



Building Energy Codes in the Clean Power Plan

**Building Codes Advocates Meeting
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American Council for an Energy-Efficient Economy (ACEEE)

Nonprofit 501(c)(3) that acts as a catalyst to advance energy efficiency policies, programs, technologies, investments & behaviors

- *Research*: buildings, industry, utilities, transportation, economic analysis & behavior
- *Policy*: national, state, & local
- *Outreach*: conferences and publications
- Nearly 50 staff based in D.C.



Codes Are in Clean Power Plan

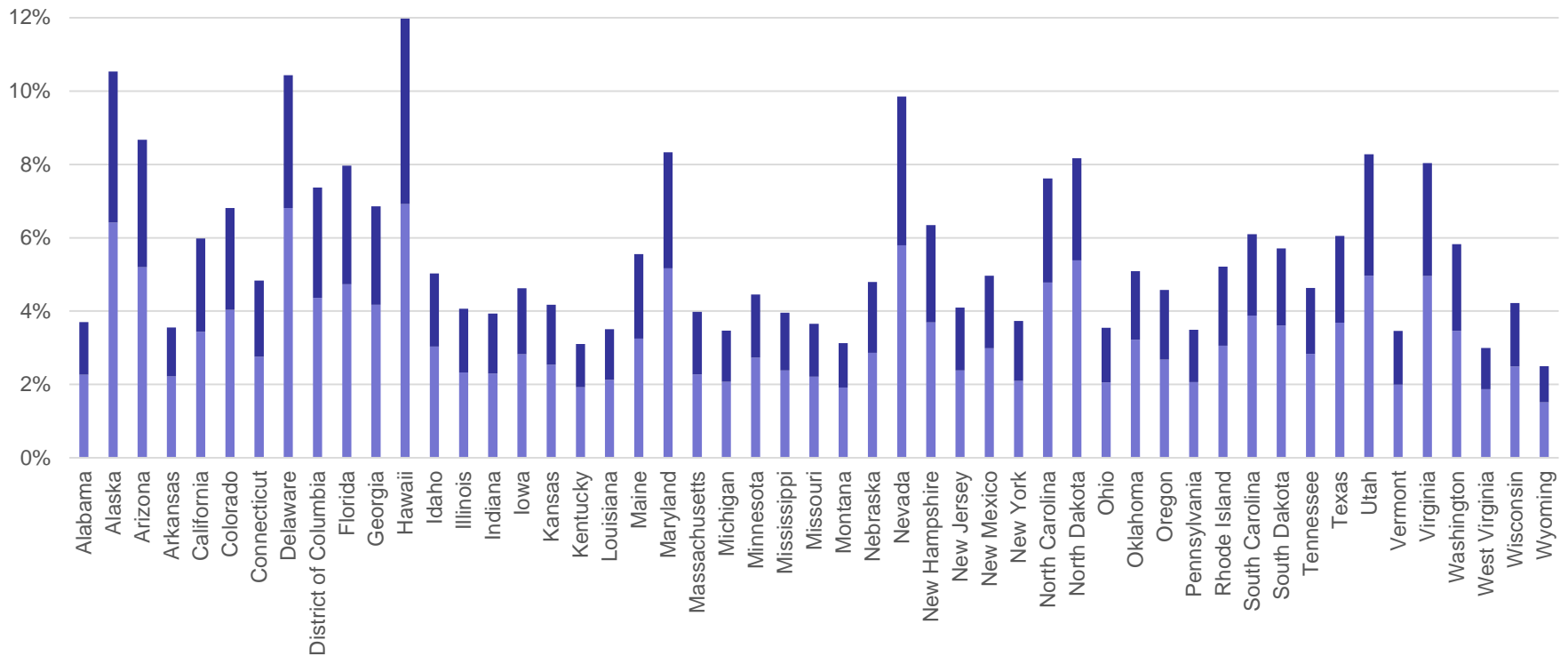
- Although EE was not considered in setting the standards,
- Codes are explicitly allowed for compliance
 - In final rule (preamble)
 - Section in draft EM&V guidance

Potential Savings

- Net savings (NPV): \$150-225 billion
- Benefit-cost ratio: 3:1
- Electricity savings in 2030: 140-230 million MWh
 - 3-5% of total US electricity sales
 - 5-9% of covered 2012 generation
- CO₂ emissions reduction in 2030: 75-175 MMT

State-level Savings as % of Sales

2030 Annual Electric Savings as % of Sales



A Note about Numbers...

- DOE, EECC, and ACEEE all now using PNNL building simulations
- Assumed baselines and compliance may vary
- Terminology may vary

Codes in Mass- and Rate-Based States

- **Mass-based:** Codes count (reduce emissions)
 - Convince states codes are effective tool
- **Rate-based:** Codes can earn credits (ERCs)
 - Also convince air regulators to allow credits for codes

Codes + CPP Resources

- ACEEE SUPR Calculator

Step 4

State selected: Virginia Detailed results...

