Energy Efficiency Strategies for Clean Power Plan Compliance: Approaches and Selected Case Studies

WORKING DRAFT

Subject to Revision

Prepared by the

National Association of State Energy Officials

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About NASEO

The National Association of State Energy Officials (NASEO) is the only national non-profit association representing the governor-designated energy officials from all 56 states and territories. Formed by the states in 1986, NASEO facilitates peer learning among state energy officials, serves as a resource for and about state energy offices, and advocates the interests of the state energy offices to Congress and federal agencies.

NASEO and EPA's Clean Power Plan

NASEO has not taken a position on the appropriateness of the U.S. Environmental Protection Agency's (EPA) Clean Power Plan (CPP). However, since the Obama Administration has advanced the rule, NASEO believes it is important to support states in: maintaining electricity system reliability and affordability; ensuring broad compliance flexibility for states; and enabling market- oriented, least-cost compliance options that would significantly reduce the cost of compliance for consumers and businesses. In support of these priorities, NASEO calls for recognition, crediting, and encouragement of energy efficiency, renewable energy, and transmission and distribution system modernization options as emissions reduction strategies that also support power system reliability and other state energy and economic development goals.

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Introduction and Context

The National Association of State Energy Officials (NASEO) engaged State Energy Offices, State Air Agencies, State Utility Commissioners, and other state-based organizations along with energy industry representatives and trade associations, utility associations, and energy efficiency organizations to determine how several major energy efficiency strategies ("case studies") might be used by states as compliance options under the U.S. Environmental Protection Agency's (EPA) proposed Clean Power Plan (CPP). The CPP is a proposal under Section 111(d) of the Clean Air Act to regulate carbon dioxide (CO_2) emissions from existing fossil fueled utility-scale electrical generating units (EGUs).[1] The EPA proposal contemplates extensive use of "beyond the fence" (i.e., beyond the premises of the regulated power plants) measures for meeting emissions targets, including energy efficiency measures. This opens a large opportunity for advancing energy efficiency as usually offering the most cost-effective and beneficial compliance options.

There are precedents for using energy efficiency as an air quality compliance tool, particularly under Section 110 of the Clean Air Act, which concerns State Implementation Plans (SIPs) for meeting National Ambient Air Quality Standards (NAAQS), but that experience is limited. The CPP, being under Section 111(d), will require states (and tribes) to develop compliance plans that are analogous but not identical to SIPs.[2] State CPP plans need to describe to EPA's satisfaction a state's approach for achieving EPA-established emission targets, including identifying responsible entities and their obligations, performance standards, milestones, corrective actions for performance shortfalls, and how measures will be quantified, verified, and enforced, among other items.[3] The CPP proposal discusses some of this with respect to energy efficiency as a compliance approach. Also EPA has described "pathways" for incorporating both energy efficiency and renewable energy in Section 110 SIPs that can be useful in the CPP context.[4]

"Beyond the fence" strategies, including end-use energy efficiency, are less familiar to air quality regulators than more conventional on-site pollution abatement methods (e.g., pollution control equipment, fuel specifications, boiler or engine controls, throughput limitations) and are seen as more complicated to include in compliance plans. They frequently involve multiple entities beyond, in this case, EGU owners and may be under the regulatory or programmatic purview of multiple agencies (e.g., state energy offices, utility commissions, building code offices). Thus, there is a need to familiarize air quality regulators and other pertinent officials (state energy officials and utility commissioners) with energy efficiency strategies and opportunities as well as to make energy efficiency proponents (private,

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[1] 79 FR 34829 (June 18, 2014) Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating

[2] Christopher James and Kenneth Colburn, 2015, "It's Not a SIP: Opportunities and Implications for State 111(d) Compliance Planning," Regulatory Assistance Project; accessible via http://www.raponline.org/featured-work/tackling-111d-compliance-planning-its-not-a-sip

[3] 79 FR 34829 op. cit., see preamble Section VIII. State Plans and proposed rule §60.5740 et seq.

[4] U.S. EPA, 2012, "Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans, http://epa.gov/airquality/eere/pdfs/EEREmanual.pdf.

public, and non-governmental [NGO] entities) aware of the needs and concerns of air quality regulators for including such measures in their compliance plans.

NASEO has been engaged with the National Association of Clean Air Agencies (NACAA—representing state and local air quality regulators) and the National Association of Regulatory Utility Commissioners (NARUC—representing state utility commissioners) in the so-called "3N" process to serve this purpose. Multiple 3N discussions have focused on a diversity of utility ratepayer-funded and non-utility energy efficiency programs that could contribute to state CPP compliance.[5] These discussions explored issues of incorporating and counting energy efficiency emission reduction impacts, matters relating to state and federal agencies' concerns and jurisdictions, and other pertinent matters. NASEO, with NACAA and NARUC, invited private sector firms, associations, and non-governmental organizations (NGOs) to participate in the 3N process in order to enhance these discussions and the understanding of energy efficiency benefits and opportunities. This led to the 3N organizations—NASEO, NARUC, NACAA—submitting to EPA in May 2014 a consensus "Principles for Including Energy Efficiency in 111(d) of the Clean Air Act" that fully supports energy efficiency as an integral and creditable part of state compliance.[6]

In light of the June 2014 EPA CPP proposal, NASEO, NACAA, and NARUC continued engagement, recognizing that the CPP proposal left open many questions regarding the details and mechanics of including energy efficiency in state compliance. Further, the CPP proposal and its supporting documents' discussion of end-use energy efficiency focused primarily on utility—mainly investor-owned utility—ratepayer-supported energy efficiency programs.

NASEO, especially, has sought to raise awareness of non-ratepayer energy efficiency activities (including voluntary private investments in energy efficiency) that, in fact, account for the great majority of U.S. energy efficiency investment and savings. Thus, such activities could provide very large opportunities under the CPP and would lead to a "least-cost" approach. NASEO engaged private sector and NGO stakeholders to develop several case studies highlighting largely non-ratepayer energy efficiency policies, programs, and strategies.[7]

An additional objective of the 3N process and wider engagement is to highlight energy efficiency as not only often being the least-cost CPP compliance approach, but also as offering multiple benefits that support other state objectives. These include reducing other conventional pollutant emissions,

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[5] In most states, public utility commissions (which may be called public service commissions or state corporation commissions) have jurisdiction over investor-owned utilities but not consumer-owned public power or cooperative ("rural co-ops") utilities, which also operate energy efficiency programs. The CPP concern EGUs so discussion of "utilities" in this paper is generally of electric utilities and may refer to both investor-owned and consumer-owned (public power and cooperative) utilities.

[6] NACAA, NARUC, and NASEO, 2014, "Principles for Including Energy Efficiency in 111(d) of the Clean Air Act". http://www.naseo.org/Data/Sites/1/principles_3n_2014.pdf

[7] There can be overlaps between ratepayer and non-ratepayer energy efficiency efforts. For instance, sometimes an energy savings performance contract may take advantage of a utility incentive for a small portion of a project's investment. In another example, a few utilities support activities to enhance building energy code compliance.

enhancing energy reliability (by reducing grid and fuel supply stresses), avoiding or deferring costly supply-side energy investments, and often supporting in-state and local economic opportunities. Thus, energy efficiency strategies can serve as "no regrets" approaches that deliver benefits irrespective of the fate of the CPP or direction of future climate-related policy.

Energy Efficiency as a Least-Cost Compliance Approach

Multiple studies reinforce that increasing energy efficiency is often more cost-effective than increasing energy supply in order to meet energy, including electricity, demand. It follows that energy efficiency is generally a less costly approach to avoid or reduce electricity generation-related emissions than alternative generation options.

In an analysis of utility ratepayer-supported electricity energy efficiency programs implemented during 2009 to 2013, the Lawrence Berkeley National Laboratory (LBNL) found that the savings-weighted average total cost of saved electricity to be 4.6¢ per kilowatt-hour saved.[8] (Table 1.) That cost includes both the cost to utility program administrators and to participating utility customers; about half and half. In comparison, the U.S. Energy Information Administration (EIA) reported the average 2013 U.S. retail price of electricity to be 10.12¢ per kWh and for residential customers, 12.22¢ per kWh.[9]

Table 1. Savings-weighted average total cost of saved electricity at the national level by market sector

Sector	Total Cost of Saved Electricity (2012$/kWh)*	Program Administrator Cost of Saved Electricity (2012$/kWh)	Participant Cost of Saved Electricity (2012$/kWh)
All Sectors	$0.046	$0.023	$0.022
Residential	$0.033	$0.019	$0.014
Commercial, Industrial, and Agricultural	$0.055	$0.025	$0.030
Low Income	$0.142	$0.134	$0.008

Note: Totals may differ from sum of component values due to rounding.

Source: LBNL

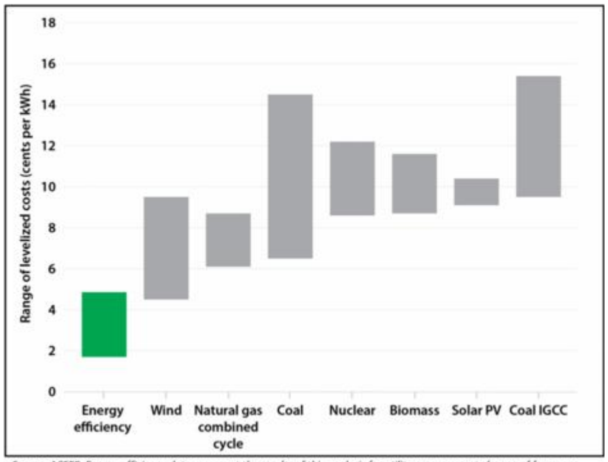
The American Council for an Energy-Efficient Economy (ACEEE) came to a consistent conclusion. Looking at utility program administrator costs, the average cost for saving a kWh was 2.8¢, with most savings in the 2 to 4¢ per kWh range. As Figure 1 shows, these costs are significantly below the cost of electricity supply.[10]

[8] Ian M. Hoffman, Gregory Rybka, Greg Leventis, Charles A. Goldman. Lisa Schwatrz, Megan Billingsley, and Steven Schiller, 2015, "The Total Cost of Saving Electricity through Utility Customer-Funded Energy Efficiency Programs: Estimates at the National, Sector and Program Level," Lawrence Berkeley National Laboratory, http://emp.lbl.gov/sites/all/files/total-cost-of-saved-energy.pdf

[9] U.S. EIA, State Electricity Profiles, United States Electricity Profile 2013, Table 8. Retail sales, revenue, and average retail price by sector, 1990-2013, accessible via http://www.eia.gov/electricity/state/unitedstates/.

[10] Maggie Molina, 2014, "The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs," ACEEE, http://aceee.org/research-report/u1402.

Figure 1. Levelized costs of electricity resource options



Source: ACEEE. Energy efficiency data represent the results of this analysis for utility program costs (range of four-year averages for 2009-2012); supply costs are from Lazard 2013.

Source: ACEEE

Outside of ratepayer-funded energy efficiency programs, energy savings performance contracting (ESPC—one of the featured case studies in this report) is a growing industry, recently amounting to about $6 billion in the United States, i.e., comparable to combined U.S. electricity utility demand-side energy efficiency budgets.[11] The ESPC model is predicated on cost-effectiveness to create "win-win" energy efficiency investments where clients realize immediate positive cash flow from energy savings even as they compensate energy service companies (ESCOs) for project costs plus profit. It is important to note that most of the State Energy Offices lead or support ESPC programs in their states and most governors have seen ESPC as a priority lead-by-example energy efficiency activity to reduce the cost of operating state and local public facilities.

In another example (also a case study in this report) the U.S. Department of Energy (DOE) and others have repeatedly found that building energy codes deliver cost-effective energy savings to both residential and commercial building owners.[12]

Evidence of energy efficiency cost-effectiveness continues to mount, reinforcing that it can serve as a major component for least-cost compliance by states under the Clean Power Plan 111(d) rule.

[11] Bloomberg New Energy Finance-Business Council for Sustainable Energy, 2015, "Sustainable Energy in America Factbook," p. 114, http://www.bcse.org/images/2015%20Sustainable%20Energy%20in%20America%20Factbook.pdf

[12] See cost analyses linked at U.S. DOE, Building Energy Codes Program, Residential Energy and Economic Analysis (https://www.energycodes.gov/residential-energy-and-economic-analysis) and Commercial Energy and Economic Analysis (https://www.energycodes.gov/commercial-energy-and-economic-analysis).

Energy Efficiency and the Mobile Source Analogy for State Compliance Plans

Limited use of end-use energy efficiency for air quality management in part derives from air quality regulators' unfamiliarity with energy efficiency approaches and concerns about quantifying and relying on energy efficiency to deliver emission reductions. Air quality regulators have greater confidence in "inside the fence" measures, such as pollution controls, fuel quality standards, and throughput restrictions, placed on facilities through legally binding permit conditions.

