Savings Through Standards: The Impact of Energy Efficiency Appliance Standards

November 10, 2016

MEEA
MIDWEST ENERGY EFFICIENCY ALLIANCE

Agenda

- 10:00-10:20 Andrew deLaski & Joanna Mauer, Appliance Standards Awareness Project
- 10:20-10:35 Nick Mark, CenterPoint Energy
- 10:35-10:50 Dan Cote, CLEAResult
- 10:50-11:00 Question and Answer

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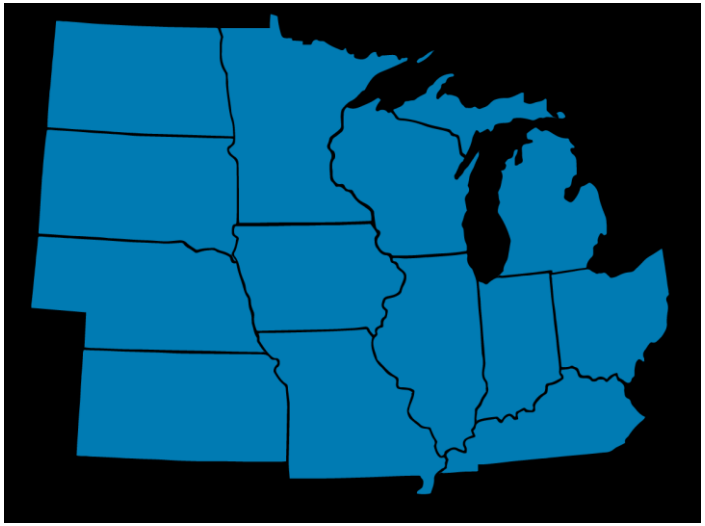
About MEEA

The Trusted Source on Energy Efficiency

We are a nonprofit membership organization with 160+ members, including:

- Utilities
- Research institutions and manufacturers
- State and local governments
- Energy efficiency-related businesses

As the key resource and champion for energy efficiency in the Midwest, MEEA helps a diverse range of stakeholders understand and implement cost-effective energy efficiency strategies that provide economic and environmental benefits.



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MEEA Webinar

Next Generation Standards:

How the National Energy Efficiency Standards Program Can Continue to Drive Energy, Economic, and Environmental Benefits

Andrew deLaski and Joanna Mauer

Appliance Standards Awareness Project

November 10, 2016

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Presentation outline

- ASAP overview
- Context for report
- Research and methodology
- Findings
- Products
  - Top 10
  - Products of interest to the Midwest
- Recommendations for increasing savings

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Appliance Standards Awareness Project

- ASAP organizes and leads a broad-based coalition which works to advance, win and defend new appliance, equipment and lighting standards which deliver large energy and water savings, monetary savings and environmental benefits.

- Founded in 1999 by ACEEE, NRDC, ASE and Energy Foundation

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ASAP Steering Committee

- American Council for an Energy-Efficient Economy*
- Alliance to Save Energy*
- Energy Foundation*
- Natural Resources Defense Council*
- Alliance for Water Efficiency
- California Energy Commission
- Consumer Federation of America
- Earthjustice
- National Consumer Law Center
- Northeast Energy Efficiency Partnerships
- Northwest Power and Conservation Council
- Pacific Gas and Electric Company

*Founders

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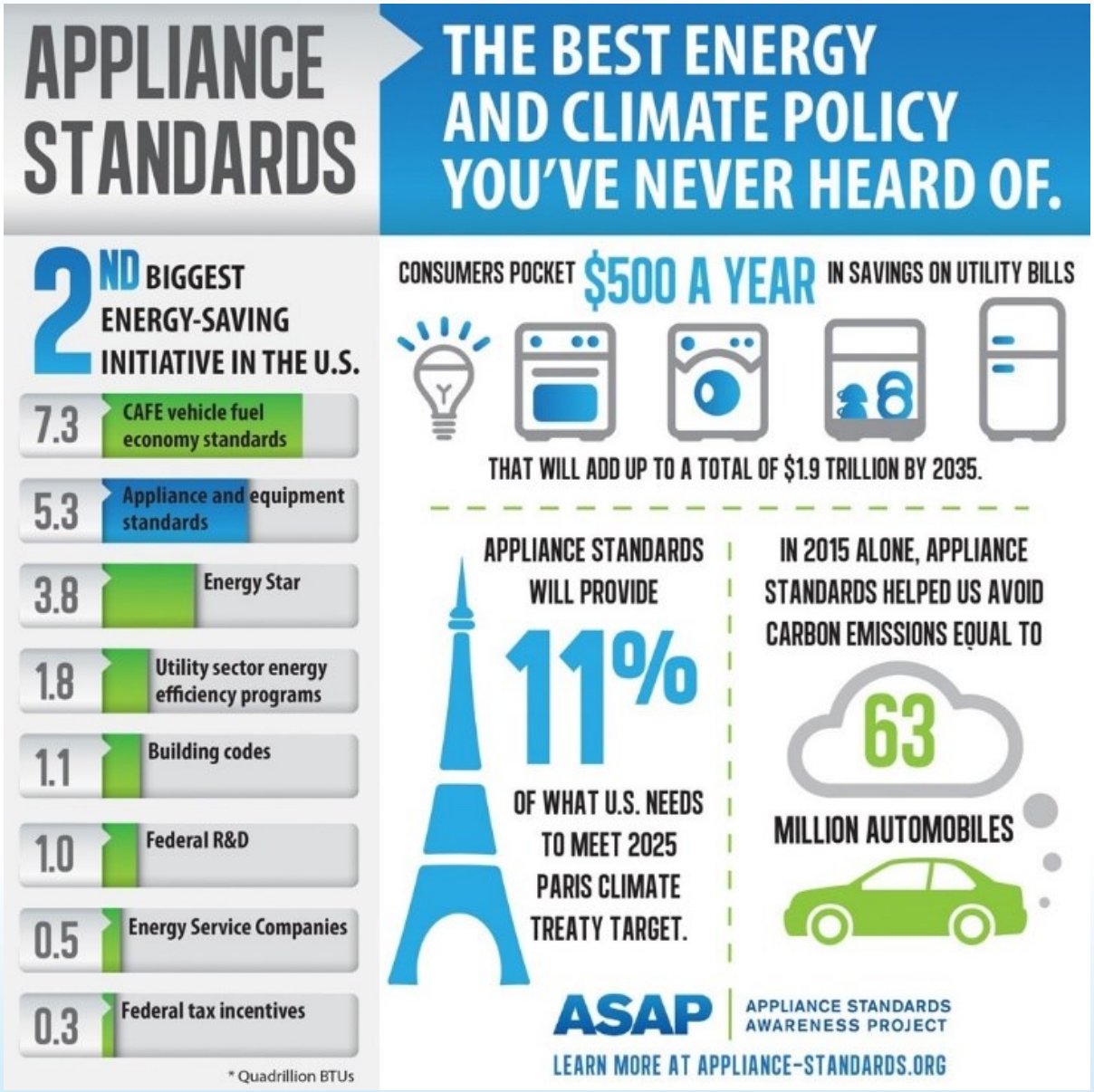

