): 3–28.  
<http://www.aeaweb.org/articles.php?doi=10.1257/jep.26.1.3>

# Value of Green Buildings (50 papers)

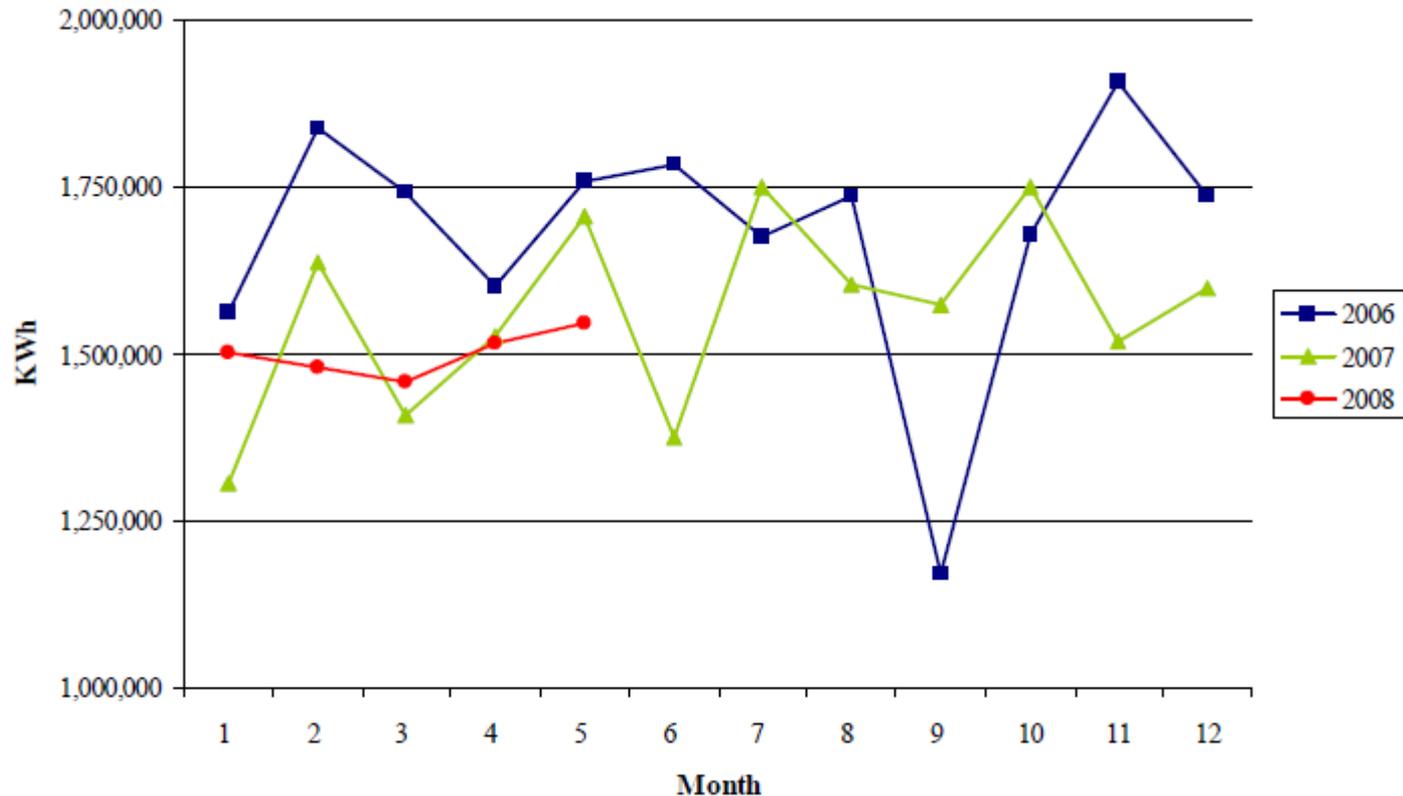
---

- Common approach: hedonic price index to determine added value of **green labels** (note: not energy efficiency per se)
- Value and rent measurements are derived from a comparison of buildings with and without green labeling

# Research Results

- **3% rent premium and 10% value premium**
  - Eichholtz, Piet M.A., Nils Kok, and John M. Quigley. 2010. "Doing Well by Doing Good: Green Office Buildings." *American Economic Review*, 100(5): 2494–511.
  - Fuerst, Franz and Patrick McAllister. "Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values." *Real Estate Economics*, V39 (1): 45-69, 2011.
- **Measurement is for green labels not actual energy consumption but case study results exist:**
  - Ciochetti, Brian A. and Mark D. McGowan. 2010. "Energy efficiency Improvements: Do they Pay?" *Journal of Sustainable Real Estate*. V2 (1).