In contrast, energy efficiency strategies often consist of large numbers of small, widely dispersed measures undertaken by many different actors not subject to enforcement. For instance, an air conditioner may need to meet a federal energy efficiency standard and a program may incentivize purchase of higher efficiency ENERGYSTAR air conditioners, but there is no enforceable limitation to how customers set their thermostats and so no guarantee that each and every customer will save some requisite amount of energy. At first blush, it might seem that such efficiency measures lack sufficient quantification and enforceability to pass muster as state compliance plan elements.

However, in fact, air quality regulators are already familiar with these sorts of issues in their approach toward transportation-related pollution (referred to as "mobile sources").[13] For example, state automobile inspection and maintenance (I&M) programs keep dirty cars off the roads but they do not control the number and models of vehicles used, miles driven, or driver behavior that greatly affect emissions. Yet, I&M programs as well as other measures, such as traffic signal timing, high occupancy vehicle lanes, land use policies, accelerated vehicle scrappage, and public transit support are creditable under Section 110 SIPs.[14] EPA and state air regulators rely on vehicle specifications, data and modeling of vehicle fleet composition and driving habits, and other factors to model emission impacts of transportation control measures. Modeling results can be compared with results of sampling and selective monitoring to verify progress. States are afforded opportunity to make up for any shortfalls that occur and can modify their plans, models, programs, and measures accordingly.

In energy efficiency policy similar approaches can be and are used. Many states have utility ratepayer-funded energy efficiency programs. Utilities use evaluation, measurement and verification (EM&V) approaches, typically under public utility commission purview, to quantify energy savings to demonstrate compliance with regulatory targets or earning of financial incentives. In most cases, EM&V is based on sampling a statistically significant portion of measures undertaken then extrapolating results to a broader program or portfolio of activities. Data and modeling are used to develop "technical reference manuals" (TRMs) containing assumptions, algorithms, and "deemed savings" values that energy efficiency program evaluators can use to assess program impacts. TRMs are periodically updated in light of new data, technologies, and market characteristics. Also EM&V protocols and approaches continue to get better, with more improvements expected as information technologies (advanced

[13] Small, dispersed "area sources," such as small businesses and households are dealt with in a similar fashion for some polluting activities.
[14] U.S. EPA, Transportation-Related Documents, http://www.epa.gov/oms/stateresources/policy/pag_transp.htm.

meters, energy management systems, automated controls, data analytics, etc.) continue to advance. Utility programs, performance contracting, appliance standards, building energy codes, and other energy efficiency approaches have yielded well-documented energy and electricity savings.

EPA and state air regulators accept and use transportation measures in SIPs for addressing nitrogen oxides, volatile organic compounds, ozone, and particulate matter, even with the complexities of atmospheric chemistry and uncertainty of weather and other factors. It seems highly likely that crediting energy efficiency measures for EGU CO_2 reductions under Section 111(d) is a significantly more tractable exercise.

A more detailed discussion of this topic can be found in “Driving Energy Efficiency: Applying a Mobile Source Analogy to Quantify Avoided Emissions” published by the Regulatory Assistance Project.[15]

[15] Kenneth Colburn, Christopher James, and John Shenot, 2015, “Driving Energy Efficiency: Applying a Mobile Source Analogy to Quantify Avoided Emissions,” http://www.raponline.org/document/download/id/7501.

About the Case Studies, their Development, and Derivative Work

Though termed case studies they do not describe past cases since the CPP is in many ways unique and past inclusion of energy efficiency in NAAQS SIPs is very limited. Their purpose is to illustrate how their subject programs, policies, and measures could be included in CPP state plans by addressing questions and components that air regulators must take up as they develop their compliance plans.

These case studies include (1) building energy codes, (2) energy savings performance contracting (ESPC), (3) combined heat and power (CHP), and (4) industrial energy efficiency via the U.S. DOE-supported Superior Energy Performance program. NASEO is collaborating with stakeholders on prospective development of additional cases, which could include "above-code" building energy certification programs, residential low-income weatherization programs, and affordable multifamily housing energy upgrades. Also, cases may be developed for electricity transmission, distribution, and storage measures and for non-investor-owned utility (i.e., public power and electric cooperative utilities) efficiency programs.

Each of the four main case studies describes an energy efficiency approach or strategy, discusses the opportunity for energy savings and emissions avoidance through the approach, and addresses issues concerning incorporation of the approach into state compliance plans. These include such matters as energy savings measurement and verification, and potential roles and responsibilities of private and public entities to assure energy savings. Three of the case studies—building energy codes, ESPC, and CHP—were presented and discussed at the 3N Energy Efficiency Compliance Options for 111(d) meeting held in December 2014.[16,17]

The case studies were developed by different sets of energy efficiency stakeholders and vary somewhat in detail and structure. In two cases, ESPC and industrial energy efficiency, industry consortia working with a consultant developed in-depth papers that were also submitted to the EPA as part of the CPP comment docket.[18] The American Council for an Energy-Efficient Economy (ACEEE) developed whitepapers designed to serve as templates for states inclusion of building energy codes and CHP into their CPP compliance plans.[19] CHP stakeholders also provided a detailed technical paper intended as a policy guide and template for states.[20]

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[16] An additional "case study" discussed at the meeting was consideration of utility-supervised residential energy efficiency programs.

[17] Meeting presentations are available at http://111d.naseo.org/3n-ee-implementation-meeting

[18] AJW, Inc., 2014, "Greenhouse Gas Reductions through Performance Contracting under EPA's Clean Power Plan," accessible via http://ajw-inc.com/pc/ and AJW, Inc., 2014, Securing Greenhouse Gas Reductions through Private-Sector Industrial Energy Efficiency under EPA's Clean Power Plan, accessible via http://ajw-inc.com/iee/

[19] Garrett Herndon and Sara Hayes, 2015, "Navigating the Clean Power Plan: A Template for Including Building Energy Codes in State Compliance Plans," accessible via http://aceee.org/white-paper/111d-building-codes-template.

[20] David Gardiner and Associates and Institute for Industrial Productivity, 2015, "Combined Heat and Power (CHP) as a Compliance Option under the Clean Power Plan," http://www.dgardiner.com/wp-content/uploads/2015/07/CHP_Pathway_Final_7_23_15.pdf.

Discussions with NACAA suggested value in tightening the case studies to address specific questions that states will need to address in their compliance plans according to the CPP proposal. Beyond being asked to provide a brief description of the strategy or approach, the questions developed for the case study authors were:

1. Who will administer the energy efficiency strategies or measures (e.g., the State Energy Office, State Environmental Agency, Public Service Commission)?
2. How will success be measured, how will progress be measured, and what happens if the objectives are not achieved? ... there must be some measure of compliance and evidence that such compliance is occurring.
3. Affected* entities—What entity would be responsible or accountable for the energy efficiency measure? Is it an ESCO? Is it a third party contracting with a utility?
4. Affected* sources—What buildings or equipment or facilities will be subject to the program requirements? For example, in the case of an ESCO, the program could include all state university buildings over a certain size.
5. What are the specific standards that must be satisfied? For example, it is unlikely that EPA or the state environmental agency would accept a completely voluntary energy efficiency program that has no funding and no way to measure whether the voluntary actors were actually implementing any programs.
6. What is the compliance schedule? What are the milestones? How will the schedule and milestones correlate with dates set forth in the state plan?
7. Are there any alternative compliance options or flexible measures that could be used?
8. What types of EM&V are necessary? What are monitoring requirements? What are the recordkeeping requirements? How long will monitoring need to be kept in place? ...
9. Would the program be different depending on whether the state plan is rate based or mass based? What are the implementation trade-offs of both approaches?
10. Is the program, or could the program be, multi-state in nature? If it is multi-state in nature, what specifically is required of each state?
11. Is the program a single element program or a multiple EE program?

* Some respondents were concerned that the term "affected" entity or source is a regulatory term-of-art that in the CPP context should apply only to EGUs directly subject to the rule and not to other entities or sources that can help "affected" entities and states to comply. How enforceability and compliance entities are interpreted under the CPP is not fully clear and can be a function of how a state's compliance plan is designed as is discussed further below.

Authors of the CHP, ESPC, and industrial energy efficiency provided draft responses. These responses (with some NASEO refinement) and one developed by NASEO for building energy codes appear below. The aforementioned ACEEE building energy code template (which is in a somewhat different format but essentially addresses the NASEO-NACAA questions) and similar ACEEE CHP template are found in

Appendix B.[21] These, along with the previously cited technical papers, constitute the written case studies for purposes of this report.[22]

At NACAA's request NASEO used these case studies to develop detailed "plan language" for NACAA's consideration as it develops its "Model Plan" document. Eight drafts were submitted to NACAA for review and to EPA for consideration (Appendix A). The plan language products further distill the question responses.

An additional product derived from the case study exercise is a "Clean Power Plan Energy Code Emissions Calculator" developed by the firm ICF International for the Energy Efficient Codes Coalition (EECN).[23] The tool allows estimation of state-by-state electricity savings, cost savings, and avoidance of CO_2, nitrogen oxides, and sulfur dioxide emissions under different scenarios of residential and commercial building energy code adoption and compliance. Further, ACEEE developed its State and Utility Pollution Reduction (SUPR) calculator as a state-level screening tool for estimating cost and emission benefits of several energy efficiency as well as electricity supply and pollution control approaches.[24]

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[21] ACEEE, 2015, Navigating the Clean Power Plan: A Template for Including Building Energy Codes in State Compliance Plans http://aceee.org/sites/default/files/111d-building-codes-template-0315.pdf and ACEEE, 2015, Navigating the Clean Power Plan: A Template for Including Combined Heat and Power in State Compliance Plans http://aceee.org/sites/default/files/chp-cpp-template.pdf

[22] The detailed ESPC and industrial energy efficiency papers were previously cited, as were case study presentations for the December 2014 3N meeting.

[23] Energy Efficient Codes Coalition, Clean Power Plan Energy Code Emissions Calculator, accessible via http://energyefficientcodes.com/energy-codes-make-sense-with-or-without-the-clean-power-plan/

[24] Rachel Young and Sara Hayes (ACEEE), 2015, "The State and Utility Pollution Reduction Calculator," http://aceee.org/state-and-utility-pollution-reduction-supr

State Plan Approaches and Energy Efficiency

The CPP proposal states that "state plans shall include emissions standard(s) that are quantifiable, verifiable, non-duplicative, permanent, and enforceable with respect to each affected entity"[25] and must include 11 enumerated elements.[26] However, states retain wide latitude in developing their approaches to compliance.

While the EPA's development of state emissions targets is based on four "building blocks,"[27] those building blocks are not relevant to compliance. A state may employ any, all, or none of the building blocks in any proportion so long as they achieve their targeted emissions rate (or emissions mass, if they so opt) in accordance with the CPP's interim and final compliance periods.

The broad flexibility available can allow states to tailor their compliance approaches according to their particular contexts, including economic structure, demographics, climate, generation and transmission assets, energy resource availability, utility regulatory structure, energy agencies' administrative structures, existing energy policies (such as energy efficiency resource standards [EERS], renewable or alternative energy portfolio standards [RPS, AEPS], building energy codes, and equipment standards), and political environment, among others. However, the breadth of options also raises questions—some of which EPA asked for comment on in the proposal—and some uncertainty about state compliance plan and implementation requirements. These include issues that can affect state inclusion of energy efficiency as compliance strategies. These topics include questions about what is meant by "enforceability," what are acceptable approaches to quantifying and verifying energy savings and avoided emissions, how to credit energy savings when power is traded across state lines, and criteria for allowing multistate sharing, trading, or other allotment of energy savings and avoided emissions credits, among others.

The CPP explicitly proposes that states be allowed to opt for significantly different approaches toward compliance. Several of these fundamental decision options are illustrated in Table 2.

Table 2. Fundamental State Compliance Approach Options

Rate-based emission targets	Mass-based emission targets
EGU-obligated compliance approach	Portfolio approach • State-led portfolio • Utility-led portfolio
Single state compliance	Multistate compliance • Joint compliance plans • Single-state plans with "common elements" enabling interstate exchanges

[25] Proposed 40 CFR §60.5780.
[26] Proposed 40 CFR §60.5740.
[27] The building blocks are (1) coal-fueled EGU heat rate improvements, (2) increased dispatch of existing natural gas combined cycle EGUs, (3) increased renewable power generation and credit for certain "at-risk" nuclear generation, and (4) enhanced end-use energy efficiency.

How a state decides on these options can significantly affect how it should structure its compliance plan (and, perhaps, underlying policies and programs) to include various energy efficiency approaches, including those in this report's case studies. The following discussion touches upon some of these compliance plan design considerations.