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Research questions

- With so much progress to date, especially over the past eight years, **what is the potential for future savings with updates to existing national standards**?

- What **strategies** could be employed **to further increase savings available from standards (within the constraints of existing law)**?

ASAP | APPLIANCE STANDARDS AWARENESS PROJECT

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APPLIANCE STANDARDS

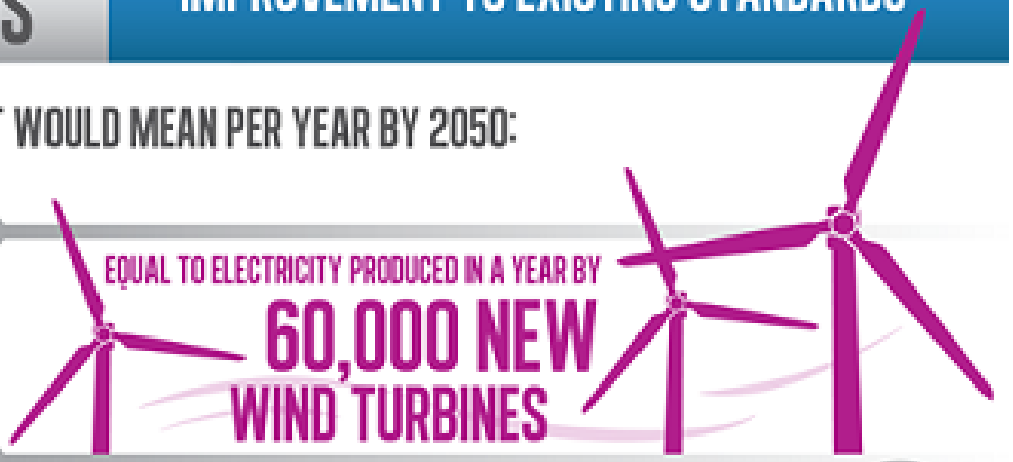
THERE IS STILL ENORMOUS ROOM FOR IMPROVEMENT TO EXISTING STANDARDS

HERE'S WHAT THAT WOULD MEAN PER YEAR BY 2050:

ELECTRICITY SAVINGS

335 BILLION KILOWATT HOURS (KWH)

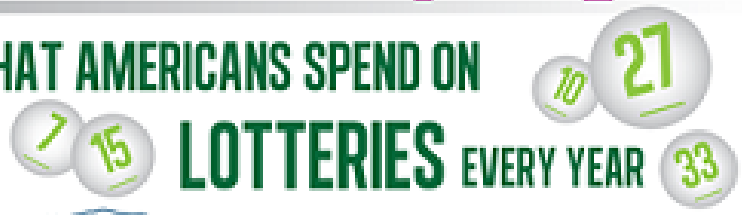
EQUAL TO ELECTRICITY PRODUCED IN A YEAR BY **60,000 NEW WIND TURBINES**



LOWER UTILITY BILLS

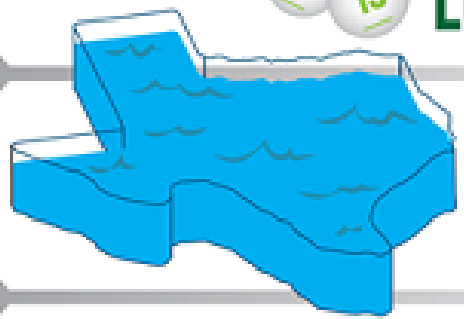
$65 BILLION

ABOUT WHAT AMERICANS SPEND ON **LOTTERIES** EVERY YEAR



WATER SAVED

850 BILLION GALLONS



EQUAL TO WHAT **TEXAS** HOUSEHOLDS USE IN A YEAR

CLIMATE EMISSION CUTS

200 MILLION METRIC TONS OF CARBON DIOXIDE

EQUAL TO ANNUAL POLLUTION FROM **60** COAL-FIRED POWER PLANTS

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Methodology

- Savings through 2050 from post-2016 standards for **45 products** based on:
  - existing technology
  - product scopes
  - test procedures
- Estimates of final rule and compliance dates based on statutory requirements
  - Compliance dates: **2022-2029**

