

THE DEVIL'S IN THE DETAILS

THE EFFECT OF METHODOLOGICAL
DECISIONS ON ESTIMATED SAVINGS

AUGUST 9, 2017

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B O N N E V I L L E
P O W E R A D M I N I S T R A T I O N



NAVIGANT

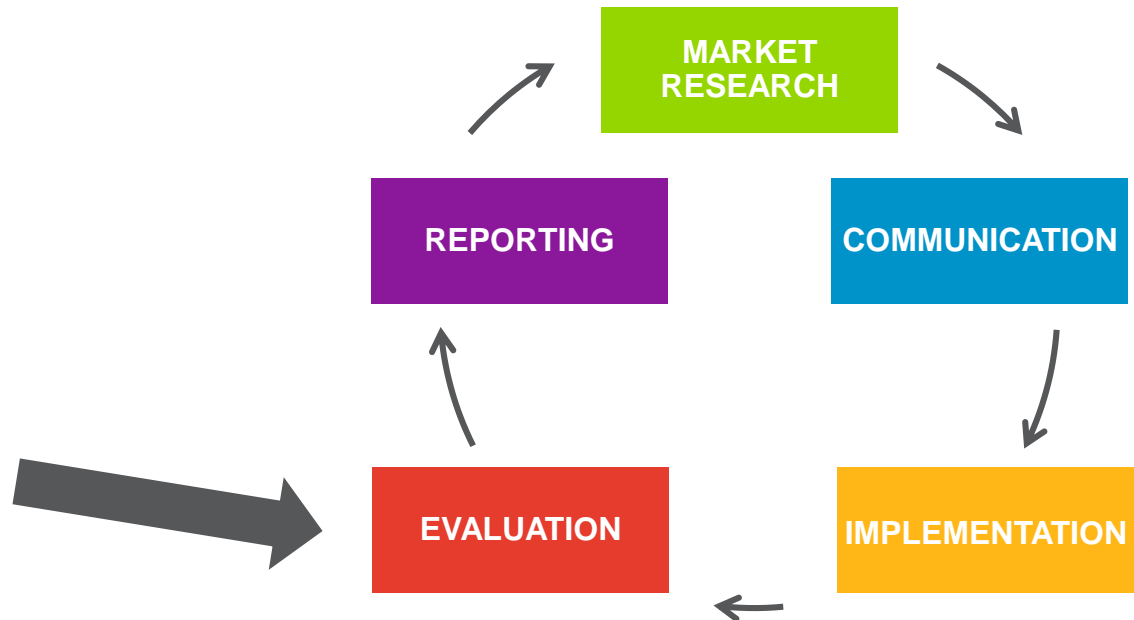
INTRODUCTION

BIG PICTURE

- Methods
- Evaluation
- Demand-side management (DSM)
- Billing or energy usage data



Source: <http://www.solarypsi.org/blog/2012/06/new-utility-meters-puts-a-hold-on-monitoring/>



DSM Program Lifecycle

INTRODUCTION

Public guidance exists.

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

ABOUT US

Uniform Methods Project for Determining Energy Efficiency Program Savings

Home > About Us > Initiatives & Projects > Uniform Methods Project for Efficiency Program Savings

Under the Uniform Methods Project, DOE is developing a set of protocols for determining savings from energy efficiency measures

Source: <https://energy.gov/eere/about-us/ump-home>

SEE Action
STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK

Our Network Resources Recent Actions Events Technical Assistance Energy Efficiency Benefits

EVALUATION, MEASUREMENT, AND VERIFICATION RESOURCE PORTAL

The State and Local Energy Efficiency Action Network (SEE Action) Evaluation, Measurement, and Verification (EM&V) Resource Portal is an EM&V resource compendium for energy efficiency program administrators and project managers. The resources focus on tools and approaches that can be applied nationwide, address EM&V consistency, and are recognized by the industry.

This web portal identifies helpful resources in the targeted categories below:

What is EM&V?

EM&V refers to the procedures for examining a product, service, or system to ensure that the requirements and specifications are satisfied and the intended purpose fulfilled. For energy efficiency, EM&V is the collection of approaches for determining and documenting energy and non-energy benefits resulting from end-use energy efficiency activities and programs. Effective EM&V can confirm energy savings, verify cost-effectiveness, and guide future energy efficiency investment decisions.

Measurement & Verification Portal

BERKELEY LAB
LAWRENCE BERKELEY NATIONAL LABORATORY

Search this site

Home Key M&V Documents Interactive Tools Discussion Other Guidelines Training Sitemap Recent Site Activity

Key M&V Documents >

IPMVP

The Efficiency Valuation Organization (EVO) publishes the International Performance Measurement and Verification Protocol (IPMVP) to increase investment in energy and water efficiency, demand management and renewable energy projects around the world. The IPMVP allows building owners, energy service companies, and financiers of energy efficiency projects to quantify the energy savings performance of energy conservation measures (ECMs). It provides an overview of current best practice techniques available for verifying savings from both traditionally funded and third-party-financed energy and water efficiency projects.