Choice of Rate- or Mass-Based Targets

The CPP proposal provides state-specific rate-based emission targets expressed as pounds of CO_2 emitted per megawatt-hour (lb/MWh) generated. However, EPA offers states the option of converting their rate-based targets into mass-based targets whereby covered EGUs' limits would be in terms of tons of CO_2 annually emitted. Both approaches can allow the intra- or interstate allocation or trading of energy savings or emissions (or emissions rate) credits or allowances, though details will differ. Also both approaches can accommodate either a state opting to place all compliance obligations on covered EGUs or a "portfolio" structure where other entities, including the state itself, may have compliance obligations (discussed further below).

There has been significant analysis of advantages, disadvantages, and implications of a state choosing either a rate- and mass-based target option.[28] These issues are not fully recounted here but some key points are noted. All of the energy efficiency case study approaches illustrated in this report can be included under both rate- and mass-based target systems, but state approaches—and compliance plan language—for including them for CPP compliance plans can differ.

A key distinction between rate- and mass-based systems is how compliance is determined and, thus, how compliance measures should be quantified, evaluated, and credited.

Under a mass-based target system, compliance is based on how much mass of CO_2 comes out of covered EGUs' stacks annually, a parameter already measured by relevant power plants. A state could allocate a specific emissions budget or it can sell or auction emissions allowances (denominated as tons of CO_2) then allow EGUs to buy and sell allowances. From the air quality regulator's perspective, EGU owners comply if their emissions do not exceed their allocated budgets or (if allowance trading is allowed) they possess sufficient allowances to cover their emissions irrespective of how emissions reductions are achieved. There is no emissions credit per sé for energy efficiency or other emissions reduction approaches undertaken. This is because emission-reducing activities impacts are automatically reflected by actual emissions from covered EGUs, even if they are due to measures and actions that might be difficult to count or deemed unallowable under a rate-based approach. Thus, one would expect relatively less EPA and state air regulator attention to crediting and EM&V matters under a mass-based approach than under a rate-based system.

[28] See, for example, Karen Palmer and Anthony Paul, 2015, "A Primer on Comprehensive Policy Options for States to Comply with the Clean Power Plan," Resources for the Future (RFF DP 15-15) http://www.rff.org/RFF/Documents/RFF-DP-15-15.pdf, and Franz T. Litz and Jennifer Macedonia, 2015, "Choosing a Policy Pathway for State 111(d) Plans to Meet State Objectives," Bipartisan Policy Center and Great Plains Institute, http://bipartisanpolicy.org/wp-content/uploads/2015/05/Policy-Pathways-Paper.pdf.

However, crediting of energy savings and EM&V may be still be important for underlying energy policies and programs that help achieve the emissions reduction. For examples, utilities may need to show compliance with EERS or that they achieved energy savings to earn rate incentives, or ESCOs may need to document fulfillment of savings guarantees to clients. Regional Greenhouse Gas Initiative (RGGI) state experience is illustrative. In those states EERS, RPSs, building efficiency programs, and other policies and programs—which may be subject to EM&V and other requirements—achieve energy savings and non-carbon generation that reduce EGU emissions. So utilities may have to show compliance with EERS and RPSs in their states by using appropriate crediting and EM&V but for purposes of RGGI CO_2 obligations, EGUs need only to possess sufficient allowances to cover their emissions; how emissions were reduced and who reduced them is irrelevant.

This means that under a mass-based compliance system, states may include details on energy efficiency policies and programs, crediting systems, and EM&V in their CPP compliance plans as "complementary" components to show EPA a credible path toward meeting emissions targets but not necessarily as federally enforceable plan requirements.

In contrast, under a rate-based target system EM&V of energy savings is critical to assuring that the savings are indeed real and credible as well as creditable. EPA and others suggest more than one way to count energy efficiency in a rate-based system but energy efficiency will generally provide a 0 lb/MWh "resource" that can be averaged or blended with the actual covered EGU emissions rates to, in essence, dilute the emissions rate of covered EGUs.[29], [30] Thus, it is critical to credibly ascertain MWh savings, establish a system to issue credits (with adequate guards against double counting),[31] and provide a mechanism for credit allocation, trade, or exchange to allow those EGUs that emit above the target emissions rate or a state as a whole to show that emissions rates have been "diluted" down to a compliant level.

EM&V methods, protocols, and accompanying assumptions (including of "baselines"—savings relative to what?; what would energy use have otherwise been?) can vary and make energy savings estimation inconsistent at times. However methods are improving and experience growing, particularly due to the need for evaluating utility ratepayer-supported energy efficiency programs as well as for ESPC purposes. Further, arguably, EM&V employed for utility ratepayer program purposes may at times be more rigorous than may be needed for the CPP because of the need for programs to meet utility commission cost-effectiveness tests to justify ratepayer funded expenditures.

[29] Environmental Protection Agency, 2015, State Plan Considerations Technical Support Document, pp. 21-23 http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-state-plan-considerations.pdf

[30] CHP utilizing fossil fuels will often be a "non-zero" emitting resource because typically there are incremental emissions increases compared to a non-CHP boiler, though usually still net emissions savings relative to "separate" heat and power (purchased grid electricity plus onsite boiler to meet thermal demand).

[31] Further below, the option of an energy efficiency registry is discussed.

It should be expected that EPA will scrutinize crediting mechanisms and EM&V—not only in the compliance plan but also over the period of compliance—stringently under a rate-based compliance regime to assure the reality of purported electricity savings.

A further complication exists if multiple rate-based states with differing rate targets wish to trade or otherwise allocate energy savings credits across state lines. EPA proposes that rate-based states wanting to trade or exchange such credits across state lines average their emissions rates together in proportion to generation because otherwise a credit in one state would not be the same as a credit in the other trading state. Without the multistate rate averaging there could be disadvantages to states with more stringent rates and, perversely, some circumstances may lead to increased emissions.[32]

Choice of an EGU-only Obligation or a Portfolio Approach

Another major dimension of state choice in developing CPP compliance strategies is whether to place full compliance obligations on covered EGUs or to adopt a portfolio approach where enforceable compliance obligations are split between EGUs and other entities.[33] EPA further distinguishes between state-driven and utility-driven portfolio approaches, the latter suggested as an option suited to states with vertically-integrated, state-regulated utilities. EGU-only and both portfolio approaches can operate in either rate- or mass-based target systems.

EPA states:

> "A portfolio approach would include both direct emission limits that apply to affected EGUs and other indirect measures that avoid EGU CO_2 emissions. Under a portfolio approach, end-use energy efficiency and renewable energy measures that avoid EGU CO_2 emissions would be enforceable components of a state plan. This would be necessary because the emission limit applied directly to affected EGUs would not assure full achievement of the required level of emission performance specified in the state plan."

Under a portfolio approach, compliance obligations may be split among varied entities including EGU owners and operators, electric distribution utilities, state agencies and authorities, and other private or public sector third party entities.

The extent to which obligations on parties other than the EGUs will be federally enforceable remains uncertain. The CPP proposal discussed and asked for comment on a "state commitment" option. Under such an approach affected EGUs and obligations taken by the state would be federally enforceable while obligations placed on (or accepted by) other parties would not be subject to federal enforcement.[34] This

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[32] Discussed in Litz and Macedonia, op. cit. and Lissa Lynch, Gabe Pacyniak, Kathryn Zyla, Tom Curry, Carrie Jenks, and Grace Vermeer, 2015, "Clean Power Plan Implementation: Single-State Compliance Approaches with Interstate Elements," Georgetown Climate Center, http://www.georgetownclimate.org/single-state-clean-power-plan-compliance-approaches-with-interstate-elements.

[33] See description of state plan pathways in Environmental Protection Agency, 2015, State Plan Considerations Technical Support Document http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-state-plan-considerations.pdf .

[34] There is an analogy to this in Section 110 NAAQS SIPs, particularly for certain mobile source emissions reduction measures. States are required to achieve certain levels of emissions reductions. The state may commit to the EPA

may have significant implications for the energy efficiency case study strategies where building energy code agencies, ESCOs and other private businesses, and other entities may be responsible for delivering significant energy efficiency and emissions reductions that support CPP compliance but for which there is strong aversion to federal enforceability. A state commitment approach would shield these other entities from potential federal compliance obligations but would then require states to deliver on their commitments, including implementing contingencies in case of underperformance. How state commitment is handled in the final rule, and whether federally-enforceable backup approaches may be required, remains to be seen.

As with the rate versus mass basis options, there is significant description and analysis of EGU-only and portfolio compliance approaches.[35] The focus here is to note that, again, the various case study energy efficiency options as well as others can be pursued under both approaches but that specific design and wording in the state's compliance plan may differ.

Under an EGU-only compliance obligation system, EGU owners would be responsible for achieving emissions or emissions-rate reductions directly or for obtaining emission allowances or rate credits (as appropriate) from others by directly funding creditable activities (for instance, funding renewable energy and energy efficiency projects) or buying or otherwise obtaining credits offered by others (for example, ESPC-generated energy savings sold by ESCOs or their clients; states selling or allocating savings credits attributable to building energy codes or state-level appliance standards; credits from low-income residential weatherization sold by the state or by NGOs that performed the projects).

An EGU-only, rate-based approach would require the establishment of a credit issuance and trading system as discussed above, which would need to be addressed in the state compliance plan. A state may benefit from including in its compliance plan, perhaps as a complementary element, details of the case study and other energy efficiency strategies to show EPA a credible path forward for generating sufficient credits to allow EGUs to establish compliance.

Under any of the portfolio options, the state compliance plan would likely need to discuss in significant detail the obligations and responsibilities of different entities, how quantification and verification will be addressed, enforceability and contingencies for underperformance, and other matters covered by the NASEO-NACAA questions previously listed. Some of these elements may be in the federally-enforceable part of the plan or, if the state commitment approach is used, they may be complementary elements backing up a state's performance commitment. Under the state commitment approach, the state would

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to undertake measures that are modeled to achieve certain emissions reductions (such as automobile emissions inspections, traffic signal timing, public transit support, and high-occupancy vehicle lanes) but there is no federally enforceable commitment placed on individual motorists. As discussed previously, the mobile source analogy is also relevant to energy efficiency EM&V under the CPP. See Colburn, James, and Shenot, 2015, op. cit.

[35] For instance, Lissa Lynch, Tom Curry, Gabe Pacyniak, and Carrie Jenks, 2015, "Clean Power Plan Implementation: Overview of Potential Compliance Pathways," Georgetown Climate Center, http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/GCC_CompliancePathwaysOverview_January2015_0.pdf

need to indicate in its compliance plan what its commitment is and any contingencies for underperformance.

Choice of Individual or Multistate Compliance Options

The choice of pursuing individual state compliance or collaborative compliance with other states is also available to the states. Like the other options discussed in this section, there has been significant discussion and analysis of implications.[36]

EPA proposed in the CPP that states wishing to employ multistate compliance options would need to prepare a multistate compliance plan. Various stakeholders and analysts suggest that joint multistate plans are often not politically or practically feasible. Instead they suggest that EPA should allow less formal arrangements in which states would still file individual state CPP compliance plans but could include provisions supporting multistate allocations, trading, or other exchange of emission allowances or credits. "Common elements" or "single-state compliance approaches with interstate elements" have been proposed that offer greater state autonomy and flexibility while supporting the integrity of multistate trading or exchange of credits or allowances.[37]

According to these proposed approaches, states that share a target basis (rate or mass),[38] commonly define qualifying credits, and have a mutual or linked platform to track and transfer credits (and assure no double counting) should—subject to perhaps other "common elements"—be able to engage in trading without signing memoranda-of-understanding or even necessarily identifying a priori the states with which they wish to exchange or trade credits.

Should a state wish to engage in or leave open the option for multistate credit and allowance trading and exchange, there likely will be implications (under the common elements approach or under more formalized multistate arrangements and agreements) for the establishment of a credit or allowance tracking and exchange system and for underlying quantification and EM&V requirements. These too could have implications for how the case study energy efficiency approaches are written into state compliance plans so that resulting credits and allowances can be exchanged.

Energy Efficiency Registry Concept

In its "Principles for Including Energy Efficiency in 111(d) of the Clean Air Act," NASEO, NACAA, and NARUC stated:

> Energy Efficiency Registry: EPA should recognize that states or private entities may choose to develop or participate in a voluntary "registry" to establish a transparent data repository of energy efficiency projects

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[36] Litz and Macedonia, op. cit.; Lynch, Pacyniak, Zyla, Curry, Jenks, and Vermeer, op. cit.; and Jonas Monast, Tim Profeta, Jeremy Tarr, and Brian Murray, 2015, "Enhancing Compliance Flexibility under the Clean Power Plan" A common Elements Approach to Capturing Low-Cost Emissions Reductions," Duke University, Nicholas Institute for Environmental Policy Solutions (Policy Brief NI PB 15-01) https://nicholasinstitute.duke.edu/sites/default/files/publications/ni_pb_15-01.pdf

[37] Lynch, Pacyniak, Zyla, Curry, Jenks, and Vermeer, op. cit.; and Monast, et al., op. cit.

