Measurement and Verification (M&V) 2.0

The National Landscape and Residential Case Studies

Presentation to:

Michigan Energy Waste Reduction Collaborative
April 18, 2017

ENERGYSAVVY

Agenda

Topics for discussion

1	M&V 2.0 Overview

2	National Landscape

3	Case Studies

4	Questions

What is M&V 2.0?

"

A defining criterion for automated M&V software is that it continuously analyzes data as it becomes available.

New York Dept. of Public Service, EM&V Guidance, Nov 2016
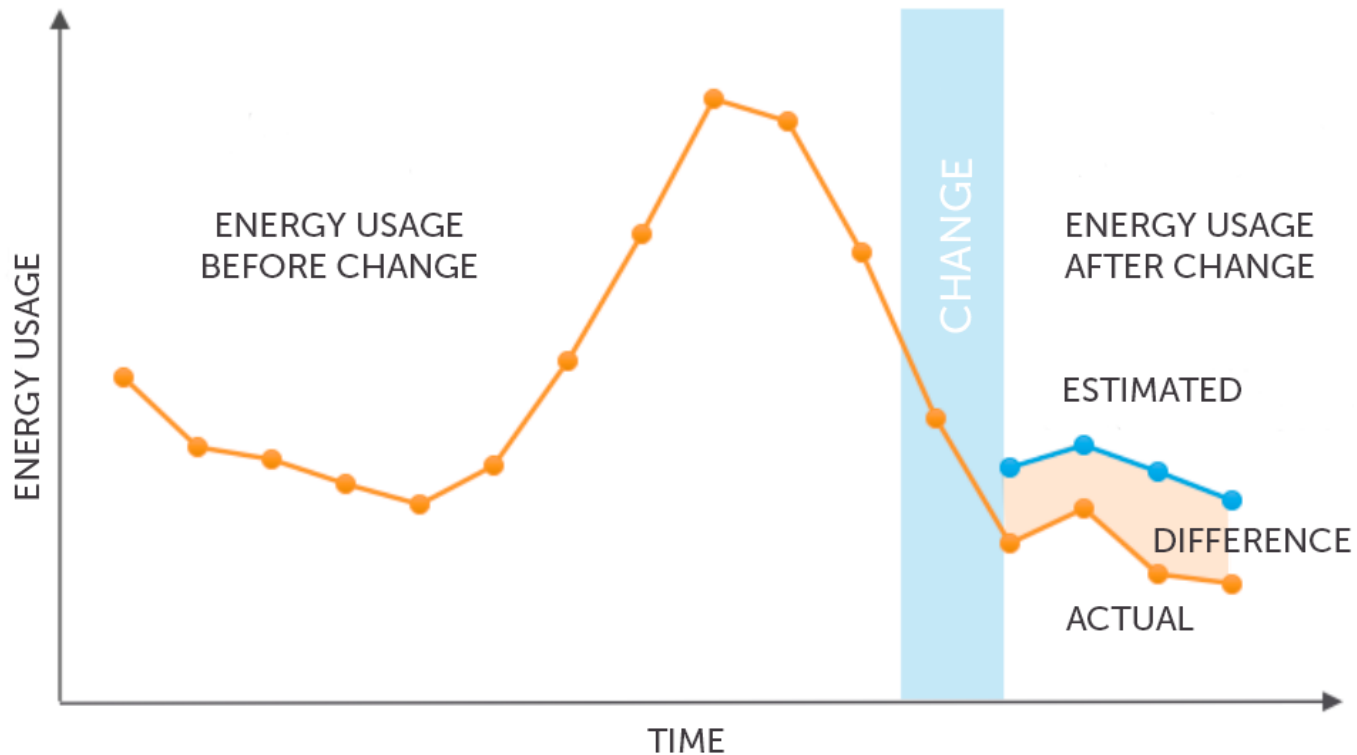
Floating Names
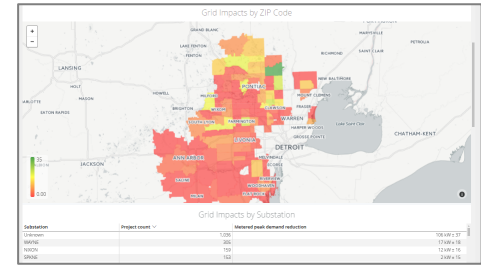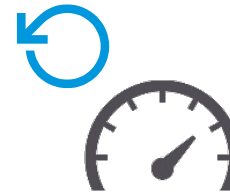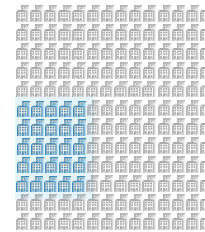
M&V 2.0	EM&V 2.0	Advanced M&V (NY REV)	Automated M&V (NEEP)	ICT-Enabled EM&V (ACEEE)

