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Industrial Energy Efficiency and CHP and the Clean Power Plan

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Presented to:

SEE Action – IE/CHP Working Group

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Energy Efficiency as a CO_2 reduction strategy

Under section 111(d) of the Clean Air Act, EPA is intends to regulate carbon emissions from power plants. The proposed rule includes the use of energy efficiency gains by customers as a compliance mechanism to meet state implementation plans. Conceivably, utilities could pay customers for electricity savings that result in power plant CO_2 reductions.

Clean Power Plan proposed rule

- Clean Air Act provides legal authority – requires a federal-state approach. The proposed rule is called the "Clean Power Plan"
  - EPA set state-specific emission rate goals
  - State are to submit compliance plans
  - Section 111(b) new power plants
  - Section 111(d) all other generators
- Reduce power sector CO2 emissions by 30% by 2030 from 2005 levels
  - Corresponds to ~17% reduction from 2013 levels

Timeline

June 2, 2014: EPA proposed the Clean Power Plan

June 2015: Final Rule due

2016-18: State plans due

2020-2029: Compliance with initial goal

2030+ Compliance with final goal

Each state has a target rate

$$\text{Rate} = \frac{\text{Pounds of } CO_2}{\text{MegaWatts/hour}}$$

The rate is based on the existing mix of electric generating units (EGUs) and the potential for improvement.

Rate improves if:

$$\text{Rate} = \frac{\text{Pounds of } CO_2}{\text{MegaWatts/hour}}$$

The numerator decreases, or;
the denominator increases.

