RAP Energy solutions for a changing world

Overview of EPA's Clean Power Plan or " § 111(d)" Rule

2014 NASUCA Annual Meeting
November 16, 2014 – San Francisco, CA

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Introduction

- The Regulatory Assistance Project (RAP) is a global, non-profit team of energy experts, mostly veteran regulators, advising current regulators on the long-term economic and environmental sustainability of the power and natural gas sectors. (www.raponline.org)
  - *Non-advocacy; no interventions*

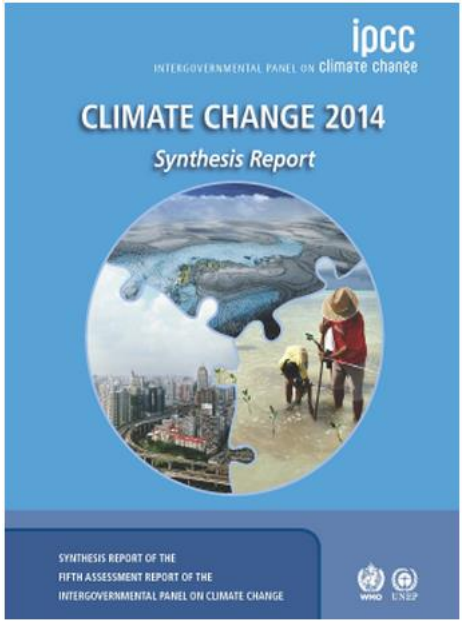
- Ken Colburn is a Senior Associate at RAP. His experience as an air quality regulator came as Air Director for the State of New Hampshire and as Executive Director of NESCAUM.

Overview

- Why are we doing this?
- Background: How did we get here?
- What's the proposed rule look like?
- Problems created
- Opportunities created
- Recommendations

Why: We Have a Climate Change Problem

- "Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems."
- "Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems."



...and solving problems usually involves costs...

Why: IPCC 5th Assessment Report

Table SPM.1 [TABLE SUBJECT TO FINAL COPYEDIT]

CO_2eq Concentrations in 2100 (CO_2eq)[6] Category label (conc. range)	Subcategories	Relative position of the RCPs[4]	Change in CO_2eq emissions compared to 2010 (in %)[3]		Likelihood of staying below a specific temperature level over the 21st century (relative to 1850-1900)[4,5]			
			2050	2100	1.5ºC	2ºC	3ºC	4ºC
< 430	*Only a limited number of individual model studies have explored levels below 430 ppm CO_2eq*[10]							
450 (430 – 480)	Total range[1,,7]	*RCP2.6*	-72 to -41	-118 to -78	*More unlikely than likely*	*Likely*	*Likely*	*Likely*
500 (480 – 530)	No overshoot of 530 ppm CO_2eq		-57 to -42	-107 to -73	*Unlikely*	*More likely than not*		
	Overshoot of 530 ppm CO_2eq		-55 to -25	-114 to -90		*About as likely as not*		
550 (530 – 580)	No overshoot of 580 ppm CO_2eq		-47 to -19	-81 to -59		*More unlikely than likely*[9]		
	Overshoot of 580 ppm CO_2eq		-16 to 7	-183 to -86				
(580 – 650)	Total range	*RCP4.5*	-38 to 24	-134 to -50				
(650 – 720)	Total range		-11 to 17	-54 to -21		*Unlikely*	*More likely than not*	
(720 – 1000)[2]	Total range	*RCP6.0*	18 to 54	-7 to 72	*Unlikely*[8]		*More unlikely than likely*	
>1000[2]	Total range	*RCP8.5*	52 to 95	74 to 178		*Unlikely*[8]	*Unlikely*	*More unlikely than likely*

Good

Bad

[1] The 'total range' for the 430 ppm to 480 ppm CO_2-eq concentrations scenarios corresponds to the range of the 10th-90th percentile of the subcategory of these scenarios shown in Table 6.3 of the Working Group III report.

[2] Baseline scenarios fall into the >1000 and 720 ppm – 1000 ppm CO_2-eq categories. The latter category includes also mitigation scenarios. The baseline scenarios in the latter category reach a temperature change of 2.5–5.8°C above the average for 1850-1900 in 2100. Together with the baseline scenarios in the >1000 ppm CO_2-eq category, this leads to an overall 2100 temperature range of 2.5–7.8°C (range based on median climate response: 3.7–4.8°C) for baseline scenarios across both concentration categories.

[3] The global 2010 emissions are 31% above the 1990 emissions (consistent with the historic GHG emission estimates presented in this report). CO_2.eq emissions include the basket of Kyoto gases (CO_2, CH_4, N_2O as well as F-gases).

[4] The assessment here involves a large number of scenarios published in the scientific literature and is thus not limited to the RCPs. To evaluate the CO_2-eq concentration and climate implications of these scenarios, the MAGICC model was used in a probabilistic mode. For a comparison between MAGICC model results and the outcomes of the models used in WGI, see Section WGI 12.4.1.2 and WGI 12.4.8 and 6.3.2.6.

Why: Climate Change Effects

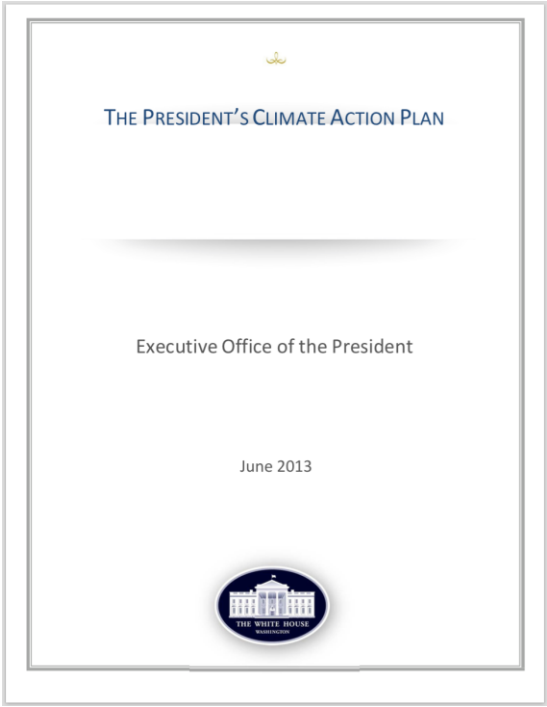
- Costly & growing health impacts
- More extreme weather events, precipitation, flooding, & sea level rise
- More frequent & severe heat waves; droughts, wildfires
- Greater risks to electricity supply, water
- Disruptions in food supply, forest die-off
- …and more

