RAP Energy solutions for a changing world

EE in EPA's Clean Power Plan (CPP): Moving from the Appetizer to a Five-Course Meal

ACEEE Market Transformation Conference
Washington, DC
April 22, 2015

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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)

- Chris James is a Principal at RAP. His experience as an air quality regulator came as Director of Air Planning, and Manager of Energy and Climate Change Programs for the State of Connecticut, and with EPA's Region 10 office in Seattle.

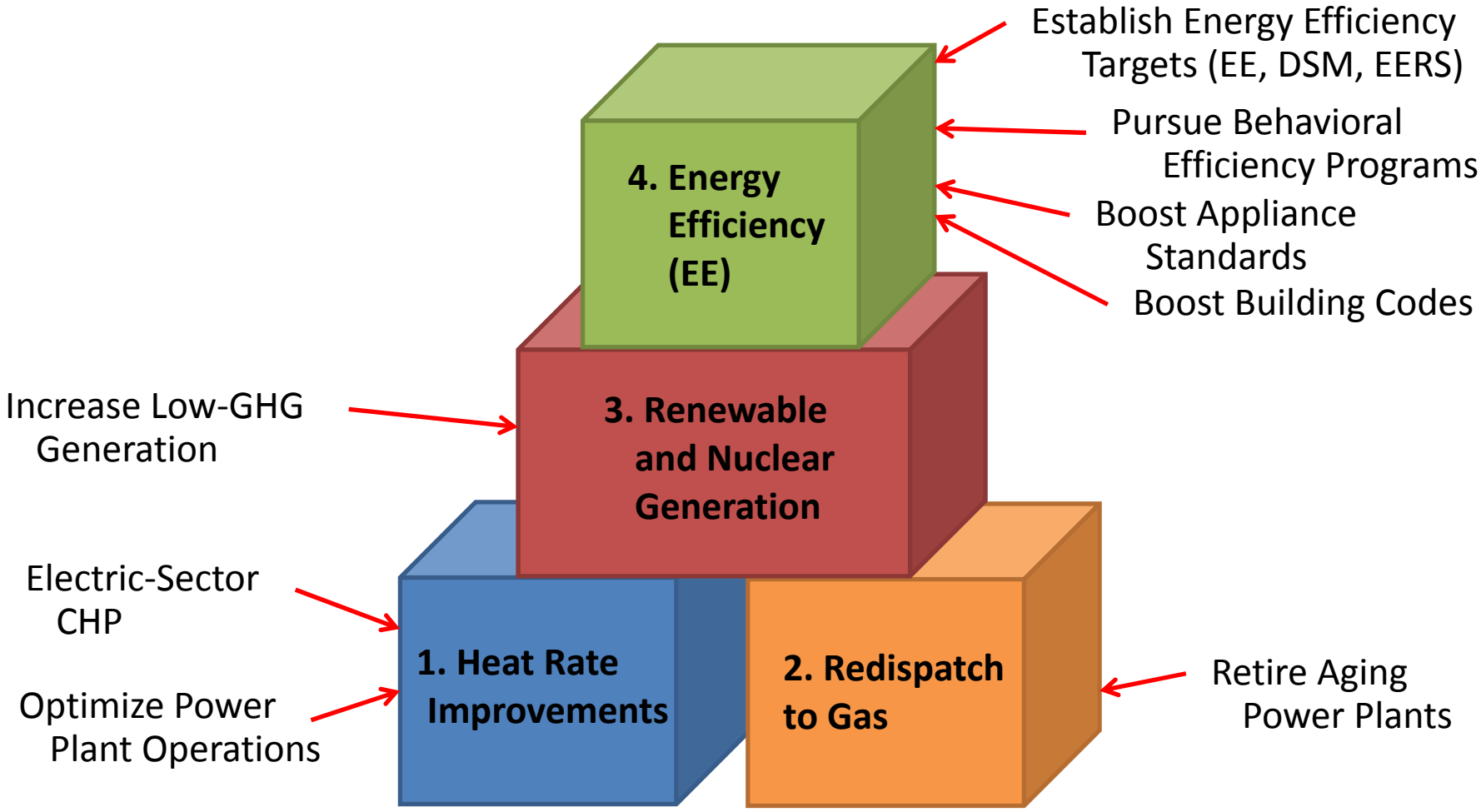
Overview

- Conclusions
- Clean Power Plan (aka “111(d)”) recap
- Role of “Big EE” to meet GHG targets
- Cautionary Note
- Mobile Source Analogy
- Characterizing EE

Conclusions

- EE “power plants” can help meet 111(d) requirements, be constructed in areas to optimize energy and economic benefits, and be reliable replacements for retiring fossil plants
- Potential in many states for EE to comprise a sizable share of 111(d) GHG requirements
- Caveats:
  - Keep it simple (80/20 rule for EM&V may be ok initially)
  - Air regulators are key actors to enable this outcome, but need help to see how EE at scale can happen, to understand EM&V, and how to determine emissions reductions
  - Complications will cause regulators to default to what they already know ➔ build gas plants

Flexibility: EPA's Building Blocks



But Many Other Technology & Policy Options Exist

- Optimize Grid Operations
- Reduce Losses in the T&D System
- Privately-delivered Energy Efficiency
- Encourage Clean Distributed Gen
- Revise Capacity Market Practices
- Improve Utility Resource Plannin
- Adopt Cap-and-Invest Programs (
- Adopt Environmental Dispatch or
- Tax Carbon Dioxide Emissions ("
- Water Conservation

"Menu of Options" coming from the National Association of Clean Air Agencies (NACAA) later this spring

CPP Planning Necessitates New Partnership Among State Regulators

	Authority to Adopt Emission Reduction Requirements ?	Authority to Approve Cost Recovery from Ratepayers?
PUCs/PSCs	**No**	**Yes**
DEPs/DEQs	**Yes**	**No**

