Baseline or Bust

Calculating Savings for a Residential Heating Equipment Program

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The Team

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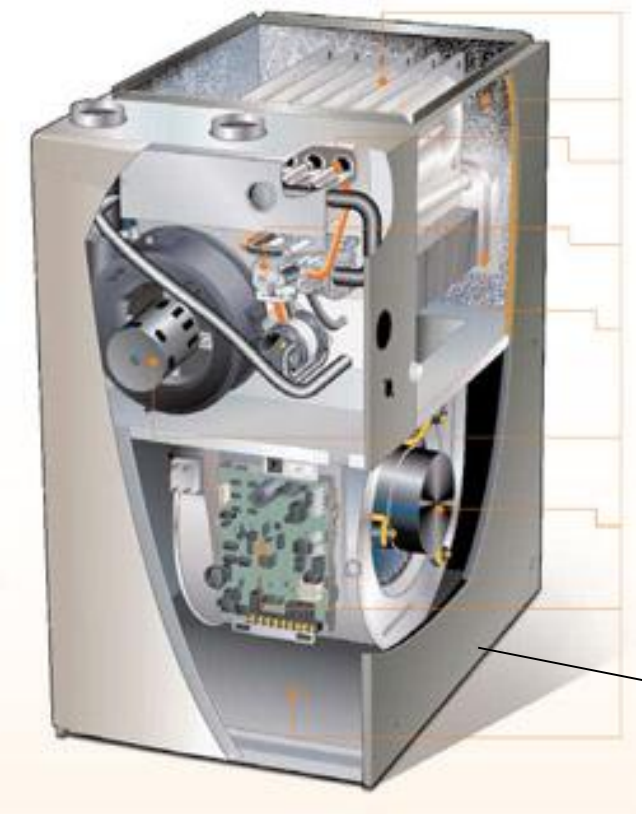
The Program: NY HEHE



- Approved NY PSC 2009
- Rebates for efficient furnaces & boilers
- Open to all residential gas customers
- Implemented by 7 utilities

Lennox SLP98V
Furnace, AFUE 98.7

The Qualifying Equipment

Equipment	Program Requirement	Federal Standard
ECM Furnace	0.92	0.78
Furnace	0.90	0.78
Water Boiler	0.85	0.80
Steam Boiler	0.82	0.75

The Project

- Impact Evaluation of the HEHE Program
  - Equipment replacement program
    - Rebates for EE heating equipment
  - Estimate first year natural gas savings
    - By measure, PA