Why: Disproportionate Impacts on Low-Income Populations

- Greater vulnerability
- Greater exposure
- Poorer quality housing
- Less healthcare coverage
- More subject to resulting economic instability
- Greater food & electricity burdens

What: EPA's Clean Power Plan

- Presidential Memo June 25, 2013
- Reduce carbon pollution from power plants
  - 30% cut from 2005 by 2030
- Required EPA to control new & existing power plants, engage states, maximize flexibility, protect reliability
- Propose by June 2014; finalize by June 2015



What: § 111(d) of the Clean Air Act

- 111(d) = little-used part of Clean Air Act
- "Best system of emission reduction" (BSER)
  - "Inside the fence line" or "outside the fence line"?
  - Rate-based or mass-based targets?
- "SIP-like": EPA sets stringency of reductions, then states determine how to meet it
- *Good news*: But not a SIP; Offers far greater flexibility for EPA, states, and sources
- *Bad news*: Short deadlines; Legal challenges; EPA doesn't have all the answers either

EPA Chose Rate-Based Targets; Unique to Each State

$$\textbf{State Goal} = \frac{\text{Emissions (lbs) from Electric Generating Units (EGUs)}}{\text{Output from EGUs (MWh)} + \text{Adjustments (MWh)}}$$

Adjustments (MWh) = RE Generation (MWh)
+ EE Energy Savings (MWh)

(All based on 2012 data)

EPA's BSER Building Block "Recipe"

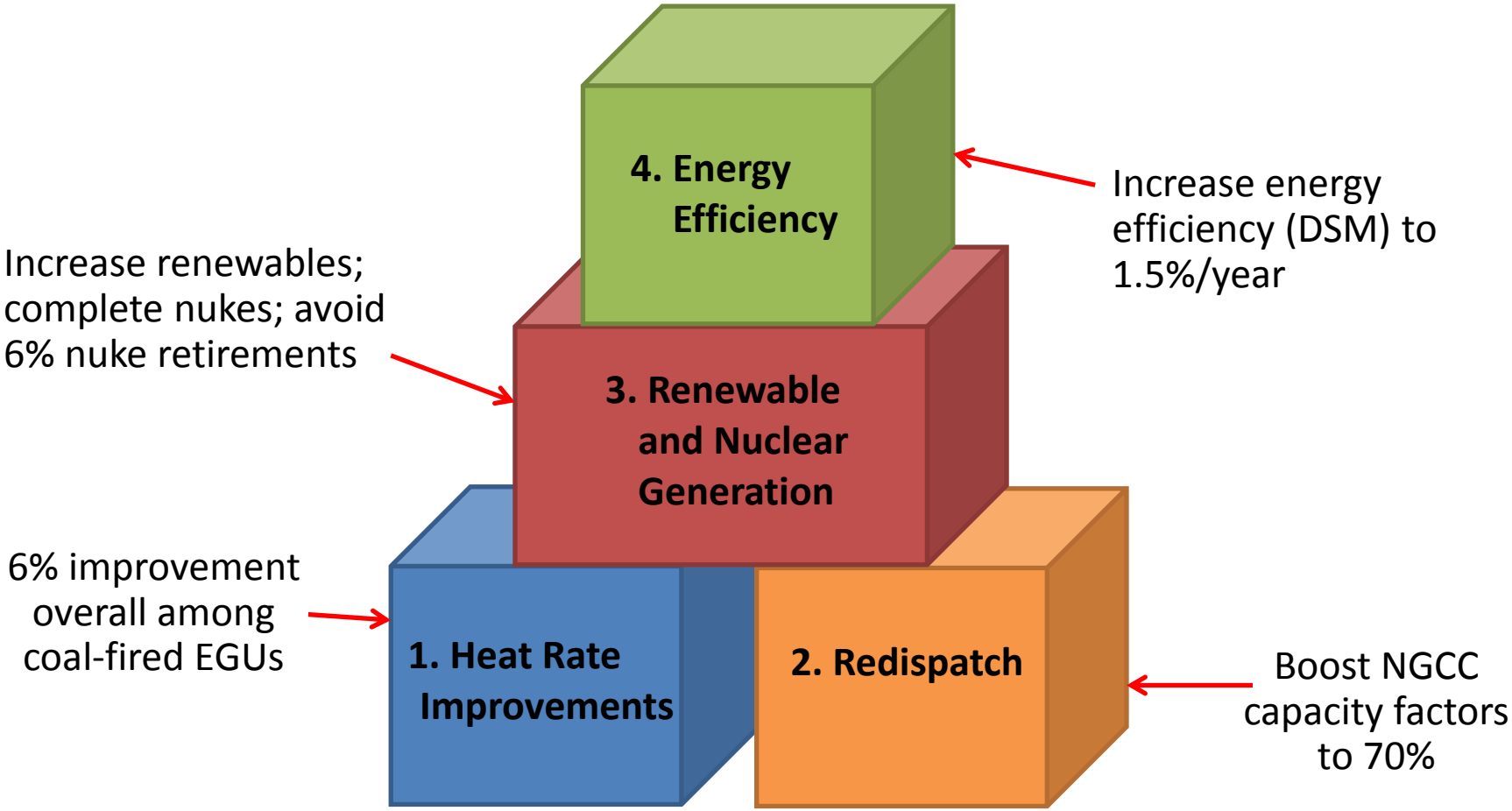
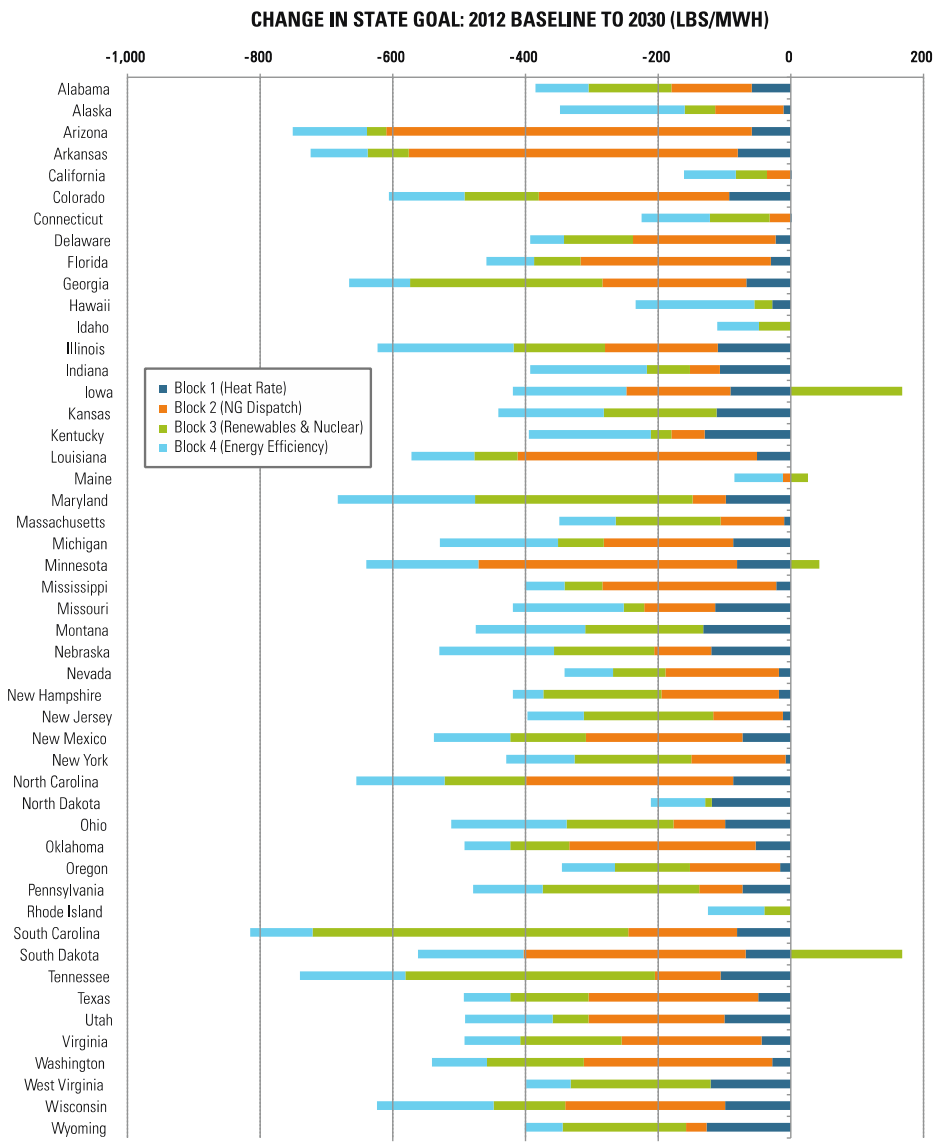