# Ciochetti and McGowan (2010): Case Study Impact of EEI on Energy Consumption



Energy consumption of an urban, East Coast office building before (2006 and 2007) and after (2008) retrofits to attain LEED Silver Certification. Indicates both reduced consumption and reduced volatility.

**Source:** Ciochetti, Brian A. and Mark D. McGowan. 2010. "Energy efficiency Improvements: Do they Pay?" *Journal of Sustainable Real Estate*. V2 (1).  
[http://www.costar.com/uploadedFiles/JOSRE/JournalPdfs/14.305\\_334.pdf](http://www.costar.com/uploadedFiles/JOSRE/JournalPdfs/14.305_334.pdf)

# Barriers to Energy Efficiency in Building Retrofits

---

**First**, agents may be unaware of, imperfectly informed about, or inattentive to energy cost savings => **undervaluation of energy efficient buildings**

**Second**, agents may be themselves perfectly informed but unable to convey costlessly the energy intensity of space they rent to others=> **split incentives, transaction costs**

**Third**, credit markets may be imperfect=> **financial barriers**

**Fourth**, uncertainty exists on building specific returns => **information barriers**

# Perspective on Valuing and Financing Energy Efficiency Retrofits: Sizing the Market

---

- How Owners Make Money
- Valuation and Financial Models
- How can we integrate information of value implications of energy efficiency into the economics of the sector?
- Efficiency revelation and self-financing methods-ESCOs

# How AERs Can Raise Returns

- Rents – Operating Costs  
= **Net Operating Income (NOI)**
- $\text{NOI} / \text{Cap Rate} = \text{Building Value}$
- How AERs Can Increase Building Value:
  - Reduce Operating Costs
  - Increase Rents
  - Improve Cap Rate

# How AERs Can Raise Returns (2)

---

- Reduce Cost of Operation
- Increase Rents
  - Reduce vacancy
  - Improve Willingness to Pay
  - Improved worker productivity
- Improve Cap Rate
  - Reduce volatility of energy costs
  - Offset regulatory uncertainty
  - Decrease chance of obsolescence

# Building Manager's Operating Costs: Example

(1) Median Gross Rents: \$25.52

(2) Operating Expenses: \$10.23

– Largest Single Category (25%):

- Energy/Utility: \$2.83

(3) NOI = (1) – (2) = \$15.29

Value/SF @ 8.3% Cap = \$184.22 / SF

**Value/SF after 30% EER = \$194.45 / SF**

# Potential Market

## *Sizing Green Retrofit Market*

- \$2.83 / SF / Year On Energy Consumption, 15-25% Average Savings from EE Retrofit
- 144.9 Million SF of Office in Philadelphia Region\*
  - $(\$2.83) * (15%) * (144.9 \text{ M}) = \underline{\$62\text{M Savings}}$
  - $(\$2.83) * (25%) * (144.9 \text{ M}) = \underline{\$103\text{M Savings}}$
- 8.3% Philadelphia Office Cap Rate, *RCA Data*
- Value = (NOI) / (Cap Rate) = (62M or 115M)/(8.3%)