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Methodology (cont'd)

- Baseline: current standards or standard levels recently proposed or finalized
- Efficiency levels analyzed:
  - For most products, max-tech level from most recent DOE rulemaking
  - For plumbing products (faucets, showerheads, toilets, urinals), CA standards
- Assumptions for compliance rates absent a new standard:
  - For products without an ENERGY STAR specification: 10%
  - For products with an ENERGY STAR specification: 25%

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Residential products

- Appliances
  - Clothes dryers
  - Clothes washers
  - Dehumidifiers
  - Microwave ovens
  - Ranges and ovens
  - Refrigerators and freezers
  - Wine Chillers
- HVAC
  - Boilers
  - Central AC & heat pumps
  - Direct heating equipment
  - Furnaces
  - Furnace fans
  - Portable AC
  - Room AC
- Electronics
  - Battery chargers
  - External power supplies
- Lighting
  - General service lamps
  - Incandescent reflector lamps
- Plumbing products
  - Faucets,
  - Showerheads
  - Toilets
- Water Heaters
- Other
  - Ceiling fans
  - Pool heaters

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Commercial/industrial products

- Automatic ice makers
- Beverage vending machines
- Comm. boilers
- Comm. clothes washers
- Comm. furnaces
- Comm. packaged AC and heat pumps
- Comm. refrigeration equipment
- Comm. three-phase AC and heat pumps
- Comm. water heaters
- Compressors
- Computer room AC
- Distribution transformers
- Electric motors
- Fans
- Metal halide lamp fixtures
- Packaged terminal AC and heat pumps
- Pumps
- Single-package vertical AC and heat pumps
- Small motors
- Urinals
- Water-source heat pumps

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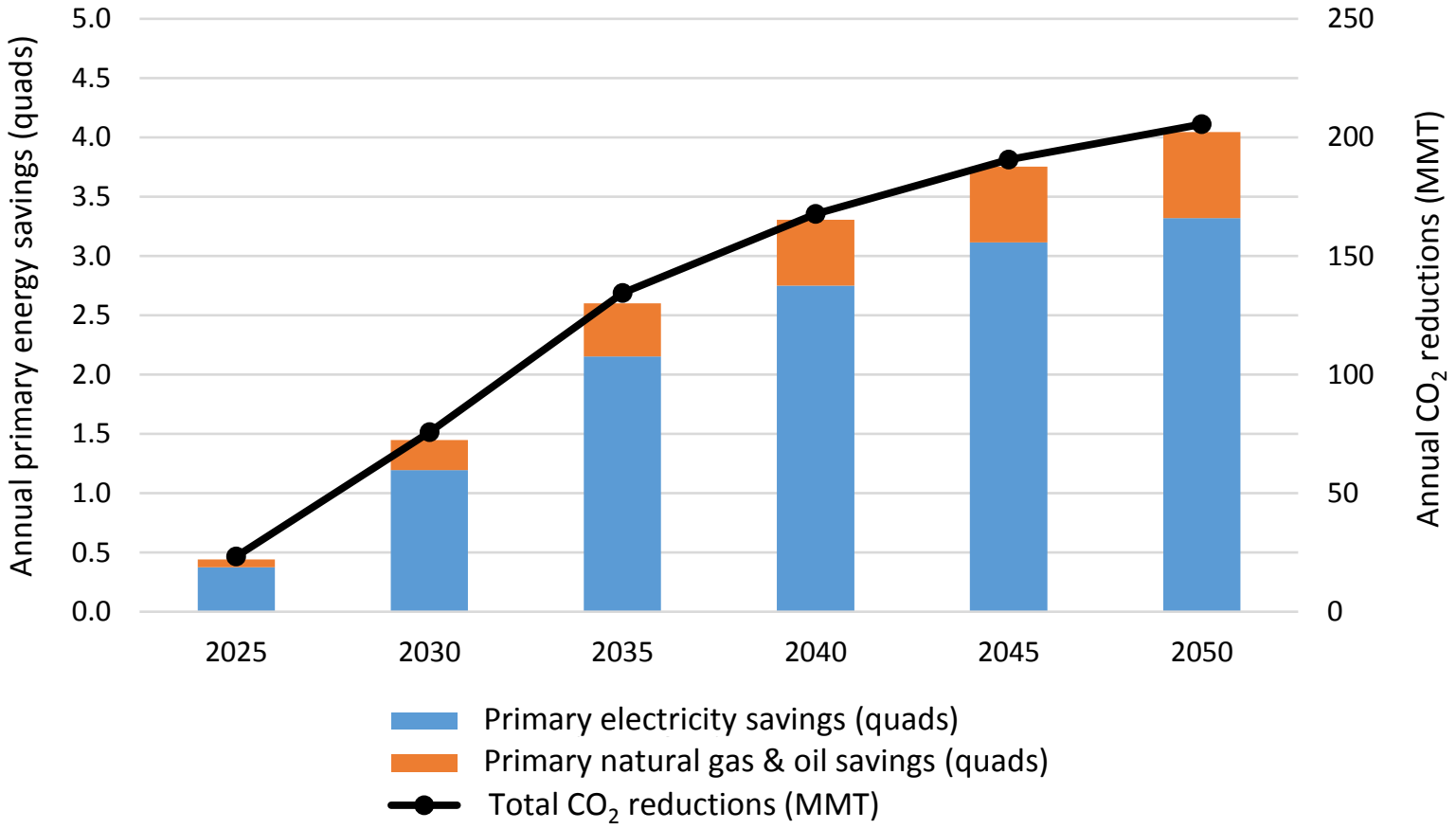
Findings: annual energy savings and CO_2 reductions