FIGURE 2: Contribution of Each Building Block to the State Goal



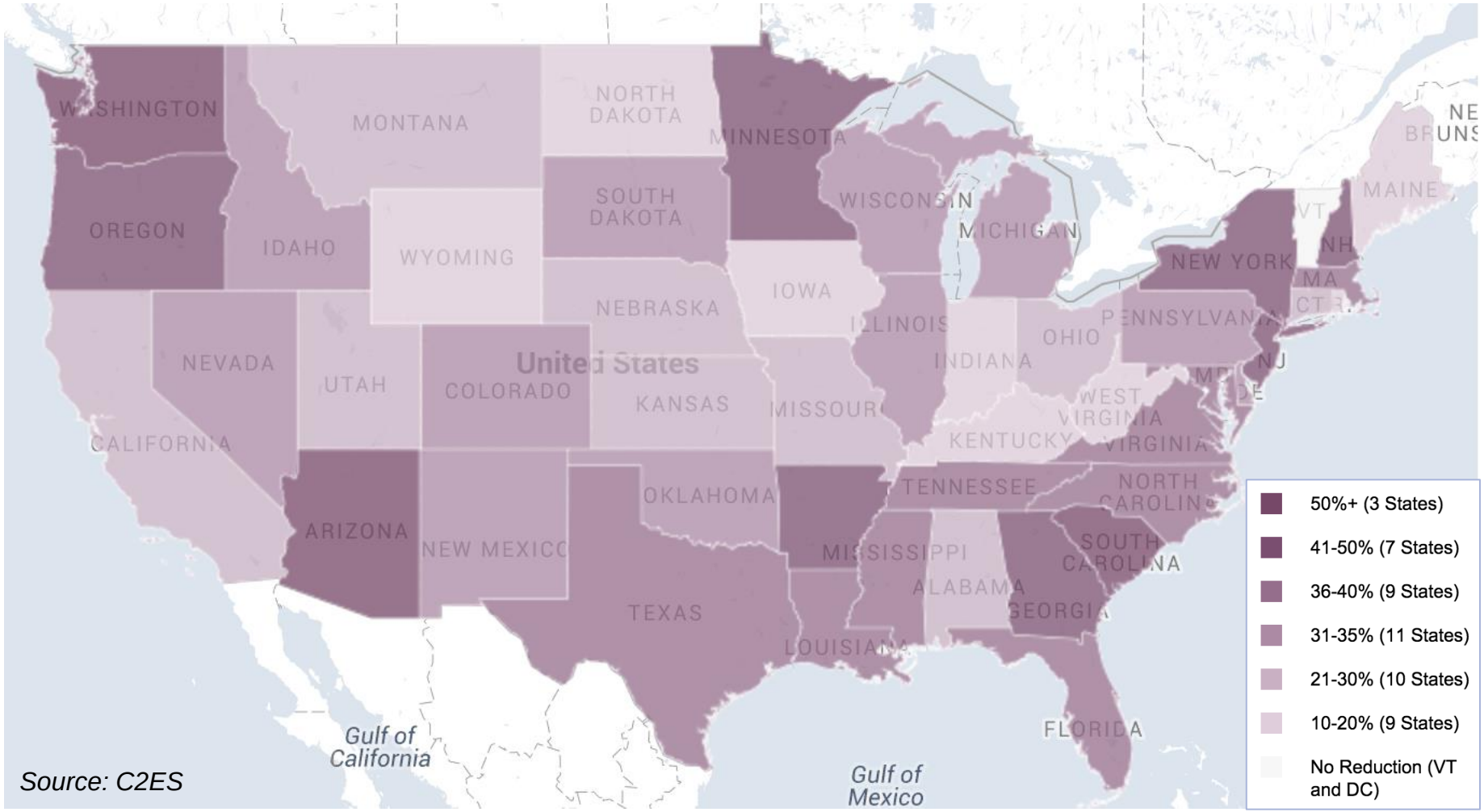
Source: NRDC

Relative Contributions of Building Blocks by State

Note that

- *State requirements vary widely; and*
- *Natural gas redispatch (orange) and RE (green) predominate*