The Problem

Equipment Replacement Baseline

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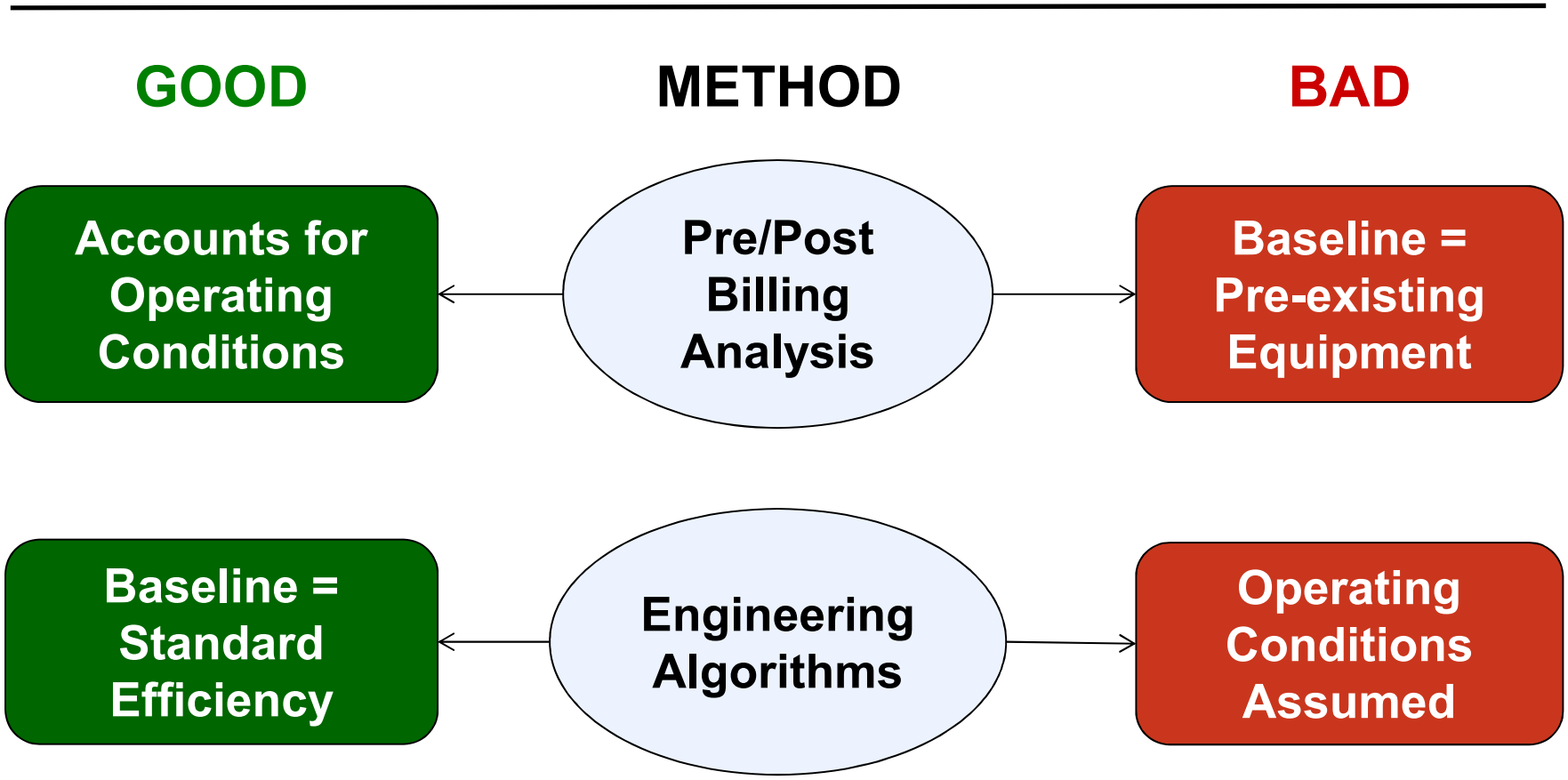
Standard New Equipment

Standard equipment was never installed . . .

BUT actual operating conditions also drive savings!

The Options


GOOD
METHOD
BAD
Accounts for Operating Conditions
Pre/Post Billing Analysis
Baseline = Pre-existing Equipment
Baseline = Standard Efficiency
Engineering Algorithms
Operating Conditions Assumed

Our Solution

Hybrid Approach: Combine billing analysis and engineering algorithms

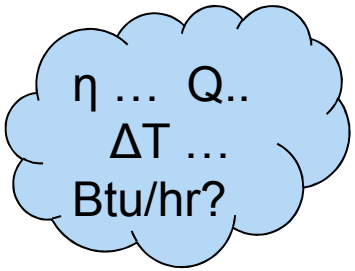
Works for any equipment replacement program

The Algorithms

$$\boldsymbol{Savings} = \boldsymbol{FLH\ x\ Capacity_{new}\ x\ \frac{\eta_{efficient} - \eta_{baseline}}{\eta_{baseline}}}$$