"State environmental regulators will become substantially more important, with responsibilities rivaling those of the PUCs, effectively dictating resource adequacy considerations as they unveil their respective (plans)"

…and 111(d) Is Not a §110 SIP

- "Similar" ≠ identical
  - Little state experience
  - Cost/useful life considerations
  - Measures, timing, contents of state plans

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It's Not a SIP: Opportunities and Implications for State 111(d) Compliance Planning

Authors
Christopher James and Kenneth Colburn

Introduction

Even before the US Environmental Protection Agency's (EPA) Clean Power Plan (CPP) becomes final, states are initiating careful planning efforts to identify ways that its proposed requirements could be met. Many observers characterize these state plans – which EPA will require under Section 111(d) of the federal Clean Air Act (CAA) – as "State Implementation Plans" (SIPs) for greenhouse gas (GHG) emissions. In reality, however, the CAA's requirements under 111(d) differ markedly from those for traditional criteria pollutant SIPs as found in Section 110 of the Act. Distinguishing the difference between Section 111(d) compliance plans and Section 110 SIPs is therefore quite important. States have

Chief among them is that unlike Section 110, the CPP offers broad flexibility for states to identify and implement technology and policy options of their own choosing to reduce GHG emissions. EPA's proposal uses four broad "building blocks" (heat rate improvements, re-dispatch to natural gas, non-emitting generation like renewable energy and nuclear power, and energy efficiency) to determine individual state emissions reduction targets. In actuality, the options open to states extend far beyond these building blocks; they include an array of additional policies and technologies that can be tailored by states to achieve compliance more cost-effectively, assist in meeting other or future air quality goals, help address other issues such as water concerns, and target state employment or economic gains. Some states may choose to submit 111(d) plans

significant differences that could operate to the detriment of the states if they constrain their 111(d) planning to SIP approaches.

is different, exactly?