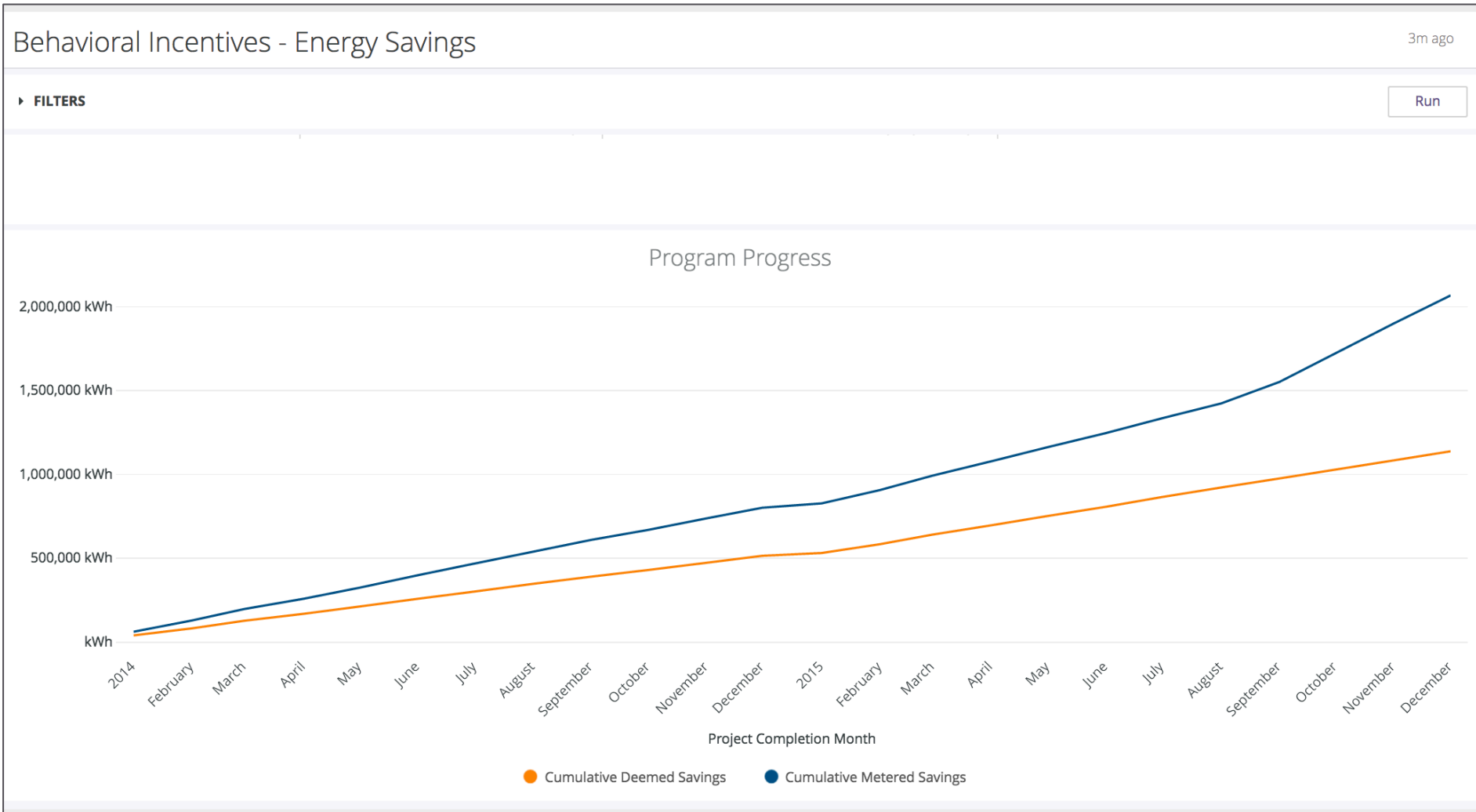# How Does M&V 2.0 Work?

