Modernization of a Legacy System
With new or existing buildings, in design, if we are not measuring how close we are to our energy goal we don’t know how far we have to go to get there.

BASE CASE (S)

DESIRED OUTCOME

Unless we measure the performance, we have no guarantee that the building is meeting it’s performance requirements.
A Review
NASEO Presentations — Evolutionary Thinking

2010
B3 Benchmarking Logic

2011
SB 2030 Target Setting

2012
Platform Thinking

The WeidtSim Platform
In Times of Change

- Net Zero Buildings
- Asset Ratings
- Benchmarking
- Emerging codes, ratings and labels
- Simulation protocols
A Review
NASEO Presentations — Evolutionary Thinking

<table>
<thead>
<tr>
<th>Year</th>
<th>Presentation Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>Asset Modeling &amp; Code</td>
</tr>
<tr>
<td>2014</td>
<td>NZE Performance</td>
</tr>
<tr>
<td>2015</td>
<td>Specific Performance</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Model Type</th>
<th>Annual kWh</th>
<th>Savings</th>
</tr>
</thead>
</table>
| M1 Code Base | 1,200,000 | 0%
| M2 As-built | 800,000 | 25%
| M3 Design As-built | 400,000 | 31%

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Our practices need to get from intention to reality without finding fault or passing judgments.

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SPECIFIC PRESCRIPTIVE

Our practices need to get from intention to reality without finding fault or passing judgments.

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GENERAL

SPECIFIC PERFORMANCE
# Code and Prescription

## Essential Value and Meaning

<table>
<thead>
<tr>
<th>Synonyms for Code</th>
<th>Synonyms for Codify</th>
<th>Synonyms for Prescriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Order</td>
<td>Rigid</td>
</tr>
<tr>
<td>Regulation</td>
<td>Specify</td>
<td>Narrow</td>
</tr>
<tr>
<td>Protocol</td>
<td>Impose</td>
<td>Inflexible</td>
</tr>
<tr>
<td>Cypher</td>
<td>Prescribe</td>
<td>Dogmatic</td>
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<tr>
<td>Enigma</td>
<td>Methodize</td>
<td>Dictatorial</td>
</tr>
<tr>
<td>Canon</td>
<td>Particularize</td>
<td>Regulatory</td>
</tr>
</tbody>
</table>

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The Case for Real-time Energy Modeling
Beyond Rules of Thumb

All thumbs not being equal...
Heuristics — A mental shortcut that allows people to make experience-based judgments quickly. Though not guaranteed to be optimal, these judgements perceived to be good enough for given conditions.

We do not think when we use heuristic methods to find a satisfactory solutions. We do it ease the cognitive load of making a decisions.
Analysis and Evaluation
Essential Value and Meaning

Synonyms for Analysis
• Study
• Evidence
• Evaluation
• Verification
• Calculation
• Substantiation

Synonyms for Evaluate
• Proof
• Settle
• Decide
• Resolve
• Answer
• Reconcile
• Determine

Model
Measure
Manage
ENERGY MODELING
ENERGY MODELING ADVANCEMENTS
Understanding That Models Have Purposes
Everyone “Models”

Not just a tiny version of something bigger but a purposeful abstraction of something real or imagined …

Constructive Modeling Vs. Deconstructive Modeling
Standards and Values
We’d like just one

USGBC LEED Certification
ASHRAE 90.1
IECC
COMNET
Title 24
ENERGY STAR®
Utility Baseline
Existing Building
CBECS
It is not an infinite number of baseline conditions.

Even if there were, they all follow similar patterns.
Planned Ongoing Performance

Adding Existing Building Base Cases

Asset Creation

Asset Management
Automating the creation of the energy models using basic information about the project, removes time and timing obstacles to allow modeling early — when it can impact the design and empower people to choose effective solutions.
Energy Modeling in Schematic Design
Analyzing More from Less

Modeling Inputs

Building program

Square footages of each building function

Building system concepts
Office Building
Study – Reconcile – Decide

Closed Enough
Early Adopters
What B3 has done for Minnesota State Colleges and Universities

To instill a sense of accountability and competition, a public website shows performance by campus is available to the public at large.

They can view rankings for

- Engagement
- Energy Use Intensity (EUI)
- Energy baseline information
- Energy cost per square foot SF
- Energy savings potential
Minnesota State Colleges and Universities
Using the B3 Benchmarking system

- Utility information regularly updated (42%)
- B3 Reports reviewed for operational adjustments (39%)
- B3 fully incorporated into daily operations and overall master plan (14%)
- Not currently using (5%)
2015 Clinton Global Initiative — Early Adopters
What B3 has done for Minnesota State Colleges and Universities

54 benchmarked campuses in MNSCU System

- 1,200 buildings
- 55.4 million square feet
- $14.2M in identified savings

21 campuses prioritize energy audits using B3

60% now doing re-commissioning work on their campuses

MnSCU campuses make energy savings potential a factor in considering all capital projects

MnSCU produces quarterly reports using B3 Benchmarking information campuses, focusing on campuses that had increased savings
B3 LESSONS LEARNED
Size vs. Savings Potential

Little Correlation Between Building Size and Savings Potential

Many large buildings are well managed and perform at or better than the current energy code.

There is not a high correlation between building size and savings potential.

Relatively small buildings can still have large potential savings.
Total Energy Use vs. Savings Potential
Many High Energy Users are Performing at or Better Than Current Energy Code

Only 36% of the variation in savings potential is explained by total energy usage

R² = 0.3654
B3 for SUNY New Paltz Energy Master Plan
Hired to Audit All Buildings

35 buildings over 20,000 sf

B3 Benchmarking utilized

12 buildings justified further detailed energy auditing

23 buildings performing at or above statistical expectations

**B3 avoided time consuming and costly auditing**

Immediate savings through focused resources
With new or existing buildings, in design, if we are not measuring how close we are to our energy goal we don’t know how far we have to go to get there.

Unless you measure the performance, you have no guarantee that the building is meeting its performance requirements.