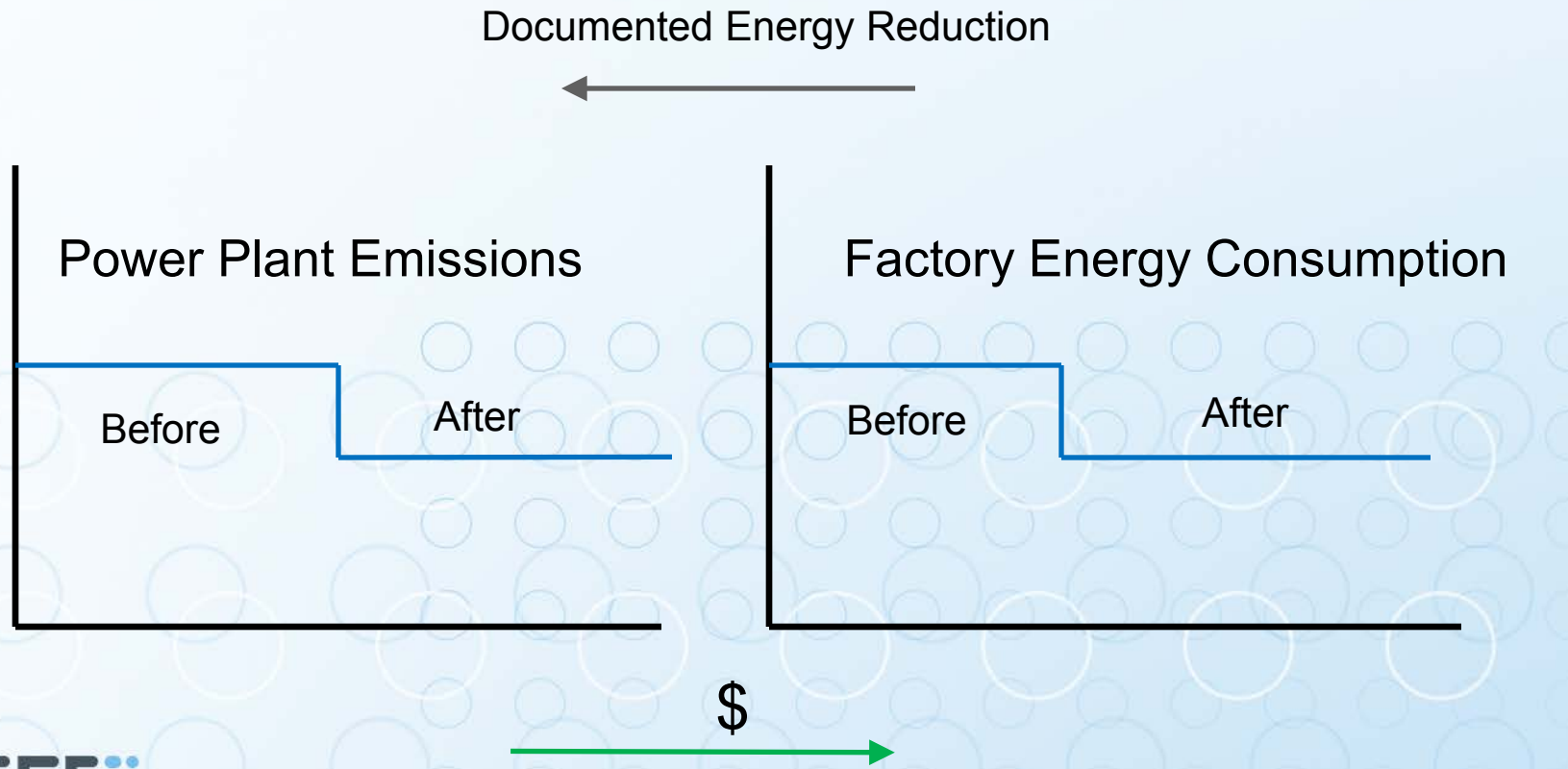
The Blocks

1. Improve efficiency of generator
2. Change dispatch order
3. Source low-carbon energy
   - RE, Biomass, WHP, Nuclear
4. End-use energy efficiency
   - Large customer EE
   - CHP and WHP

EE as Emission Reduction

How it might work

Electricity only



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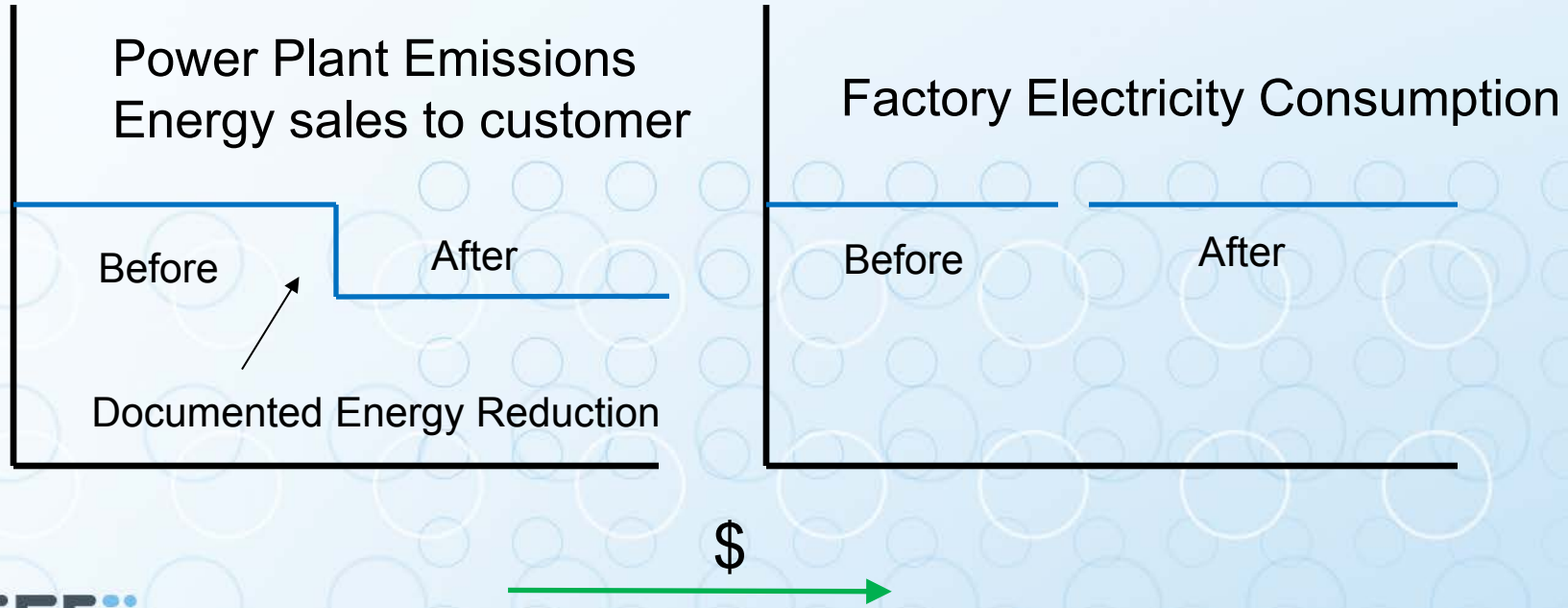
Types of CHP Units