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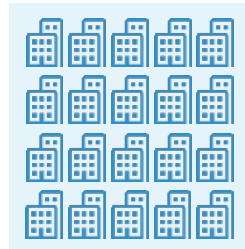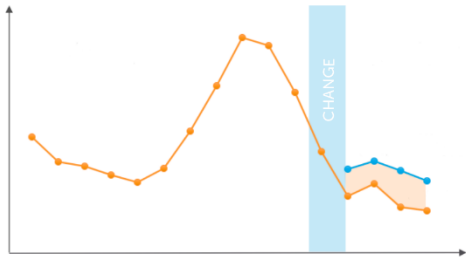
Build weather-normalized models for each customer

Compare changes in usage for treated customers vs. overall population

Repeat analysis for all customers with each new addition of data

Generate dashboard of findings, analytics and actionable insights

Generic Demo – Continuous Measurement

Demo cont... – Mapping Savings on the Grid

Home Solutions - Demand Savings

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Run
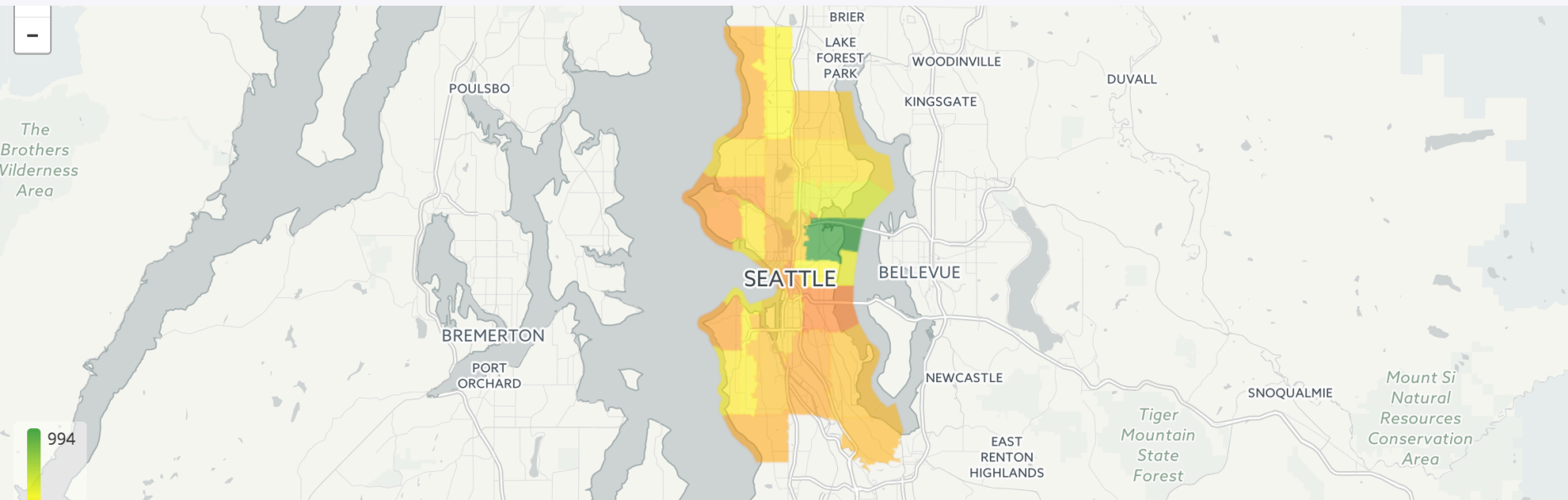
Grid Impacts by Substation