[38] Trading between a rate-based and mass-based state is problematic.

or activities. A registry should provide clear attribution and ownership of energy savings and be used by the state to perform audits and assure credibility of savings and emissions reduction claims.[39]

One or more voluntary energy efficiency "registries" can play important roles for assuring the credibility and creditability of energy savings under the CPP. They can enhance CPP compliance cost-effectiveness by facilitating trading, exchange, and allocation of credits both intra- and interstate as states so opt, and increase participation and supply of privately contracted energy efficiency for CPP compliance. An energy efficiency registry can also serve purposes beyond the CPP such as for crediting energy efficiency for criteria air pollutant reductions, allowing private third parties to bid energy efficiency for utility or EGU EERS compliance, supporting "energy efficiency as a resource" in regional transmission organization energy and capacity markets, and for broader state energy planning purposes.

As discussed previously, there are varied energy efficiency EM&V processes. These processes and underlying assumptions as well as reporting formats and terminology can differ by state and utility as well as across the range of private and other non-utility energy efficiency programs, projects, and measures. Energy savings reporting often lacks transparency. This can raise concerns with regulators as to the amount of energy savings being realized (and, thus, emissions impacts effected) and lead to uncertainty over proper counting (i.e., avoiding double counting) of savings and emission impacts.

A statement issued by the Executive Committee of The Climate Registry cogently states functions and benefits that an energy efficiency registry would offer.

"Specifically, an energy efficiency registry would:

- "aggregate data from demand-side energy efficiency programs that could be consistently reported to EPA;
- "provide a transparent platform for documenting and communicating the benefits of energy efficiency, as well as the methods for measuring and reporting it;
- "consolidate evaluation, measurement and verification (EM&V) documentation of energy efficiency measures;
- "provide clear and transparent attribution and ownership of energy savings;
- "serve as the foundation for a trading platform for energy efficiency credits for interested states and regions;
- "demonstrate, verify, and track energy and carbon savings – that may then be recorded as credits - generated in partnership with energy service companies (ESCO's) or as the result of municipal and state policies (i.e. building codes);
- "serve as a platform to share knowledge and build capacity across states and regions."[40]

There are already registries or similar bodies that track power generation attributes (including emissions) in much of the United States and are used to support compliance with state RPSs and similar

[39] NACAA, NARUC, and NASEO, op. cit.
[40] "Statement: Establishing an energy efficiency registry as a tool for state compliance under U.S. EPA's Clean Power Plan," (September 22, 2014) http://www.theclimateregistry.org/wp-content/uploads/2014/12/TCR_An-EE-Registry.pdf

requirements through the issuance and tracking of certificates. They are generally focused on the supply side of electricity but several of them (e.g., NEPOOL GIS, NAR, NC-RETS) include energy efficiency. They issue, track, and facilitate exchange of either energy efficiency certificates or renewable energy certificates that cover energy efficiency resources.[41]

Such registries enable interstate exchange of credits or certificates among states that wish to trade without the need for greatly detailed and formalized agreements. For example, NAR is the designated compliance system for the Missouri Renewable Energy Standard. North Carolina designated NAR as an eligible registry for out-of-state renewable facilities seeking to qualify under North Carolina's RPS and EERS. Certain NAR-registered renewable energy facilities are eligible for Kansas, Illinois, and Puerto Rico programs. And NAR has the ability to exchange certain certificates with five other registries.[42]

Energy efficiency registries provide transparency that strengthens confidence in the veracity of energy savings as well as ownership claims on such savings. As just cited, states can have the flexibility to designate one or more registries to qualify in-state resources while recognizing other registries' certificates that meets a state's own criteria.

As previously discussed, the role of energy efficiency credits and whether they are used directly for CPP compliance or support compliance via complementary and supportive EERS, ESPC, or other policies, programs, and measures depends on how a state structures is overall compliance architecture (such as rate- or mass-based target, or EGU-only or portfolio approach). These decisions can have bearing on how to include the role of a registry (or registries) in a state's CPP compliance plan.

Greater discussion on issues in establishing or adapting registries for energy efficiency under the CPP is found in a number of papers and presentations.[43]

States Explore Streamlining Non-Ratepayer Energy Efficiency Tracking

Various states have developed systems for tracking energy savings from there utility ratepayer-funded energy efficiency programs. This is done to see if such programs are meeting regulatory requirements under state and utility commission supervision, such as EERS and RPS, or that utilities have earned incentives that may be offered for achieving certain savings levels.

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[41] APX Research, 2014, "Using Tracking Systems with the Implementation of Section 111(d) State Plans," http://www.narecs.com/wp-content/uploads/sites/2/2014/10/APXAnalytics_1_Section111d.pdf; NEPOOL GIS is the New England Power Pool Generation Information System, NAR is the North American Renewables Registry, and NC-RETS is the North Carolina Renewable Energy Tracking System.

[42] North American Renewables Registry, http://www.narecs.com/

[43] APX Research, 2014, op. cit.; The Climate Registry, 2014, "An Energy Efficiency Registry: A Flexible and Transparent Way to Track and Report Energy Efficiency under the Clean Power Plan," http://www.theclimateregistry.org/wp-content/uploads/2014/12/TCR_An-EE-Registry.pdf; Patricia D. Stanton, 2015, "Energy Efficiency Registry" presentation at the NASEO 2015 Energy Policy Outlook Conference, Washington, DC, February 5, 2015 http://energyoutlook.naseo.org/Data/Sites/6/media/presentations/Stanton-CPP-Compliance-Registry.pdf; Lars Kvale, 2015, "Energy Efficiency Registry" presentation to U.S. Climate Partnership Association, March 23, 2015 http://www.usclimatepartnership.org/documents/Kvale_000.pdf.

One good example is the Minnesota's cloud-based Energy Savings Platform used by the state's investor-owned, municipal, and cooperative utilities to track, manage, and report on energy efficiency activities.[44] The Northeast Energy Efficiency Partnerships EM&V Forum developed a Regional Energy Efficiency Database (REED) in an initiative to promote consistent reporting of energy savings in nine Northeastern states and the District of Columbia.[45] And, as noted above, some existing renewable energy registries are being applied to energy efficiency.

Beyond utility ratepayer-funded programs, tracking of energy savings has been less systematic because there has not been strong market or policy motivation for such tracking. The prospect of potential crediting under the CPP or other environmental programs is one strengthening motivation. Greater interest in whether customers and taxpayers are getting their money's worth in energy efficiency investments is another.

Motivated by the latter but likely applicable to the former, LBNL developed the eProject Builder (ePB) for tracking federal ESPCs.[46] The Federal Energy Management Program (FEMP) is beginning to require that federal ESPCs be entered into and tracked by ePB. A number of states, including a partnership of Virginia, Kentucky, and Georgia, are beginning to pilot ePB as a tool for states to track ESPC performance. This tristate effort, supported by NASEO, Clean Energy Solutions, Inc., and the Southeast Energy Efficiency Alliance, with funding from the U.S. DOE, is also addressing EM&V and emissions quantification matters related to ESPCs with an eye toward applying ePB as a shared tracking system that can support emissions crediting through a voluntary registry.

[44] Energy Savings Platforms http://www.energyplatforms.com/OurStory.aspx
[45] Northeast Energy Efficiency Partnerships, Regional Energy Efficiency Database, http://www.neep.org/initiatives/emv-forum/regional-energy-efficiency-database
[46] eProject Builder, https://eprojectbuilder.lbl.gov/home/#/login

Case Studies

The following case studies were developed in collaboration with industry trade associations and non-governmental organizations, in consultation with State Energy Offices, State Air Agencies, State Utility Commissions, and others engaged through the 3N process. Lead organizations cooperating with NASEO on the development of case studies responded to 12 questions that state CPP compliance plans are to address according to the CPP proposal. The responses are illustrative. They do not represent the only way nor do they presume to suggest what is the “best” way for the energy efficiency approaches to be included in a particular state’s CPP compliance plan. As previously discussed, states can choose from many options and how they decide on fundamental approaches, such as the choice between rate-based and mass-based or between EGU-only obligations and portfolio-based approaches, will affect the design and details of compliance plans. The examples below discuss some distinction between EGU-obligated and state-led portfolio approaches for the features energy efficiency strategies.

Building Energy Codes[47]

Description

1. Brief description of the energy efficiency strategy.

Building energy codes specify minimum standards for key energy performance-related building components in new construction and renovation. These codes cover such building components and systems as insulation, windows, lighting, heating, and cooling. In 2012, energy codes are estimated to have saved about $5 billion on energy bills, 500 trillion Btu of total energy, and 40 billion kWh of electricity while avoiding 36 million metric tons of CO_2 emissions.[48]

Buildings account for about 70% of U.S. electricity consumption.[49] So adoption and implementation of new building energy codes could help states achieve significant electricity savings along with corresponding CO_2 avoidance and, thus, could serve as a major component of state CPP compliance strategy. For illustration, the 2012 International Energy Conservation Code (IECC), issued by the International Code Commission, saves 32% in covered energy use nationwide over the 2006 IECC.[50] For commercial buildings, ASHRAE Standard 90.1-2013 saves 28% in whole building energy use, as compared to the ASHRAE 90.1-2004 baseline.[51] Energy savings calculations associated with those codes are made by the U.S. DOE in accordance with Federal law.[52]

ACEEE estimates that enhancing code stringency and compliance could save 139 to 232 million MWh of electricity and reduce CO_2 emissions by 102 to 169 million metric tons in 2030.[53]

DOE projects that adoption of the latest national model codes (2015 IECC and ASHRAE 90.1-2013)[54] in 2017 would yield energy savings in 2030 in selected states illustrated in Table 3.[55]

[47] Portions of this section draws from ACEEE, 2015, Navigating the Clean Power Plan: A Template for Including Building Energy Codes in State Compliance Plans http://aceee.org/sites/default/files/111d-building-codes-template-0315.pdf

[48]U.S. DOE, http://www.energycodes.gov/building-energy-codes-program-national-benefits-assessment-1992-2040-0 .

[49] U.S. DOE, 2011,"2011 Energy Data Book," http://buildingdatabook.eere.energy.gov

[50] Typically the IECC model code is adopted for residential single-family and low-rise buildings while ASHRAE 90.1 is adopted for commercial buildings.

[51] Formally ASHRAE Standard 90.1 is the ANSI/ASHRAE/IES Standard 90.1 indicating it is also a standard of the American National Standards Institute, the Illuminating Engineering Society. ASHRAE's former name was the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

[52] U.S. DOE, https://www.energycodes.gov/determinations and https://www.energycodes.gov/sites/default/files/documents/PNNL-22972.pdf.

[53] S. Hayes, L. Ungar, and G. Herndon. 2015. The Role of Building Energy Codes in the Clean Power Plan. Washington, DC: American Council for an Energy-Efficient Economy. http://www.aceee.org/white-paper/building-codes-111d.

[54] IECC is the International Energy Conservation Code issued; ASHRAE is the American Society of Heating, Refrigeration, and Air-Conditioning Engineers.

[55] Pacific Northwest National Laboratory conduced analysis based on methodology documented in this published report: http://www.energycodes.gov/building-energy-codes-program-national-benefits-assessment-1992-2040-0.