The IPMVP was recently revised, and is now in three volumes, available at <http://www.evo-world.org/>

Source: <http://mnv.lbl.gov/keyMnVDocs/ipmvp>

Source:
<https://www4.eere.energy.gov/seeaction/topic-category/evaluation-measurement-and-verification>

INTRODUCTION

But, methods differ.

Matching as Nonparametric Preprocessing for Reducing Model Dependence in Parametric Causal Inference

Daniel E. Ho

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Elizabeth A. Stuart

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Johns Hopkins Bloomberg School of Public Health,
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e-mail: estuart@jh

Source: Ho et al 2007 paper on matching approaches for causal inference.

Webinar: Non-Intrusive Load Monitoring Advances and Opportunities

July 31, 2017 12:30-2 PM EST

[Register Now](#)

Join **NEEP** and guest speakers **Terese Decker**, a Managing Consultant from Navigant, and **Dave Korn**, Vice President of Energy Services from Cadmus, as we explore the advances, opportunities, and potential limitations of Non-Intrusive Load Monitoring (NILM). This webinar will explore definitions, state of current technology, applications from evaluation to program implementation, and the role of the researchers decided to use NILM as a tool for enhancing stakeholder

Source: NEEP's invite to a July 31, 2017 webinar on NILM.

The screenshot shows the EnergySavvy website. The navigation menu includes: PRODUCTS, SERVICES, CUSTOMERS, RESOURCES, ABOUT, and a prominent orange 'REQUEST DEMO' button. The main content area is titled 'Continuous Savings Measurement' and includes a breadcrumb trail: 'Products / Customer Operations / M&V 2.0'. Below the title, there is a paragraph of text and a sidebar with three menu items: 'PRODUCT OVERVIEW' (with a PDF icon), 'WEBINARS' (with a play icon), and 'RESULTS' (with a target icon).

Continuous Savings Measurement

For utility evaluation and planning professionals, evaluation results often contain too little detail and arrive too late to provide benefits beyond fulfilling regulatory requirements. Further, evaluation and planning teams typically lack in-house analytics to develop deep insights on their own.

Available for mass market DSM programs, M&V 2.0 performs a

Source: <https://www.energysavvy.com/products/customer-operations/mandv2.0>

It is not new, but it is growing rapidly.



Energy and Buildings

Volume 9, Issues 1–2, February–May 1986, Pages 161–168



Using the scorekeeping approach to monitor aggregate energy conservation

Margaret F. Fels, Miriam

Source:
<http://www.sciencedirect.com/science/article/pii/0378778886900174>

gtm:
A Wood Mackenzie Business

- SOLAR
- GRID EDGE
- ETC.
- Podcasts
- Webinars
- White Papers
- Videos
- About
- Advertising
- Creative Strategies
- Careers

Oracle Is Buying Opower for \$532 Million. Here's Why the Deal Could Be Good for Both Companies



Photo Credit: Opower

Oracle's offer is half of Opower's IPO price in 2014, but it's an improvement over 2016 pricing.

by Stephen Lacey
May 02, 2016

Source: <https://www.greentechmedia.com/articles/read/oracle-acquires-opower>



BRIEF

Illinois regulators approve ComEd's smart meter data sharing program

By Robert Walton • Feb. 16, 2017

Source: <http://www.utilitydive.com/news/illinois-regulators-approve-comeds-smart-meter-data-sharing-program/436338/>



INTRODUCTION

Guidance already exists

Various methods are used

More billing analysis is coming

More data = wider variety of methods

OUR RESEARCH QUESTIONS

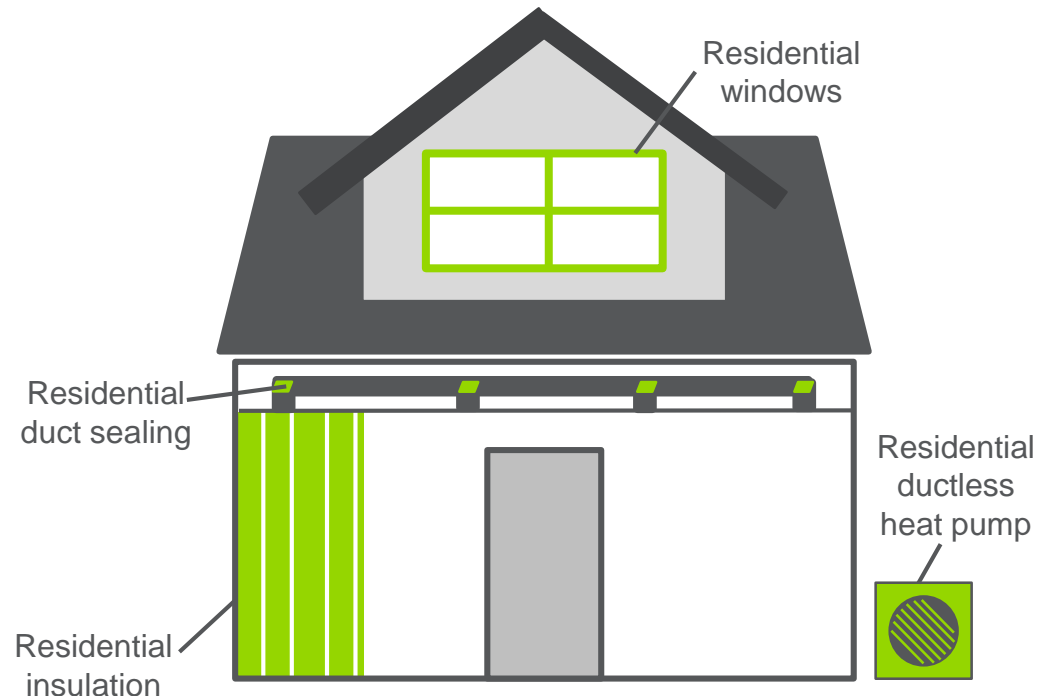
- Do existing differences in methods matter?
- If so, which matter most?

