



Welcome to AESP's Brown Bag

Who Gets the Credit:

A Framework for Determining Causality and Attribution
for Energy Efficiency and Renewable Programs



The DNA of Attribution in Program Evaluation

AESP Webinar Presentation

Mary Sutter

9/9/2010

Causal Dictionary

Causality

Counterfactual

Outcomes

Attribution

Contribution

Effect size

Effect

Cause and effect

Net savings

The DNA of Attribution



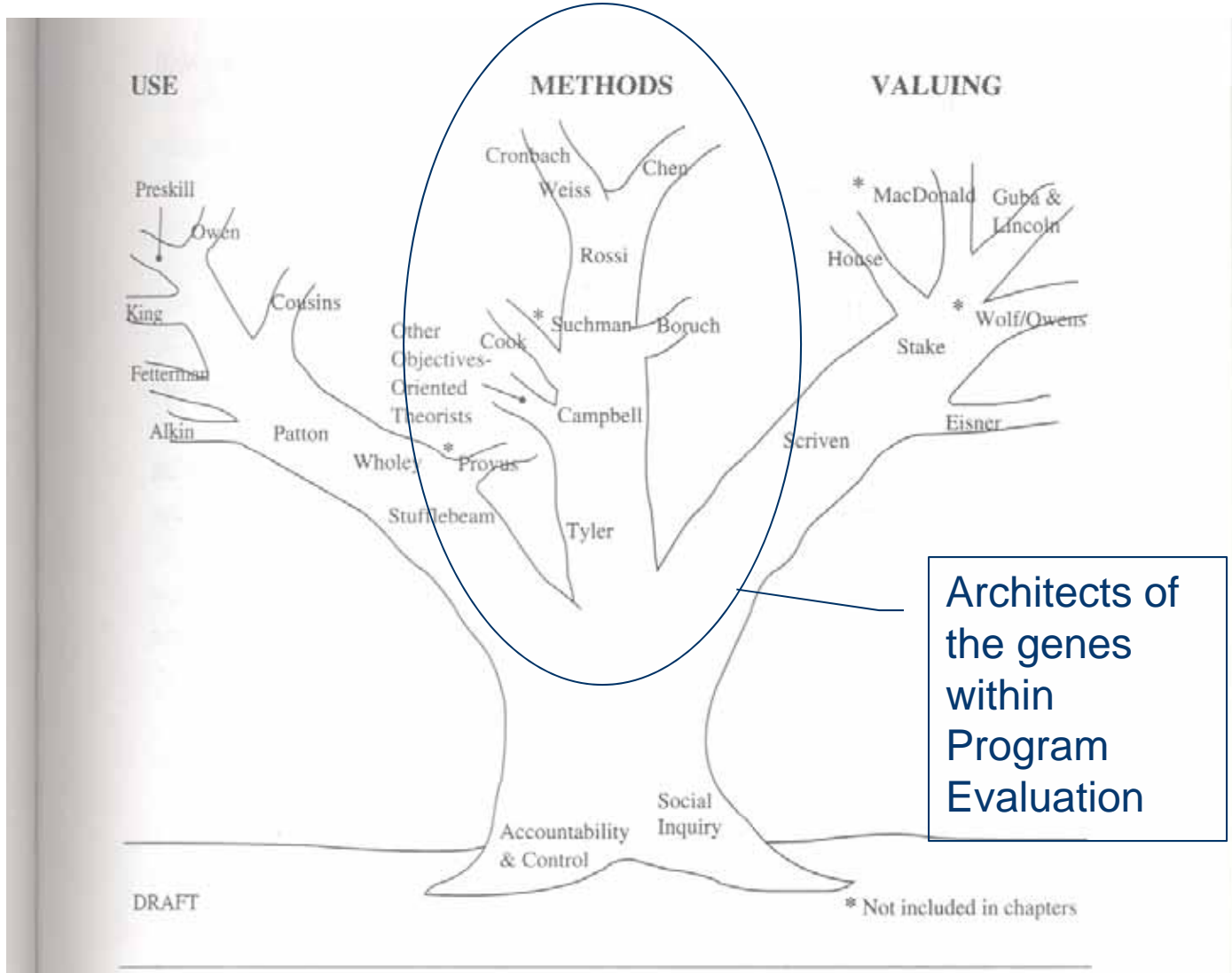
- Building blocks based in the academic literature
- Expressed in evaluation