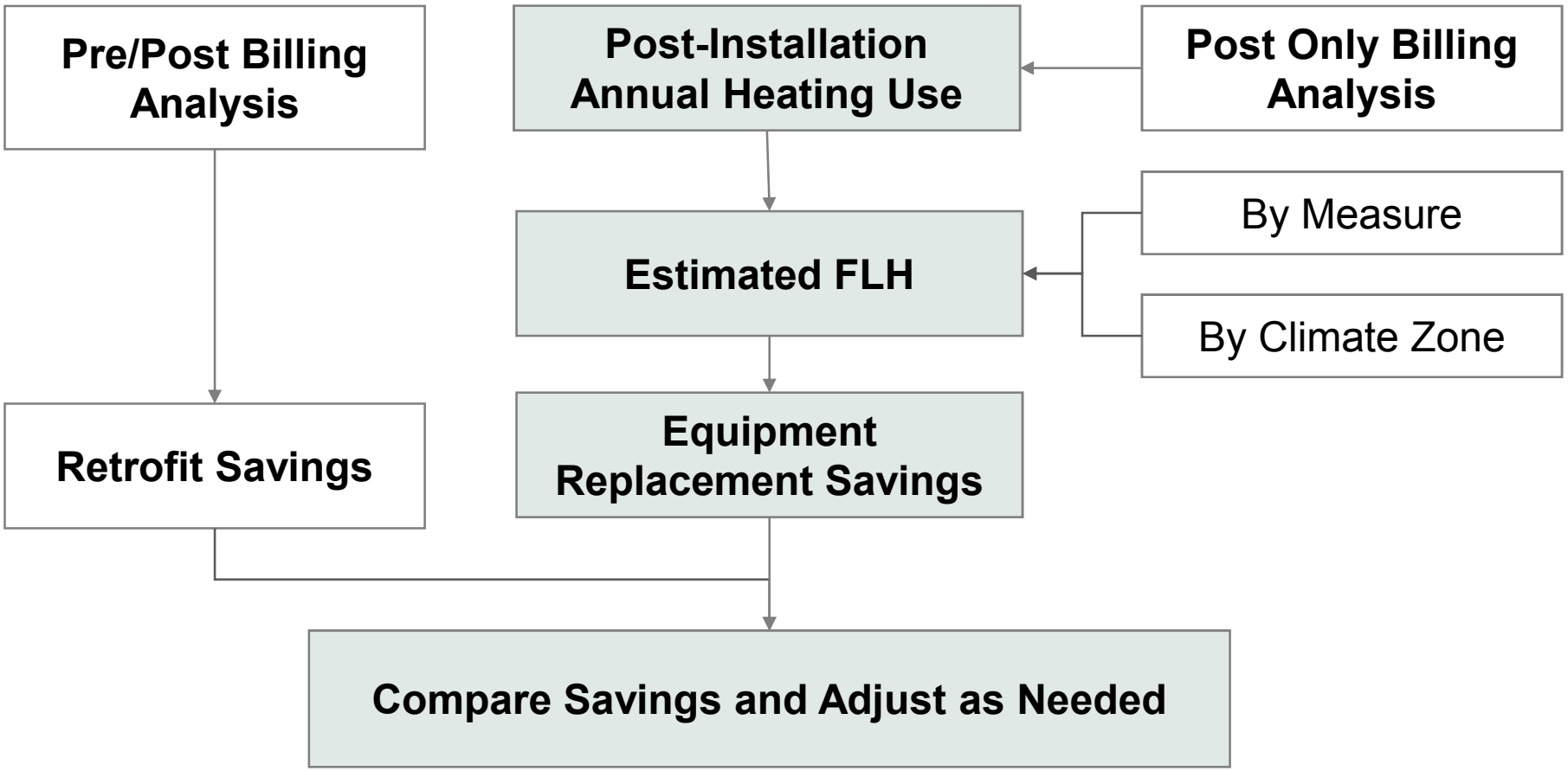
$$\boldsymbol{FLH = \frac{Annual\ Heating\ Use_{Post}\ (Btu)}{Input\ Capacity\ \left(\frac{Btu}{hr}\right)}}$$