Table 3. Projected Building Energy Code Energy Savings in Selected States

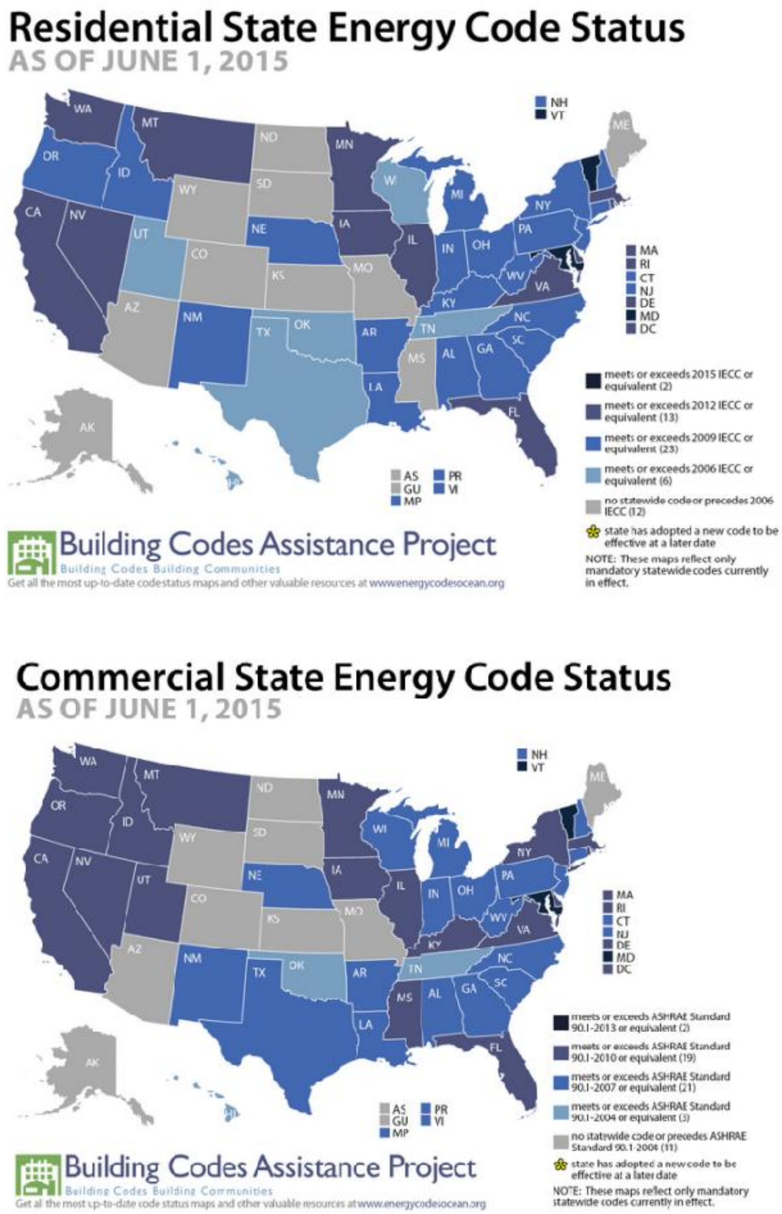
State	Annual Total Energy Savings in 2030 (Trillion BTUs)	Annual Electricity Savings in 2030 (billion kWh)
Texas	25.9	5.82
Florida	20.1	4.99
Massachusetts	13.5	2.24
North Carolina	12.3	2.40
New York	11.0	2.05
Georgia	10.7	2.54
Pennsylvania	10.2	1.97
Virginia	9.6	1.92
Arizona	7.3	1.72
Illinois	7.2	1.42

Source: U.S. DOE, 2015, "Achieving Energy Savings and Emission Reductions from Building Energy Codes: A Primer for State Planning"

Because buildings are long lived assets, building energy codes can deliver long-term persistent energy savings and concomitant emissions avoidance. IECC and ASHRAE 90.1 model codes become "national model codes" only following a DOE analysis that finds that they are cost-effective. Further, energy savings coming from code compliance reduces electric grid and other energy supply stresses, thus offering energy reliability benefits.

Typically building energy codes are adopted by states (usually based on national model codes) and implemented by localities. Some states allow localities to adopt and enforce code variations including more stringent "stretch codes." Building energy codes are legal requirements subject to penalties for noncompliance, though compliance rates can vary. Figure 2 provides state building energy code status.

Figure 2. Residential and Commercial State Energy Code Status



Source: Building Codes Assistance Project

Energy savings and related emissions avoidance for CPP purposes could be ascertained against a baseline of the level of code stringency and compliance prior to the Clean Power Plan proposal. Baseline compliance rates can be conservatively estimated and such tools as the DOE-developed Utility Savings Estimator[56] can be used.

[56] U.S. DOE, https://www.energycodes.gov/resource-center/utility-savings-estimators

There are tools and resources available to project, including on a state level, future energy savings from adoption of more stringent code as well as for enhanced code compliance.[57] Various training, best practice cases, and technical assistance resources are also available to support code adoption and compliance.

Compliance Pathway

2. Who will administer the energy efficiency strategies or measures (e.g., the State Energy Office, State Environmental Agency, Public Service Commission)?

Typically states adopt building energy codes covering residential and commercial buildings (often based on versions of the IECC and ASHRAE 90.1 model codes, respectively). State-level jurisdiction may reside with the State Energy Office or other agency (for example, Virginia Department of Housing and Community Development, Minnesota Department of Labor and Industry, Florida Department of Business and Professional Regulation). Implementation and enforcement is usually at the local level. Some states allow localities to adopt and implement "stretch codes" that are more stringent than the statewide code.

State plans strategies will likely fall into two distinct categories: a state-driven portfolio approach and an EGU-obligated compliance approach. Either approach can be implemented as a rate-based or mass-based program. The State Energy Office (or other appropriate office) will play a role in both approaches, but that role may differ depending on which strategy is employed.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office or other agency with codes authority plans, estimates, tracks, and records savings from building energy codes. If the building codes agency is separate from the State Energy Office, that agency can collaborate with the State Energy Office to assure that the State Energy Office can track savings across multiple EE strategies and approaches beyond codes. Under this approach, the State Energy Office, or another appropriate office, would serve as an aggregator of code-derived savings for use in CPP compliance. Construction and renovation data supplemented by sampling and analysis of compliance rates allows good estimation of savings as compared to prior levels of code stringency and compliance. The State Energy Office or other authorized aggregator would register estimated savings and GHG emission reductions available for compliance. This information,	The State Energy Office (or State Energy Office in collaboration with other agency with codes authority) tracks and records savings from building energy codes based on construction and renovation data supplemented by sampling and analysis of compliance rates. States may opt for code-derived savings to be assigned to the state, the locality in which construction occurred, the builder or developer, or the building owner. If savings are assigned to the state, the state could sell or otherwise distribute the energy savings credits to EGUs. If energy savings credits are owned by other entities, EGUs could purchase them, perhaps via a registry. If code-derived energy savings credits are owned by the builder or developer, EGUs could enter into contractual arrangements directly with those builders or developers to be assigned resulting credits.

[57] EECN op. cit; also resources listed in U.S. DOE, 2015, "Achieving Energy Savings and Emission Reductions from Building Energy Codes: A Primer for State Planning" https://www.energycodes.gov/sites/default/files/documents/Codes_Energy_Savings_State_Primer.pdf

once aggregated, can then be shared with the state air office responsible for compliance with CPP.	

3. How will success be measured, how will progress be measured, and what happens if the objectives are not achieved (e.g., NASEO had suggested that states consider multiple EE programs so that if one measure does not achieve the goals, and other programs do, would that be sufficient)? For example, in the building energy codes area, it is not sufficient to simply upgrade the building energy code, there must be some measures of compliance and evidence that such compliance is occurring.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The state office responsible for documenting emission reductions attributable to building energy codes (e.g. State Energy Office) should estimate energy savings and emissions impacts based on construction data plus sampling and analysis to determine code compliance rates. (Note that conventional criteria pollutant State Implementation Plans also rely on sampling and analysis, particularly for area and mobile sources.) Building energy codes are legally binding. Excessive non-compliance can be addressed through state and local enforcement action. A building owner could sue a builder that fails to meet code. Under a state-driven portfolio approach, the state could make the commitment to achieve requisite savings and provide for contingencies in case of shortfalls in performance. States should consider multiple EE programs and apply a conservative "discount" to each one to assure that programs in aggregate meet overall objectives. (Note that conventional criteria pollutant State Implementation Plans also often employ "discounting" to allow a margin of error in projecting emissions reductions.) If projected energy code savings are due to lower than expected new construction, the State Energy Office and air regulatory agency should not be penalized. Unless new construction is for replacing old buildings that would otherwise remain in use, less new construction means fewer new energy-using buildings, less than expected electricity load growth, and in general correspondingly less additional emissions.	The state office responsible for documenting emission reductions attributable to building energy codes (e.g. State Energy Office) should estimate energy savings and emissions impacts based on construction data plus sampling and analysis to determine code compliance rates. (Note that conventional criteria pollutant State Implementation Plans also rely on sampling and analysis, particularly for area and mobile sources.) Building energy codes are legally binding. Excessive non-compliance can be addressed through state and local enforcement action. A building owner could sue a builder that fails to meet code. Under the EGU-obligated compliance approach, EGUs would be responsible for obtaining requisite numbers of credits to meet its obligations. Such credits could come from multiple EE, renewable energy, or other sources through the EGUs' direct action, purchase, assignment, or other allocation. If a credit market or exchange is established, EGUs are not dependent on a single EE strategy. States should consider multiple EE programs and apply a conservative "discount" to each one to assure that programs in aggregate meet overall objectives. (Note that conventional criteria pollutant State Implementation Plans also often employ "discounting" to allow a margin of error in projecting emissions reductions.) If projected energy code savings are due to lower than expected new construction, the State Energy Office and air regulatory agency should not be penalized. Unless new construction is for replacing old buildings that would otherwise remain in use, less new construction means fewer new energy-using buildings, less than

	expected electricity load growth, and in general correspondingly less additional emissions.

4. Affected entities – What entity would be responsible or accountable for the energy efficiency measure and the associated reductions? E.g., is it an ESCO? Is it a third-party contracting with a utility?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office or other state agency responsible for building codes would be responsible for policy/program oversight, and guidance. Typically localities are responsible for implementation and enforcement of building energy codes. Builders are responsible for meeting building energy code requirements. State and local bodies have enforcement authority. Under the state-driven portfolio approach, the state takes responsibility for achieving some or all needed emissions reductions across measures, strategies, and programs and responsibility for making up for any shortfalls.	The State Energy Office or other state agency responsible for building codes would be responsible for policy/program oversight, and guidance. Typically localities are responsible for implementation and enforcement of building energy codes. Builders are responsible for meeting building energy code requirements. State and local bodies have enforcement authority. EGUs can buy credits or contract with builders and developers to achieve acceptable savings. If a state takes assignment of codes-related savings, it can opt to sell or otherwise distribute credits to EGUs.

5. Affected sources –What buildings or equipment or facilities will be subject to the program requirements? For example, in the case of an ESCO, the program could include all state university buildings over a certain size.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
New and significantly renovated buildings are subject to building energy code requirements. Building categories, criteria, and thresholds for code applicability are already well established.	New and significantly renovated buildings are subject to building energy code requirements. Building categories, criteria, and thresholds for code applicability are already well established. EGUs can buy credits or contract with builders and developers to achieve acceptable savings. If a state takes assignment of codes-related savings, it can opt to sell or otherwise distribute credits to EGUs.

6. What are the specific standards that must be satisfied? For example, it is unlikely that EPA or the state environmental agency would accept a completely voluntary energy efficiency program that had no funding and no way to measure whether the voluntary actors were actually implementing any programs.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Building energy codes include clear requirements legally binding and enforceable on builders. DOE and other tools allow estimation of incremental energy and electricity savings from adoption of new, more rigorous code and from enhanced compliance. States should employ sampling and analysis to assess compliance rates. (Note that conventional criteria pollutant State Implementation Plans also rely on sampling and analysis, particularly for area and mobile sources.)	Building energy codes include clear requirements legally binding and enforceable on builders. DOE and other tools allow estimation of incremental energy and electricity savings from adoption of new, more rigorous code and from enhanced compliance. States should employ sampling and analysis to assess compliance rates. (Note that conventional criteria pollutant State Implementation Plans also rely on sampling and analysis, particularly for area and mobile sources.)

7. What is the compliance schedule? What are the milestones? How will the schedule and compliance options correlate to the dates set forth in the state plan?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Building energy codes are typically adopted by the state and implemented by localities. States have varied code adoption processes (via legislation or via an authorized codes adoption body) that define the code being adopted, schedule for adoption, and schedule for implementation. Builders are responsible for meeting codes in force at time of construction. State Energy Office or other agency with codes authority plans, estimates, tracks, and records savings from building energy codes. If the building codes agency is separate from the State Energy Office, that agency can collaborate with the State Energy Office to assure that the State Energy Office can track savings across multiple EE strategies and approaches beyond codes. The State Energy Office can provide annual reports to the state air quality regulatory agency. If projected energy code savings are due to lower than expected new construction, the State Energy Office and air regulatory agency should not be penalized. Unless	Building energy codes are typically adopted by the state and implemented by localities. States have varied code adoption processes (via legislation or via an authorized codes adoption body) that define the code being adopted, schedule for adoption, and schedule for implementation. Builders are responsible for meeting codes in force at time of construction. State Energy Office or other agency with codes authority plans, estimates, tracks, and records savings from building energy codes. If the building codes agency is separate from the State Energy Office, that agency can collaborate with the State Energy Office to assure that the State Energy Office can track savings across multiple EE strategies and approaches beyond codes. The State Energy Office can provide annual reports to the state air quality regulatory agency. If projected energy code savings are due to lower than expected new construction, the State Energy Office and air regulatory agency should not be penalized. Unless

new construction is for replacing old buildings that would otherwise remain in use, less new construction means fewer new energy-using buildings, less than expected electricity load growth, and in general correspondingly less additional emissions.	new construction is for replacing old buildings that would otherwise remain in use, less new construction means fewer new energy-using buildings, less than expected electricity load growth, and in general correspondingly less additional emissions.