Reduction Requirements by State



Source: C2ES

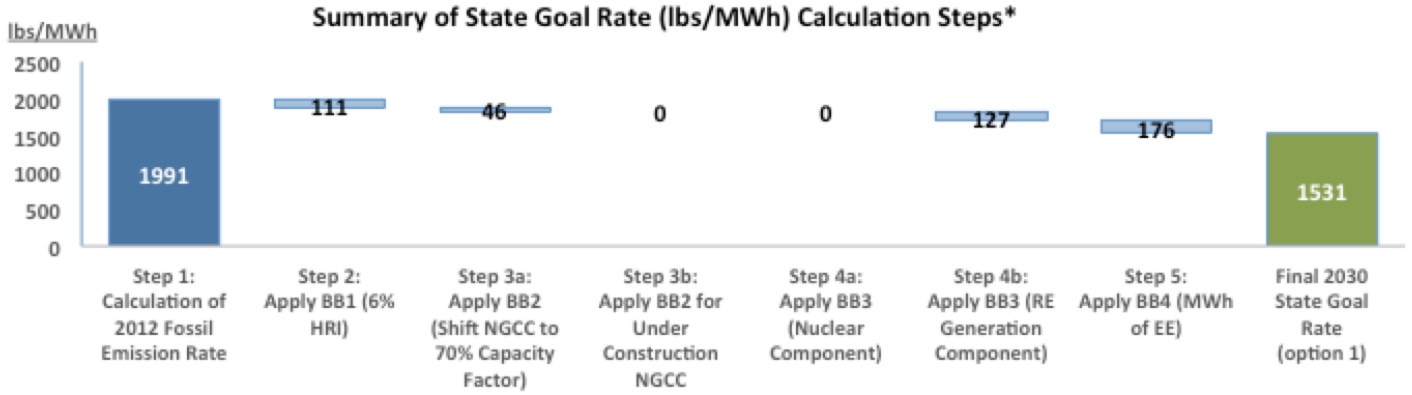
EPA's 111(d) Rate Goal Visualizer

Data Viewer EPA Proposed Clean Power Plan, State 2030 Goal Calculation: Indiana

Start & Key Resources
Summary
Step 1
Step 2
Step 3a
Step 3b
Step 4a
Step 4b
Step 5
Back Next

Getting from 2012 Fossil Emission Rate to Final 2030 State Goal Rate (option 1)

Building Block 1 (step 2)	Improve the heat rate at existing coal units 6% to reduce the emission rate from **2,158** lbs/MWh to **2,029** lbs/MWh
Building Block 2 (steps 3a and 3b)	Shift generation from fossil-fired boilers to NGCC units up to a 70% capacity factor, increasing NGCC generation from **12,839** GWh to **17,018** GWh
Building Block 3 (steps 4a and 4b)	Increase generation from renewable sources from **3,546** GWh in 2012 to **7,547** GWh in 2030. State has no nuclear capacity.
Building Block 4 (step 5)	Improve end-use energy efficiency to decrease electricity demand **12,564** GWh, equivalent to avoiding **11.1%** of projected electricity sales in 2030



*This graph and the associated calculations are for illustrative purposes only to demonstrate how state goals are calculated to take into account all of the building blocks identified in Option 1 of the proposed Clean Power Plan. While this demonstration yields apparent "incremental" changes to state emission rates from quantifying the effect of each building block in a given state, the state goal is a product of all of the building blocks considered simultaneously in the computation process. While the "incremental" effect calculated for each building block depends on the sequence in which the building blocks are quantified (with only one particular sequence demonstrated here), the computed state goal is the same regardless of the sequence selected to calculate each building block's effects within the overall state goal computation process.

Source: http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-technical-documents

Compliance Timeframe

- Comments end December 1st; final rule in June
- Proposed due dates for state plans:
  - June 30, 2016: Individual and multi-state plans due
  - June 30, 2017: 1-year extension for individual states (if justified)
  - June 30, 2018: 2-year extension for multi-state plans (with progress report due June 30, 2017)

A Work-in-Progress => Problems

- Little 111(d) precedent, and BSER never this broad
- So, all new to EPA too…
- Extraordinary outreach; many problems identified:
  - Baseline issues (single-year, unusual years, plants down, etc.)
  - Circumstances (redispatch requires more gas infrastructure, etc.)
  - Unintended consequences (RE goal vs. RECs; orphaned EE, etc.)
  - Credit for early action
  - Interim goal harder & sooner
  - Rate-to-mass conversion questions
- "Notice of Data Availability (NODA)" issued Nov 6th to get comment on these & other issues

But, Also Opportunities…

- EPA developed its "Building Blocks" approach to provide a consistent way to determine state-specific rate targets…
- …*NOT* to constrain states to those options alone!
- EPA will welcome "*Beyond* Building Blocks" plans:
  - Optimize grid operations; reduce line losses
  - Revise T&D policies & access, capacity markets
  - Encourage DG, DR; do environmental dispatch; require IRP
  - Fuel-switch or co-fire; improve fuel quality
  - Adopt cap & trade; carbon tax
  - And beyond (e.g., water conservation)
- EPA encourages joint, multi-state plans

RAP's Initial Advice:

RAP™ Energy solutions for a changing world

Preparing for 111(d): 10 Steps Regulators Can Take Now

1. **Engage with fellow state regulators.** State utility regulators, environmental regulators, consumer advocates, and state energy officers serve the same jurisdiction and their actions often impact each other, but routine communication among them remains rare.