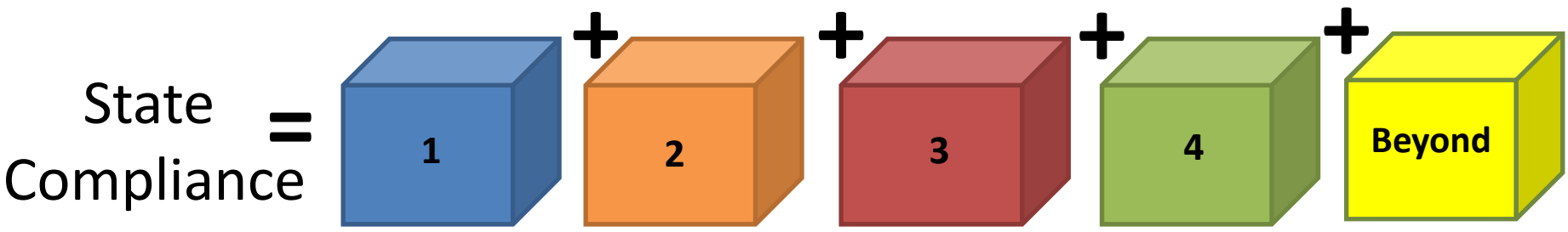
1 42 U.S. Code § 7411 (d) (1).

Some states may approach 111(d) compliance planning as though it were a SIP, but they may endure higher costs, fewer options, and less innovation as a result.

www.raponline.org/document/download/id/7491

State 111(d) Compliance Plans: The Actual Opportunity

~~Conventional Wisdom:~~ **Actual Opportunity:**



~~Each BB likely > 0~~ **Some BBs *may* be zero**

Keys:

- States can think outside the "Building Block Box"
- Better to seek 'approval' than to ask permission

Quantifying EE Emissions Reductions: Apply a "Mobile Source Analogy"

EE Can Be Like A Car???

Driving Energy Efficiency: Applying a Mobile Source Analogy[1] to Quantify Avoided Emissions

Authors

Kenneth Colburn, Christopher James, and John Shenot*

Over the past 40 years, energy efficiency (EE) has helped the United States to cost-effectively avoid emissions that cause air pollution. Studies show that the costs per ton of reducing emissions through EE are lower than traditional control measures implemented by air regulators.[2] Further,

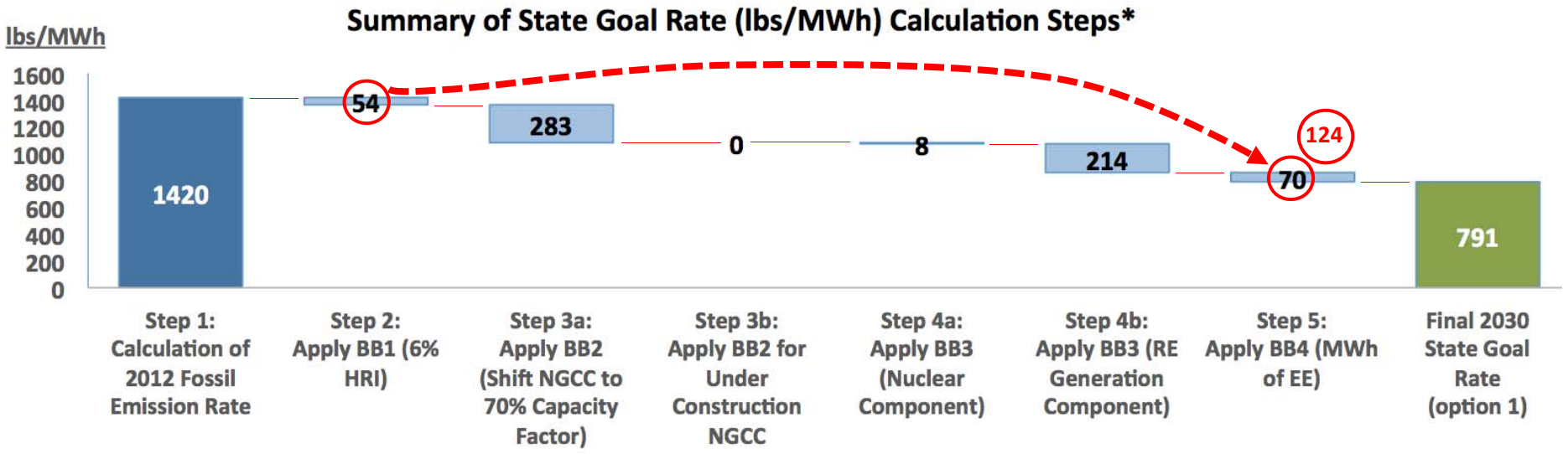
Through quantification approaches approved by EPA and adopted by states in compliance with the Clean Power Plan, energy efficiency can establish its efficacy as a cost-effective, enforceable, multi-pollutant emissions