METHODS: MEASURES

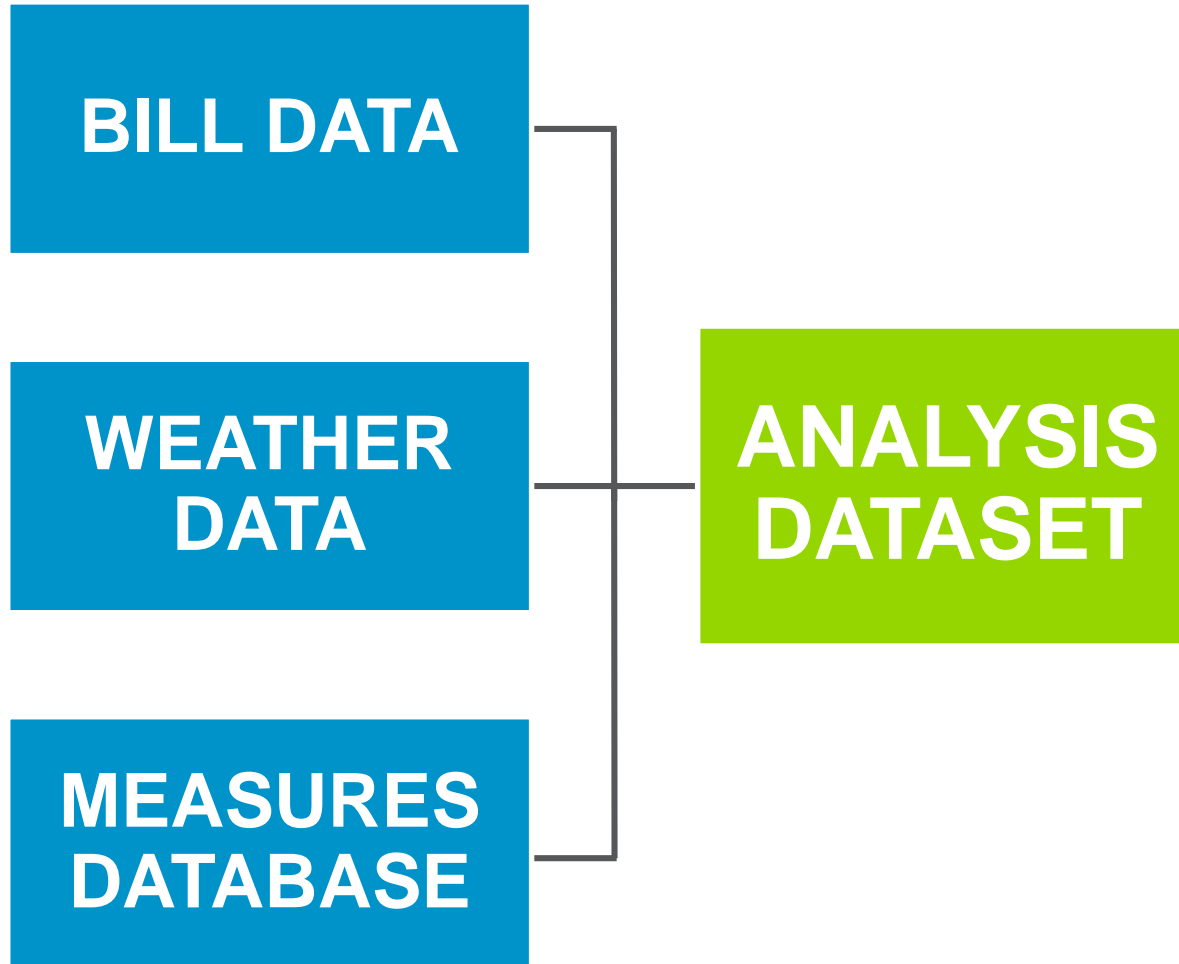
APPLIES TO

- **WHOLE-BUILDING RETROFITS**
- **HEATING OR COOLING MEASURES**
- Behavioral interventions

