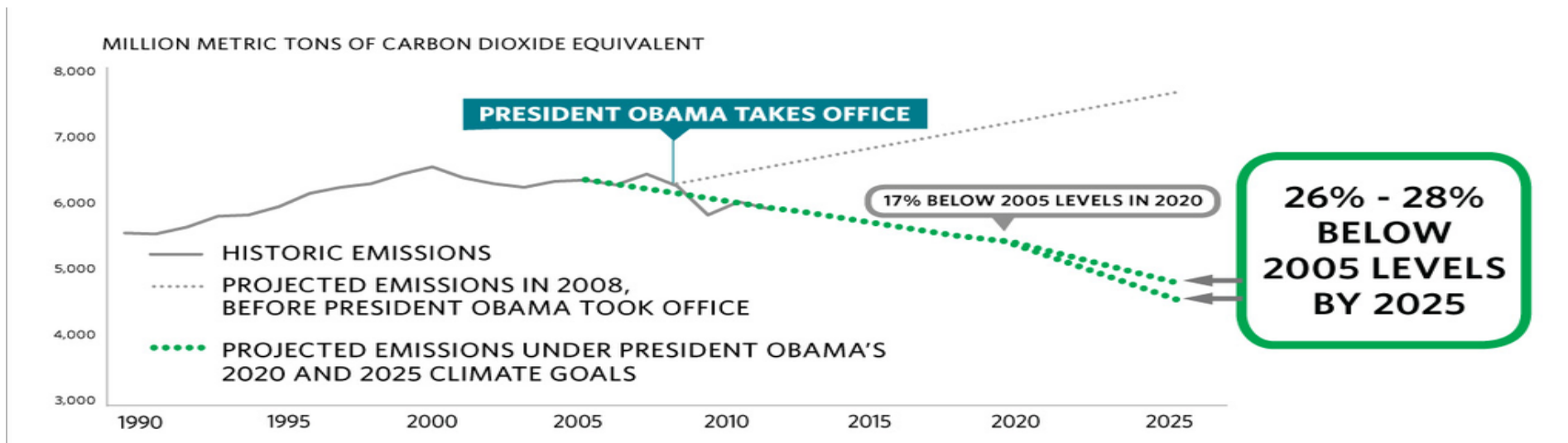# Data-Driven Policymaking

June 2015

Elena Alschuler

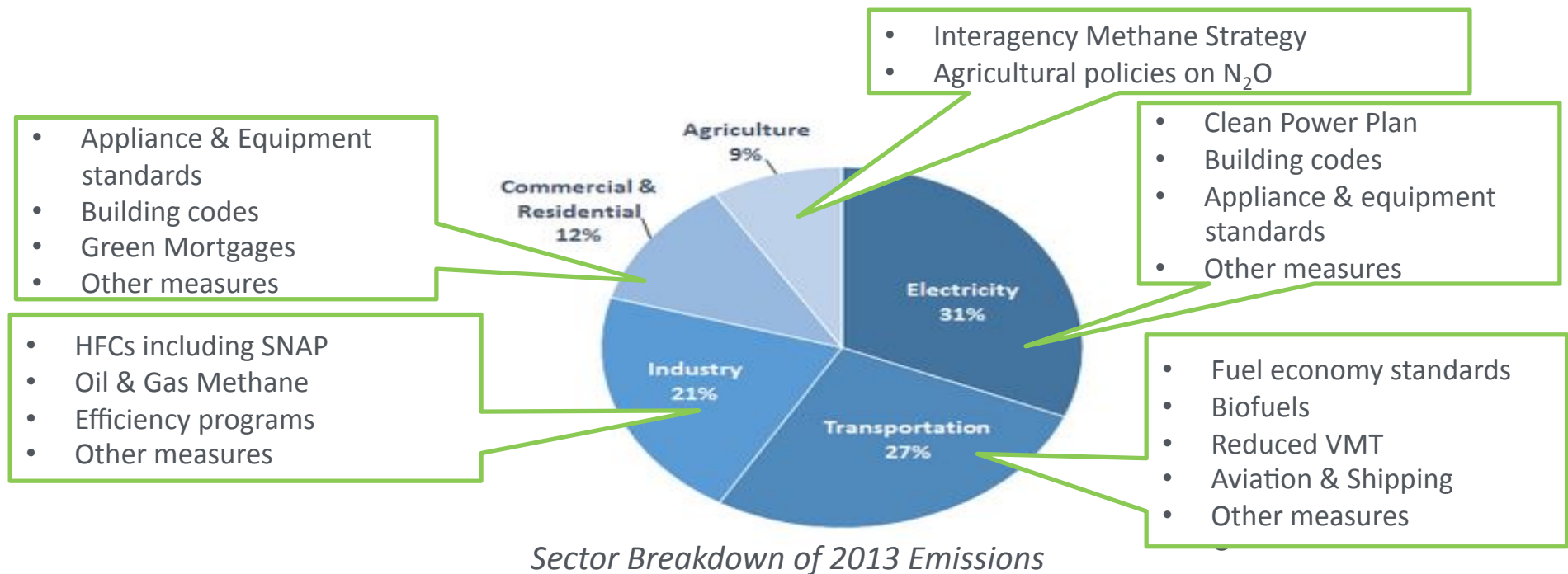**Elena.alschuler@ee.doe.gov**
Building Technologies Office