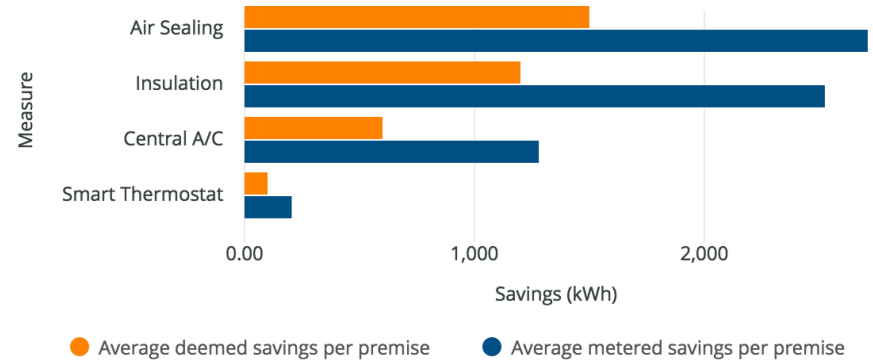| Substation	Project count ∨	Metered savings	Deemed savings
Broad	407	2,391 kW ± 57	1,157 kW
Union	401	2,345 kW ± 55	1,142 kW
Hill	395	1,990 kW ± 55	1,055 kW
West	392	2,608 kW ± 54	1,191 kW
Denny	385	2,324 kW ± 54	1,060 kW

Demo cont… – Measure analysis

Measure Details

"Metered savings" are annualized kWh savings as determined by the EnergySavvy usage data analysis. Only data from directly analyzed premises is shown in all visualizations below. The Measures table and chart only show

Measures

Measure name	Project count ∨	Metered/Deemed Ratio	Average metered savings per premise	Average deemed savings per premise
Insulation	144	210% ± 2%	2,524 kWh ± 22	1,200 kWh
Central A/C	133	213% ± 4%	1,280 kWh ± 23	600 kWh
Air Sealing	113	181% ± 2%	2,711 kWh ± 24	1,500 kWh
Smart Thermostat	103	205% ± 27%	205 kWh ± 27	100 kWh

Measures

Legend:
- ● Average deemed savings per premise
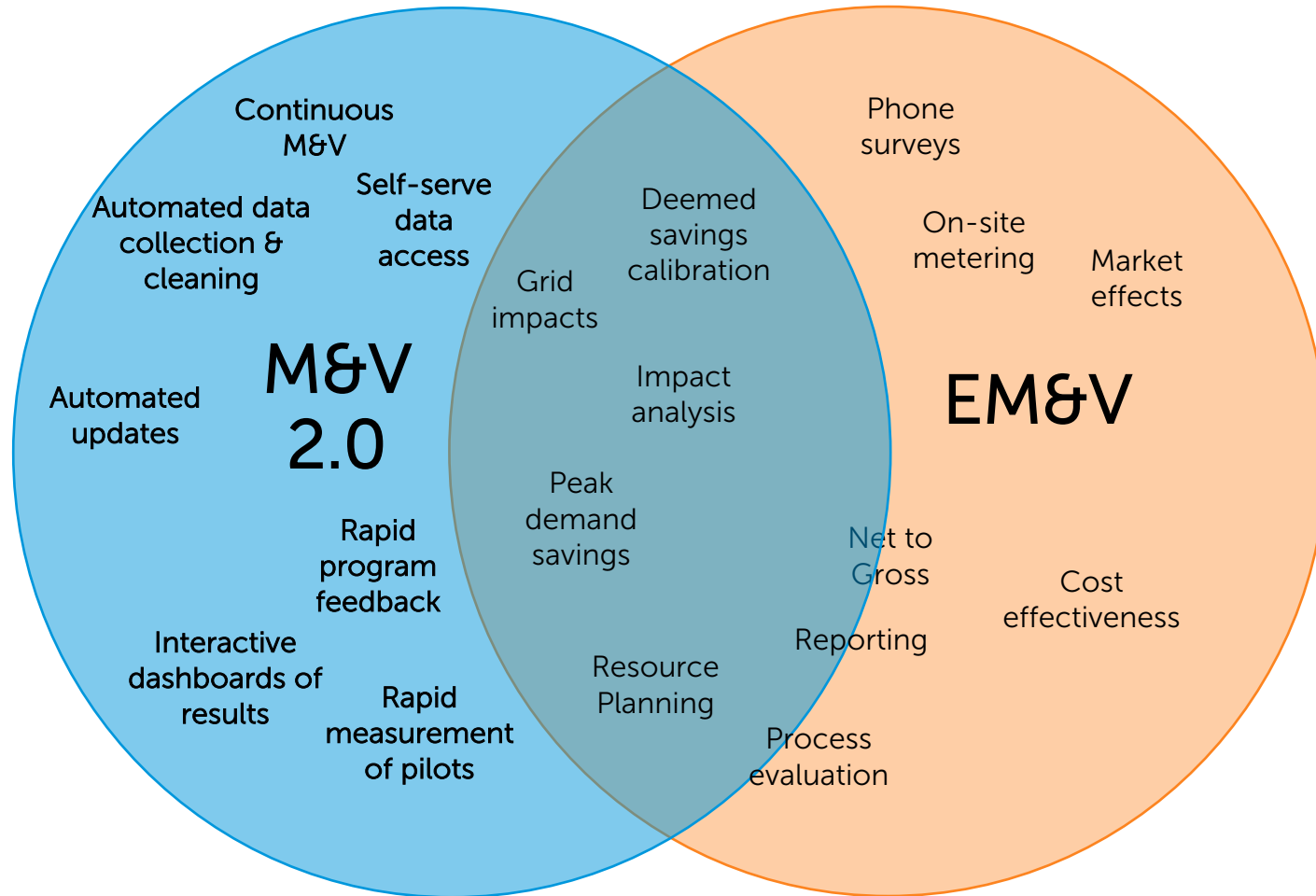- ● Average metered savings per premise