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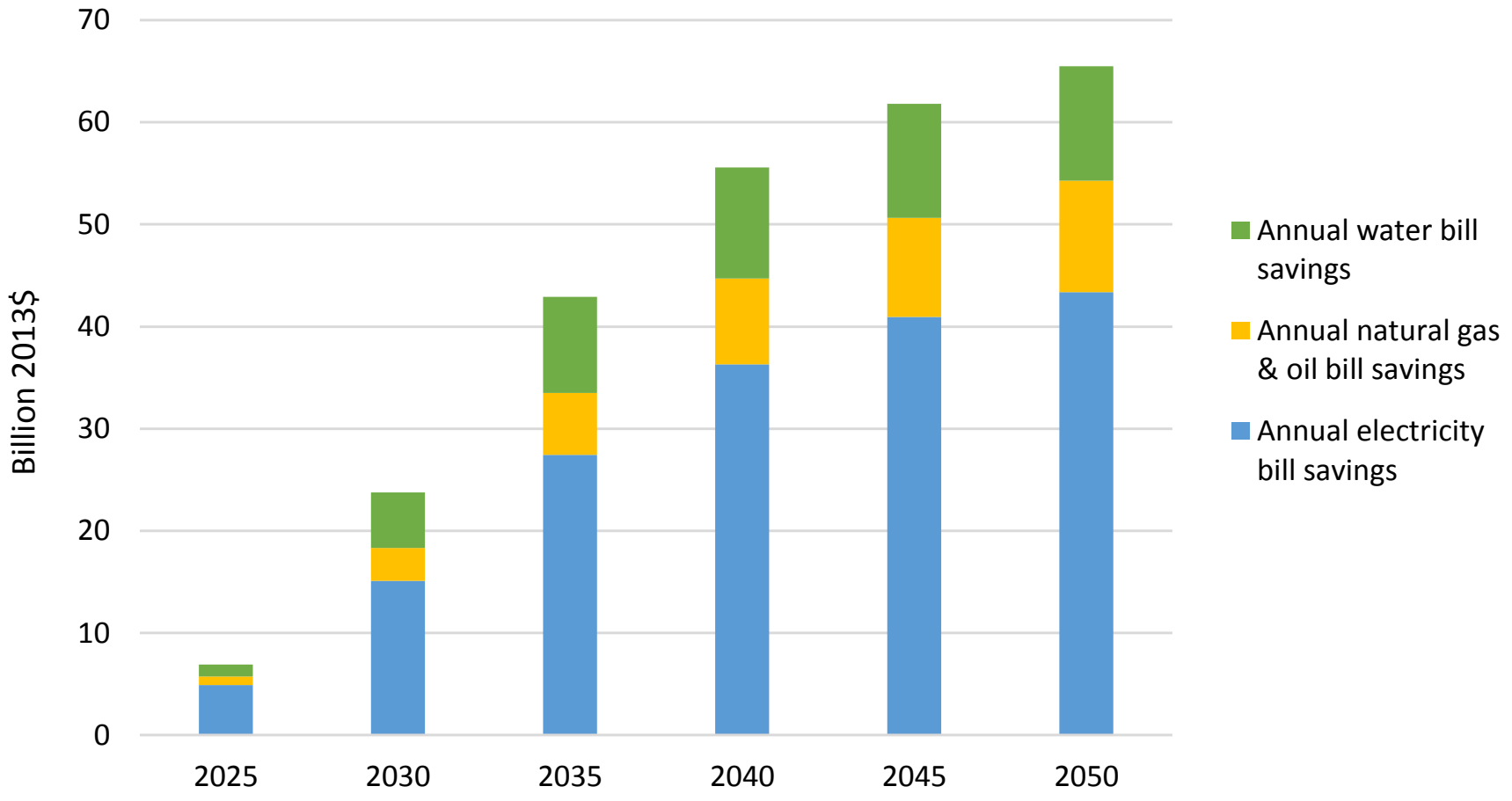
Findings: annual utility bill savings



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Findings: national cumulative savings through 2050

- **70** quads of energy
- **17.5** trillion gallons of water
- **3.5** billion metric tons of CO_2
- **$1.1** trillion on utility bills

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Findings: Midwest annual savings

	Annual Savings	
	2035	**2050**
Electricity (TWh)	48	74
Natural gas (TBtu)	140	243
Water (billion gallons)	183	203
CO_2 (MMT)	40	61
Utility bills (billion 2013$)	9	14

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Findings: Midwest cumulative savings through 2050

- **18** quads
- **4.2** trillion gallons of water
- **1.0** billion metric tons of CO_2
- **$250** billion on utility bills