We have mutated the genes



And modified them to fit Energy Efficiency Programs





Source: Evaluation Roots - Tracing Theorists' Views and Influences. Edited by Marvin C. Alkin. 2004

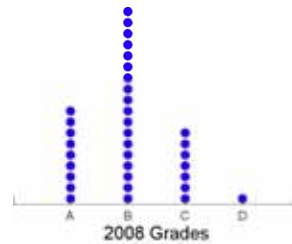
Other academics of note:

- Patricia Rogers and Jane Davidson blog about real, genuine, authentic, practical evaluation
<http://genuineevaluation.com/>
- Lawrence B. Mohr
- Stewart Donaldson, Christina Christie & Mel Marks
- Stephen Morgan & Christopher Winship
- Many pushing towards usability of evaluation


Other program evaluation areas

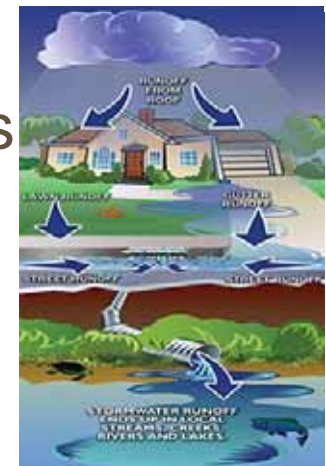
Educational Programs

- Quantitative Approaches
 - Statistics are big
- The Campbell Collaboration
- Meta-evaluation