U.S. Department of Energy

President's Climate Action Plan: 2025 Targets

MILLION METRIC TONS OF CARBON DIOXIDE EQUIVALENT

PRESIDENT OBAMA TAKES OFFICE

17% BELOW 2005 LEVELS IN 2020

26% - 28% BELOW 2005 LEVELS BY 2025

HISTORIC EMISSIONS

PROJECTED EMISSIONS IN 2008, BEFORE PRESIDENT OBAMA TOOK OFFICE

PROJECTED EMISSIONS UNDER PRESIDENT OBAMA'S 2020 AND 2025 CLIMATE GOALS

- Robust action brings us in range of 26-28% below 2005 levels by 2025
- Doubling of decarbonization pace
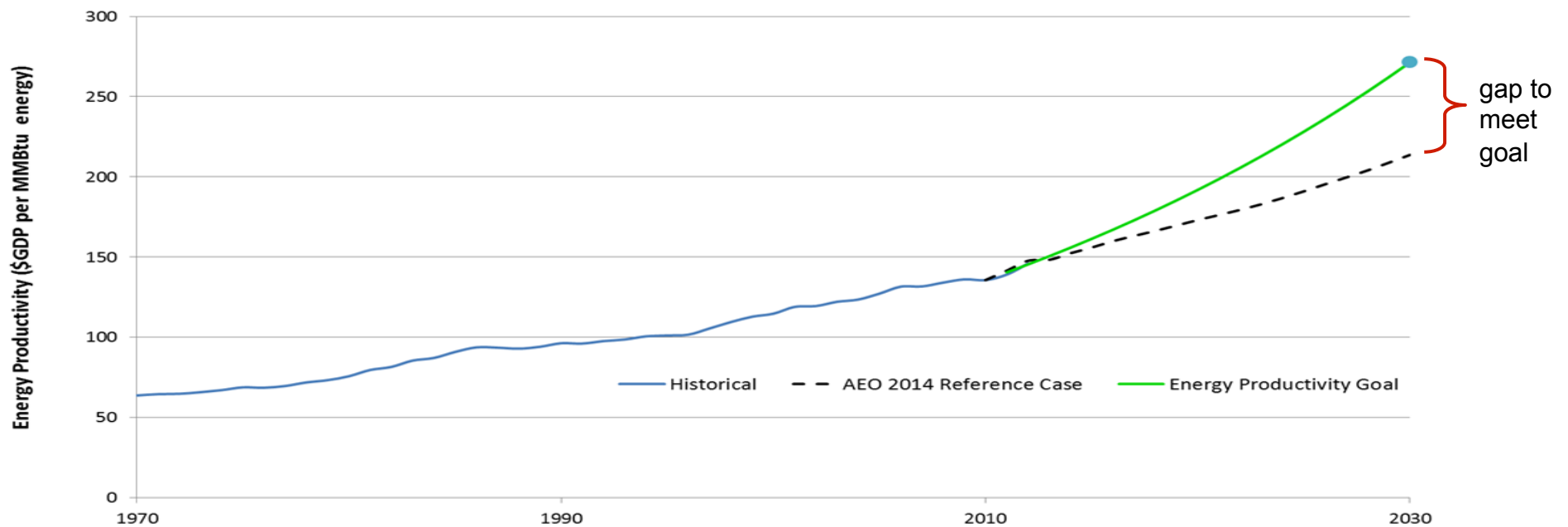- Consistent with reductions of >80% by 2050

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US Climate Action Plan: Strategies by Sector

- Interagency Methane Strategy
- Agricultural policies on N_2O

- Appliance & Equipment standards
- Building codes
- Green Mortgages
- Other measures

- Clean Power Plan
- Building codes
- Appliance & equipment standards
- Other measures

- HFCs including SNAP
- Oil & Gas Methane
- Efficiency programs
- Other measures

Agriculture 9%

Commercial & Residential 12%

Electricity 31%

Industry 21%

Transportation 27%

- Fuel economy standards
- Biofuels
- Reduced VMT
- Aviation & Shipping
- Other measures

Sector Breakdown of 2013 Emissions

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Accelerate Energy Productivity 2030

Energy productivity $=$ $\dfrac{\text{GDP}}{\text{primary energy}}$

"[We] will take action aimed at **doubling the economic output per unit of energy consumed** in the United States by 2030, relative to 2010 levels."