8. Are there any alternative compliance options or flexible measures that could be used?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
In the event that building energy codes savings/reductions are greater than anticipated (more construction at higher stringency of code and/or higher than expected code compliance rates), the state has the opportunity to apply the extra savings (and avoided emissions) to defray any shortfall in other CPP compliance components or to adjust compliance targets for more costly compliance components downward. In the event that building energy codes savings /reductions provide less EE than planned, the state will have time to adjust plan to require additional emissions reductions through other compliance plan components to address any shortfall. States should consider multiple EE programs and apply a conservative "discount" to each one to assure that programs in aggregate meet overall objectives. (Note that conventional criteria pollutant State Implementation Plans also often employ "discounting" to allow a margin of error in projecting emissions reductions.) If projected energy code savings are due to lower than expected new construction, the State Energy Office and air regulatory agency should not be penalized. Unless new construction is for replacing old buildings that would otherwise remain in use, less new construction means fewer new energy-using buildings, less than expected electricity load growth, and in general correspondingly less additional emissions.	N/A

9. What types of EM&V are necessary? What are the monitoring requirements? What are the recordkeeping requirements? How long will the monitoring need to be kept in place? For example, it must be sufficient to demonstrate compliance with a required performance standard. It must measure or estimate and verify the CO_2 emissions reductions. The state must be able to translate this into demonstrable progress for meeting the CO_2 reduction goal.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The state office responsible for documenting emission reductions attributable to building energy codes (e.g. State Energy Office) should estimate energy savings and emissions impacts based on construction data plus sampling and analysis to determine code compliance rates. (Note that conventional criteria pollutant State Implementation Plans also rely on sampling and analysis, particularly for area and mobile sources.) Typically localities issue construction permits identifying the project and applicable codes subject to local code official approval and inspection. The state should assure that representative samples of construction projects are reviewed to estimate compliance rates. Software tools, such as DOE-provided COMcheck and REScheck, facilitate compliance demonstration. States could consider authorizing use of electric utility metered data (with, as warranted, protections of privacy) to compare actual with modeled energy performance of samples of new construction to verify savings. Further, in jurisdictions with building energy benchmarking and disclosure requirements, such data for new and renovated buildings can support codes compliance and energy savings evaluation.	The state office responsible for documenting emission reductions attributable to building energy codes (e.g. State Energy Office) should estimate energy savings and emissions impacts based on construction data plus sampling and analysis to determine code compliance rates. (Note that conventional criteria pollutant State Implementation Plans also rely on sampling and analysis, particularly for area and mobile sources.) Typically localities issue construction permits identifying the project and applicable codes subject to local code official approval and inspection. The state should assure that representative samples of construction projects are reviewed to estimate compliance rates. Software tools, such as DOE-provided COMcheck and REScheck, facilitate compliance demonstration. States could consider authorizing use of electric utility metered data (with, as warranted, protections of privacy) to compare actual with modeled energy performance of samples of new construction to verify savings. Further, in jurisdictions with building energy benchmarking and disclosure requirements, such data for new and renovated buildings can support codes compliance and energy savings evaluation.

10. Would the program be different depending on whether the State Plan is rate-based or mass-based? What are the implementation trade-offs of both approaches?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The implementation of building energy codes, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).	The implementation of building energy codes, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).

11. Is the program, or could the program be, multi-state in nature? If it is multi-state in nature, what is specifically required of each state?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Building energy codes can work similarly under both single-state and multi-state compliance approaches. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options.	Building energy codes can work similarly under both single-state and multi-state compliance approaches. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options.

12. Is the program a single element program or a multiple EE program?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Building energy codes can operate on its own or in conjunction with other EE programs. Nothing would prevent other EE programs (e.g. ESPC, CHP, etc.) from being implemented simultaneously for CPP compliance purposes.	Building energy codes can operate on its own or in conjunction with other EE programs. Nothing would prevent other EE programs (e.g. ESPC, CHP, etc.) from being implemented simultaneously for CPP compliance purposes.

Energy Savings Performance Contracting[58]

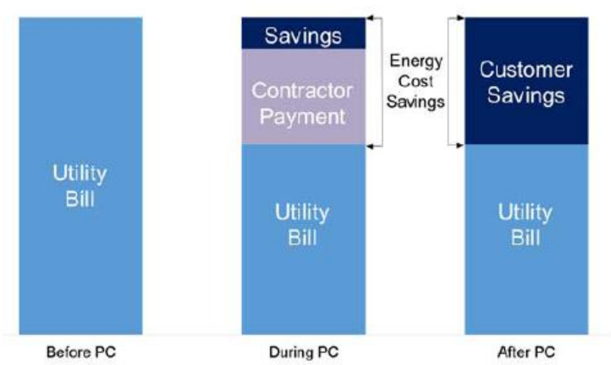
Description

1. Brief description of the energy efficiency strategy.

Energy Savings Performance Contracting (ESPC) and other approaches to guaranteed energy savings provide a one-stop procurement process that enables building owners to use savings from avoided energy consumption to pay for new energy-efficient equipment and services. Performance contracting is widely regarded as a turnkey mechanism to complete energy-savings projects without reliance on capital funds.

Under an ESPC, a facility owner enters into a guaranteed energy savings contract with an energy services company (ESCO). The ESCO will conduct a comprehensive energy audit of the buildings owners' facility or facilities and will identify potential Energy Conservation Measures (ECMs) geared toward achieving maximum cost-effective energy savings. In consultation with the building owner, the ESCO will design and construct a project that saves energy and meets the energy and facility needs of the building owner. The project will bundle multiple ECMs, which individually have varying paybacks and together achieve energy savings, and cash flow, by an agreed-upon and allowable contract term. The ESCO guarantees that the comprehensive energy savings improvements will generate sufficient energy cost savings to pay for the project over the term of the contract. After the ESPC, all cost savings accrue to the building owner. Figure 3 illustrates this process. The building owner benefits from the reductions in energy consumption and the significant equipment upgrades made to the building(s), which improve functionality, performance, and overall energy management.

Figure 3. How Energy Service Performance Contracting Works



Source: AJW

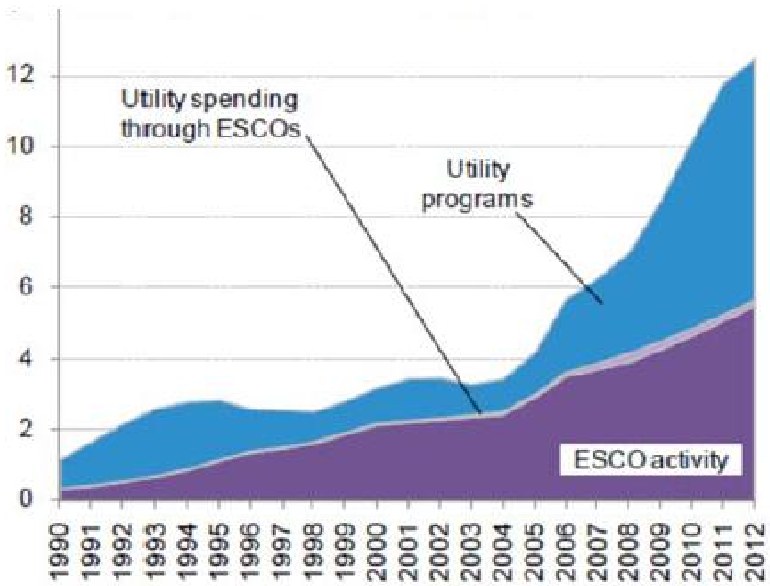
The standard protocols already in use by ESPC projects to accurately measure and verify energy savings can also support quantification of CO_2 savings. The high level of rigor associated with the M&V of savings under ESPC projects is a chief reason why ESPC is a desirable and complementary tool to achieve

[58] Prepared primarily by AJW on behalf of a consortium of ESCOs with NASEO editing.

the energy efficiency savings sought by the Clean Power Plan. States will benefit from ESPC in either rate- or mass-based approaches.

ESCOs today are delivering more than $6 billion of projects annually, according to reports published by the Lawrence Berkeley National Laboratory.[59] As illustrated in Figure 4, this amount is comparable to utility ratepayer energy efficiency program expenditures.

Figure 4. Investment in Energy Efficiency through ESCOs and Utility Programs, 1993-2012 (billion dollars)



Source: Bloomberg New Energy Finance and Business Council for Sustainable Energy, "Sustainable Energy Factbook"

Since 1990, U.S. ESCOs have implemented tens of thousands of projects for federal, "MUSH" (municipal, university, school and hospital) market, private commercial and industrial, institutional, and residential customers. In aggregate, ESCO projects have produced:[60]

- $50 billion in projects paid from savings
- $55 billion in savings – guaranteed and verified
- 450,000 person-years of direct employment
- $33 billion of infrastructure improvements in public facilities
- 470 million tons of CO_2 savings at no additional cost

[59] Elizabeth Stuart, Peter H. Larsen, Charles A. Goldman, and Donald Gilligan, 2013, *Current Size and Remaining Market Potential of the U.S. Energy Service Company Industry*, Lawrence Berkeley National Laboratory, http://emp.lbl.gov/projects/energy-services-company-esco-industry-and-market-trends

[60] National Association of Energy Service Companies (NAESCO), "What is an ESCO?" http://www.naesco.org/what-is-an-esco

Nearly 90% of ESCO projects are implemented for public sector customers subject to public contracts, most of which include energy savings guarantees. Federal government projects utilize standard contracts, which are available from the Federal Energy Management Program. Most contracts for MUSH market and institutional projects incorporate the key terms of model contract documents that have been developed by the U.S. DOE and are available at no cost.[61]

ESPC has strong bi-partisan political support at both the federal and state level. At the federal level, ESPC is recognized by the President and the Congress -- represented by the House ESPC Caucus co-chaired by Representatives Kinzinger (R-IL) and Welch (D-VT) – as the preferred method for meeting the aggressive federal mandates for improvements in building efficiency which began in the mid-1990s. Every state has legislation that specifically authorizes ESPC in public buildings. These laws have been enacted by both Republican and Democratic-majority legislatures. For example, the conservative Michigan legislature updated its ESPC legislation in 2012 with almost unanimous votes in both houses. Many states also have Executive Orders that establish statewide ESPC programs.[62] Public support for ESPC is demonstrated by Georgia's landslide approval of a 2010 constitutional amendment permitting ESPC in state facilities on the same day that voters in Oregon rejected a bond issue in order to finance EE improvements in schools.

Compliance Pathway

2. Who will administer the energy efficiency strategies or measures (e.g., the State Energy Office, State Environmental Agency, Public Service Commission)?

While ESCOs enter into ESPCs to implement strategies and measures that save energy, the State Energy Office (SEO), or other appropriate office, would oversee the interaction of performance contracting with CPP planning and compliance activities.

State plans strategies will likely fall into two distinct categories: a state-driven portfolio approach and an EGU-obligated compliance approach. Either approach can be implemented as a rate-based or mass-based program. The State Energy Office (or other appropriate office) will play a role in both approaches, but that role will be different depending on which strategy is employed. Therefore, the answers to each of the following questions will be different depending on which strategy is employed.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
State Energy Office estimates, tracks, and records measured and verified savings from ESPC projects. Under this approach, the State Energy Office, or another appropriate office, would serve as an aggregator of EE produced by ESPC projects for use in CPP compliance. By using conservative estimates of PC	State Energy Office tracks and records measured and verified savings from ESPC projects. In this approach, EGUs should be able to utilize all EE from ESPC projects with appropriate M&V to support their demonstration of compliance.

[61] See U.S. DOE, http://energy.gov/eere/wipo/model-documents-energy-savings-performance-contract-project

[62] Examples of Executive Orders are available at: Energy Services Coalition, "Strong Legislative and Gubernatorial Support," http://energyservicescoalition.org/resources/tools/practice02 and ACEEE, State and Local Policy Database, Energy Savings Performance Contracting, http://database.aceee.org/state/energy-savings-performance.

project potential, the state plan can credibly estimate the amount of savings that will be generated by ESPC projects. Aggregating savings from ESPC projects with appropriate M&V, the aggregating official would aggregate the quantity of EE produced and the GHG emission reductions available for compliance. Project information, once aggregated, can then be shared with the state air office responsible for compliance with the CPP.	EGUs can access this source of verified, predictable GHG emission reductions in a multitude of ways. For instance, EGUs can enter direct contractual relationships with ESPC project participants that assign credit to the EGU for emission reductions created by the project. Another approach would be for the EGU to acquire emission reduction credits created by the ESPC project either through market-based emission credit exchanges or directly from the project.