Difficult State Regulatory Authority Concerning 111(d)

	Authority to Adopt Emission-Reduction Requirements?	Authority to Adopt EE/RE Programs & to Recover Costs?
DEPs/DEQs	**Yes**	**No**
PUCs/PSCs	**No**	**Yes**

The shortcomings evident in this traditional division of labor suggest that it is crucial for energy and environmental regulators, consumer advocates, and energy officers to have regular, detailed dialogues in planning for 111(d).

Also Crucial: Focus on Bills vs. Rates Illustrating the Impact of EE

2025 (no EE)

Household with
900 KWh/Month

Rate: 10.8 cents/KWh*

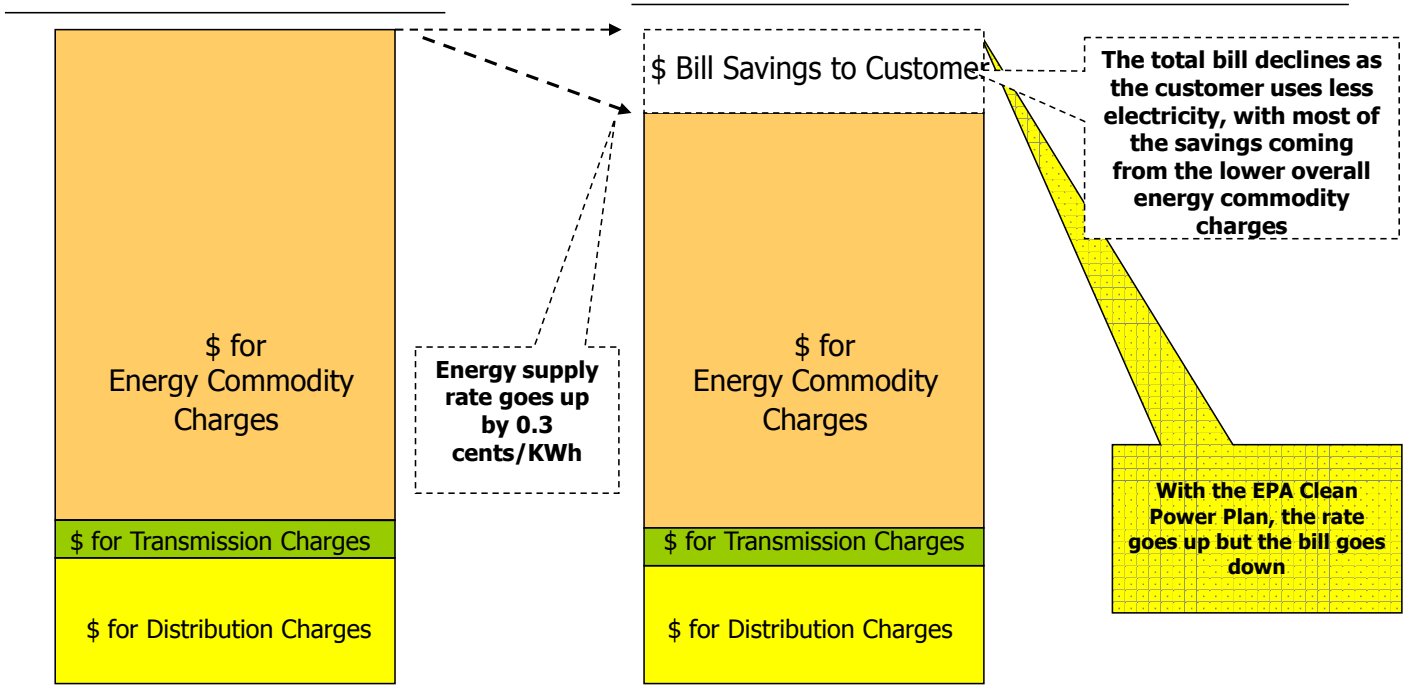
Bill = $107.28

2025 (with EE)

EE lowers overall electric usage by 10%
(to 810 KWh/month)

Rate: 11.1 cents/KWh*

Bill = $89.91

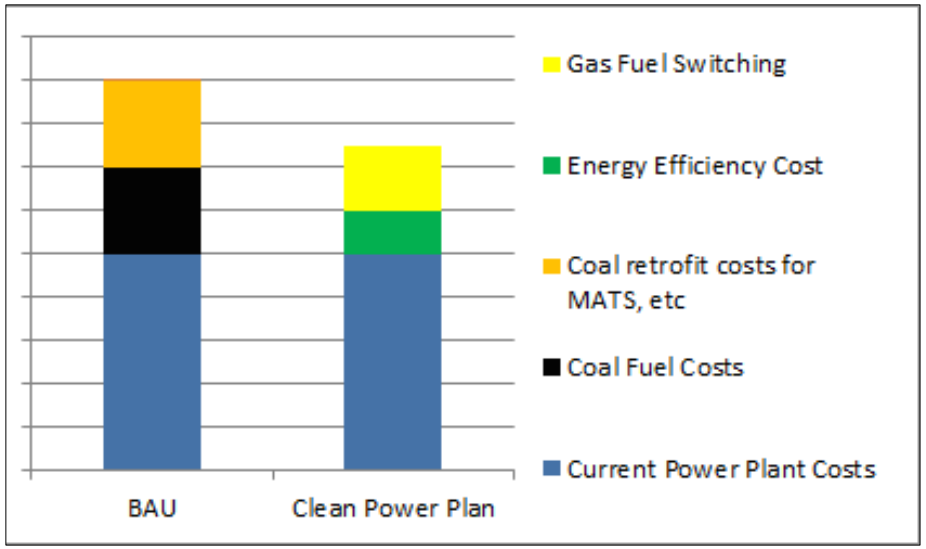


* 2025 rate estimate from EPA RIA analysis

Source: Analysis Group

Push for Least-Cost Options

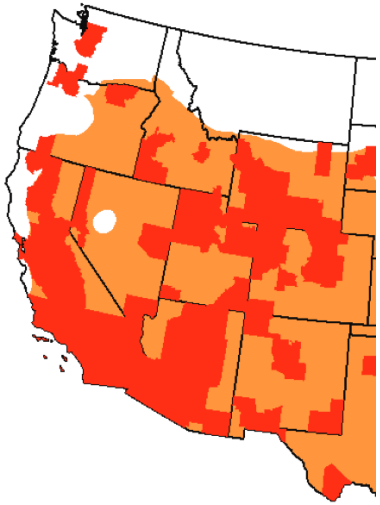
- e.g., require utility IRP or other processes to compare:
  - BAU scenarios: Don't retire coal, don't fuel-switch to gas, don't accelerate efficiency, do incur coal retrofit costs, and with/ without CO2 adders; vs. …
  - … 111(d) scenarios with gas and EE replacing coal fuel costs and coal retrofit costs.
  - Hypothesis: the latter scenario will save money, even at low/no $/ton CO2
- Helpful tools arriving
  - Synapse
  - MJ Bradley & Associates
  - EPA / DOE



Consider Other Issues at Play…

energy API
AMERICAN PETROLEUM INSTITUTE

New EPA Ozone regulations could mean America is closed for business.