President Obama, 2013 State of the Union

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4

Need ~20 quads energy savings *or* ~$6T GDP increase *or* combo

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Using data for policy-making: Appliance Standards

- Pursuant to the Energy Policy and Conservation Act of 1975 (EPCA), any new or amended energy conservation standard must be designed to achieve the *maximum improvement in energy efficiency that is technologically feasible and economically justified*. (42 U.S.C. 6295(o)(2)(A))

- Technical data collected for analysis include:

  – Engineering data, performance data, technological feasibility, product testing data, energy use

- Economic data collected for analysis include:

  – Manufacturing capacity, employment, cost and capital requirements , cash flow, capital investment, energy prices, discount rates

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Analysis used to determine Appliance Standards

- Analysis using technical data: maximum technologically feasible level, product classes, energy savings, average life-cycle cost, efficiency levels

- Analysis using economic data: manufacturer cost estimates, national impact analyses, payback period, energy use analysis, net present value

- The results of the technical and economic analyses inform the development of Technology Standard Levels (TSLs)

Table: Trial Standard Levels for Residential Dehumidifiers*

TSL	PC1 ≤ 30.00 pints/day		PC2 30.01 − 45.00 pints/day		PC3 > 45.00 pints/day		PC4 ≤ 8.0 ft³		PC5 >8.0 ft³	
	EL	AEU kWh/yr	EL	AEU kWh/yr	EL	AEU kWh/yr	EL	AEU kWh/yr	EL	AEU kWh/yr
--	0	720	0	1,030	0	905	0	951	0	1,137
1	1	505	1	808	1	781	1	809	1	1,016
2	2	463	2	693	2	670	1	809	2	784
3	3	428	3	607	2	670	1	809	2	784
4	4	355	4	540	3	513	2	671	3	617

- DOE considers the impacts of each TSL on the manufacturer and economy to determine which level is economically justified to be set as the appliance standard

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How to achieve data-driven policy for buildings?

DOE's vision for the future:

Energy performance *information and analytical tools are available and accurate at all levels of granularity throughout a building's lifecycle*, enabling decision makers to better implement energy efficiency programs and policies and better understand the potential for and impacts of investing in energy efficiency.

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Goal 1: Integrate energy-related information throughout building lifecycle

Design

Build

Operate

ENERGY STAR Portfolio Manager®
— Tracks actual building energy usage

Energy Asset Score
— Rates physical and structural building performance
— Recommends energy efficiency improvements

Advanced Energy Design Guides
— Provide sector-specific solutions to construct highly energy efficient buildings
— Offer tools to reach 50% energy savings above standard code

Open Studio
— Assists code compliance
— Provides design options that incorporate energy use

Building Component Library
— Energy model attributes

Building Energy Asset Score

- Rating tool that provides a whole-building score and identifies inefficient systems and potential capital upgrades, based on <u>as-built physical characteristics</u> (independent of operations)