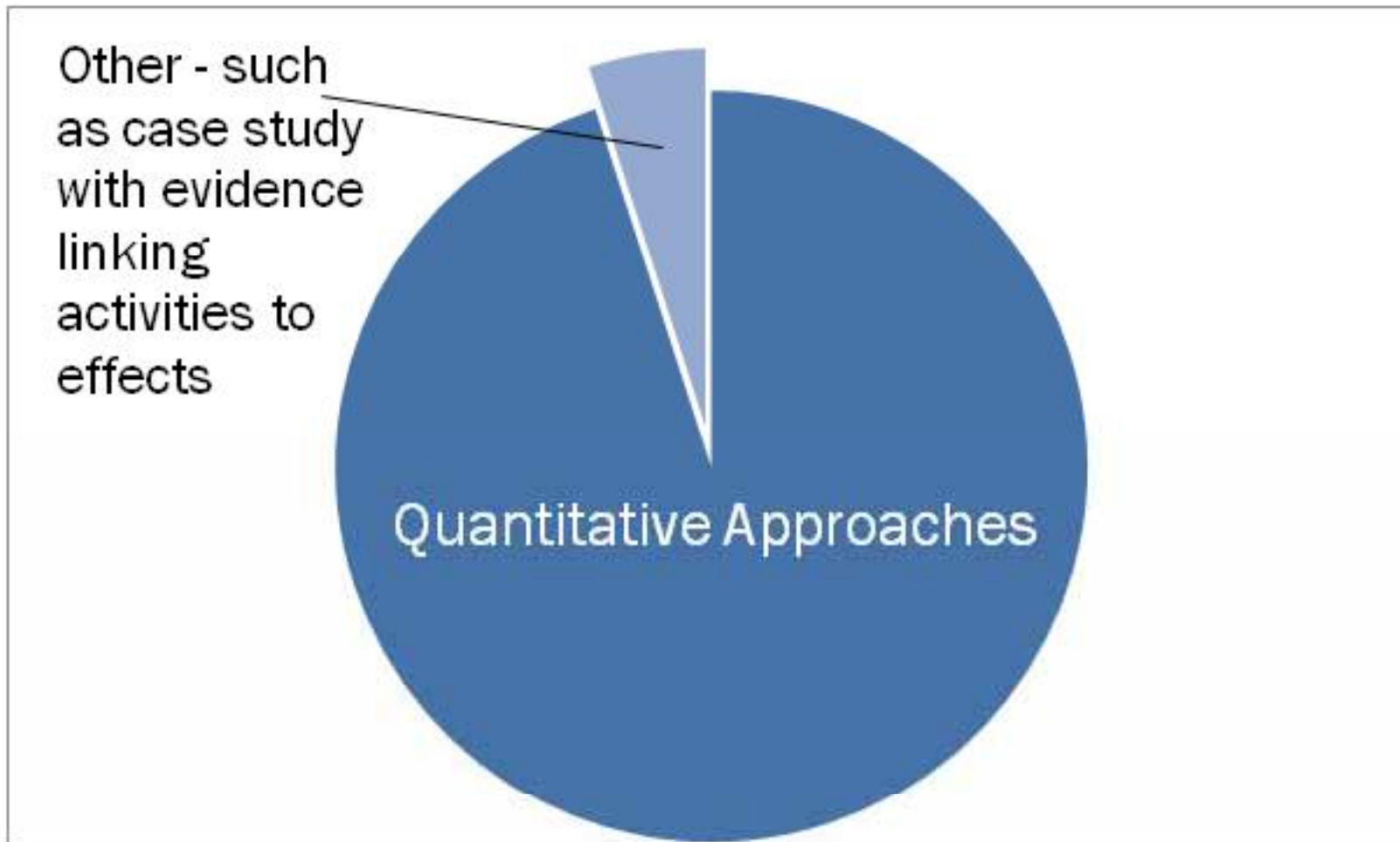


Environmental Programs

- Similar struggles
-  Physical and Social world
- Credible data for effectiveness
- Long time horizons



Where we are now



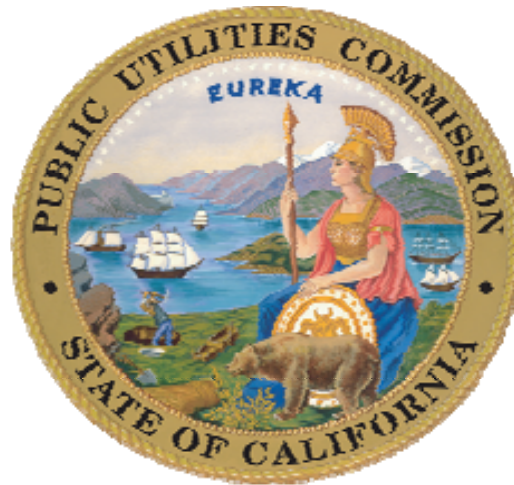
Thank You!



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*Attribution and Causality Challenges in Evaluating
CA's 2006-2008 Upstream Lighting Programs*



Mikhail Haramati

California Public Utilities Commission

September 9, 2010





Presentation Overview

1. Why we care about attribution
2. Upstream lighting program
3. CFL Market effects
4. What worked especially well in CA
5. Reflections on assessing attribution





Why we care about attribution

- Net savings needed for load forecasting and resource procurement
- Needed to assess cost-effectiveness of rate-payer funded utility programs
- Part of CA policy to incentivize incremental energy efficiency and transform markets





Upstream Lighting Program

Upstream Lighting Program

- Provided rebates for ~100 million CFLs, 95% bare spirals
- Largest single program, and accounted for over ½ of expected kWh savings
- statewide annual net savings estimated at 1,325 GWh and 134 MW in demand reduction

Focus of ULP impact evaluation

- Determine an appropriate net-to-gross ratio for estimating net energy and demand impacts
- Requires estimate of gross savings before the NTG ratio can be applied





ULP Methods

Self-report	<ul style="list-style-type: none">• Consumer Intercept survey• Supplier interviews
Econometric Analysis	<ul style="list-style-type: none">• Conjoint elasticity models• Revealed purchaser model• Stated preference purchaser elasticity model
Total Sales Approach	<ul style="list-style-type: none">• Multi-state regression





ULP Challenges

- **Self-report Method**
 - Didn't have information on who purchased program bulbs
 - People often don't know when they're participants (since the rebate occurs upstream)
 - Lag time of when bulbs were purchased to when evaluation was fielded
 - Low cost, frequently purchased item making it more difficult for respondents to remember detail about bulb purchases
- **Econometric Methods**
 - Expensive with low sample size
 - Low internal reliability for stated preference sample





ULP-Challenges

- **Total Sales Method**
 - Issues with IOU tracking data
 - Cyclical stocking and bulb promotion patterns in stores
 - Rapidly maturing market
 - Other market pressures pushing down the cost of rebated bulbs
 - Very difficult to tell program bulbs from non program ones
- **Other Challenges**
 - Possibility of market cannibalization or a shift in the customer purchasing patterns from one store type to another
 - Assessments of customer-side leakage for tracking from gross bulbs sold