**\$0.75-1.2 billion of Increased Asset Value**

# Barriers to Valuing/Financing SEERs

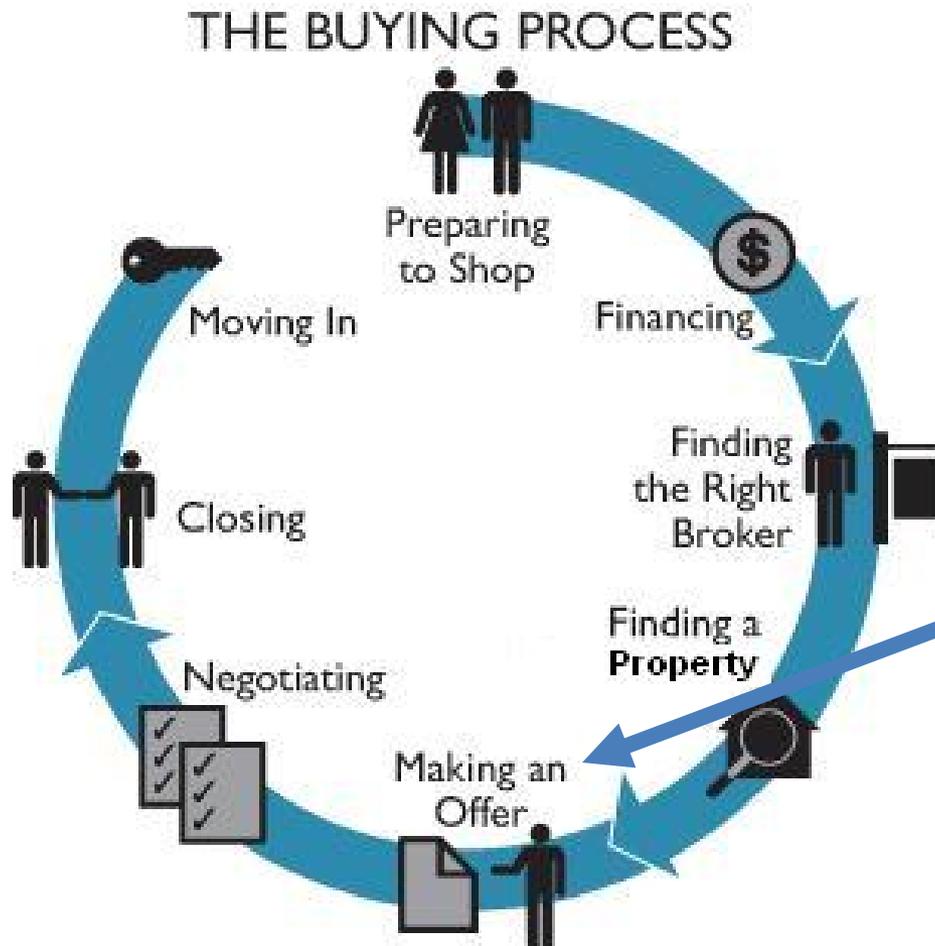
---

**Undervaluation of energy efficient buildings** : Traditionally “appraisers do not take into account future operating savings. [...] difficult to quantify exactly how much money will be saved by EER.”

**Split incentives** : “Benefits and costs of implementing EE projects are not balanced among the parties that are involved. [...] the party investing the upfront capital must benefit from the lifetime savings.”

**Financial/Information transaction barriers** : “Lack of financing model and documentation necessary to facilitate EE transactions.”

# Appraisal & Purchase Process



In Commercial Real Estate, at least one appraisal is required in order to receive financing for acquisition.

# Appraisal Initiatives

- **Appraisal Institute:**
  - DOE Asset Rating tool/National Database
  - Information needed to measure impact of EE on pricing : annual energy savings reduced to a dollar figure, rental rates, sales prices, and operating costs.
- **Appraisal Institute in the observation phase:** “We do not believe it would be appropriate to give a green premium without sufficient market evidence.”
- **Lack information on long term benefits of retrofits:**
  - Wide-ranging and inconsistent information on costs, few groups tracking what the actual results are after EER. Post-occupancy evaluations extremely important
- **“Valuation of Sustainable Properties” professional development program** under development by Appraisal Institute

# Energy Efficient Financing Options

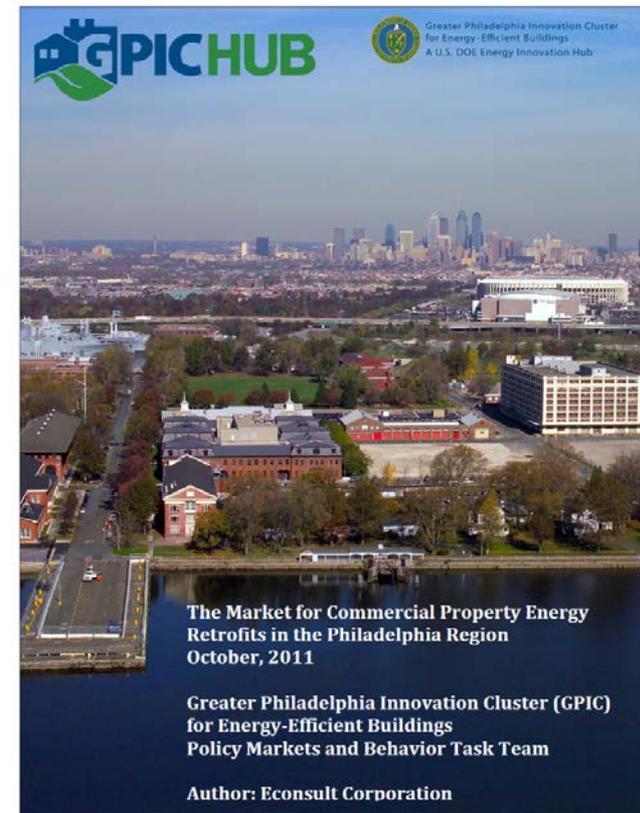
---

- **Options:**
  - **Energy Savings Performance Contracting**
  - **Utility On-Bill Financing**
  - **Property Assessed Clean Energy (PACE) for Commercial Properties**
- **Limitations and barriers?**

# The Philadelphia Story

Econsult Corporation, October 2011. “The Market for Commercial Property Energy Retrofits in the Philadelphia Region.”