- User input data used to run an energy model, generate a 1-10 score, and identify opportunities to upgrade building efficiency
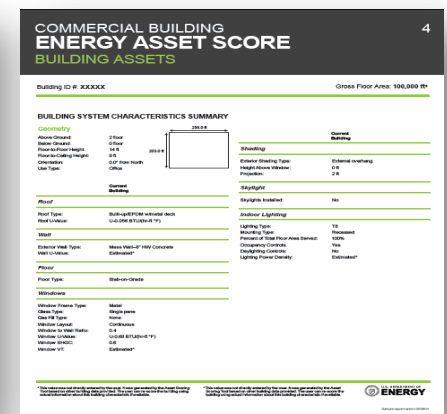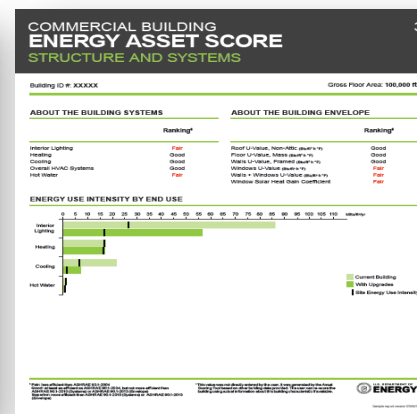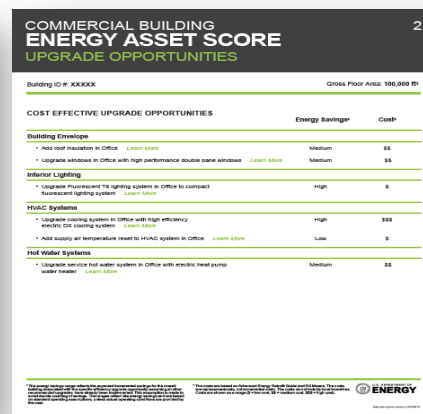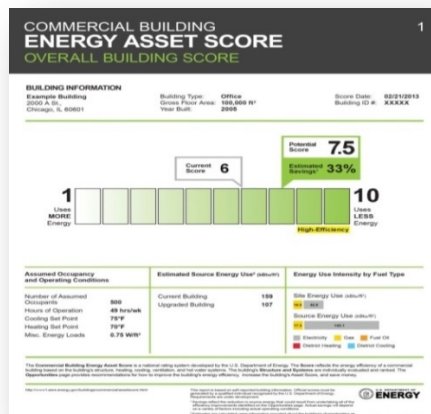
ENERGY STAR Portfolio Manager

- Tool that tracks energy and water consumption, and provides a weather normalized Energy Use Intensity and a 1-100 score based on building performance.
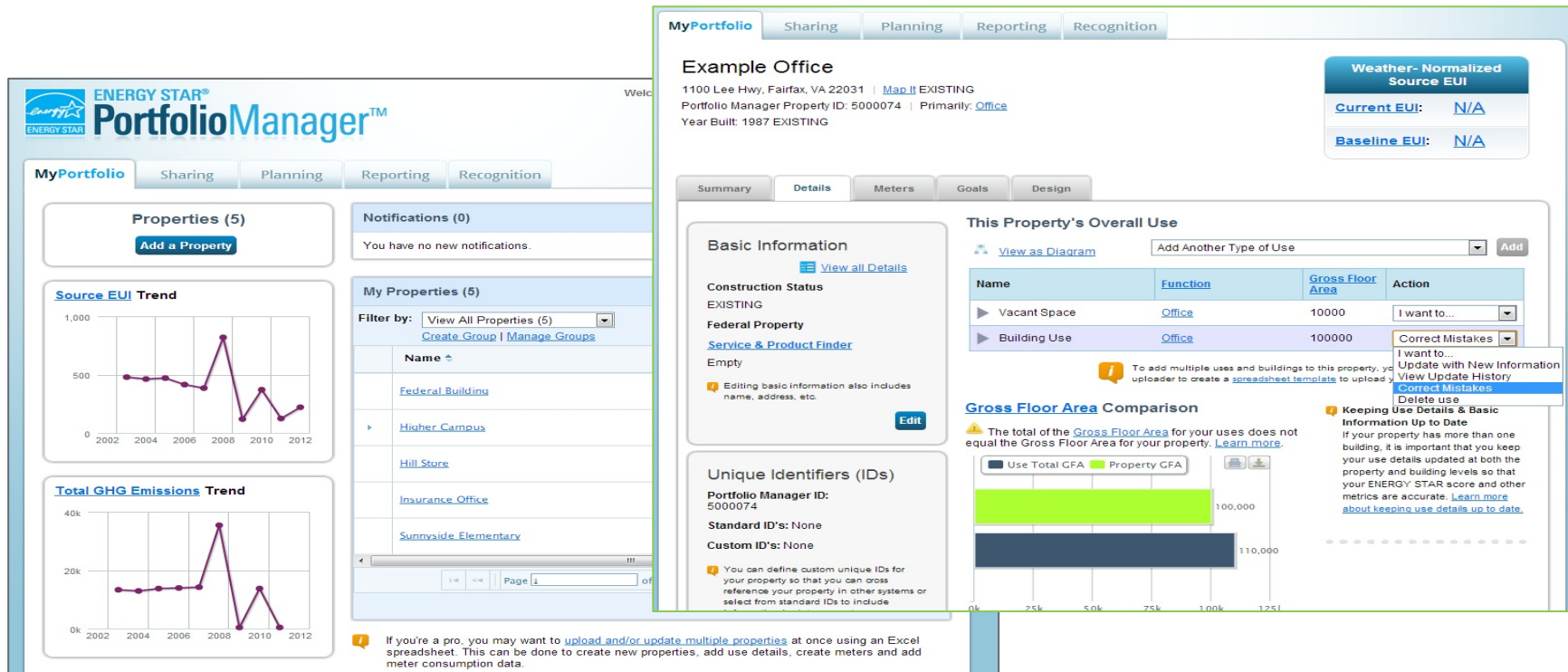
Goal 2: Increase availability & consistency of energy-related information