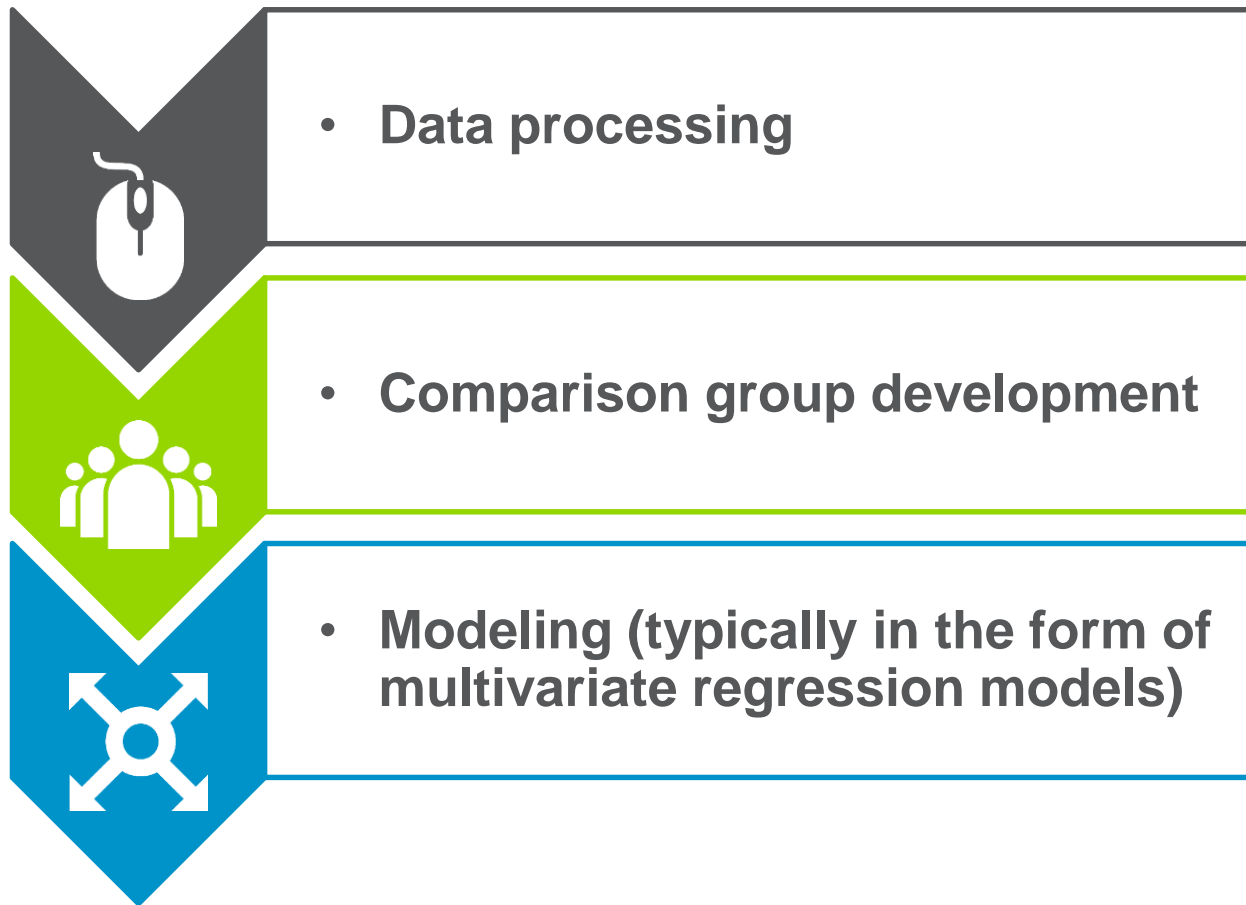
- Residential duct sealing
- Residential ductless heat pumps (DHP) replacing electric forced air furnaces
- Residential windows
- Residential insulation