Measure Combinations

Measure name	Project count ∨	Metered/Deemed Ratio	Average metered savings per premise	Average deemed savings per premise
Air Sealing, Central A/C, Insulation, Smart Thermostat	154	220% ± 1%	7,493 kWh ± 21	3,400 kWh
Air Sealing, Central A/C	143	216% ± 1%	4,528 kWh ± 22	2,100 kWh
Insulation, Smart Thermostat	142	167% ± 2%	2,173 kWh ± 22	1,300 kWh
Air Sealing, Central A/C, Smart Thermostat	142	209% ± 1%	4,607 kWh ± 22	2,200 kWh
Air Sealing, Insulation	139	201% ± 1%	5,417 kWh ± 22	2,700 kWh
Air Sealing, Insulation, Smart Thermostat	136	183% ± 1%	5,117 kWh ± 22	2,800 kWh
Central A/C, Insulation	133	202% ± 1%	3,628 kWh ± 23	1,800 kWh
Central A/C, Insulation, Smart Thermostat	133	202% ± 1%	3,844 kWh ± 22	1,900 kWh
Air Sealing, Central A/C, Insulation	129	209% ± 1%	6,893 kWh ± 23	3,300 kWh
Central A/C, Smart Thermostat	127	198% ± 3%	1,385 kWh ± 24	700 kWh
Air Sealing, Smart Thermostat	109	196% ± 2%	3,130 kWh ± 25	1,600 kWh

M&V 2.0 and EM&V

M&V 2.0:
- Continuous M&V
- Self-serve data access
- Automated data collection & cleaning
- Automated updates
- Rapid program feedback
- Interactive dashboards of results
- Rapid measurement of pilots

Overlap:
- Grid impacts
- Deemed savings calibration
- Impact analysis
- Peak demand savings
- Resource Planning
- Net to Gross
- Reporting
- Process evaluation

EM&V:
- Phone surveys
- On-site metering
- Market effects
- Cost effectiveness

M&V 2.0: FAQ's

AMI or Interval data?
- 2.0 applications are meter agnostic and work with interval, monthly or bi-monthly meter data

>10% avg savings per project?
- A billing analysis with an M&V 2.0 approach can estimate savings down to 1%

Black box?
- EnergySavvy provides a written methodology to clients, evaluators and regulators. Same as done by traditional evaluators.

Replacing evaluation?
- M&V 2.0 tools enhance and support formal third party evaluation. They are not intended as a replacement.

National Landscape

M&V 2.0 Outside of Michigan

States taking policy action on M&V 2.0

State	Actions Related to M&V 2.0
NY	2016: PSC orders incentives related to EE net savings are "tied to advances in EM&V that utilize direct customer information." 2016: EM&V Guidance establishes "Advanced M&V" as part of the formal evaluation process for state energy efficiency programs.
CA	2015: Order requires "data collection strategies embedded in the program" and "internal performance analysis during deployment." 2015: law defaults to use of "normalized metered energy consumption" for M&V
CT	2015 Order directs $1 million of annual EM&V budget to "direct measurement and verification" 2016 State receives DOE SEP grant for EM&V 2.0 pilots

M&V 2.0 Outside of Michigan cont...

