The Green Engineer, Inc.
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Building Efficiency and Sustainability
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Conference Paper Session 11 – Building Energy Modeling vs. Measurement & Verification

From Design to Occupancy: Strategies to Enhance Building Performance and Prediction Accuracy

2013 Annual Conference, Denver, Colorado

1

Learning Objectives

- Explain misaligned expectations between architects and buildings engineers.
- Describe how customized workflow maps can optimize the energy modeling process.
- Have gained knowledge from experience from an evaluation of nine properties with energy efficient multi-family dwellings.
- Have an insight to what might be the reasons to the gap between measurements and simulation results.
- Distinguish between the two general factors causing the discrepancy between predicted energy performance and actual energy consumption.
- Recognize that even projects following the LEED process do not always perform as well as predicted.

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2

Acknowledgements

- This paper was co-written by Leslie Beu, CEM and Tom Riead, CEM of Tolin Mechanical Systems.

3

Outline/Agenda

- Is Sustainability Here to Stay?
- Prediction Accuracy in Practice
- What's the typical approach?
- What are the common hindrances?
- How do we address these issues?
- Conclusion

4

Is Sustainability Here to Stay?

- Air Quality
- Economics
- Climate Change

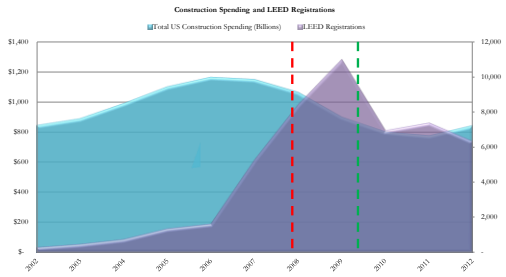
5

Is Sustainability Here to Stay?

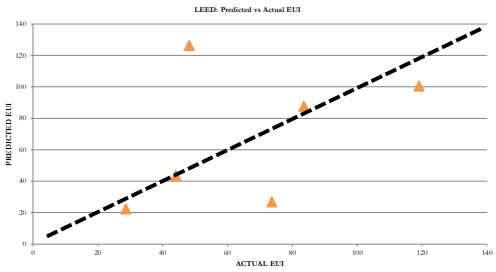
- Bottom Line
  - 142 Million Americans Experience Dangerous Pollution Levels
  - WHO estimates 1.3 million deaths annually worldwide

6

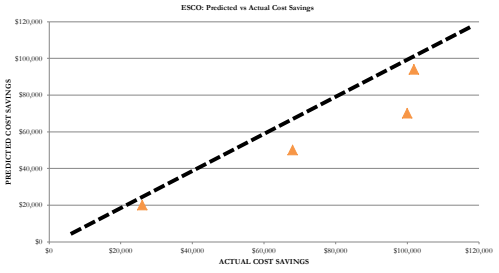
Is Sustainability Here to Stay?



Prediction in Practice



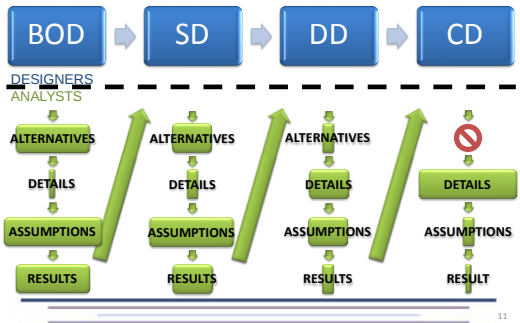
Prediction in Practice



Common Approaches

- Energy Analysis: New Construction
  - Typically occurs in FOUR steps
    - Design alternatives are identified at a schematic level
    - Analyst must identify critical design details
    - Simplifying assumptions are made
    - Final configuration is assessed

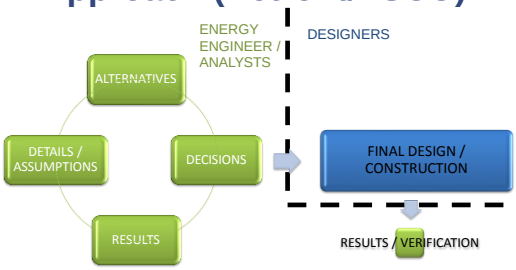
Common Approach



Common Approaches

- Energy Analysis: Existing Building
  - Typically occurs in FIVE steps
    - Concept is sold
    - Analyst quantifies the sales model
    - Client chooses to accept or deny project based on internal criteria
    - Project designed according to analyst Requirements
    - ESCO team verifies installation and performs M&V as necessary

Typical Energy Project – Approach (Retrofit/ESCO)



13

Common Pitfalls

- Under Qualified Team Members
  - Analyst Perceived Value
- Lack of Design Detail
  - Envelope, HVAC, Lighting
- Installation Errors
  - Redlines not accomplished, Cx holes
- Communication Breakdown
  - Changes not disseminated to all affected parties
- Project Team Accountability

14

Corrective Measures - 1

- Under Qualified Team Members
  - Analyst SOQ
    - Documented experience on two projects of similar scope
    - Documented QC Process
      - Should at least include peer review
    - No dual hats
    - Third party certifications
      - BEMP, CEM, CMVP

15

Corrective Measures - 2

- Integrated Design AND Operations
- 5 Keys
  1. Keep analyst in loop
  2. Positive confirmation of SOO
  3. Redlines, redlines, redlines…
  4. Installer feedback
  5. Continuous operator training

16

Corrective Measures - 3

- Mandatory BCx

17

Corrective Measures - 4

- Mandatory M&V
  - Cost Effective M&V Process
    - Emphasize risk of no data and fight for budget
    - Rank order energy enduse
    - Allocate budget accordingly

18

Corrective Measures - 5

- Operate as Intended
  - Operator Training
    - Emphasize performance alongside longevity
    - Establish performance goals and incentivize accordingly

Conclusions

- Mistakes Occur Across Lifecycle
- Corrective Measures Include
  - Analyst SOQ
  - Integrated Design/Ops
  - BCx
  - Efficient M&V
  - Train

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Questions?

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