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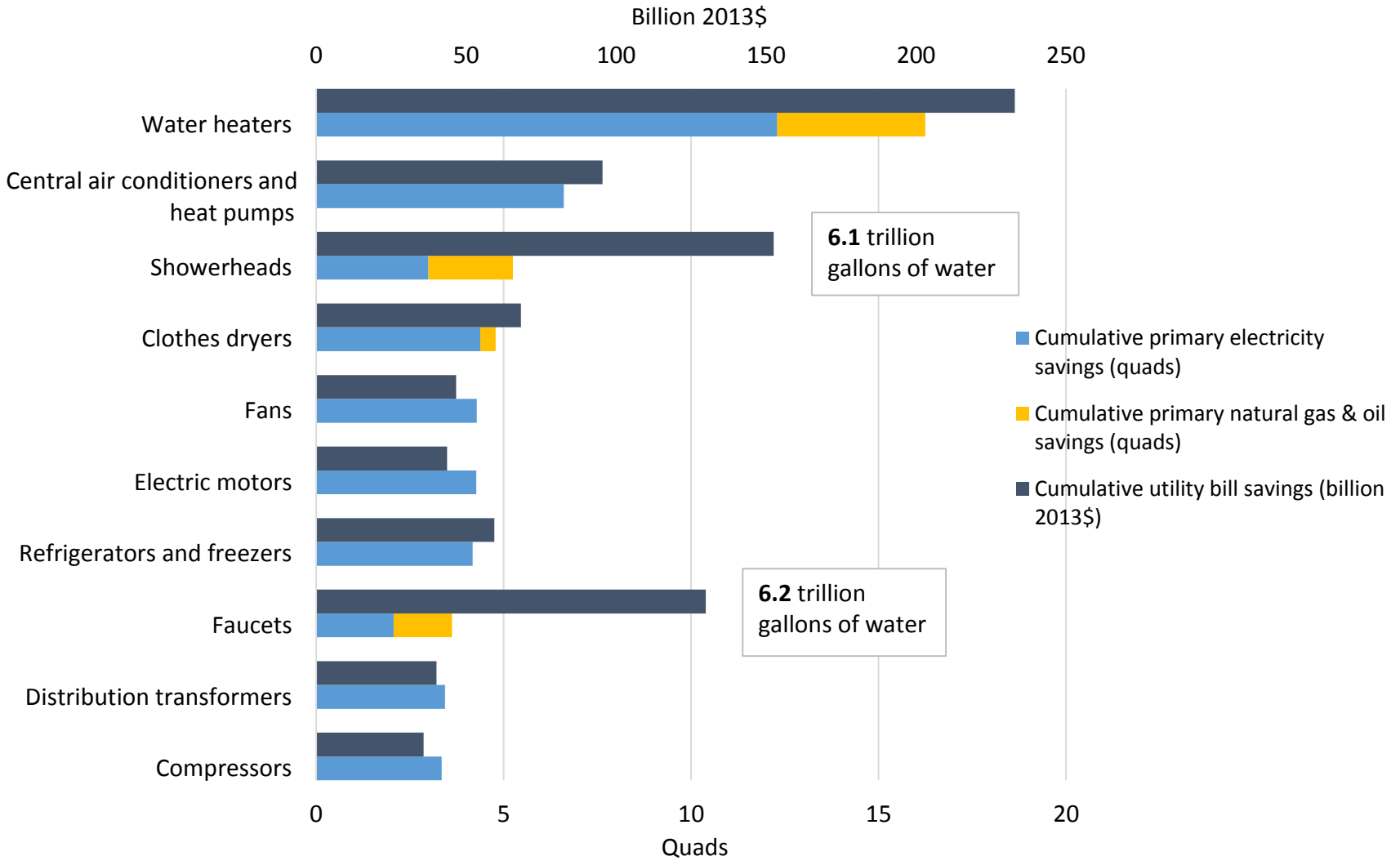
Top 10 products



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Top 10 products: water heaters

- 16.2 quads and $233 billion
- Electric storage water heaters: ~50% savings with heat pump technology (1,090 kWh)
- Gas storage water heaters: ~25% savings with condensing technology (3.6 MMBtu)

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Top 10 products: clothes dryers

- 4.8 quads and $68 billion
- Electric clothes dryers consume more than refrigerator, clothes washer, dishwasher combined
- ENERGY STAR Emerging Technology Award for clothes dryers that save ~40% in their most efficient setting
- Heat pump dryers recently introduced to US market
- Analyzed standard levels that represent savings of 30%
  - 250 kWh
  - 0.9 MMBtu

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Top 10 products: electric motors

- 4.3 quads and $44 billion
- 2016 standards for 1-500 hp three-phase induction motors: NEMA Premium (IE3)
- Analyzed standards roughly equivalent to “Super Premium” (IE4) levels
  - ~15% reduction in losses
  - Can be met by conventional induction motors as well as by advanced motor technologies

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How to further increase savings

- **Invest in improved test methods**, including expedited updates for top priorities
- Systematically assess opportunities to **expand scope** and conduct rulemakings for the biggest new opportunities
- Continue to **improve analysis methods** and **data sources**.