Covered Existing	Non-Covered Existing
• Lower emission rates than conventional generation • #1 and #2	• Bio-mass (#3)
Covered New	**Non-Covered New**
• Sec. 111(b) NSPS • Lower emission rate than conventional generation (#2) • Bio-mass #3	• Treated as end-use energy efficiency resource (#4)

CHP as Emission Reduction

How it might work

Electricity only



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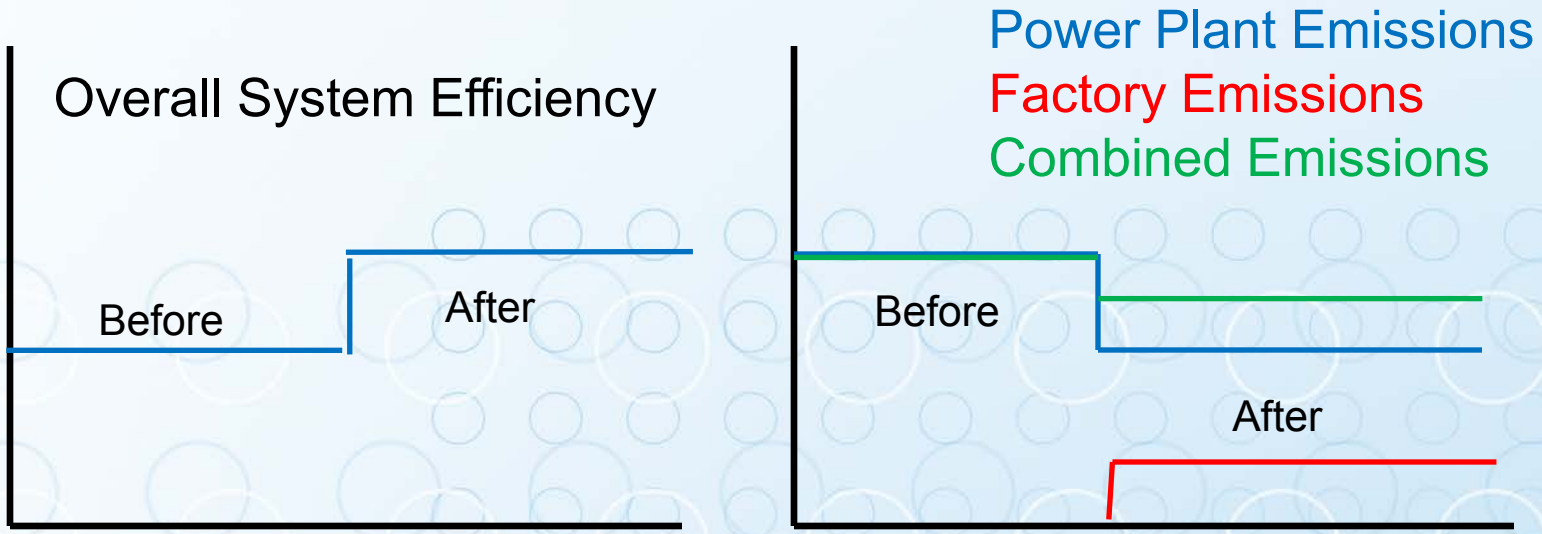
CHP as Emission Reduction