Transmit

HPMXL Residential Audit

BUILDINGSYNC Commercial Audit

GREEN BUTTON Utility Energy Data

Harmonize

SEED PLATFORM Software that combines existing datasets into single platform designed for buildings

Compare

BPD BUILDING PERFORMANCE DATABASE — Public database of anonymized building energy performance

BEDES BUILDING ENERGY DATA EXCHANGE SPECIFICATION — Dictionary of common terms to ensure interoperability between data tools

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Building Energy Data Exchange Specification

- Dictionary of terms, definitions, and field formats to facilitate the exchange of information on building characteristics and energy use

- Improve data quality and decrease the cost and time involved in aggregating and sharing data

- Support for industry-wide standardization increases the efficiency of business processes and helps grow the market of products and services that utilize energy data
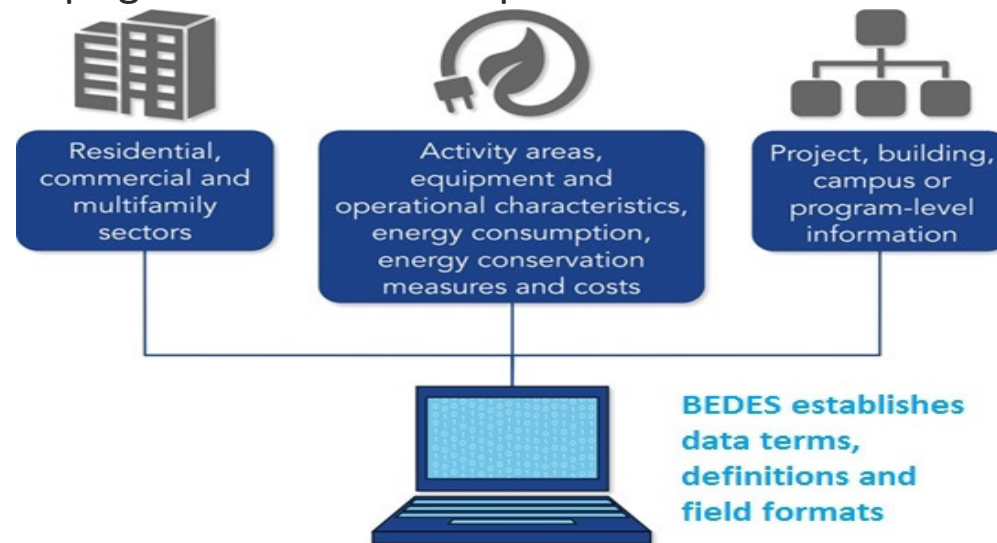
Green Button Initiative

- Consumer access to energy data in electronic format

- Enables development of software applications

- Available to 50+ million customers now and 60+ million in the future

- Based on North American Energy Standards Board (NAESB) Energy Services Provider Interface (ESPI) standard
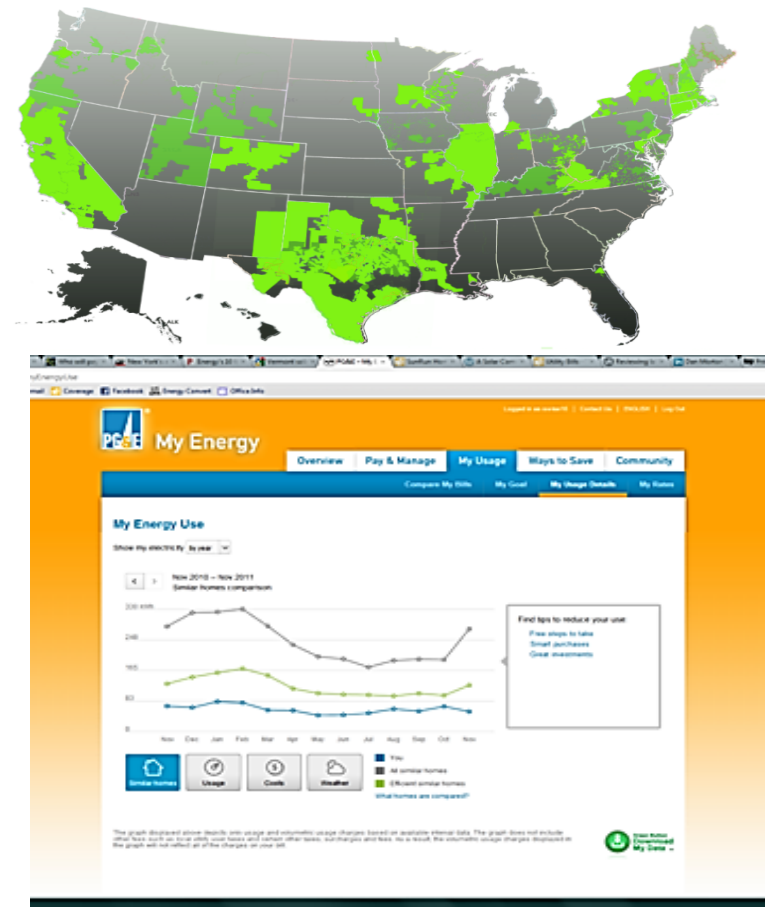
Standard Energy Efficiency Data Platform