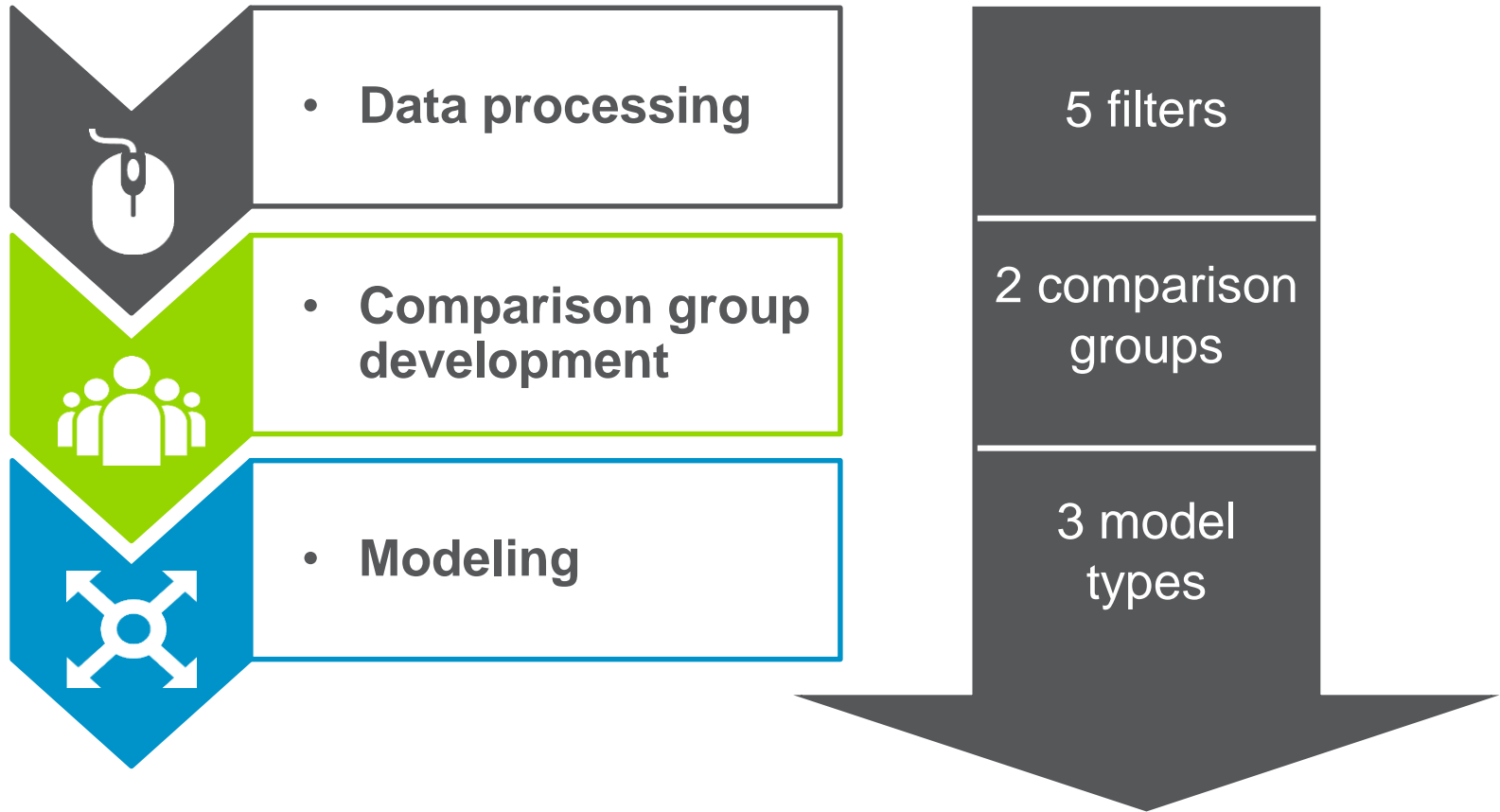
METHODS: AVAILABLE DATA



METHODS: ANALYSIS FLOW



METHODS: ANSWERING OUR RESEARCH QUESTION

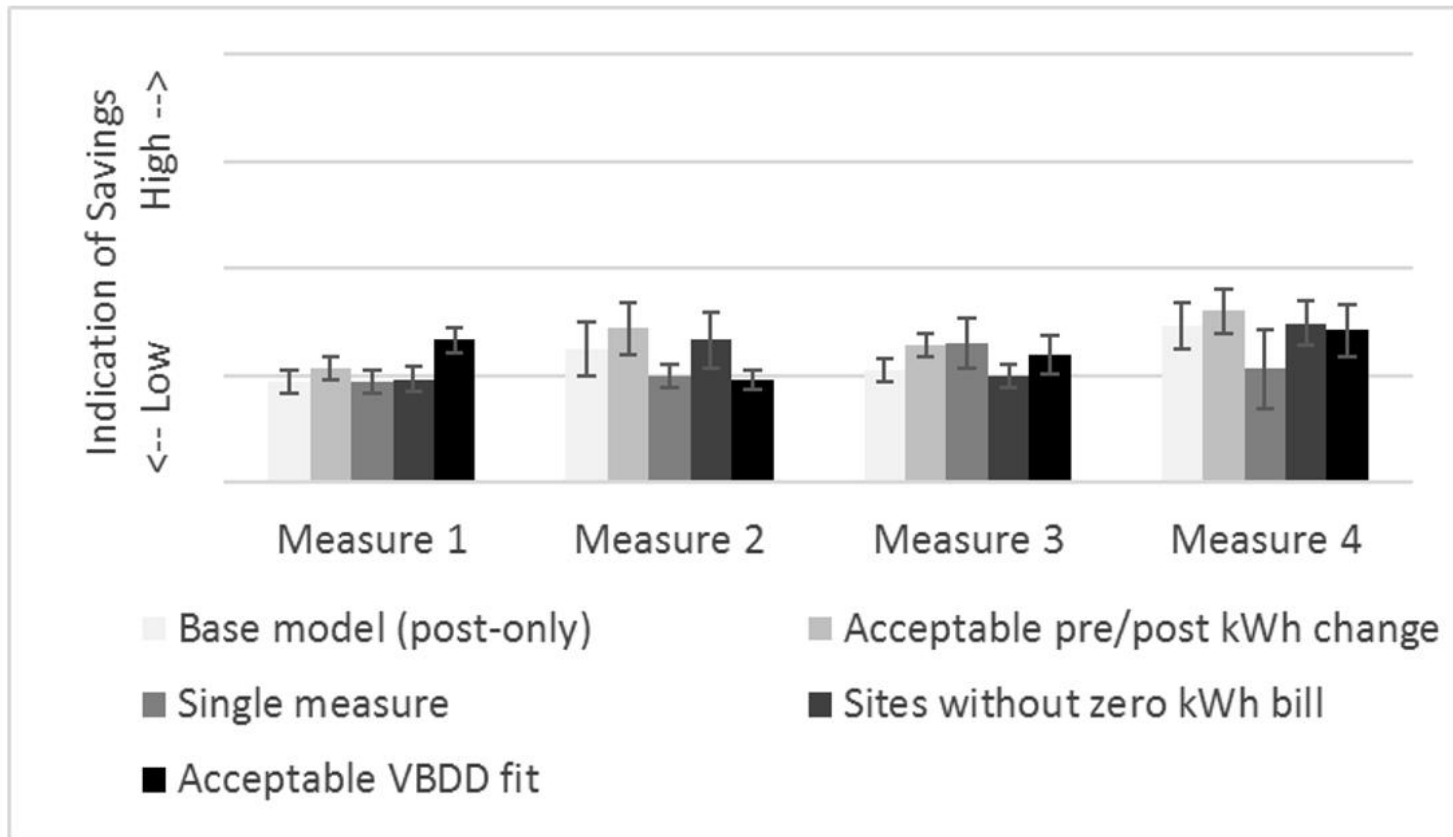


RESEARCH QUESTIONS

- Do existing differences in methods matter?