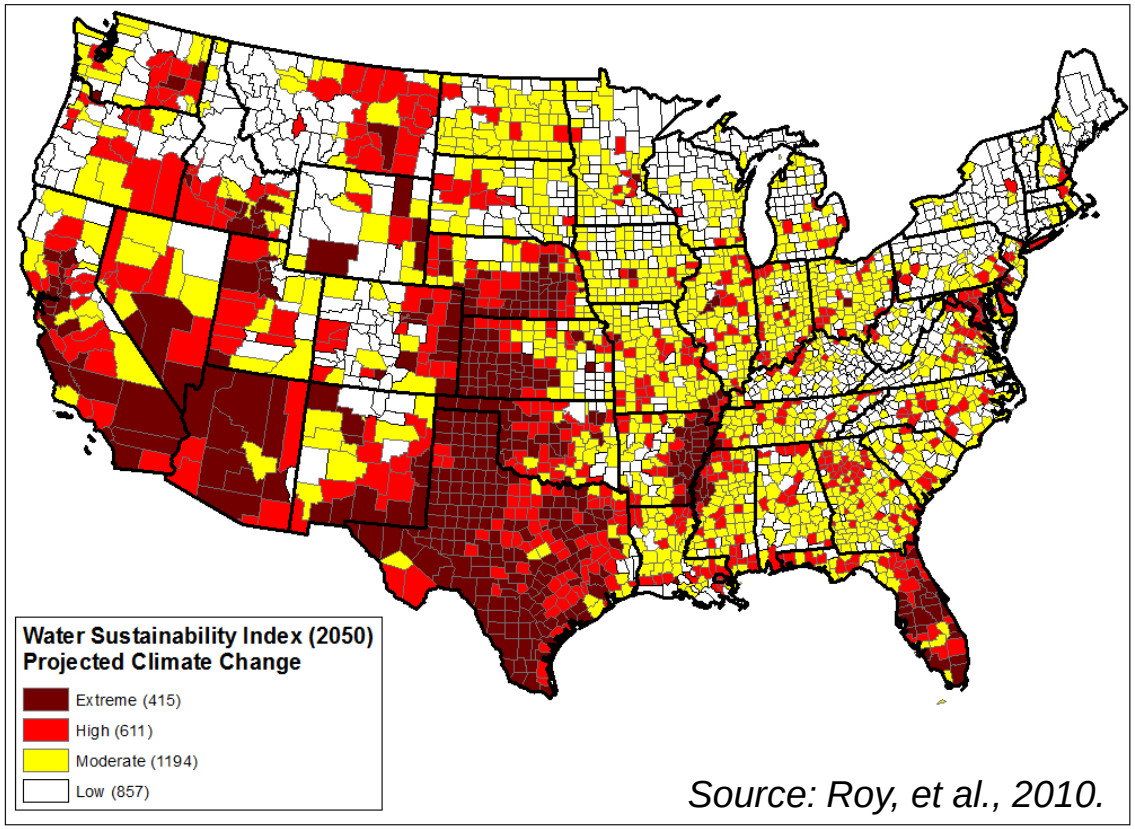
Upcoming EPA regulations of ozone could shut down business expansion and new jobs where 94 percent of Americans live, without providing any significant environmental benefit.

Strict new standards could force communities to shut down business activity in a futile attempt to force ozone levels below background levels. Needless to say, operating under such stringent requirements could stifle new investment necessary to create jobs and could slow the economy or even nudge it back into recession.

Meanwhile, air quality continues to improve under the existing standards. The health data being used to justify tightening the standard is not compelling and EPA and the states have not even begun to implement the stringent 2008 ozone standard.

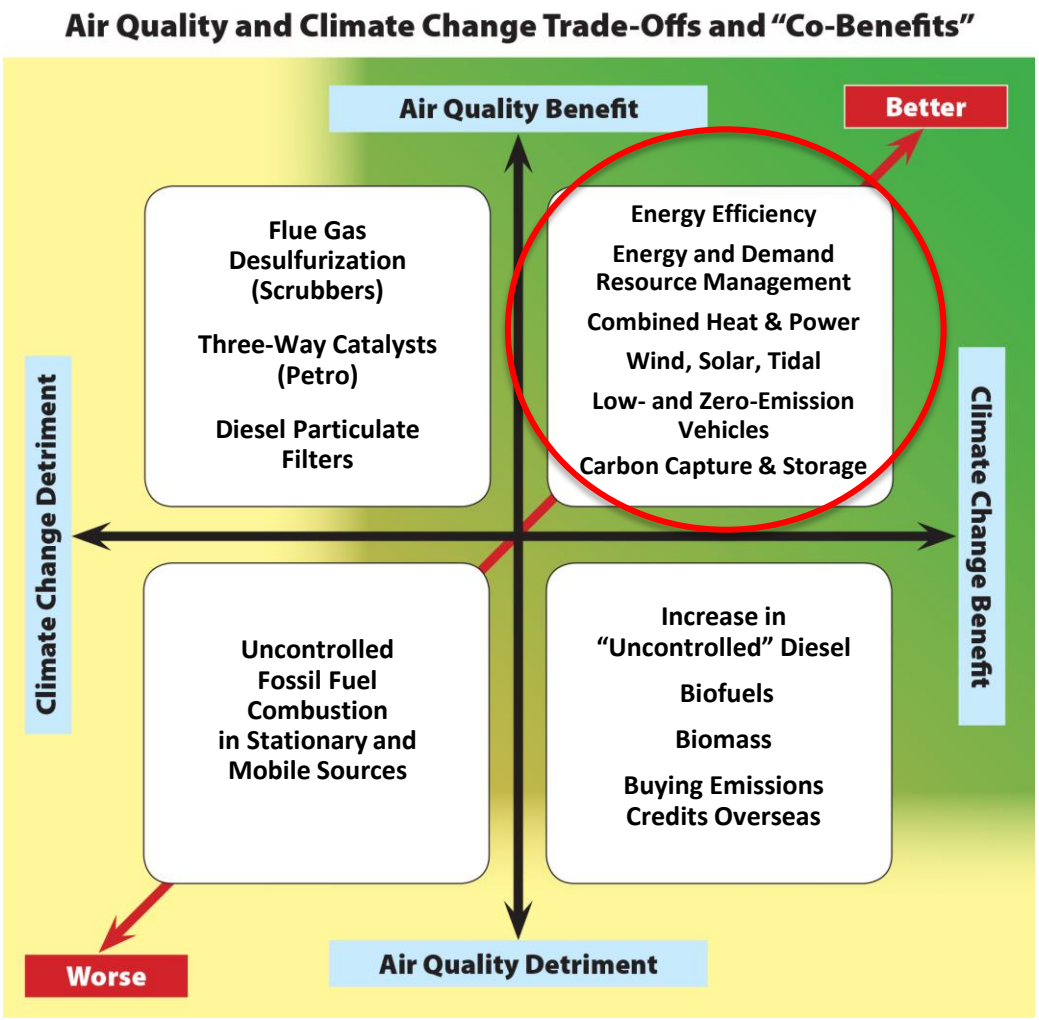
EPA should consider keeping the current standards—the most stringent ever—before closing America for business.