- Open source software that manages data about large groups of private and/or public buildings

- Combine data from multiple sources, clean it, and share it with others

- The open source and extensible platform can support apps and connect to other software

Buildings Performance Database

- The BPD is the largest publicly-accessible dataset of information about the physical and operational characteristics of real buildings (>750,000 bldgs incl. CBECS/RECS)
- Explore data across real estate sectors, compare trends in the energy performance, and tailor programs and policy design based on the conditions of the local building stock
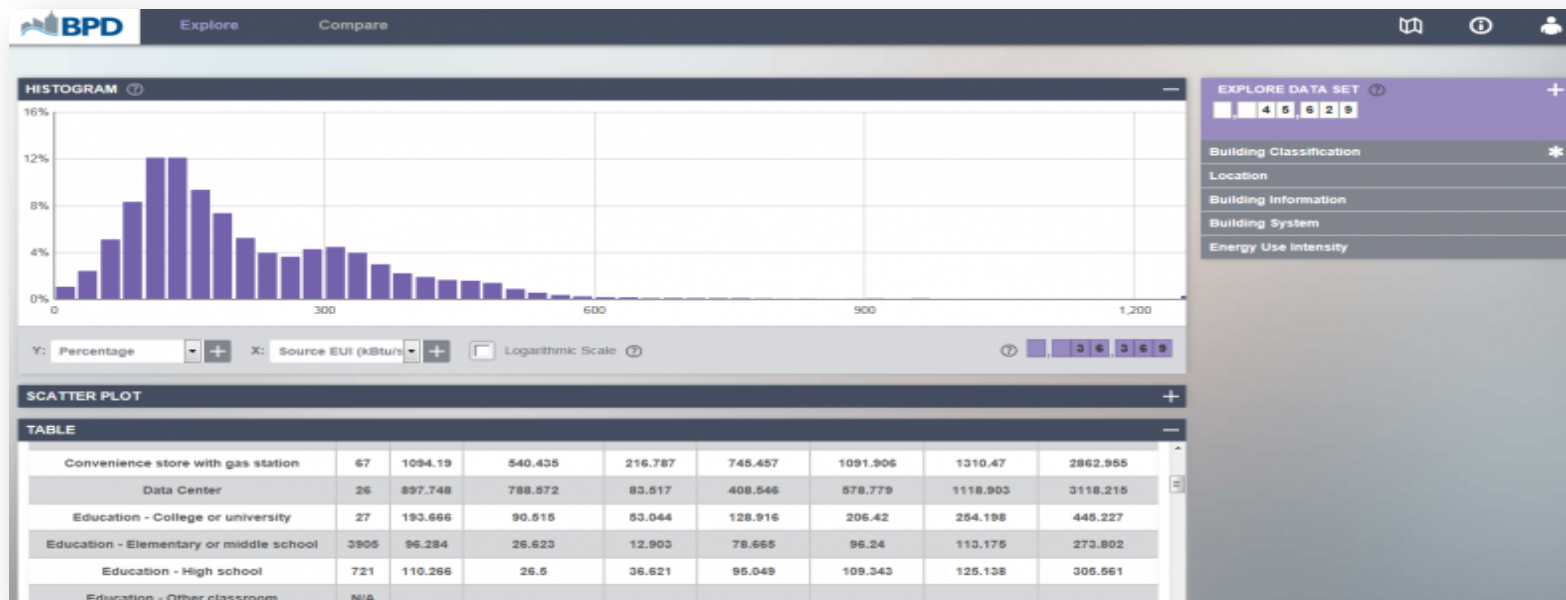
The future of M&V