Selected measures

1.	Building energy codes (high)
2.	Combined heat and power (CHP) (medium)
3.	ESCO programs
4.	-
5.	-
6.	-
7.	-
8.	-
9.	-
10.	-

Summary results

	2010	2020	2050
Cumulative NO2 reductions (tons)	1,400	30,200	40,700
Cumulative SO2 reductions (tons)	14,300	43,700	95,400
Cumulative CO2 reductions (tons)	3,143,000	31,670,000	11,656,000
Annual CO2 reductions (tons)	2,397,000	10,870,000	32,155,000
Cumulative net cost (billions 2018)	1,740	1,604	583
Cumulative energy saved (MWh)	10,519,800	28,106,900	82,241,300
Annual energy saved (MWh)	3,495,000	7,576,000	12,536,000

*Results are for all selected measures combined reported cumulatively.

What does this mean?

Number of 100 MW power plants offset by 2050	66
Savings from energy efficiency measures by 2050 (billions 2018)	\$1,423
Percent of EPA's goal achieved by selected measures	5%

Helpful definitions:

Annual savings: the savings in a given year from all the measures that have been installed under a policy or program in prior years and in that year that are still saving energy (and CO2, SO2, and NO2).

Cumulative savings: all the savings under a policy or program up through a given year; the sum of annual savings through that year.

Cumulative cost: all the spending on a policy or program up through a given year; the sum of all of the money spent through that year.

Cumulative net cost: all of the spending on a policy or program up through a given year minus all of the avoided spending through that year. The spending on the program minus any avoided spending from lower energy consumption/lower energy bills.

Impact of measures on emissions rate compared to EPA goal

Impact of measures on emissions rate compared to EPA goal

D.C. and Vermont do not have emission targets under the EPA Clean Power Plan, so their figures will not generate for these states.

- ACEEE codes template

Codes + CPP Resources

- EECC Code Emissions Calculator

111(d)-Related Results

Electricity Savings Summary

2020 Snapshot

Avoided Emissions / Energy	Residential	Commercial	Total
Annual MWh	66,891	242,184	309,075
Cumulative MWh	279,897	975,260	1,255,157
Annual Metric Metric tons of CO ₂	61,194	221,559	282,753
Cumulative Metric Metric tons of CO ₂	256,061	892,205	1,148,265

2030 Snapshot

Avoided Emissions / Energy	Residential	Commercial	Total
Annual MWh	71,802	259,221	331,023
Cumulative MWh	1,008,262	3,577,587	4,585,849
Annual Metric Metric tons of CO ₂	65,687	237,145	302,832
Cumulative Metric Metric tons of CO ₂	922,397	3,272,912	4,195,309

Cost & Savings

Projections Through 2040	Residential	Commercial	Total
Energy Cost Savings (Millions \$ NPV)	\$1,743	\$3,226	\$4,969
Costs (Millions \$ NPV)	\$796	\$1,764	\$2,560
Benefit-Cost Ratio	2.19	1.83	1.94

Results By Year

Year	Cumulative MWh	Cumulative CO ₂ (Metric tons)
2014	0	0
2015	0	0
2016	111,884	102,356
2017	331,430	303,205
2018	637,184	582,920
2019	946,083	865,512
2020	1,255,157	1,148,265
2021	1,584,521	1,449,580
2022	1,912,547	1,749,671
2023	2,247,268	2,055,886
2024	2,584,021	2,363,960
2025	2,922,436	2,673,555
2026	3,258,354	2,980,866
2027	3,591,513	3,285,652
2028	3,923,379	3,589,256
2029	4,254,827	3,892,477
2030	4,585,849	4,195,309