To find out more, visit API.org



Source: Roy, et al., 2010.

… and Insist on Paths That Capture Co-Benefits



- Good 111(d) choices can help air quality; good air quality choices can help 111(d) compliance
- Ditto for increasing ***water*** concerns
- Integrated multi-pollutant, multi-media approach can lower cost, risk (e.g., RAP's IMPEAQ)

Perhaps the Biggest Challenge…

- The federal Clean Air Act:
  - 40-years old and highly prescriptive
  - 2 generations of federal delegation to state air agencies
- Section 111(d) is:
  - Little-used and highly flexible
  - EPA's never done anything like this before either…
- *Morphing the traditional practice of air regulation into the new permissiveness in EPA's proposed rule may be more difficult (for EPA offices and state air regulators) than for sources to actually comply with the rule…*

Your 111(d) Mission?

- Don't have to become 111(d) experts – too dense, too foreign, too little time
- Instead, work with DEQ, PUC, SEO, EE/RE advocates; environmental groups to help ensure "directionally correct" and looks beyond the building blocks
- Engage early and often to prevent state compliance plans that are not long-term, comprehensive, least-cost solutions

Thank You for Your Time and Attention

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts focused on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies to:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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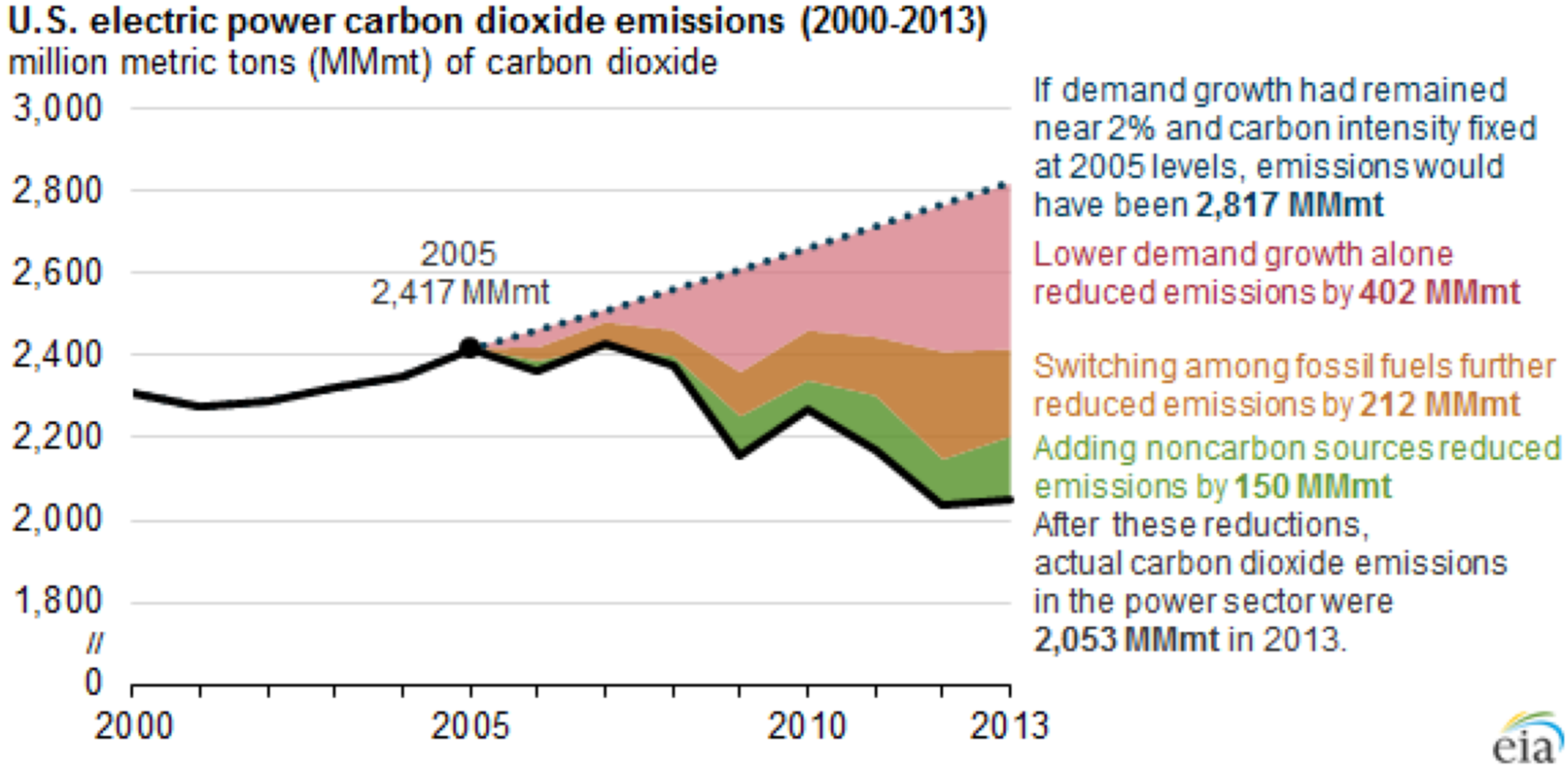
Additional Slides

