

# Buildings Are People Too

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# Measuring Buildings and People

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Talk is about how to use data analysis methods from social and medical science to develop better programs for energy efficiency.

# Benchmarking

## NYC Local Law 84:

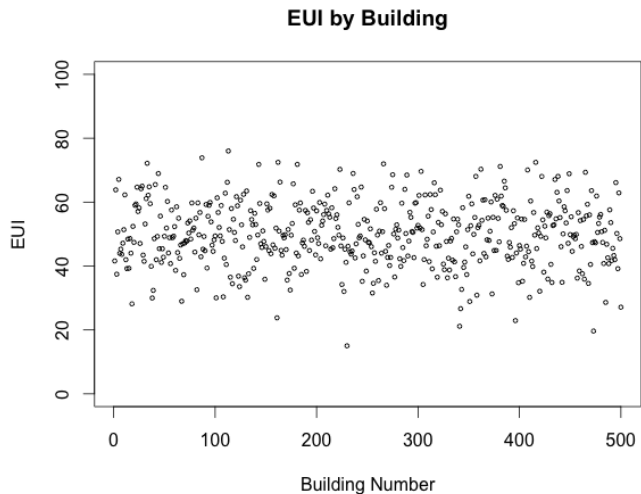
- starting August 2011, applies to commercial buildings > 50,000 gsf
- owners upload energy information to benchmarking tools
- public disclosure of:
  - ▶ energy & water use, total and psf
  - ▶ ratings / comparison to other buildings
  - ▶ ratings / comparison over time

## Information is expected to affect:

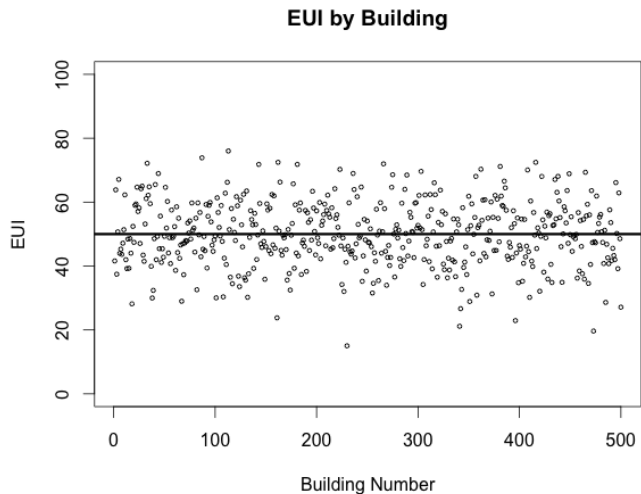
- owners & prospective buyers
- building managers & operators
- tenants