States taking policy action on M&V 2.0

State	Actions Related to M&V 2.0
NM	2016 Statewide RFP include optional scope for "M&V 2.0" solutions
MO	In progress: Guide on how EM&V 2.0 can EE programs and TRM updates
IL	2016, Future Energy Jobs Act: when practical, shall "incorporate advanced metering infrastructure data into the planning, implementation, and evaluation of energy efficiency...
MD	Feb 2017: EmPOWER order calls for use of "tracking actual energy savings...in real time..." for the home performance program
MA	April 2017: Dept of Energy Resources announces market-based residential EE pilot with M&V 2.0 component to measure savings and pay incentives

NY Evaluation Guidance in detail

Three important policy changes

#1 – Encouraging M&V 2.0
"Program administrators and evaluators are encouraged to use advanced M&V techniques…"

#2 – Budget sharing
"In instances where advanced M&V tools support program implementation and evaluation, the costs of implementing systems that generate data may be shared between program implementation and evaluation budgets."

#3 – Formal impact analysis
"In instances where advanced M&V tools are providing continuous savings estimates for a particular energy efficiency activity, and the data and analysis has been assessed to determine the reliability of the information, program administrators may be able to extend program EM&V cycles and rely on the advanced M&V tools to provide interim impact results."

Industry Update

#Trending – M&V 2.0 Catching Attention Across the Industry

Lawrence Berkeley National Lab formed M&V 2.0 National Stakeholder Group
- First meeting January 2017. Utilities, academics, regulators, evaluators and M&V 2.0 providers.

Midwest interest in M&V 2.0 is growing
- IL Commerce Commission held policy session on 2/27 in Chicago
- Potentially slated for Mid-American (MARC) Regulatory 2017 Conference

Growing topic at conferences
- Four M&V 2.0 sessions at last ACEEE Summer Study
- M&V 2.0 panel at National Regulatory (NARUC) summer meeting in 2016
- Topic at next International Evaluation (IEPEC) conference

Hot off the Press – March 2017!

Rocky Mt Institute: The Status and Promise of Advanced M&V

Collaborative Study involved DOE, Utilities, Evaluators, and Analytics Firms

Automated analytics that can provide **ongoing, near-real time savings estimates**

Increased data granularity in terms of frequency, volume, or end-use detail

M&V 2.0 benefits evaluators, program administrators, regulators, grid operators and others.

> " *Advanced M&V can increase the value of evaluation, reduce costs through automation, enhance program targeting, allow for early adjustments to program designs and budgets, and increase accuracy of savings estimates to support EE as a resource.*"

Basic Case Study

Does it work?
Is it accurate?
How long does it take?

Case Study: PSEG Long Island

Can M&V 2.0 match the existing results in less time w/ bimonthly data?

1,100 Homes in HPD program → Reproduce evaluation results with **M&V 2.0** → Reliable estimate of performance 7 months into program → **6%** margin of error
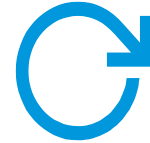
Pending Case Study

Embedding 2.0 into formal evaluation process

Formal EM&V: Illustrative example

EnergySavvy & EM&V firm jointly evaluating Res HVAC program
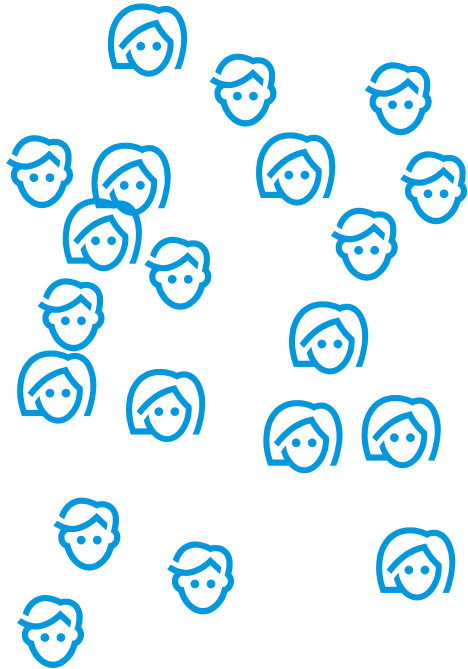
| Collaboration on models | Continuous reporting | Supplemental evaluator work | Early insights and feedback |

Case Study on Faster Feedback

How can we optimize programs?