integrating EE into air quality planning is primarily due to the challenge of accurately quantifying the air pollution emissions reductions that EE measures provide. There are two complex steps in this process: (1) characterizing the energy savings that result from EE measures, and (2) translating those energy savings into

What Might an EE Power Plant Look Like?

"End Use" (what the electricity is being used for)	Representative installed equipment (also called "Measure")	Unit of installed equipment (what are you counting?)	Quantity of installed equipment (how many will be installed?)	Savings per Unit (kWh/yr)	Total Savings (MWh/yr)
				RESIDENTIAL	
Residential Cooling	ENERGY STAR Central A/C	Air Conditioner	756	150	113
Cooking & Laundry	CEE Tier 3 Washer	Washing Machine	6,830	237	1,619
Lighting	CFL	Light Bulb	981,130	35	34,340
Refrigeration	Recycled Refrigerator	Refrigerator	2,127	720	1,531
Space Heating	Weatherization	One Home	542	1,500	813
Water Heating	Low Flow Showerhead	Showerhead	3,530	260	918
Other	Custom Projects	One Home	3,257	1,000	3,257
			Total Residential		**42,591**

Example: Boost EE to Ease Requirements on Coal Plants in Texas?



Caution: Using EE Probably Won't Be Easy (Quantifying Avoided Emissions from EE)

1. Develop a **baseline** forecast of energy consumption and associated emissions
2. Determine which EE policies and programs are already **embedded** in the baseline forecast
3. Quantify the expected **energy savings** from incremental EE (MWh)
   - EM&V?
   - Net vs. Gross?
   - Free Riders?
4. Quantify the expected **avoided emissions** from incremental EE (tons)
   - Marginal Plant?
   - Time of Day?
   - In-State or Out?

Very Short Compliance Window!

If We Make EE Difficult to Use, Regulators Likely to Default to What They Know

"Scale-It-Up" – Libraries of EE/AQ Data

Units Needed to Avoid 1 Ton-per-Year Emissions			
Measure	**NOx**	**SO2**	**CO2**
LED Light – New Construction	3,734	2,555	5.4
Mobile Home Duct Sealing	712	475	1.0
SEER 16 Air Conditioner with Electronically Commutated Motor	5,216	3,130	8.6
EnergyStar Clothes Washer with electrically heated water	29,333	11,000	22

Sources: Northwest Regional Technical Forum; Wisconsin Focus on Energy

Similarities Between Mobile Source and Energy Efficiency Programs

Attribute	Commonality	Mobile Sources	Energy Efficiency
Source Characteristics	Sources are numerous, dispersed and decentralized	Thousands or millions of vehicles operate in major metro areas and statewide	Thousands or millions of light bulbs, appliances, motors, etc., are installed and operate in major metro areas and statewide
Program Characteristics	Programs may be concentrated or dispersed	Requirements for an entire vehicle fleet or for individual buyer	Statewide building codes, multiple property retrofits or single family home
Program Benefits	Aggregation of improvements over numerous small sources can yield large emission reductions	Improvements in vehicle operation and fewer vehicle miles traveled result in reduced emissions	Reduced electricity demand on the grid results in less power production and EGU emissions