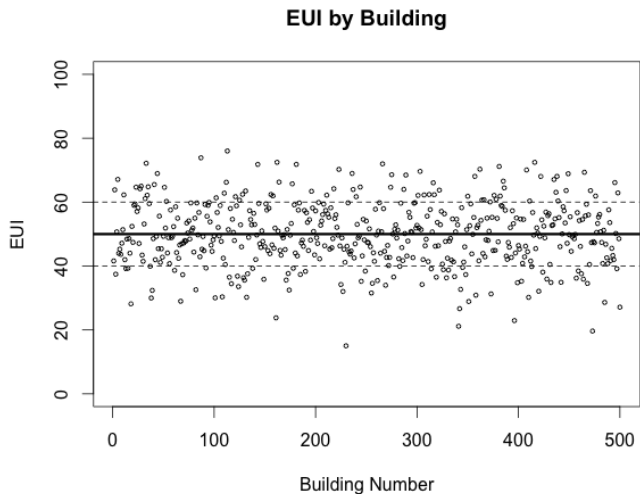
# Identifying Outliers



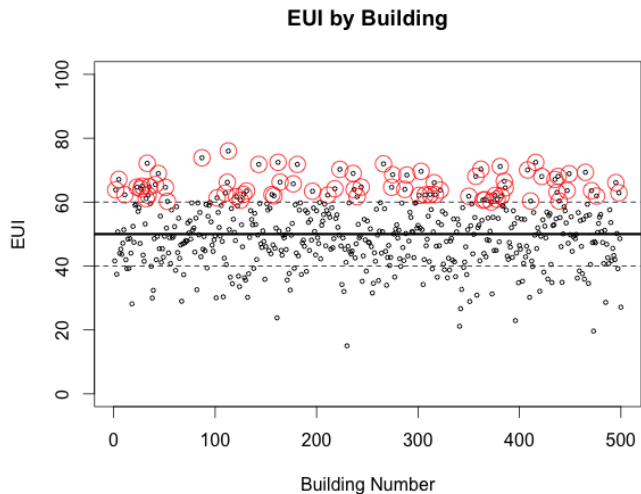
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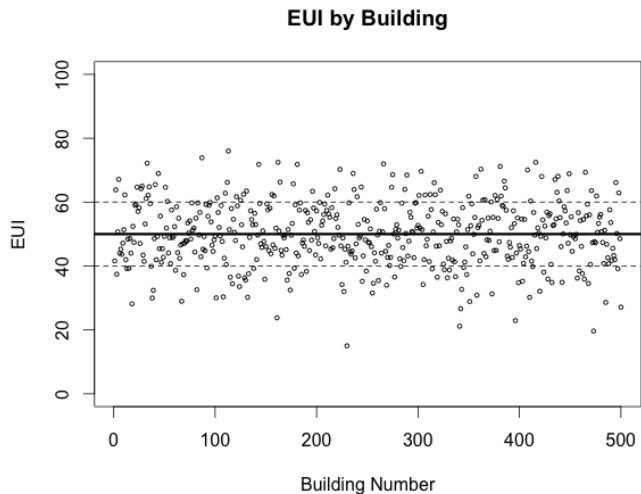
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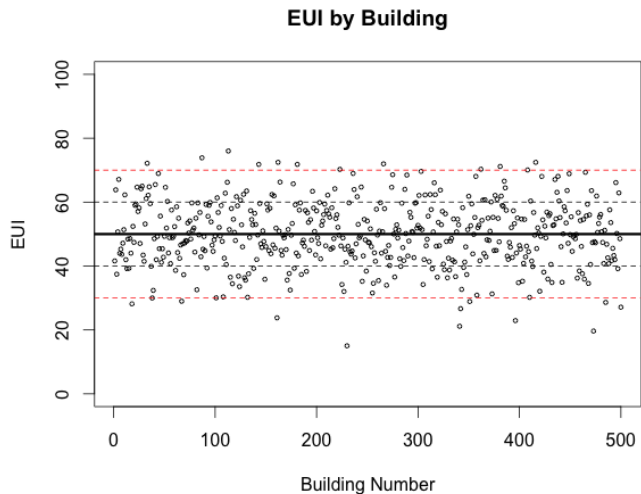
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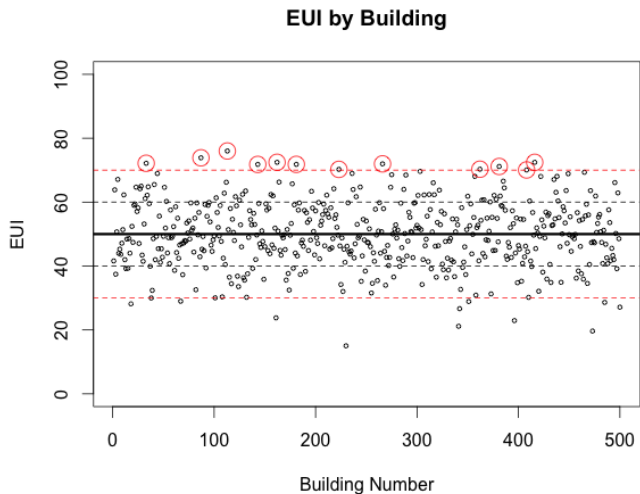
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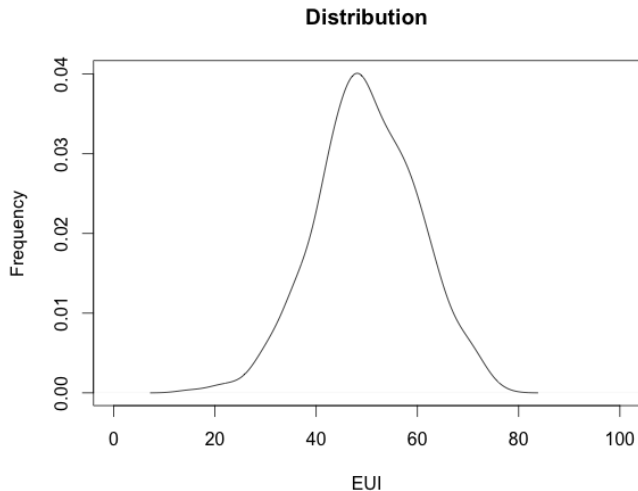
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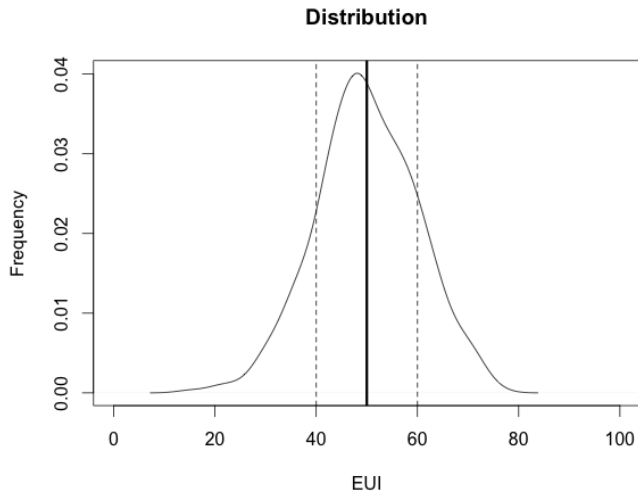