Lower electricity-related CO2 emissions reflect lower carbon intensity and electricity use



Source: U.S. Energy Information Administration, *Annual CO_2 Analysis*

Unfortunately, EM&V Hurdles Remain

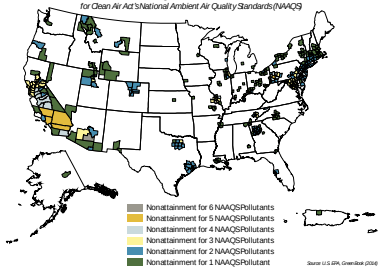
Calculating Avoided Emissions Should be a Standard Part of EM&V and Potential Studies

— John Shenot, Regulatory Assistance Project

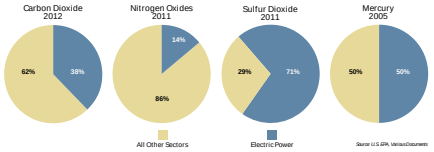
The Problem

147 Million Americans in 43 States Breathe Unhealthy Air

Counties Designated "Nonattainment"
for Clean Air Act's National Ambient Air Quality Standards (NAAQS)



Electricity is a Big Source of Air Pollution



EE is a Proven Solution

Examples of Avoided Emissions Attributed to Energy Efficiency

Wisconsin

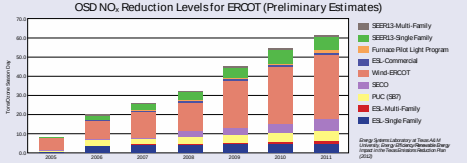
Lifecycle Verified Gross Emissions Displaced
July 1, 2001 – December 31, 2010

Program Area	Lifecycle Verified Gross MWh	Lifecycle Verified Gross Therms	CO_2 (lbs)	NO_x (lbs)	SO_2 (lbs)	Mercury (lbs)
Business	1,978,570	106,048,600	4,810,382,690	6,237,757	7,588,884	29.62
Residential	746,807	20,200,130	1,582,495,514	2,160,038	2,863,243	10.68
Total	2,725,377	126,248,730	6,392,878,204	8,397,795	10,452,127	40

Source: Tetra Tech, Focus on Energy Evaluation Annual Report (2010)

Texas

OSD NO_x Reduction Levels for ERCOT (Preliminary Estimates)



Northeast States

Avoided Emissions from Electric Sector EE Programs

State	Avoided CO_2 (lbs)	Avoided NO_x (lbs)	Avoided SO_2 (lbs)
Connecticut	245,692,110	132,240	299,120
Maine	118,488,550	63,800	144,310
Maryland	699,625,780	634,910	2,155,040
Massachusetts	741,682,600	399,370	903,330
New Hampshire	43,977,220	23,680	53,560
New York	1,479,008,990	1,450,360	3,187,210
Rhode Island	85,000,140	45,770	103,530
Vermont	84,777,170	45,650	103,250
Total	3,498,152,560	2,795,780	6,949,350

Source: Northeast Energy Efficiency Partnerships, Regional Energy Efficiency Database Program Year 2011 Annual Report (2013)

EE is a Smart Solution

EE is the Cheapest Way to Control Air Pollution

Cost of Selected Emissions Control Measures

	Carbon Dioxide (CO_2)	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Particulate Matter
Selective Catalytic Reduction	No reduction	$1550+/ton	No reduction	No reduction
Fabric Filter ("Baghouse")	No reduction	No reduction	No reduction	$42+/ton
Electrostatic Precipitator	No reduction	No reduction	No reduction	$40+/ton
Wet Flue Gas Desulfurization ("Wet Scrubber")	No reduction	No reduction	$80+/ton	$80+/ton
Energy Efficiency	≤ $0/ton	≤ $0/ton	≤ $0/ton	≤ $0/ton

Source: U.S. EPA, Menu of Air Pollution Control Measures (2013)

Avoided Emissions are Part of What Makes EE Cost-Effective

Wisconsin 2012 Costs, Benefits, and TRC Ratio

State	Residential	Nonresidential	Total
Incentive Costs	$15,775,767	$28,090,892	$43,866,659
Admin Costs	$3,792,038	$3,374,847	$7,166,885
Delivery Costs	$8,647,538	$13,780,905	$22,428,443
Incremental Measure Costs	$38,764,692	$98,249,403	$137,014,095
Total Non-Incentive Costs	$51,204,268	$115,405,154	$166,609,422
Electric Benefits	$61,608,536	$203,458,650	$265,067,186
Gas Benefits	$45,627,166	$138,716,232	$184,343,398
Emissions Benefits	$30,541,571.90	$100,147,119	$130,688,691
Total TRC Benefits	$137,777,274	$442,322,000	$580,099,274
TRC Benefits Minus Costs	$86,573,006	$326,916,846	$413,489,852
TRC Ratio	2.69	3.83	3.48

Over 20%!

Source: Cadmus, Focus on Energy Calendar Year 2012 Evaluation Report (2013)

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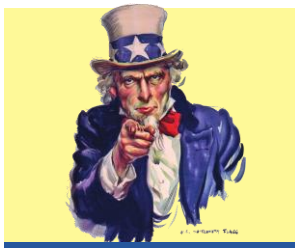

I Want You!

We Need Better Data

- Improve accuracy of cost-effectiveness tests and economic potential studies
- Include EE in State Implementation Plans (SIPs) for air quality (e.g., ozone SIPs)
- Earn credits for "111d" compliance (power plant carbon regulations)

We Need Your Help

- Air quality profession has very limited resources and lacks expertise on EE
- EE program money already allocates resources for EM&V
- Missing ingredients are timing and location of energy savings
- EE professionals have the knowledge and skills to estimate timing and location
- Little incremental effort is needed to calculate avoided emissions using standard U.S. EPA tools