The collective emissions of power plant and factory are reduced with CHP



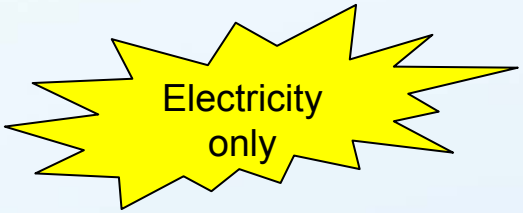
Ways to determine CO_2 Reduction

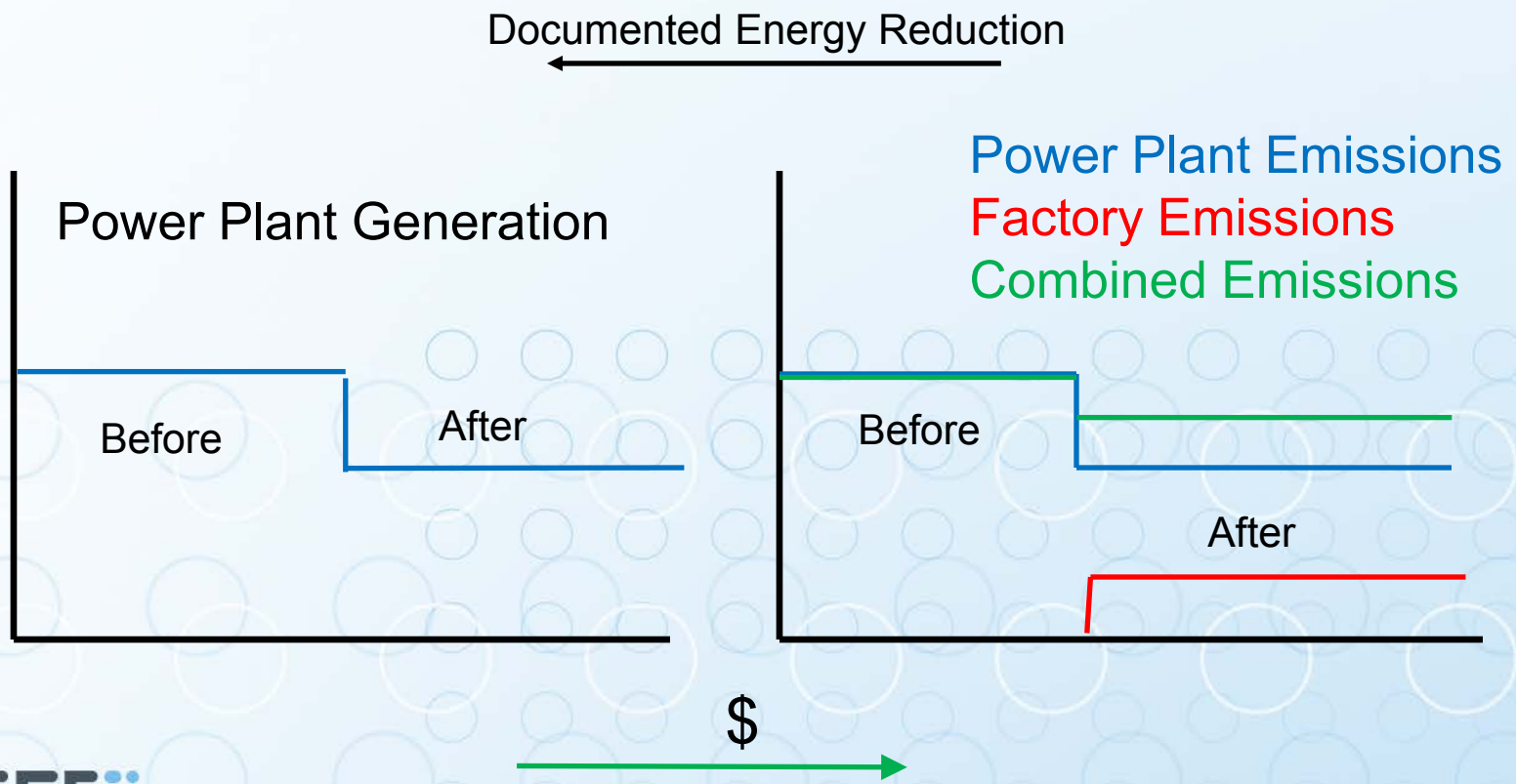
1. Reduced generation at EGU
   - EGU emission rate x MWh not produced
   - (No credit for thermal)
2. Equivalence approach
   - CHP generation & % of thermal converted to MWh not produced by covered EGUs
   - MWh converted to CO_2 emissions*
3. Avoided emissions approach
   - Before emissions* – after emissions