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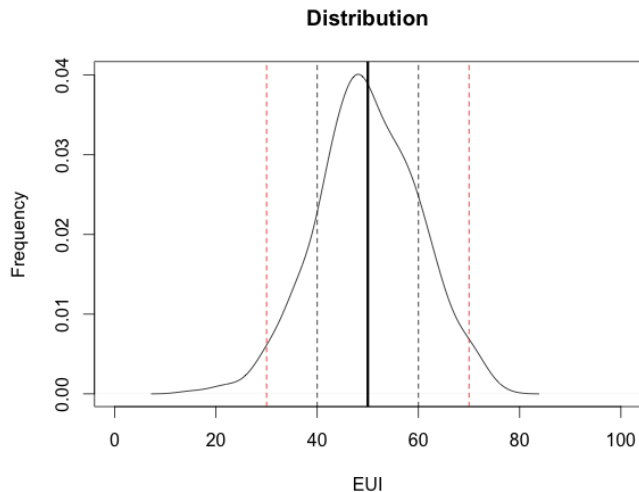




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# Peer Comparisons

Metrics highlight the need for meaningful peer groups / comparisons.

Peer groups for buildings are usually established by:

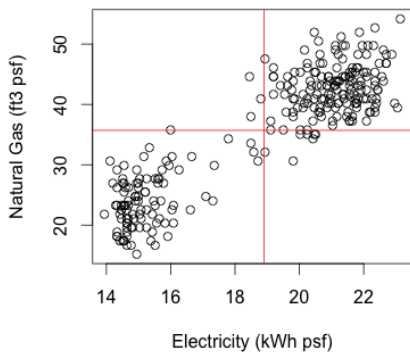
- energy system
- building type
- occupancy
- building size
- microclimate

We want to compare buildings on all of these dimensions simultaneously.

# Segmentation & cluster analysis

Standard technique used by marketers to identify 'latent classes'

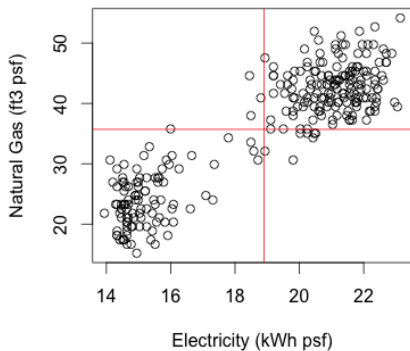
**CBECS Energy Intensities**



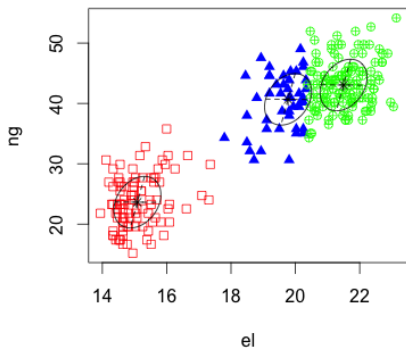
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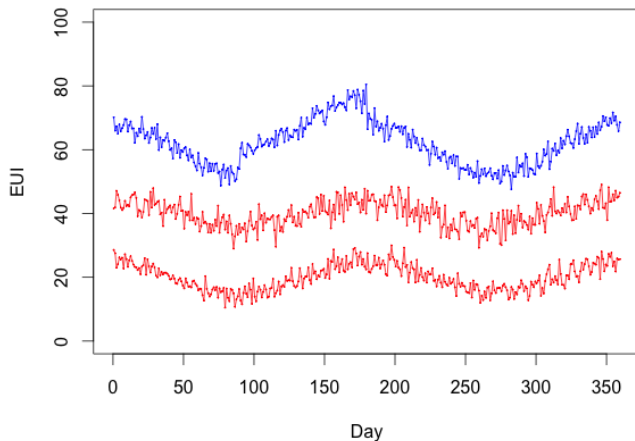