- If so, which matter most?

RESULTS: DATA FILTERS

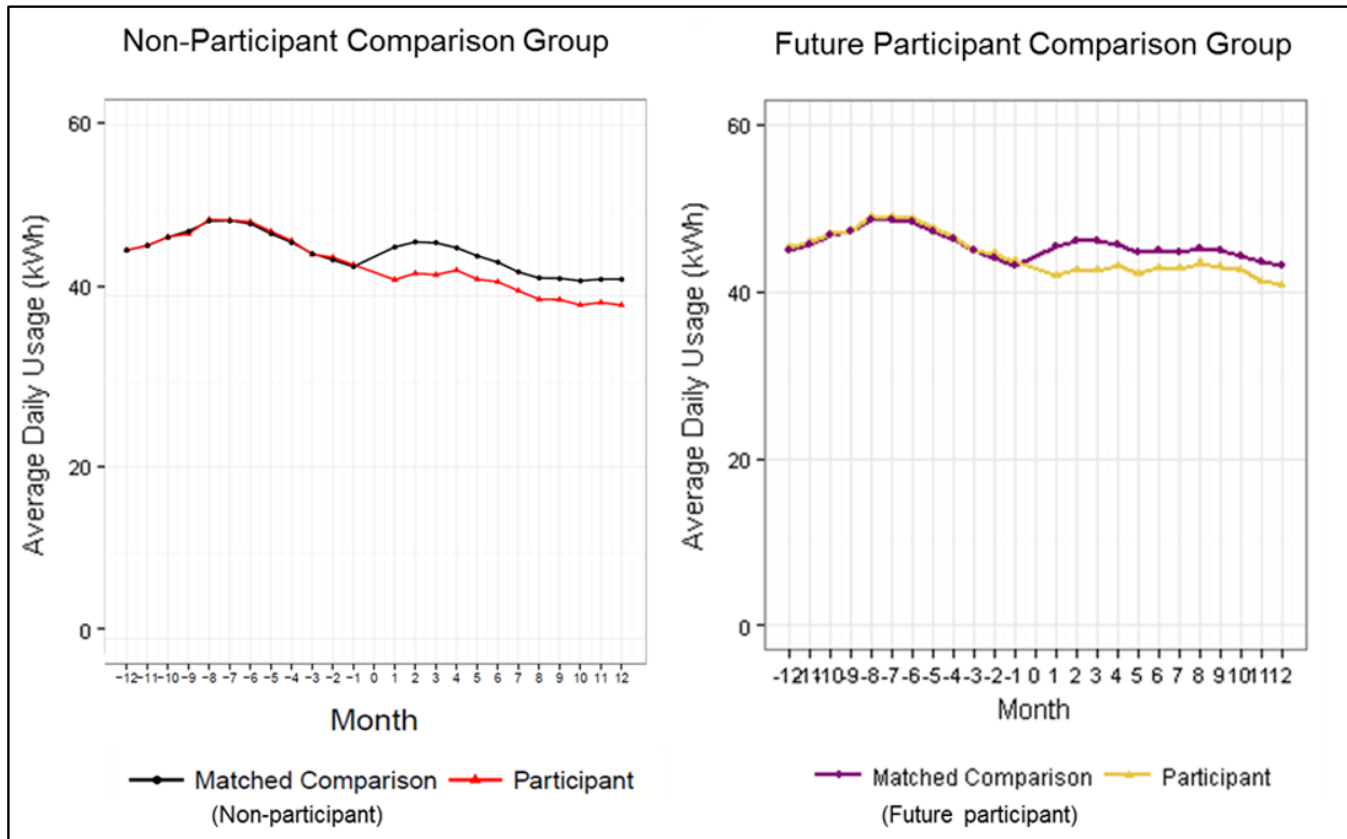
Variation in Savings when Using Select Filters across Measure Groups



Source: Preliminary Navigant Analysis on Anonymous Data 2017.

