Cage Match or Happy Couple?
Engineering Simulation Models and Billing Analysis

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2015 IEPEC Conference — Long Beach, California
CAGE MATCH
SENSATIONAL MAIN EVENT

HEAD TO HEAD

JOSH
“BILLING ANALYSIS”
RUSHTON

VS

JUSTIN
“ENGINEERING MODEL”
SPENCER
MICHAEL “MR GUIDELINES” BAKER VS DAVID “RAISING HELL” BAYLON
Northwest EE Landscape

- Bonneville Power Administration
- Northwest Power and Conservation Council
- Regional Technical Forum
- Tacoma Power
- Snohomish County PUD
- EWEB
- Clark Public Utilities
- Seattle City Light
- Energy Trust of Oregon, Inc.
- PSE
- Puget Sound Energy
- Avista
- NEEA
Lining up Methods with Goals

Stakeholders
- RTF
- Council
- Program Operators

Goals
- Overall Impacts
- Measure-specific estimates
- Attribution

Methods
- Billing analysis
- Building Simulation Models
- Both?
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CAGE MATCH

BILLING ANALYSIS vs ENGINEERING SIMULATION
Left Corner: Billing Analysis

Changes in usage with billing data

Easy data, reliable and inexpensive

Granularity, small signal, why, baselines

You didn’t let the temperature set point vary??
Right Corner: Engineering Simulation

Measure-specific savings using simulation tool

Thermodynamics, variations, small, baselines, interactions

Occupants, input heavy

You want how many millions for sub-metering?
Happy Couple?

I estimate savings reliably on aggregate, but lack precision to estimate measure savings.

I understand physical drivers and can extrapolate, but usually lack the data to accurately estimate savings.
Combined Approaches

- Statistically Adjusted Engineering Models
  - Engineering results into regression model

- Calibrated Building Energy Simulation
  - Regression for overall change; simulation to divvy up
NW Ductless Heat Pumps
DHP Research

- Lab Tests
- Detailed metering
- VBDD on Metered
- VBDD on Entire Population
- Building Simulation Model
- Billing Analysis
- “Final” Calibrated Results
Supplemental Fuels

Metering vs Billing vs RBSA
Weatherization

Phase 1: Well-behaved Homes
- Calibration Factors: SEEM heating Vs. Billing analysis
- Fixes input errors, thermostat takeback, modeling errors

Phase 2: Rest of Homes
- Estimated fraction of heating energy from other fuels
- Accounts for supplemental fuels, odd occupancy, odd heating signatures

Building Simulation Model
- SEEM model using RBSA audit data
- Adjusted for Phase 1 and Phase 2 calibration
You’re killing my programs!

Supplemental Fuels

Granularity
Conclusions

Better off with both methods.

But it often hurts getting the answer.

Maybe it’s both cage match and happy couple?
Questions?

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_Huge thanks to co-authors:_
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