ULP Reflections

- Difficult to know how to triangulate between multiple results
 - Yet gives a more complete picture
 - need to know which methods are more reliable and how to combine results
 - If you can, good to define a process for triangulation on the front end, but will still need to review data and make subjective assessment of reliability after it's been collected.
- Make sure to match the methods to the product
 - ULP a single measure so many methods possible, harder when offerings are more disperse
- Consider cost-effectiveness of evaluation effort





CFL Market Effects (ME)

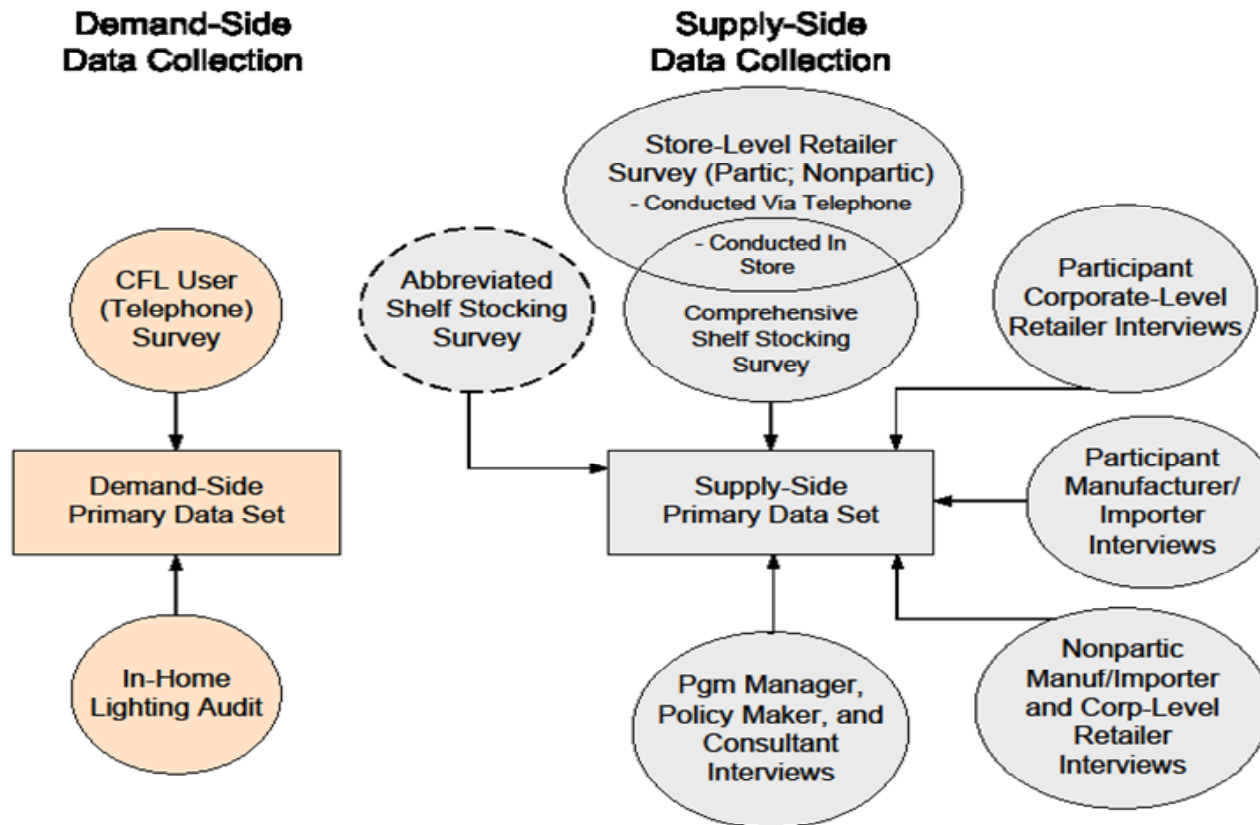
Focus:

- Understand cumulative effects of California's energy-efficiency programs on the CFL market
- Quantify the 2006-08 kWh and kW savings (if any) caused by market effects and not yet claimed as direct or participant spillover savings
- Investigate whether savings from market effects can be quantified with sufficient reliability to be treated as resources