RESULTS: COMPARISON GROUP (1 OF 2)

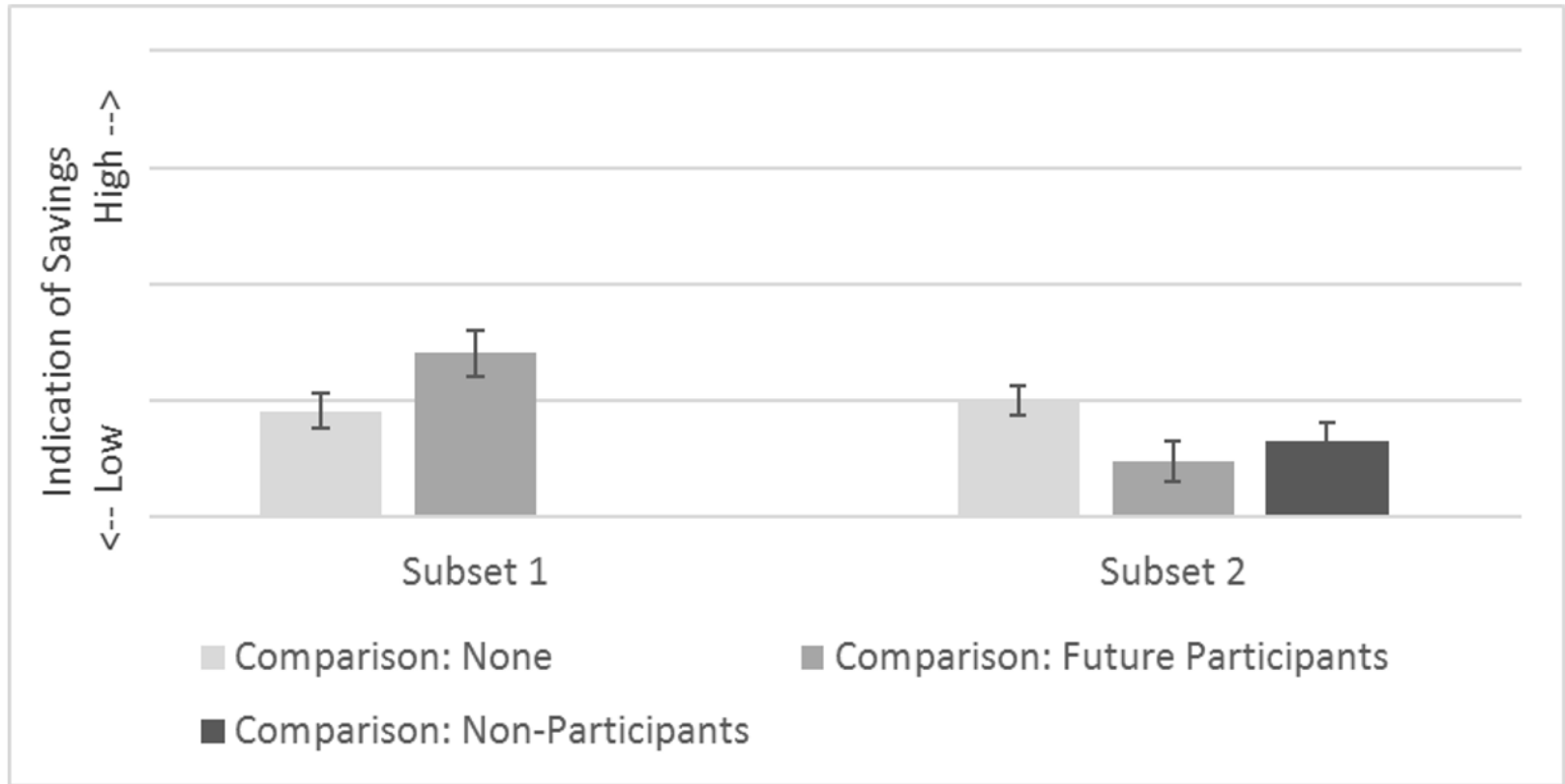
Pre and Post Energy Usage for Participants and Comparison Groups



Source: Preliminary Navigant Analysis on Anonymous Data 2017.