The Steps

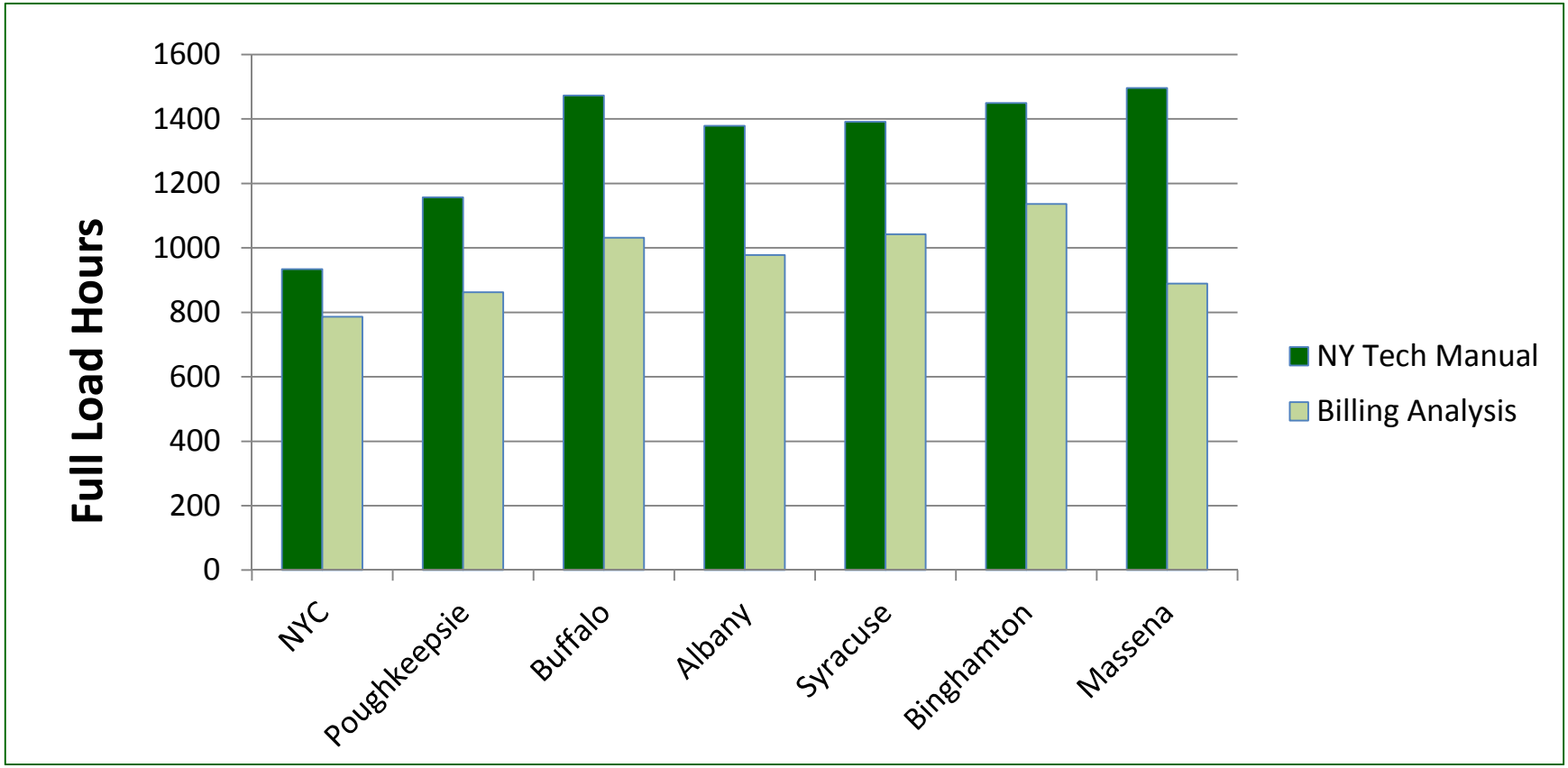


1. Estimate post-installation Full Load Hours (FLH) from post installation billing
2. Replace FLH in engineering algorithms
3. Use characteristics of new equipment

The Approach



The FLH Comparison



The Savings Comparison

Measure	Number of Homes in Model	Program-Reported Savings per Home (therms)	Pre/Post Modeled Savings per Home (therms)	FLH Modeled Savings per Home (therms)[a]
ECM Furnace	14,376	240	100 ± 3	143 ± 4
Furnace	15,529	199	129 ± 3	117 ± 3
Water Boiler	3,934	203	160 ± 4	107 ± 5
Steam Boiler	781	139	53 ± 7	113 ± 7