CFL ME methods: Primary Data Collection Activities





CFL ME methods-attribution

Self-report	<ul style="list-style-type: none">• Household survey<ul style="list-style-type: none">– On-site verification of user survey responses• Supplier interviews
Statistical Analysis	<ul style="list-style-type: none">• Comparison state approach (primary approach)• Multi-state data regression (supplemental approach)
Price Analysis	<ul style="list-style-type: none">• Shelf-stocking survey (in CA and 3 comp states)





CFL ME-Challenges

Mixed Methods:

- Contradictory results from the different methods
 - Regression model estimated cumulative 2008 total net impacts of 0.23 (includes FR and spillover, for savings *realized* in 2008)
 - Residential Retrofit Upstream Lighting Report found NTG of 0.54 (only for savings *caused* in 06-08, estimate for entire 06-08 period)
- Which methods to believe
 - Seem contrary but methods not equivalent
- Story of historical ME
 - (Retailer interviews and decline in CFL prices) suggest historical effects of CA programs on CFL market, but (CFL user-survey, in-home survey, shelf-stocking and price analysis) found no effects at the end of 2008.
 - Likely due to: Increasing CFL saturation and dominance of large Energy Star retailers increasing sales nationally.





CFL ME Reflections

- Didn't have good historical market baseline data to know CFL market prior to 2006
- Study did not find MEs in CA, but a lot of noise in the data due to large, national efforts like Wal-Mart and Energy Star
- ME studies useful for market characterization, but causality very difficult to prove in **short time frame** and in **complex environments**
- Evaluators recommended using a diffusion of technology curve to better understand CA influence on US market (but purpose of CFL ME effort was to see if savings could be quantified and relied upon as a resource.)





What worked well

- Multiple methods
 - Provided more complete, comprehensive picture than any one method could
 - single measure (CFLs) allowed for evaluation to focus more than if many measures were included in evaluation
- ULP Self-report approach utilizing both CFL users, non users and suppliers
 - Covered both supply and demand sides
- CFL ME price analysis
 - Extensive, and utilized 3 comparison states





Reflections on assessing attribution

- Attribution in CA very controversial since tied to incentive payments
- CA NTG uses mostly quantitative methods with self-report due to reliability constraints
- Attribution harder to determine in more advanced markets (due to noise and increasing # of free-riders)
- Use attribution as a way of targeting programs and moving towards market transformation
- Know a lot about lighting in CA, need to use this to inform program implementation-bringing attribution full-circle.
- Multiple methods likely to become more important in next few years as state and federal recovery programs run concurrently





Thank you!

**For comments/questions please
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Gas Furnace Market Transformation Evaluation