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How to further increase savings (con't)

- Consider how DOE test methods, ratings, and standards can realize or facilitate **systems savings opportunities**
- Develop a strategic approach to **address connected products**

Full report at: http://www.appliance-standards.org/next-generation-standards

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Appliance Efficiency Standards: A Gas Utility Perspective

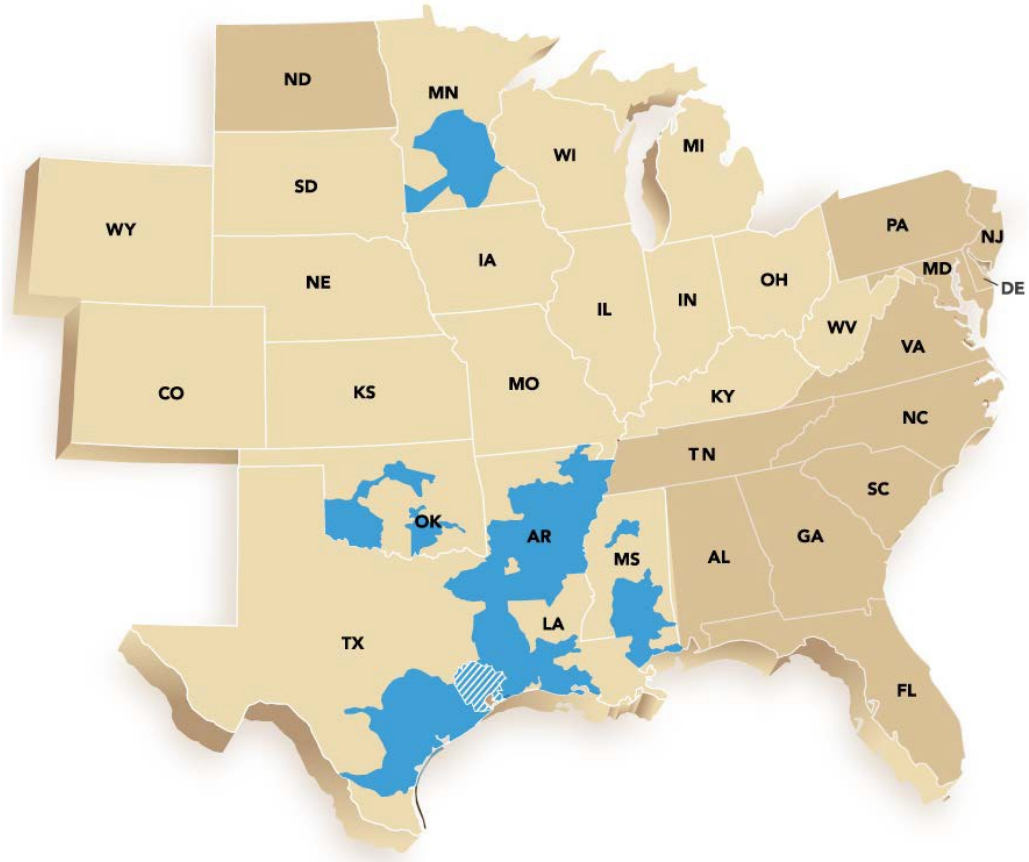
Nick Mark

Manager, Conservation & Renewable Energy Policy

CenterPoint Energy Minnesota Gas

November 10, 2016

CenterPoint Energy



Segments

- Electric Transmission & Distribution
- Natural Gas Distribution
- Energy Services

As of June 30, 2013

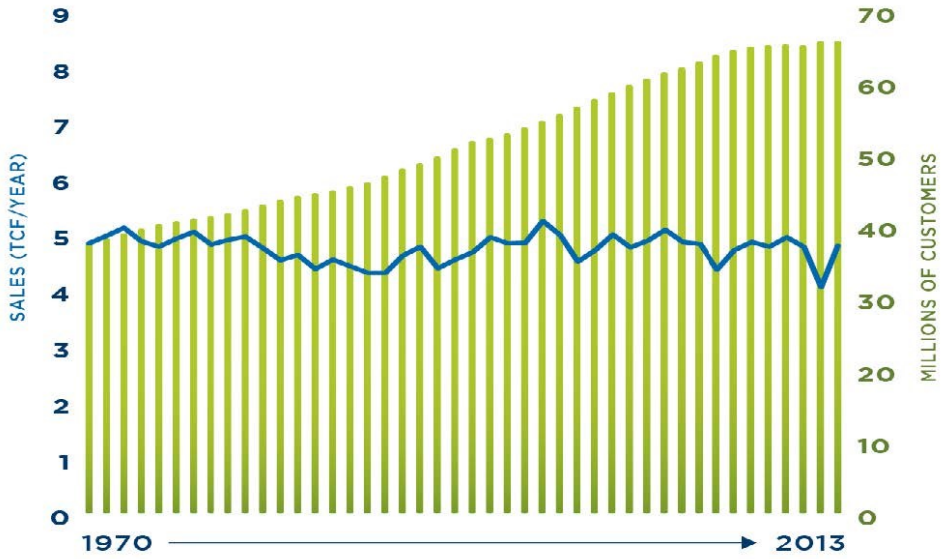
Impacts of Appliance Standards

- Utility Sales
- Energy Efficiency Programs
- Unintended Consequences
- Other Thoughts

- Assumes utility already predisposed in favor of EE

Standards and Utility Sales

- Efficient appliances mean reduced sales volume
- This can mean lower overall revenue