(* based on regional grid average)

CHP as Emission Reduction

In Summary, it looks like this:





Implementation Possibilities

- Up to each state whether or not to include efficiency as a compliance method
- Two possible approaches:
  - Mass-based (cap in #tons/year)
  - Rate-based (#tons/MWh)
- Up to each state whether or not to include CHP as a compliance method
  - Many, many possible approaches
  - However, none can include offsets because…

Concluding Thoughts

- EPA is attempting to use market forces to reduce the amount of CO_2 released by electricity generation
- Each state must develop its own implementation plan
- Demand side efficiency and CHP should be part of such plans
- If they are, customers could monetize such investments

Thank you!

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Appendix: A
ACEEE report on 111(d) and EE:

Change Is in the Air: How States Can Harness Energy Efficiency to Strengthen the Economy and Reduce Pollution

Sara Hayes, Garrett Herndon, James P. Barrett, Joanna Mauer, Maggie Molina, Max Neubauer, Daniel Trombley, Lowell Ungar

April 2014. http://aceee.org/research-report/e1401

A SNAPSHOT OF THE U.S. IN 2030

Following the current energy path will have devastating economic, environmental, and health impacts. Enacting energy efficiency policies would avoid 600 million tons of carbon dioxide emissions.

CURRENT ENERGY PATH

An additional 494 power plants would be maintained

NOx

527,000 tons* of additional nitrogen oxide pollution

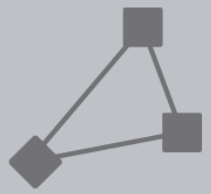
SO2

980,000 tons* of additional sulfur dioxide pollution

CO2

600 million tons* of additional carbon dioxide pollution

Transmission and distribution cost increases

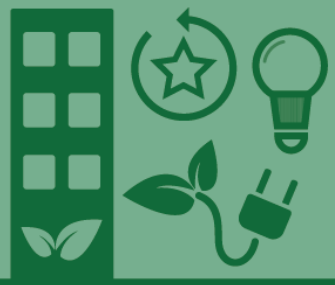


Erosion of energy grid reliability

$95 billion in electricity generation costs

*i.e., the amount of pollution that would be avoided by choosing the energy efficiency scenario

ENERGY EFFICIENCY SCENARIO



Energy efficiency policies would save 925 million MWh of electricity

Environmental impacts:

26%
reduction in carbon emissions relative to 2012

25%
reduction in power demand relative to 2012

Economic impacts:

611,000
new jobs created

$17.2 billion
increase in GDP in 2030

$47 billion in energy efficiency investments

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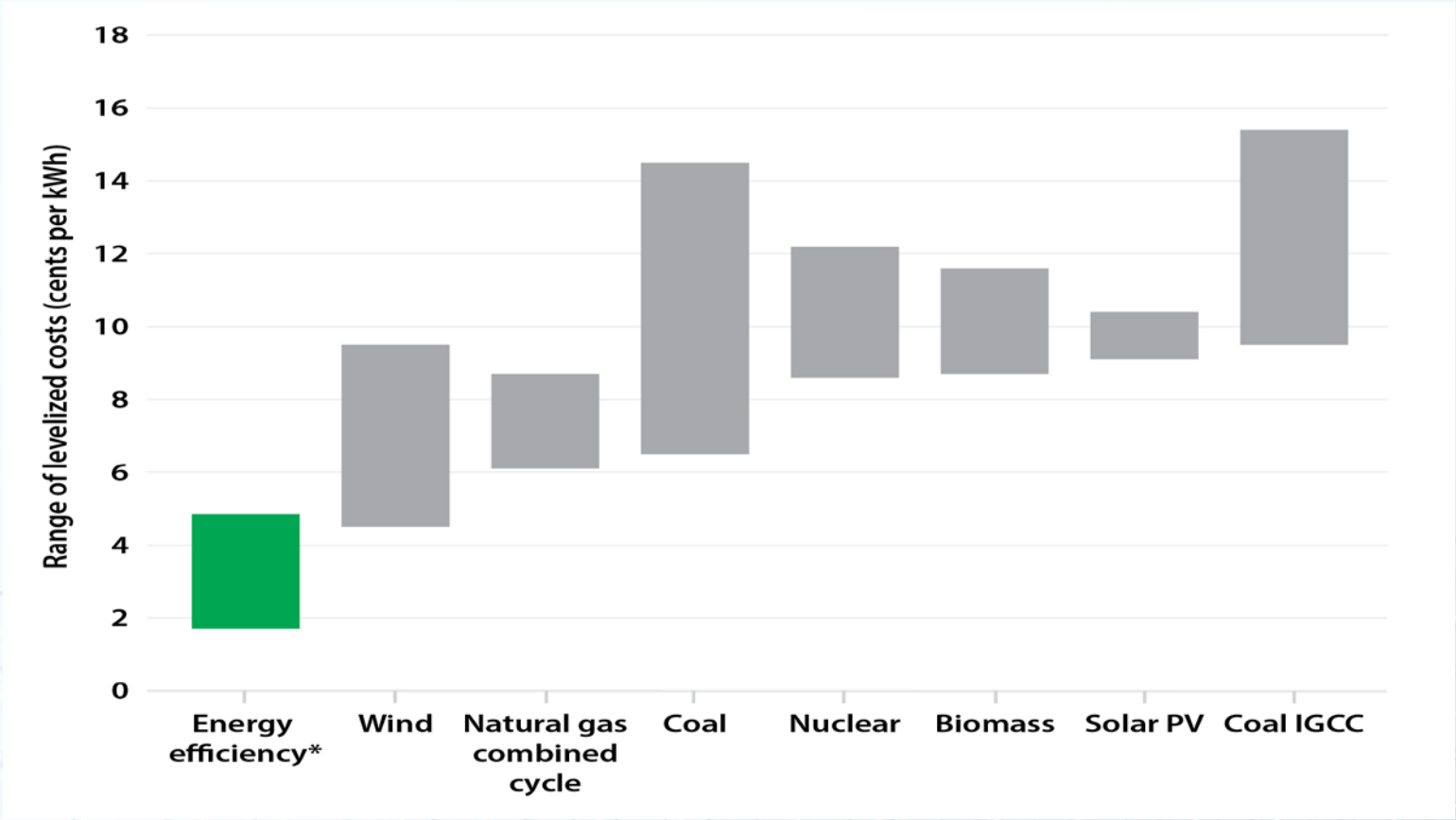
Levelized Cost of Energy Resources



High-end range of advanced pulverized coal includes 90% carbon capture and compression. *Source:* Molina 2014.

Savings relative to costs of energy efficiency policies

	High and low range for all states
Energy savings target	1.1 - 4.9
Building codes	1.8 - 3.0
CHP	1.0 - 4.1
Equipment standards	1.8 - 9.4

Table 3. 2030 electricity savings if all four policies adopted

2030 electricity savings if all four policies adopted

	Annual electricity savings (MWh)	Cumulative electricity savings (MWh)	Avoided capacity (GW)	Percent avoided electricity consumption relative to 2012
Energy savings target	**692,200,000**	**5,470,500,000**	**185**	**18.8%**
Building codes	155,400,000	1,100,100,000	41	4.2%
Combined heat and power	**68,300,000**	**564,500,000**	**18**	**1.9%**
Equipment standards	9,400,000	112,100,000	3	0.3%
National total for all four policies	925,400,000	7,247,200,000	247	25.1%

Building CHP instead of Central Generation

18 GW of central generation not built

20 GW of CHP built by 2030

Where will it go?