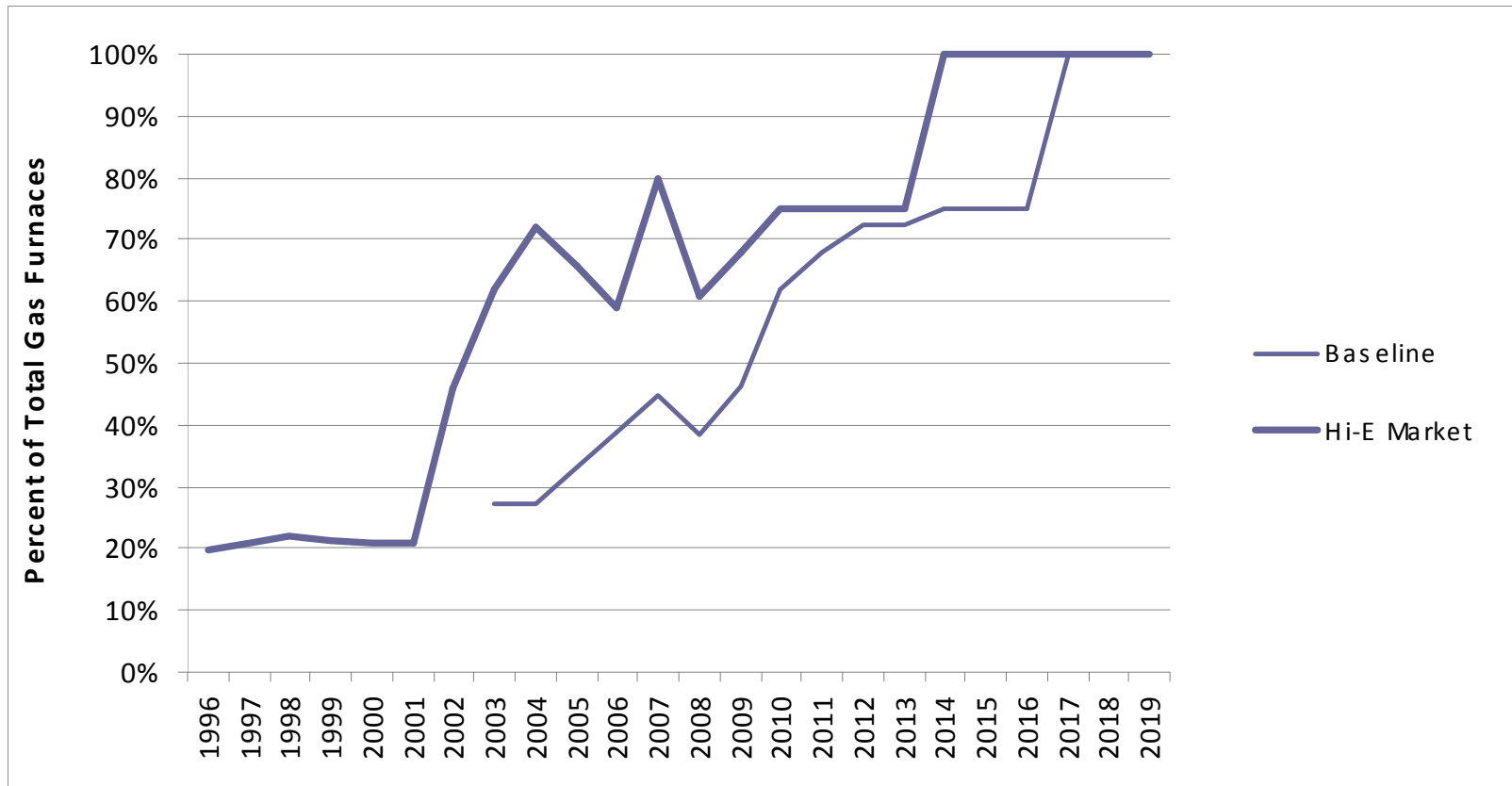
Fred Gordon, based on work by Matt Braman,
and a study by Summit Blue, now Navigant,
synthesizing many other reports, and so on into the night