Building-level M&V Will Evolve

- Energy efficiency = measuring something that never happened
- M&V has generally existed for two audiences:
  - <u>Project Owners</u> who want to know if they're getting what they paid for
  - <u>Utility Regulators</u> who want to know if funds are well-spent
- In present and near future it may have two more audiences:
  - <u>Buyers in capacity markets</u> who want to keep the lights on
  - <u>State and federal air regulators</u> who want to meet air pollution regs
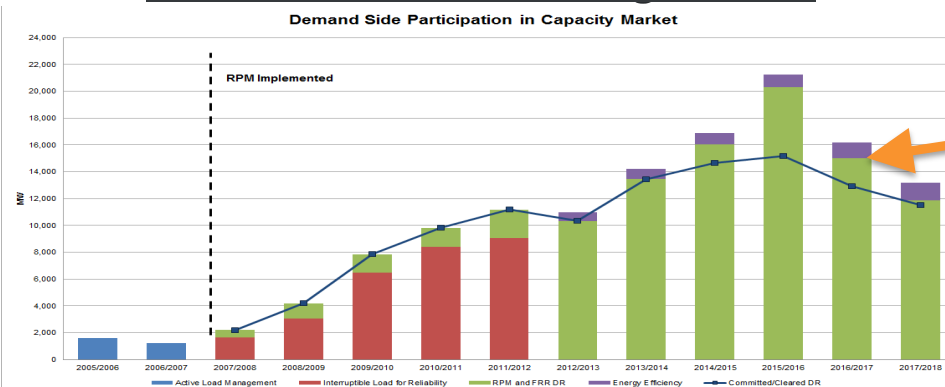
Purple = EE in PJM Capacity Market

Uniform Methods Project

DOE is developing a framework and a set of protocols for determining the energy savings from specific energy efficiency measures and programs. The protocols provide a straightforward method for evaluating gross energy savings for common residential and commercial measures offered in ratepayer-funded initiatives in the United Sates.
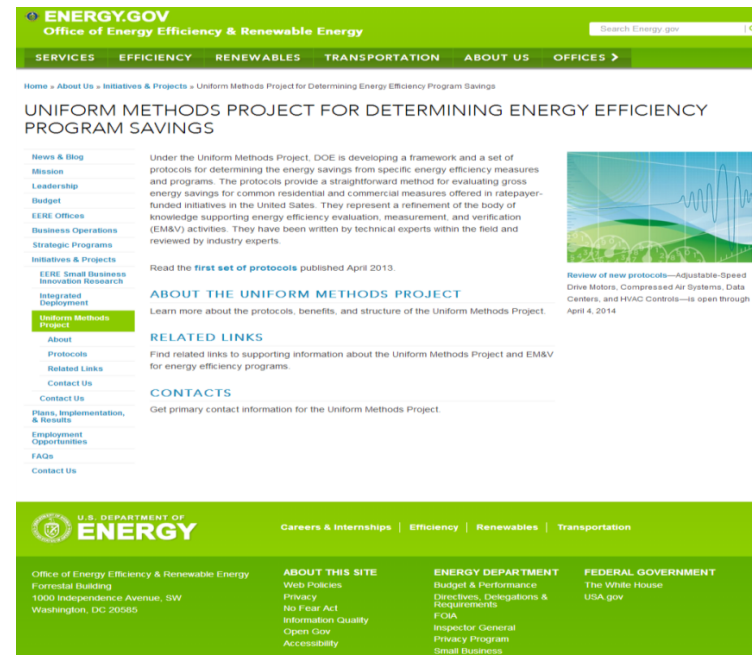
DOE Motivation: Industry Need