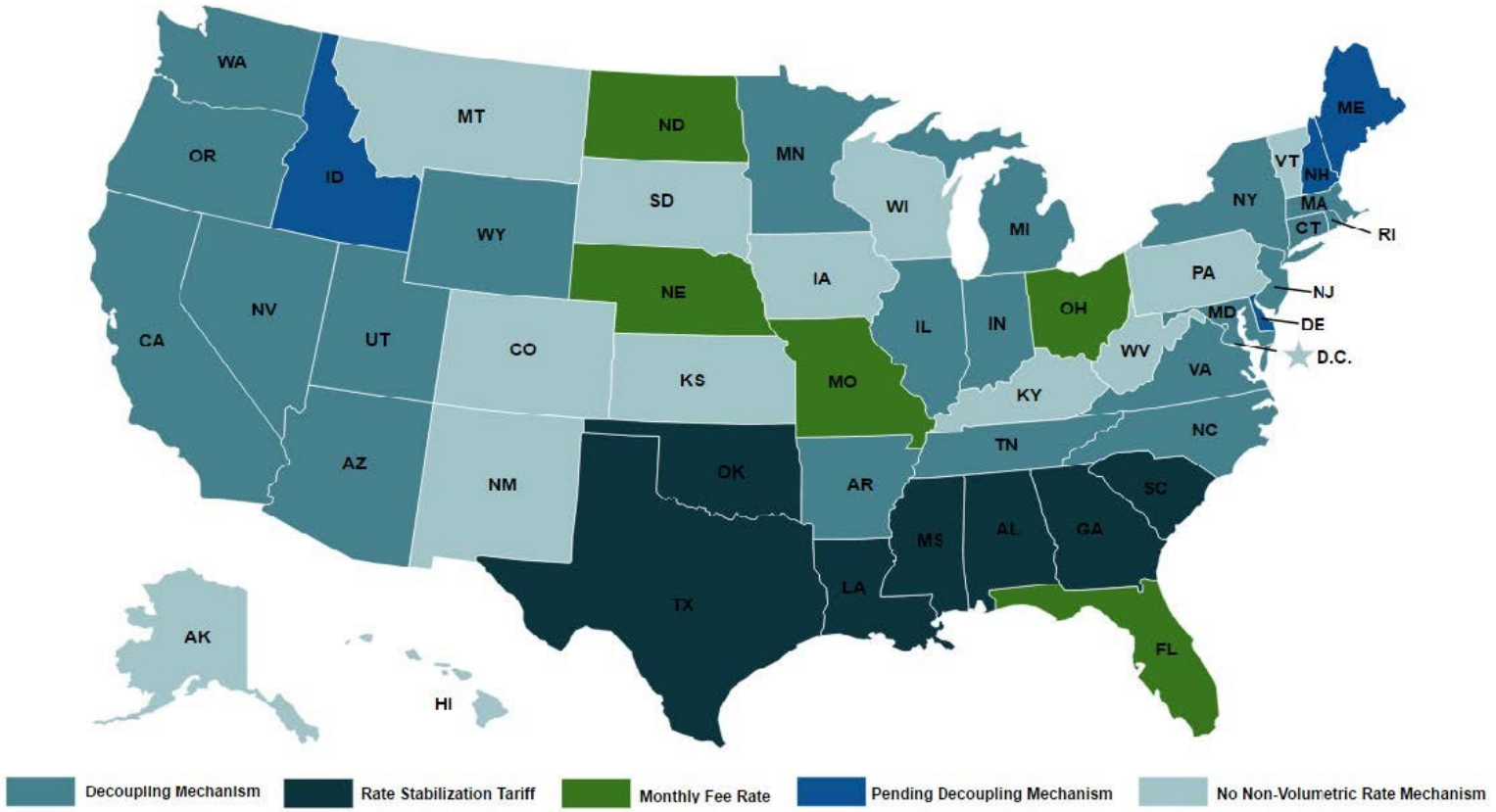


US Gas Sales and Residential Customers
Source: American Gas Association (AGA), 2015

Standards and Utility Sales

- Rate Design Considerations:
  - Traditional Design
    - Large portion of fixed cost included in volumetric charges
    - Lower sales means less recovery of fixed costs
  - Straight Fixed/Variable Design
    - All fixed costs included in monthly customer charge
    - Changes in sales don't change cost recovery
    - Reduces link between usage and bill amount; decreases "price signal for energy efficiency"
  - Decoupling
    - Regular adjustment of volumetric rates based on actual sales and revenue
    - Can be controversial among stakeholders
    - Other aspects of rate design (fixed vs variable charges) are still important

Standards and Utility Sales



States with Non-Volumetric Rate Mechanisms

Source: AGA, 2015

Standards and EE Programs

- Utility Savings Goals are Measured from a Baseline
  - Higher standards mean reduced savings from a given measure

- State EERS Goals tend to be fixed in statute
  - May not have considered available savings potential when created
  - Increasing standards can eliminate savings potential without affecting the expectation of utility achievements

Standards and EE Programs

- Example: Residential Furnaces

- 2013 CenterPoint Energy Goal:
  - 9,500 Furnace Retrofits (94%-95.9% AFUE)
  - At 80% Baseline: ~13 Dth/unit
  - At 90% Baseline: ~4 Dth/unit

  - 90% Baseline = loss of 66,500 Dth in savings
  - >13% of savings goal for residential sector
  - Enough to make plan non-compliant with EERS

Standards and EE Programs

- Make up savings with other measures?
  - Limited end uses
  - Standards can affect savings from other measures (e.g. weatherization)
- Program Design – early retirement?
  - Complicated, possibly expensive (possibly not cost-effective?)
  - How long can you run it?
- Ultimately goals should be informed by available potential, and revisited!