Similarities Between Mobile Source and Energy Efficiency Programs

Attribute	Commonality	Mobile Sources	Energy Efficiency
Performance assessment data	Key variables include: manufacturing parameters, vintage, persistence, and operating characteristics	Vehicle tailpipe and other field testing occurs at approved labs (EPA Ann Arbor, CARB, SCAQMD); models and guidance developed by EPA	Device- specific analytical and field-test data are provided by EPA and state-approved sources (NEEP, PNW RTC)
Tools, models and methods used	Simplifying quantification to be workable requires readily available and approved (or nearly so) tools	EPA-developed or approved mobile source models are used by federal, state and local agencies for planning and assessment purposes	Energy savings: best-practice EM&V, utility planning models, ISO/RTO models Avoided emissions calculations: EPA tools, EPA-approved protocols, ISO-NE marginal emissions analysis

Other Ways to Simplify EE Emissions Quantification

1. "Deemed Energy Savings" for good EE programs…
   – *Why not "Deemed Emission Reductions" too?*

2. "AP-42 *Emission Factors*" hierarchy approach…
   – *Why not apply to EE emissions reductions?*

3. *Modeling:* EPA provides the MOVES model for states to assess vehicle emissions…
   – *Why not a similar model for EE (AVERT?)*

REMEMBER: §111(d) is NOT a SIP; EPA has far greater flexibility than under §110

Summary

- Each state has significant EE potential ➔ include initial study/update as part of CPP plan
- Think of hierarchies in terms of energy savings and emissions reductions data; identify and improve over time
- Critiques of MSA welcome; what next steps should be taken?
- Thank you for your time and attention!

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About RAP

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

- 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

Absolute and Relative Reductions in Emissions and Energy Use

Air Emissions Programs	Energy Efficiency Programs
Emission programs can result in absolute emission reductions or reductions in emission rates:	**Efficiency actions can result in absolute or relative reductions in energy use:**
Emission rate reductions reduce total emissions only relative to the use of the affected equipment **(e.g., miles driven by mobile sources) and subject to the influence of independent variables**	***Efficiency actions reduce total energy use only relative to the use of the affected equipment*** **(e.g., hours that the efficient lights are operated) and subject to the influence of independent variables**
• **Emission reductions are usually** ***reported either as absolute reductions in total emissions or as reductions relative to what would have been the emissions in absence of the program/regulation***	**Energy use reductions are usually only** ***reported as reductions relative to what would have been the energy use in absence of the program/regulation***

Approaches to Documenting Savings

Air Emissions Programs	Energy Efficiency Programs
Document *change in emissions rates or absolute change in emissions*, using one or more of the following:	Efficiency actions can result in absolute or relative reductions in energy use:
CEMS (e.g., to determine total emissions of power plant)	*Efficiency actions reduce total energy use only relative to the use of the affected equipment* (e.g., hours that the efficient lights are operated) and subject to the influence of independent variables
Equipment installation/operation verification and/or emissions source testing (e.g., to determine emissions rate for mobile sources)	Energy use reductions are usually only *reported as reductions relative to what would have been the energy use in absence of the program/regulation*
Monitoring and verification of emissions relative to counterfactual baseline (e.g., offset programs)	
Sampling – spot testing, verification, measurements of sample of sources over time Continuous Emissions Monitoring Systems	

Who Determines Impacts and Reporting Cycle

Air Emissions Programs	Energy Efficiency Programs
Who: regulatory agencies, permit holders, contractors, and third-party compliance firms	*Who: regulatory agencies, project owners, contractors, and third-party compliance firms (evaluators)*
When: Annual reporting of verification and true-ups (documentation) is the norm	*When: annual reporting of verification and true-ups* (documentation) is the norm