3. How will success be measured, how will progress be measured, and what happens if the objectives are not achieved (e.g., NASEO had suggested that states consider multiple EE programs so that if one measure does not achieve the goals, and other programs achieve or exceed the goal, would that be sufficient)? For example, in the building energy codes area, it is not sufficient to point to existing building energy codes or to simply upgrade energy code, there must be some measures of compliance and evidence that such compliance is occurring.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
At the start of each compliance year, the State Energy Office, for example, would be responsible for aggregating emission reductions attributable to ESPC EE projects and should be able to confirm total emissions avoided from the prior year using M&V reporting provided by a registry. This will enable the state to identify any shortfall of ESPC-related reductions, and to take credit when ESPC-related emission reductions exceed planned levels. The state will also be able to reliably project the future savings produced by projects implemented during the compliance period, because these savings are guaranteed, generally for contract terms longer than the compliance period. ESPCs contain contractually-binding correction requirements in the event that expected savings fail to materialize. Typically the ESCO is responsible for addressing any savings shortfall and correcting those measures that contributed to the shortfall.	At the start of each compliance year, the State Energy Office, for example, would be responsible for aggregating emission reductions attributable to ESPC EE projects and should be able to confirm total emissions avoided from the prior year by counting the amount of ESPC savings/reductions with appropriate M&V claimed by EGUs. ESPCs contain contractually-binding correction requirements in the event that expected savings fail to materialize. Typically the ESCO is responsible for addressing any savings shortfall and correcting those measures that contributed to the shortfall.

4. Affected entities – What entity would be responsible or accountable for the energy efficiency measure and the associated reductions? E.g., is it an ESCO? Is it a third-party contracting with a utility?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office (or other appropriate office) would be responsible for policy/program oversight, guidance and implementation. ESCOs and other contractors will be responsible for contractual requirements, including any performance guarantees for savings for implemented projects. Through an ESPC, ESCO guarantees provide a mechanism to address potential energy savings shortfalls. ESCOs could register ESPC projects with a national, regional, or state registry and a state office could check the registry to ensure M&V has successfully occurred to enable quantification and certification of EE results of ESPC projects. The registry would be responsible for collecting, aggregating, and keeping M&V records of EE projects – allowing a state to easily conduct audits of M&V for any oversight purposes. By using standard reports from a project registry, states will be able to evaluate its ESPC program.	EGUs can buy credits or contract with ESCOs or building owners to achieve savings in any building sector. ESCOs and other contractors will be responsible for contractual requirements, including any performance guarantees. ESCOs could register ESPC projects with a national, regional, or state registry and a state office could check the registry to ensure M&V has successfully occurred to enable quantification and certification of EE results of ESPC projects. The registry would be responsible for collecting, aggregating, and keeping M&V records of EE projects – allowing a state to easily conduct audits of M&V for any oversight purposes. By using standardized formats for collecting ESPC project data, states will be able to easily evaluate their ESPC program and projects. The state may choose to periodically review a project registry to benchmark ESPC emission reductions.

5. Affected sources –What buildings or equipment or facilities will be subject to the program requirements? For example, in the case of an ESCO, the program could include all state university buildings over a certain size.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
State ESPC plans can achieve savings in any building sector. The most success in historic ESPC markets has been in public buildings. Based on a variety of factors, including economics, politics, and policy mechanisms, a state can establish specific goals for target buildings. (E.g., by utilizing state ESPC authority, a 20% EE improvement will be achieved in public buildings comprising at least 50% of the energy used in state public buildings, etc.) Several states (CO, KS and PA) have demonstrated that a program with strong Gubernatorial leadership can predictably implement ESPC in virtually all state facilities within the ten-year CPP compliance period.	EGUs can buy credits or contract with ESCOs or building owners to achieve savings in any building sector.

6. What are the specific standards that must be satisfied? For example, it is unlikely that EPA or the state environmental agency would accept a completely voluntary energy efficiency program that had

no funding and no way to measure whether the voluntary actors were actually implementing any programs.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The ESCO market in public buildings, now more than $5 billion annually, is driven by factors independent of the CPP, including legislative and/or executive savings mandates (broadly bi-partisan at the federal and state level) and the need for energy-related capital improvements in buildings that are starved for capital improvement and maintenance funding. The growth of the market is predictable based on these factors and is not dependent on incentives from ratepayer-funded energy efficiency programs. The M&V conducted on each measure and each building in a ESPC project provides rigorous verification needed to include ESPC-derived emission reductions in State plans. States can ensure that M&V protocols are enforced prior to accepting any GHG reduction credit for those projects. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed.	The ESCO market in public buildings, now more than $5 billion annually, is driven by factors independent of the CPP, including legislative and/or executive savings mandates (broadly bi-partisan at the federal and state level) and the need for energy-related capital improvements in buildings that are starved for capital improvement and maintenance funding. The growth of the market is predictable based on these factors and is not dependent on incentives from ratepayer-funded energy efficiency programs. The M&V conducted on each measure and each building in a ESPC project provides rigorous verification needed to include ESPC-derived emission reductions in State plans. States can ensure that M&V protocols are enforced prior to accepting any GHG reduction credit for those projects. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed.

7. What is the compliance schedule? What are the milestones? How will the schedule and compliance options correlate to the dates set forth in the state plan?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Designate an entity (e.g., State Energy Office) responsible for collecting the data and confirming the CPP contribution made by projects. Create a system and standard format for collecting data. Identify targets (e.g., all MUSH facilities in state). Estimate (using 3rd party support if needed) reasonable savings potential for inclusion in state CPP compliance plan. At the start of each year, the State Energy Office, for	Designate an entity (e.g., State Energy Office) responsible for collecting the data and confirming the CPP contribution made by projects. Create a system and standard format for collecting data. Registered projects can produce units of EE (e.g., tradable credits, incentives, etc.) for use in compliance. Units of EE produced by ESPC projects used for compliance would be identified in EGU reports to state compliance authority. The fact that projects have long lead times (up to two years) from signing the project contract to final commissioning, the state will have

example, would be responsible for aggregating emission reductions attributable to ESPC EE projects and should be able to confirm total emissions avoided from the prior year using M&V reporting provided by a registry and to project savings for the performance period of these projects, which on average exceed the length of the compliance period. This will enable the state to identify any shortfall of ESPC-related reductions, and to take credit when ESPC-related emission reductions exceed planned levels. The fact that ESPC projects have long lead times (up to two years) from signing the project contract to final commissioning gives states excellent visibility on future-year contributions from contracted ESPC projects. If a state measures progress against interim goal milestones during the compliance period, it can evaluate past ESPC (and EE in general) performance, as well as look in the pipeline of ESPC projects to determine future-year contributions. Using M&V reports from all ESPC projects registered in the state, a registry can aggregate on an annual basis all EE produced by installed ESPC projects and provide compliance officials with the GHG avoided by EE projects. The rigor of the M&V will provide precise data regarding EE produced to date.	excellent visibility on future-year contributions from contracted ESPC projects.

8. Are there any alternative compliance options or flexible measures that could be used?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
In the event that ESPC projects are producing greater amounts of EE than anticipated (e.g. more or larger projects have been implemented than assumed in the state plan), the state will have time (12-24 months as described above in "Progress Reports") to adjust – delaying or possibly cancelling – requirements for other, more costly compliance actions. In the event that ESPC projects in aggregate are producing less EE than planned (fewer projects were implemented than projected), state will have time to adjust plan to require additional measures or incentives to increase EE delivered from any source including increased ESPC project utilization – to address any shortfall. Alternately, the state can extend or increase the enforcement of its EE mandates, which will increase	N/A

the number of ESPC projects implemented.	

9. What types of EM&V are necessary? What are the monitoring requirements? What are the recordkeeping requirements? How long will the monitoring need to be kept in place? For example, it must be sufficient to demonstrate compliance with a required performance standard. It must measure or estimate and verify the CO_2 emissions reductions. The state must be able to translate this into demonstrable progress for meeting the CO_2 reduction goal.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
M&V used by ESPC projects (e.g., IPMVP[63] and U.S. DOE Federal Energy Management Program [FEMP] M&V Guidelines[64]) on each measure and each building provides rigorous verification needed to include ESPC-derived emission reductions in State plans. Since the average ESPC project has a performance period longer than the CPP compliance period of ten years, the state is assured that the savings. States can ensure that M&V protocols are enforced by the project registry prior to accepting any GHG reduction credit for projects from the registry. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed. The potential problem of double-counting savings by several different types of EE programs is minimized by the rigor of ESPC project documentation. The cost of each measure and the utility or other ratepayer incentive for that measure is detailed in an ESPC contract, so it is easy to identify the fraction of project energy savings and CO_2 emissions reductions that will be credited to the utility. A registry can clarify tracking and ownership of energy savings credits to prevent double counting. The fact that government agencies at all levels lack the funding necessary to undertake necessary repairs required to bring buildings up to code, and therefore, in the absence of an ESPC project, nurse obsolete equipment indefinitely, makes it difficult to claim that	M&V used by ESPC projects (e.g., IPMVP and FEMP M&V Guidelines) on each measure and each building provides rigorous verification needed to accept electricity avoided or GHG reduced by the EGU. Since the average ESPC project has a performance period longer than the CPP compliance period of ten years, the state is assured that the savings. States can ensure that M&V protocols are enforced prior to accepting any GHG reduction credit for those projects. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed. The potential problem of double-counting savings by several different types of EE programs is minimized by the rigor of ESPC project documentation. The cost of each measure and the utility or other ratepayer incentive for that measure is detailed in an ESPC contract, so it is easy to identify the fraction of project energy savings and CO_2 emissions reductions that will be credited to the utility. A registry can clarify tracking and ownership of energy savings credits to prevent double counting. The fact that government agencies at all levels lack the funding necessary to undertake necessary repairs required to bring buildings up to code, and therefore, in the absence of an ESPC project, nurse obsolete equipment indefinitely, makes it difficult to claim that energy savings from an ESPC project are due to the energy building code rather than the ESPC project.

[63] Efficiency Valuation Organization, 2014, "International Performance Measurement and Verification Protocol," http://www.evo-world.org/index.php?lang=en
[64] U.S. DOE, 2015, "M&V Guidelines: Measurement and Verification for Performance-Based Contracts, Version 4.0," http://energy.gov/sites/prod/files/2015/05/f22/final_draft_mv_guidelines.pdf

energy savings from an ESPC project are due to the energy building code rather than the ESPC project.[65]	

10. Would the program be different depending on whether the State Plan is rate-based or mass-based? What are the implementation trade-offs of both approaches?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The implementation of performance contracting, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).	The implementation of performance contracting, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).

11. Is the program, or could the program be, multi-state in nature? If it is multi-state in nature, what is specifically required of each state?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Performance contracting will work similarly in both single-state and multi-state plans. All states have performance contracting enabling legislation, and could therefore be developed in any state that participated in a multi-state plan. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options, which in many cases, will involve comprehensive energy retrofits.	Performance contracting will work similarly in both single-state and multi-state plans. All states have performance contracting enabling legislation, and could therefore be developed in any state that participated in a multi-state plan. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options, which in many cases, will involve comprehensive energy retrofits.

12. Is the program a single element program or a multiple EE program?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Performance contacting can operate on its own or in conjunction with other EE programs.	Performance contacting can operate on its own or in conjunction with other EE programs.

[65] For example, it is estimated that U.S. public school facilities need about $250 billion in improvements, as documented in the report by F. Crampton and D. Thompson, 2008, “Building Minds, Minding Buildings: School Infrastructure Funding Need: A State-by-State Assessment and an Analysis of Recent Court Cases,” American Federation of Teachers.