Case Study: Contractor Management

Challenge
Managing a large
network of contractors

Solution
Monitor performance of
individual contractors

60+
independent
contractors

Continuous monitoring of
programs and contractor
performance

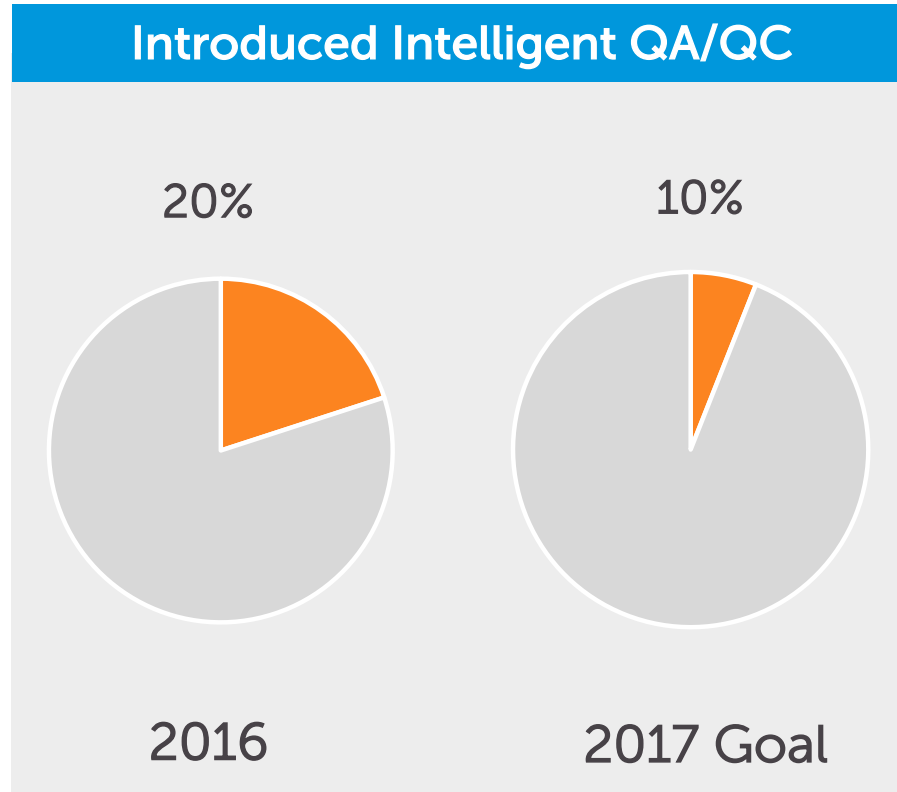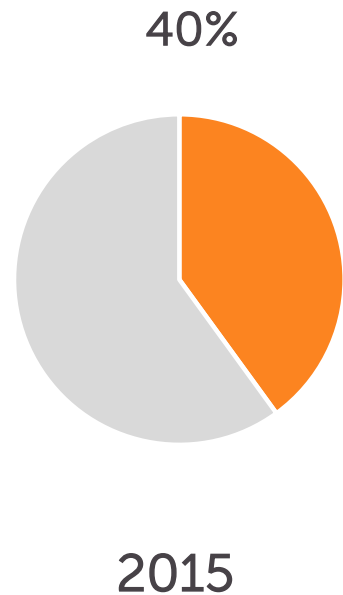# Case Study: Contractor Scorecard

Challenge
Contractors are unaware of their project performance

Solution
Issue scorecards to contractors to communicate performance of projects

Case Study: Attic Inspections

Introduced Intelligent QA/QC

40%

2015

20%

2016

10%

2017 Goal

Challenge
Reduce costs and intrusiveness of QA/QC process

Solution
Use intelligent monitoring to reduce and target # of QA/QC inspections

APS shifted approximately 25% of the overall inspection budget to directly improve the program.

All percentages are the percent of total annual projects (assumes 2,000 projects/year)

aps Case Study: Outcome-based marketing

Identifying qualified customers with Program Optimization

2x Program participation

2x Energy savings per home

Identify customers with high potential for savings using Program Optimization

Target them with an email blast

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