- 47% of the commercial and industrial buildings in the Philadelphia area identified as potential candidates for energy retrofits:
  - 4,201 buildings, 154m sqft
- Currently 18% of commercial space eco-labeled



# Energy Consumption by Property Type

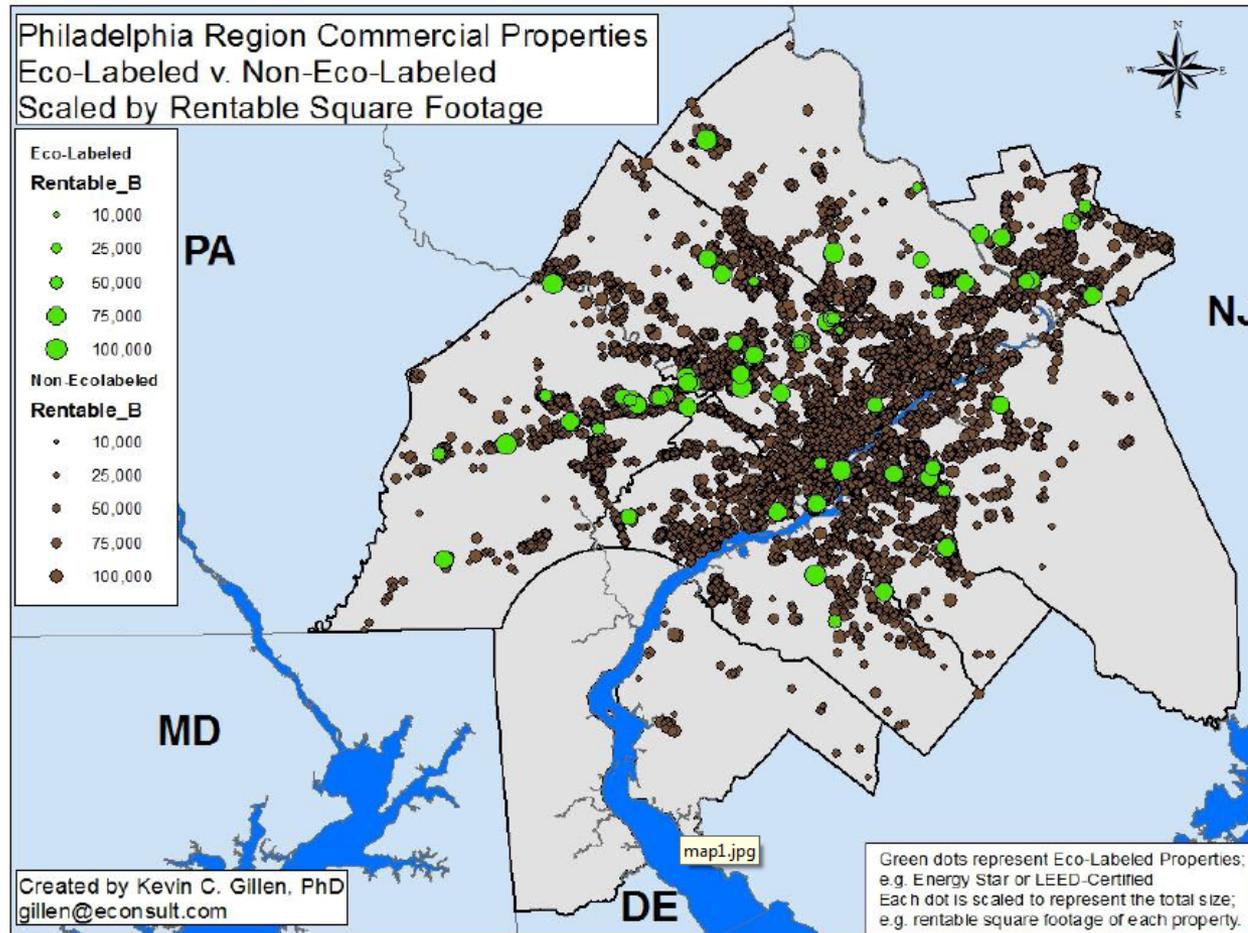
*Philadelphia Region, Estimated (2011)*

## Annual Energy Consumption<sup>9</sup>by Property Type

Type	Energy Consumption	No. of Properties
Flex-Industrial <sup>10</sup>	45	4,762
Office	93	2,249
Retail	99.5	1,738
Hospitality	100	159
Healthcare	188	150
<b>Average</b>	<b>91</b>	

*Source: Buildings Energy Data Book, Dept. of Energy  
<http://buildingsdatabook.eren.doe.gov/ChapterIntro3.aspx>*

# Commercial Properties Eco-Labeled: 18% of Total CRE in Region



Source: CoStar

Econsult Corporation, October 2011. "The Market for Commercial Property Energy Retrofits in the Philadelphia Region."