1. Location and Baseline

2. Building Growth Projection

3. Building Code Updates

4. Display Results

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111(d) Results

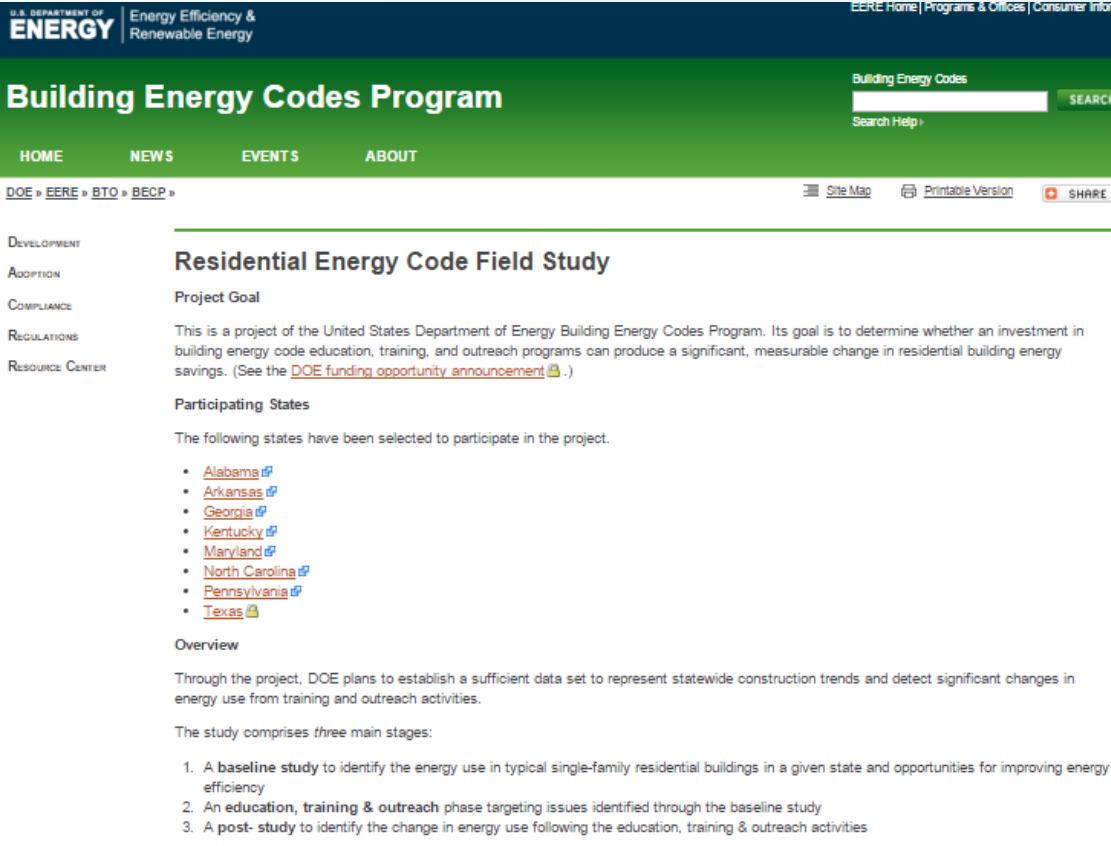
More Results

Evaluation (EM&V) for Credits

- EPA draft EM&V guidance includes codes
 - Bottom-up approach using building simulation and estimated compliance is acceptable
 - Common practice baseline (CPB) should account for naturally occurring market adoption (NOMAD)
 - Seeming contradictions (eg a footnote elsewhere bars cost-effective codes)

EM&V – DOE Methodologies

- DOE working on improved EM&V



The screenshot shows the DOE Building Energy Codes Program website. The header includes the U.S. Department of Energy logo and navigation links for EERE Home, Programs & Offices, and Consumer Information. The main navigation bar features links for HOME, NEWS, EVENTS, and ABOUT. A search bar is located in the top right corner. The breadcrumb trail reads: DOE » EERE » BTO » BECP. The page title is "Residential Energy Code Field Study". The "Project Goal" section states: "This is a project of the United States Department of Energy Building Energy Codes Program. Its goal is to determine whether an investment in building energy code education, training, and outreach programs can produce a significant, measurable change in residential building energy savings. (See the [DOE funding opportunity announcement](#).)". The "Participating States" section lists: Alabama, Arkansas, Georgia, Kentucky, Maryland, North Carolina, Pennsylvania, and Texas. The "Overview" section states: "Through the project, DOE plans to establish a sufficient data set to represent statewide construction trends and detect significant changes in energy use from training and outreach activities." and "The study comprises three main stages: 1. A baseline study to identify the energy use in typical single-family residential buildings in a given state and opportunities for improving energy efficiency; 2. An education, training & outreach phase targeting issues identified through the baseline study; 3. A post-study to identify the change in energy use following the education, training & outreach activities".

Opportunities to Comment

EPA seeking comment by 1/21/16 on:

- Draft EM&V guidance
- Draft federal plan
 - Rate-based version does not allow EE to earn credits

Resources

- NASEO: <http://111d.naseo.org/>
- ACEEE: <http://aceee.org/topics/section-111d-clean-air-act>
- EECC: <http://energyefficientcodes.com/energy-codes-make-sense-with-or-without-the-clean-power-plan/>
- EPA: <http://www2.epa.gov/cleanpowerplan/clean-power-plan-existing-power-plants>

Note many are being updated

Thank you!

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Common Practice Baseline

- “default technology or condition that would have been in place at the time of project implementation absent the EE installation”
- For new construction programs, most stringent of:
 - state or local building code as of 1/1/13,
 - market industry average practice in the state
 - ASHRAE 90.1-2007/2009 IECC
- Consistent with “gross” savings
- Not include codes and standards determined to be cost-effective?

CPB for Codes

- “determined with consideration of naturally occurring market adoption (NOMAD) of efficiency building practices in the absence of an energy code or a prior energy code”
- NOMAD: “The proportion of savings or application of measures equivalent to the code that would have taken place in the market even if the code had not been adopted.”
 - NOMAD changes over time