The Gas Furnace Market Over Time

Note: Federal standard in 2013





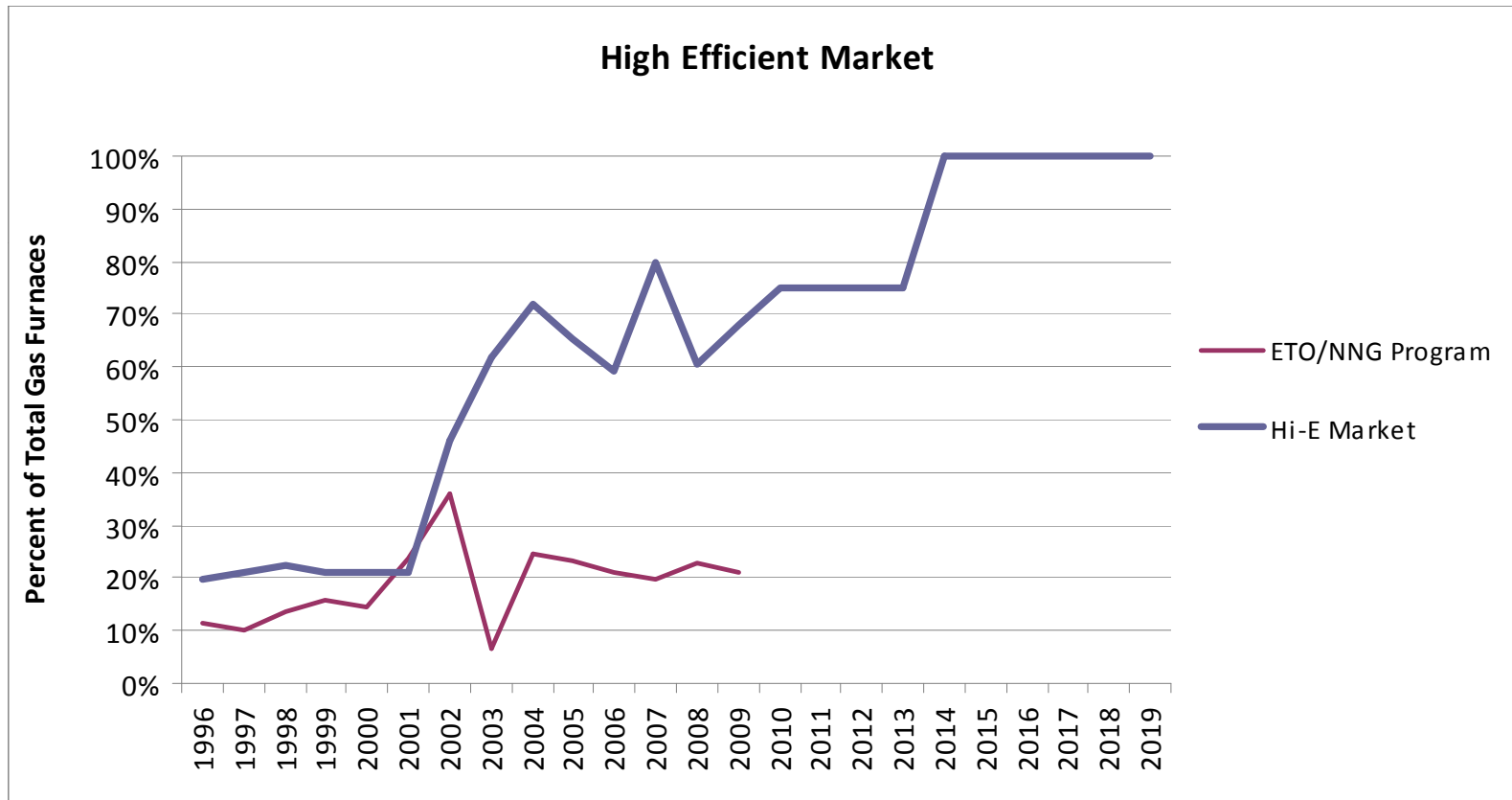
Approach to Considering Incentive Changes and Claiming Savings

There is no precise data nor perfect sample, ***and never will be. Indicators of market change:***

- Multiple sources agree that market share is high.
- Nonparticipant vendors show high market share
- Surrounding territories show high market share
- Data over several years shows high market share. (not always feasible for timely decisions, but available in this case).
- A small fraction of sales use our incentives.



The Gas Furnace Market Over Time





Data Sources

- Distributor Interviews
- Contractor Interviews
- Customer free rider questions
- Crosscheck with studies of nearby areas
- Talked to parties to Federal standards agreement



Causality

- NW Natural, then NWN/Energy Trust helped build a manufacturer/distributors/contractor referral system.
- Incentive was a building block for a high profit sale, along with state tax credits and manufacturer “discounts”
- Market share shot up with program advent and stayed up.
- Eventually, most sales outside of program
- Parties to Federal standards agreement: increase in volume thruout Northern US critical to agreement
- Market share stayed up when program ended
- Market players said we were influential



Keys to Agreement

- Sustained effects, complimentary sources of data.
- Multiple complimentary data points all pointing in same direction (minor muddles)
- Both market tracking and causal evidence
- Open process, ongoing discussion.
- Input and participation of trade allies, as well as evaluation experts. Vetted by Conservation Advisory Council and Board Evaluation Committee.
- Picked a middle-lower number out of a range of possible savings numbers.
- Only claimed to accelerate the standard a few years.



Can This Be Done in a Regulated Utility Environment?

- Profit incentives for efficiency lead to contested claims, information control, quasi-judicial process. “Too big not to fight over”.
- Regulatory review process in most places is more reliant on judgment of regulatory staff than consensus development by experts.
- Most regulatory staff not staffed or trained to analyze market change.
- Focus on “statistical precision” driven by profit incentives often in absence of logical frame for market analysis.



Possible Solutions for Regulated Environment

1. Regulatory staff organize external impartial review and defer to it. (And commissioners respect it).
2. Formal agreement on principles behind study
3. Alternatives to profit incentives include third party delivery or regulatory incentives based on customer satisfaction, service levels, not Megawatt Hours or therms saved.



Questions?

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QUESTIONS