**Classification**



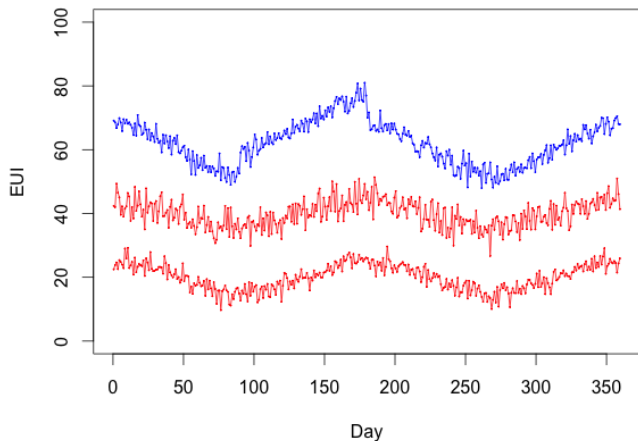
## Anomaly Detection in Time Series

Operator error is a frequent source of lost energy; weather normalization can detect and alert us to pattern differences.



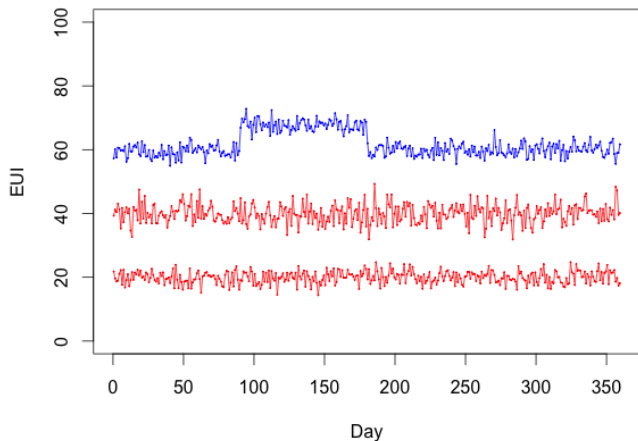
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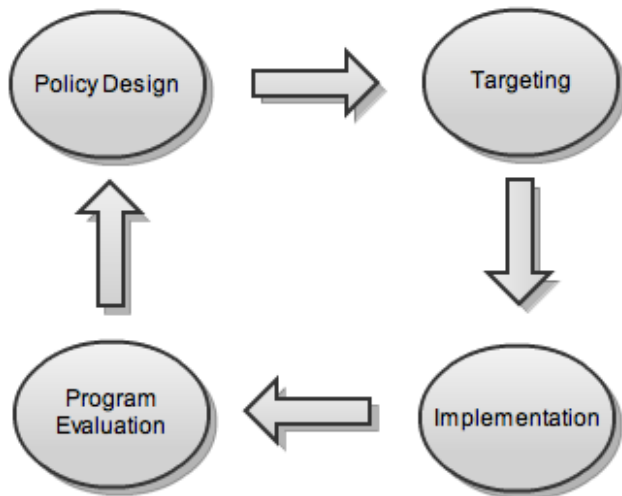
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For the past 30 years, the “energy efficiency gap” has been attributed to:

- lack of information
- custom
- split incentives
- lack of upfront capital
- ...



# Improving Policy & Design



# Data is Still A Challenge

Level	Actors	Information
individual building	owners tenants designers	energy, water use occupancy building characteristics, history

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Level	Actors	Information
individual building	owners tenants designers	energy, water use occupancy building characteristics, history
city / regional	large owners government utilities brokers	portfolio characteristics public buildings, permitting energy & program data real estate market
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# Research Design & Questions

We quickly get into rather philosophical questions:

counterfactual	what would have happened instead?
treatment & control	randomized trials of technologies?
attribution	can we distinguish the effects of specific programs?
values	how do we allocate externalities, both + and -?
participation	mandated or encouraged?

These start to sound like medical / ethical / social questions . . .

# Thank You!

Questions & discussion afterwards.

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