Today

- Site-by-site M&V, **costly, difficult to scale, hard to calculate accuracy**

- **Small savings**, single-measure, modest programs **can get lost in noise**

- M&V by EMIS done in a **black box** – no disclosure of accuracy
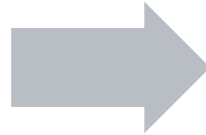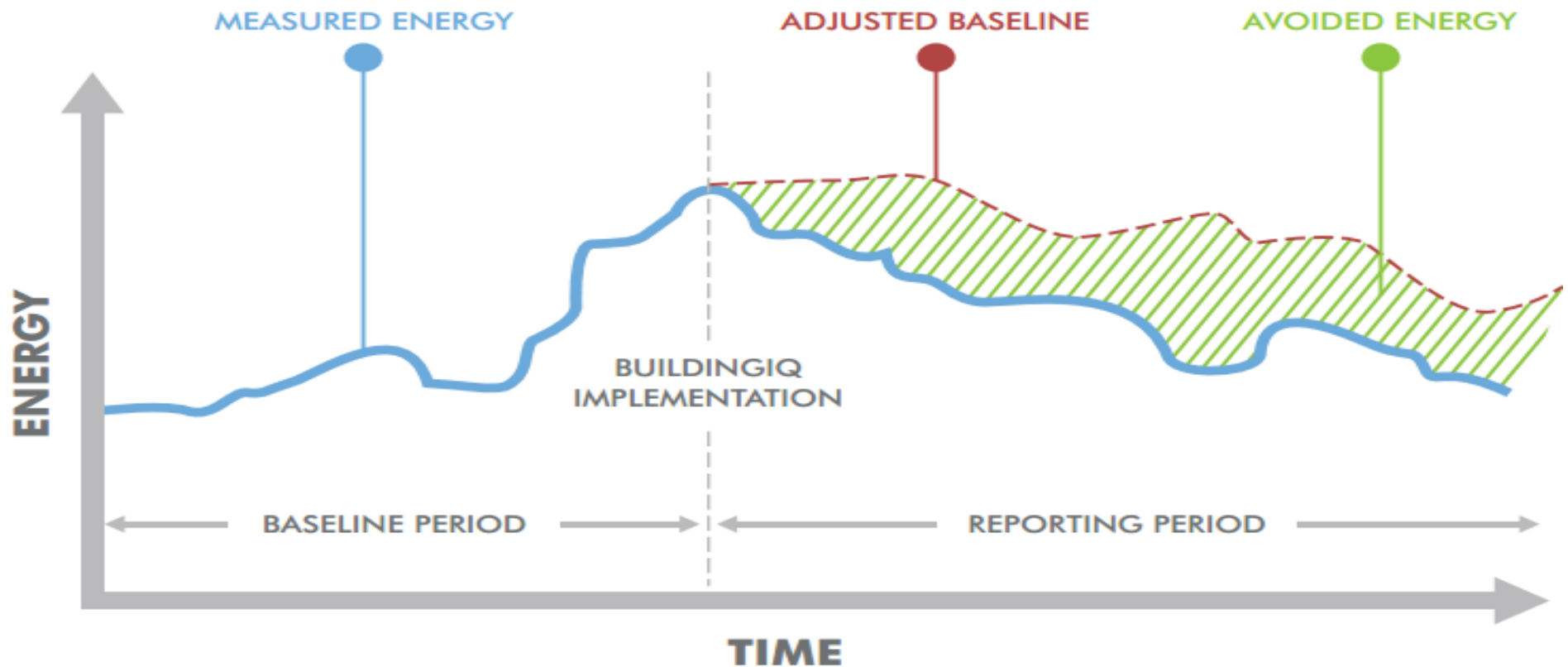
Promise of M&V 2.0

- Cost-effective whole building M&V, **automated to scale**

- **Whole building multi-measure programs** deliver **deeper savings,** including O&M, behavioral measures

- **Accuracy** of baseline models, uncertainty in savings are **disclosed**

Whole Building M&V 2.0 Advantages

Much of the promise of M&V 2.0 centers on quality

- Comprehensive: accounts for all ECM savings, including interactive effects
- Simple: few data streams required
- Shorter monitoring requirements: Baseline model development and savings estimations based on months, not years
- Higher quality: Estimates savings uncertainty
- Persistence: Fast feedback on building performance
- Scalable: one methodology for all buildings
- Lower administration costs: standardization & automation reduces time for savings analysis & technical review
- Tool Availability: public domain and embedded in EMIS

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Many in the market claim to be doing this

Source: **Building IQ**

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Protocol to Assess Baseline Performance Accuracy

- Premise: statistical performance metrics can be used to evaluate automated baseline methods
  - To determine and compare accuracy of both **proprietary** and '**open**' methods

- Objective test protocols can remove key barriers – questions of accuracy, transparency and performance
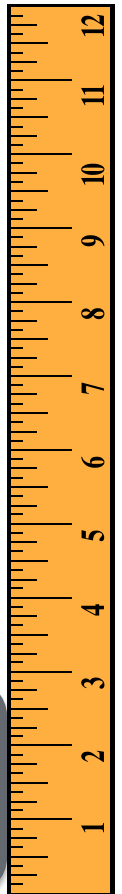
Planned Outcomes:
- Testing methodology, framework for use by public
- Performance metrics most relevant to M&V use case
- Ability to compare contrast tools/model accuracy based on those metrics

How to achieve data driven policy-making for buildings

- DOE is building tools and resources intended to serve as the foundation for policy-making and private market activity

- Questions for this group:

- *How can we get more value out of the data that is already being collected?*

- *How can we make it easier to implement data tracking and analysis tools?*

- *How can we set ourselves up for success as data becomes increasingly available?*

Thank you!

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