Unintended Consequences

- Venting
- Fuel Switching
- Cost

Unintended Consequences

- Lower Efficiency?
  - Hypothetical Example: 96% AFUE Furnace

	Vs 80% Baseline	Vs 90% Baseline
Incremental Cost	$1,200	$500
Annual Savings	14 Dth	4 Dth
Gas Cost (Retail)	$5.00 / Dth	$5.00 / Dth
Simple Payback	17.1 yrs	25.0 yrs
Rebate	$400	$150
Payback after Rebate	11.4 yrs	17.5 yrs

Figures are fictitious and invented for purposes of the example

  - Which scenario makes it easier to convince a customer to choose the 96% AFUE furnace?

Summary

- Standards can be a powerful tool to reduce energy use
- Sometimes the use of one tool reduces the effectiveness of another
- Care must be taken to avoid unintended consequences

Thank You

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CLEAResult®

Federal Standard Changes: How they Impact EE Programs

Dan Cote, Business Analyst, Consumer Product Services - CLEAResult

We change the way people use energy™

Agenda

- Overview of Federal Standards
- Impact on Savings
- Cost Effectiveness Impacts
- Impacts on Program Design
- Q&A

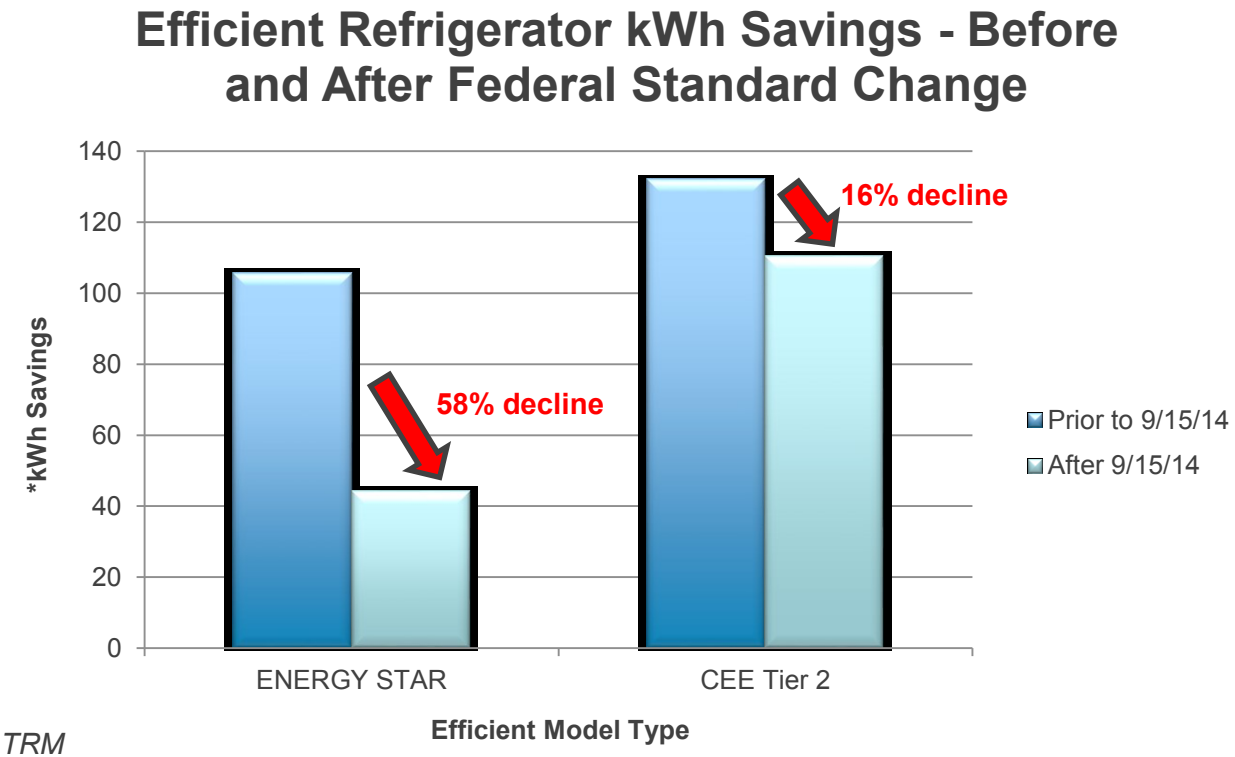
Federal Standards Overview

- Minimum energy efficiency standards set by the DOE
- Cover approximately 60 categories of appliances and equipment
- Significantly reduce energy demand, reduce greenhouse gas emissions, and save consumers money

Impact on Savings

Impact on Savings

- Energy efficient appliances use less energy, but that energy savings is decreasing



*Source 2016 Illinois TRM

Why are Savings Declining?

- Federal Standards are becoming more stringent
- Manufacturers can only improve the efficiency of models so much
  - Internal costs
  - Consumer purchase prices

Cost Effectiveness Impacts

Cost Effectiveness Impacts

- Federal Standard changes make measures more expensive on a $/kWh basis
- Stand-alone appliance programs often do not pass TRC testing

Measure	Incentive	ΔkWh before Federal Standard Change	ΔkWh after Federal Standard Change	$/kWh before Federal Standard Change	$/kWh after Federal Standard Change
Refrigerator	$50	105.7	44.3	$0.47	$1.13
Freezer	$25	42.0	31.2	$0.60	$0.80
Clothes Washer	$50	75.8	48.0	$0.66	$1.04

Impacts on Program Design

Impacts on Program Design

- Reduced incentive levels
- Certain measures may no longer warrant an incentive
- Promote more measures
- Higher costs

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Thank You

Question and Answer

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