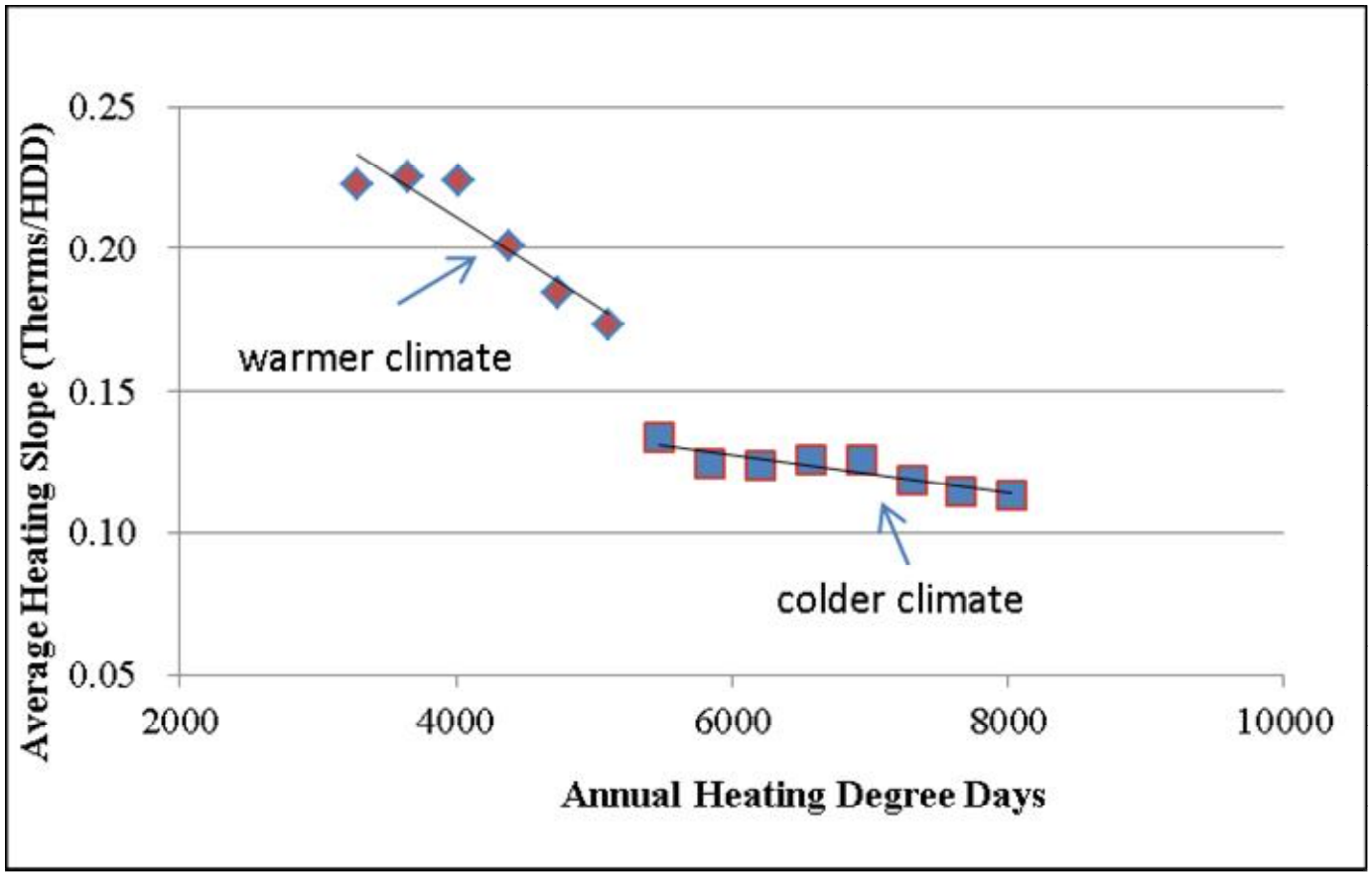
Our Comments

- Comparison to pre/post vary by measure
  - FLH modeled savings are higher than pre/post models for ECM furnaces and steam boilers
  - FLH savings are lower for furnaces and water boilers
- Efficiency of existing equipment
  - Higher than federal standard for homes installing ECM furnaces?

The Other Evaluations

Measure	NY Statewide HEHE: Hybrid FLH	NYSEG/RG&E HEHE: Pre/Post	Mass HEHE: Pre/Post
Furnaces with ECM	147	131	118
Furnaces without ECM	119	128	127
Water Boilers	116	156	104
Steam Boilers	93		109

The Weather Station Effect



The Overview

- Hybrid approach only relies on post-installation energy use
  - Consistent with equipment replacement approach
- Lower data requirements than pre/post
- Engineering estimates ‘trued up’ to usage

The Conclusions

- FLH hybrid results
  - fairly similar to pre/post results from other, similar evaluations
- Reliability of results also dependent on baseline assumptions
  - Further research on market baseline needed

Thank You!

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