RESULTS: COMPARISON GROUP (2 OF 2)

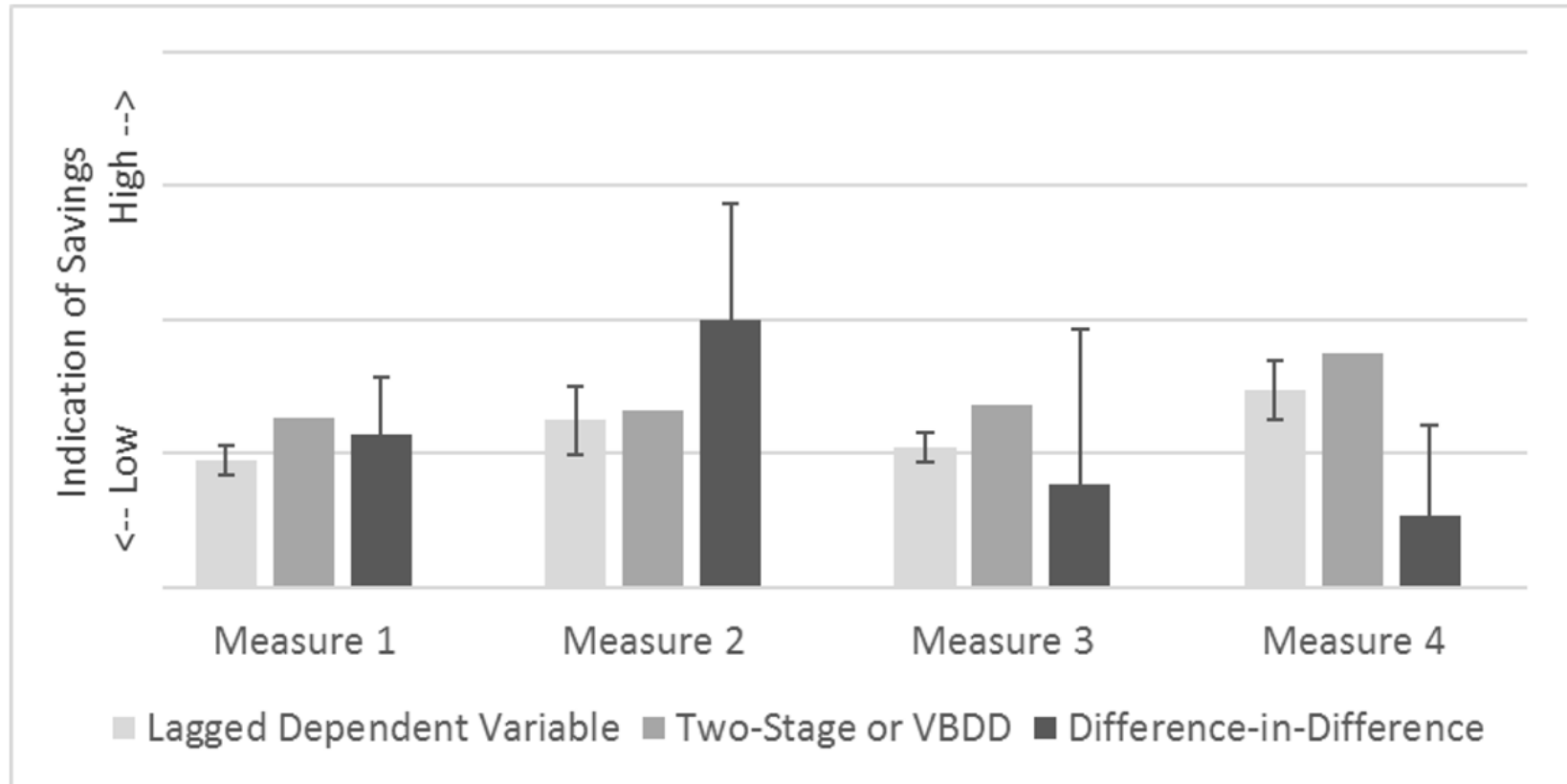
Variation in Savings when Using Different Comparison Group Sources



Source: Preliminary Navigant Analysis on Anonymous Data 2017.

RESULTS: MODEL TYPES

Variation in Savings across Three Model Types and Four Measures



Source: Preliminary Navigant Analysis on Anonymous Data 2017.

CONCLUSIONS

OUR RESEARCH QUESTIONS

- Do existing differences in methods matter?
- If so, which matter most?

Yes

Our results point to model type & whether there is a comparison group

- Future studies should:
 - Investigate the impact from different approaches to develop comparison groups
 - Replicate similar analyses, but compare results for a truth data set

NEXT STEPS

- What do we do about it?

Policy Options	
Status Quo	Continue developing guidance and encouraging evaluators, regulators and program managers to use it
Certification	Require certification for analysis package/code/function (ie, analogous to EnergyStar)
Model Validation	Provide an anonymized, truth data set (either developed through RCT or for a case where savings = 0) and require evaluators to test their code with this data set
Public Option	Mike Li develops usage analysis code that is open to the public
Independence	Further ensure through regulation that evaluations are independent
Other ideas?	

- We may be on the forefront of change, is there more we can do to prepare?

ABOUT ME

INTERESTS

- Innovative uses of data
- Billing analysis
- Connected devices (eg, thermostats)
- Utility 2.0 ideas

EXPERIENCE & EDUCATION*

- 7+ years at Navigant
- 1 year at Symbiotic Engineering
- 2+ years as a research assistant
- Publications at ACEEE, IEPEC and Public Utilities Fortnightly
- Master's of Science in Building Systems Engineering
- BS degrees in Applied Math & Environmental Science



Source: <https://www.bitmoji.com/>

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