Combined Heat and Power[66]

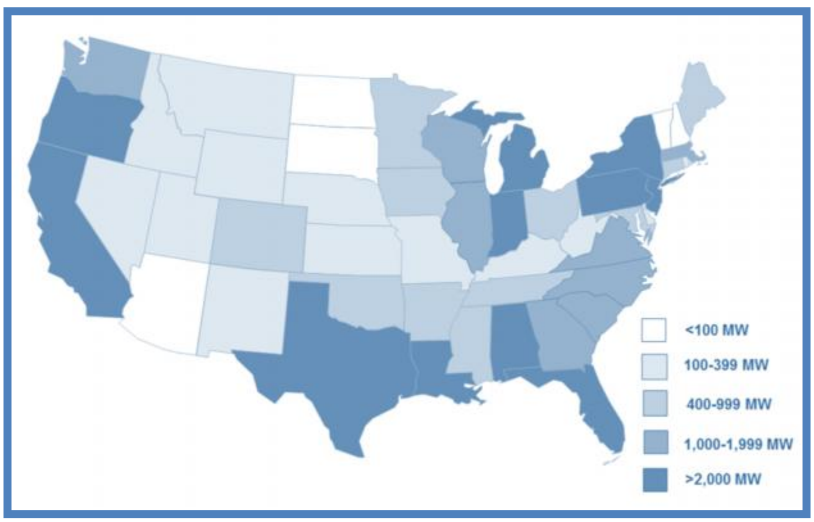
Description

1. Brief Description of Combined Heat and Power (CHP), Potential for Deployment, and How CHP Can Help States Achieve Emissions Targets at Less Cost

Combined Heat and Power (CHP) is an integrated energy system that utilizes commercially available technology to generate electricity or mechanical power and useful thermal energy from a single source of energy at or close to the point of use. When properly designed, CHP systems can provide significant energy efficiency and environmental advantages over separate heat and power applications. CHP's efficiency advantage comes from recovering the heat normally lost in power generation to provide heating or cooling on site. CHP's inherent higher efficiency and elimination of transmission and distribution losses in getting power from the central power plant to the user results in reduced overall energy use and lower greenhouse gas (GHG) emissions.

CHP is well-proven.[67] About 4,200 CHP installations across the United States provide 83 Gigawatts of capacity (about 8% of U.S. generation capacity) and about 12% of U.S. generation. These installations avoid 1.8 quadrillion Btu of fuel consumption and 241 million metric tons of CO_2 annually as compared to equivalent separate generation of heat and power.[68] (See Figures 5.)

Figure 5. Existing CHP Capacity by State



Source: International Energy Agency, "CHP/DHC Country Scorecard: United States," prepared by U.S. DOE, 2014.

While CHP is already fueling American's factories, tremendous potential remains to increase deployment and make American businesses and institutes more competitive and resilient, while also

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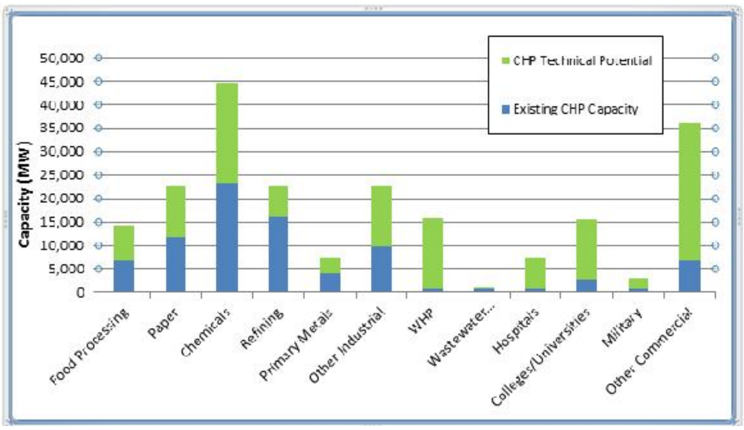
[66] Text mainly provided by David Gardiner and Associates and the Institute for Industrial Productivity; boxed material on "state-driven portfolio approach" and "EGU-obligated compliance approach" developed by NASEO.
[67] Thomas Edison's first commercial power plant, Pearl Street Station, built in 1882, was a CHP facility.
[68] Cited in David Gardiner and Associates and Institute for Industrial Productivity, 2015, "Combined Heat and Power (CHP) as a Compliance Option under the Clean Power Plan: A Template and Policy Options for State Regulators" http://www.dgardiner.com/wp-content/uploads/2015/07/CHP_Pathway_Final_7_23_15.pdf

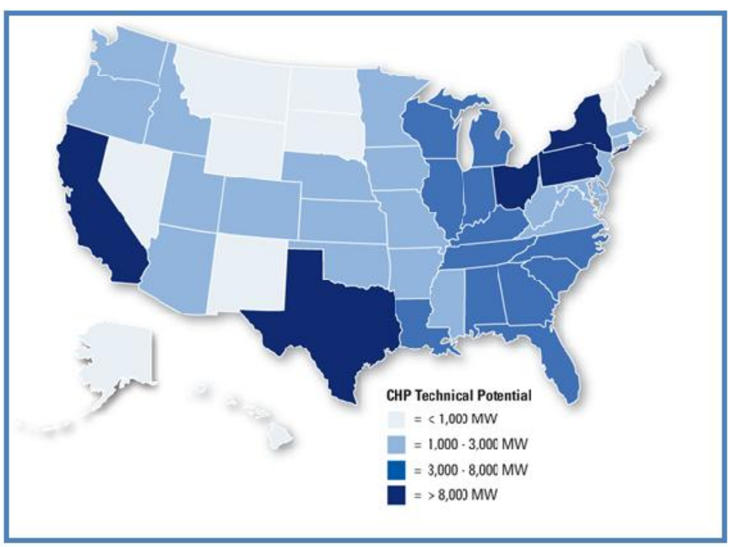
reducing overall CO_2 emissions in general and from grid power and existing fossil EGUs in particular. In fact, the U.S. DOE) and EPA have identified as much as **130 Gigawatts of remaining CHP potential – the equivalent of 260 conventional power plants.** Figures 6 and 7 indicate remaining CHP technical potential by sector and state. To date, U.S. CHP deployment has been concentrated in the industrial sector; however, tremendous opportunity remains in hospitals, universities, and multi-family housing, with future potential roughly equally divided between the commercial and industrial sectors. Unlike clean energy sources, deployment is not limited to places where the sun is shining or the wind is blowing.

Figure 6. Remaining CHP Technical Potential by Sector



Source: International Energy Agency, "CHP/DHC Country Scorecard: United States," prepared by U.S. DOE, 2014.

Figure 7. Remaining CHP Technical Potential by State



Source: International Energy Agency, "CHP/DHC Country Scorecard: United States," prepared by U.S. DOE, 2014.

CHP provides an available, reliable clean energy solution for *every* state in the Unites States, although as a practical matter, the potential is greater for some states than for others. Some of the greatest potential is in states that have greater reliance on coal fired power and some of the more challenging proposed emission reduction targets under EPA's proposed Clean Power Plan rule.

Compliance Pathway

2. Who will administer the program?

Each state takes its own unique approach to energy efficiency policy, and thus there is no one-size fits all approach that should be required in order to achieve widespread and demonstrative energy efficiency through the use of CHP.

In order for a state to assess options for incorporating CHP into a compliance plan, it must first evaluate the technical potential for deployment. Most, but not all, states have access to studies and databases that quantify the industrial base and associated thermal loads. That said, it is important to take into account that the technical potential for CHP will vary widely from state to state.

As well, in a more detailed resource document under development we suggest that the fastest and most effective way to integrate CHP into CPP compliance plans is to expand upon existing state or utility CHP programs. Generally, existing state policies relating to CHP can be broken out into three broad categories--financial assistance, regulatory support, and creating markets. States and utilities have adopted a wide variety of financial and regulatory incentives including grants, loans, utility rebates, bonds, commercial Property Assessed Clean Energy (PACE) programs, discounted utility rates, state tax credits and other measures to support the deployment of CHP. States could also implement separate, voluntary market-based mechanisms to stimulate CHP investment, creating mechanisms for affected entities to purchase emission reduction credits from industrial, commercial or institutional customers who install CHP. This option may be important in states without existing ratepayer programs or for states where industrial customers have opted-out of state or utility incentive programs.

Many of the answers to the questions posed depend entirely on the program itself. For example, a state loan program may be administered by a state energy or economic development office and must meet a certain set of standards, whereas discounted utility rates are approved and overseen by state public utility commissions and are operated under an entirely different set of standards. As a result, policies that are successful in one state may not be suitable for another. Instead, there are a wide array of options available to states to advance CHP as part of their Clean Power Plan compliance as reflected in our forthcoming resource document.

States should be strongly encouraged to do what they deem appropriate given technical potential and existing state or utility programs in order to maximize the deployment of CHP, and states should be provided sufficient flexibility so as to allow diverse methodologies for implementation.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
State Energy Office plans, estimates, tracks, and records measured and verified savings from CHP. Under this approach, the State Energy Office, or	State Energy Office tracks and records measured and verified savings from CHP. In this approach, EGUs should be able to utilize all CHP

another appropriate office, would serve as an aggregator of IEE for use in CPP compliance. By using conservative estimates of CHP potential, the state can credibly estimate creditable savings. Using standardized reporting of CHP output and performance supported by M&V reports, the aggregating official would register CHP-derived energy and electricity savings and the GHG emission reductions available for compliance. Once aggregated, this information can then be shared with the state air office responsible for compliance with the CPP	with appropriate M&V to support their demonstration of compliance. EGUs can access this source of verified, predictable GHG emission reductions in a multiply of ways. For instance, EGUs can enter direct contractual relationships with industrial facilities that assign credit to the EGU for emission reductions created by the project. Or the EGU could acquire emission reduction credits created by CHP through market-based emission credit exchanges.

3. **How will success be measured, how will progress be measured, and what happens if the objectives are not met?** There must be some measure of compliance and evidence compliance is occurring.

For purposes of a state's CPP and portfolio of complementary measures, success and progress for a CHP program can be measured by the amount of installed capacity above an established baseline. The amount of electricity produced by installed CHP units can be and typically is measured. The electric power produced by the CHP unit generally equates to a one-for-one reduction in demand for grid power – one megawatt hour (MWh) reduced for every megawatt hour generated – whether it is used on site or a portion is sold back on the grid[69]. Standard data sources and models such as eGRID[70] and AVERT[71] can be used to determine what mix of fossil-fuel fired existing electric generating unit (EGU) power would be displaced and not dispatched to the grid as a result of a given level of grid power demand reduction in the particular state or region. The state's Clean Power Plan emission target is to reduce CO_2 emissions from CPP affected sources – meaning existing fossil fuel fired EGUs. That reduction can be measured and verified.

It would be wise for a state plan to include a discounted, conservative estimate for the amount of CHP expected to be installed as a result of a given incentive program. That will make it far more likely that the objective for CHP will be met or even exceeded. In addition, we would highly recommend not relying on only one type of energy efficiency or demand side management, but instead to deploy a diversified portfolio of energy efficiency measures, each with conservative estimates for their ability to

[69] When power produced from a CHP system is consumed on-site, the overall grid savings also includes the avoided delivery losses for power that occur along the transmission and distribution systems. Because of these losses, the amount of electricity actually delivered to consumers is less than the amount generated at central station power plants, usually by about 6 to 8 percent. Consequently, consuming 1 MWh of CHP generated electricity on-site means that slightly more than 1 MWh of electricity no longer needs to be generated at the central station power plant. The amount of central station power displaced by every MWh of CHP generation consumed on-site is equal to 1 / (1- percent T&D losses) MWh.

[70] eGRID provides information on emissions and fuel resource mix for individual power plants, generating companies, states, and regions of the power grid. eGRID is available at http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html.

[71] EPA's AVoided Emissions and geneRation Tool (AVERT) is a publicly available tool with a simple user interface designed evaluate county, state and regional emissions displaced at electric power plants by energy efficiency and renewable energy policies and programs. AVERT is designed to use public data, which is accessible and auditable.

reduce demand for and thus CO_2 emissions from existing EGUs. Programs that exceed expectations will help to offset those that may under-perform.

You have also asked what would happen if actual installed capacity does not keep up with conservative projections? As for all CPP strategies, the answer is to evaluate progress and make adjustments as needed. The state could ramp up incentives, take steps to reduce known barriers to CHP, and/or increase reliance on alternative compliance strategies (e.g., other energy efficiency measures). A state may wish to include a contingency in the plan describing what next steps it would pursue, if needed in the event that CO_2 emission reductions from affected EGUs fall short of mile post goals.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
A State Energy Office, for example, would be responsible for documenting emission reductions attributable to EE projects, including CHP, and should be able to confirm total emissions avoided from the prior year using reporting provided by a registry. This will enable the state to take credit for emission reductions from validated projects. If industrial facilities participating in the Superior Energy Performance program are found by the Superior Energy Performance Verification Body to not conform to the requirements, the Verification Body will issue corrective actions that the facility must complete before receiving Superior Energy Performance certification. Certification is valid for three years, as long as the facility completes the annual surveillance audits to confirm continued maintenance of the EnMS (a requirement of ISO 50001).	At the start of each year, a State Energy Office, for example, would be responsible for aggregating emission reductions attributable to CHP and should be able to confirm total emissions avoided from the prior year by counting the amount of CHP savings/reductions with appropriate M&V claimed by EGUs. If industrial facilities participating in the Superior Energy Performance program are found by the Superior Energy Performance Verification Body to not conform to the requirements, the Verification Body will issue corrective actions that the facility must complete before receiving Superior Energy Performance certification. Certification is valid for three years, as long as the facility completes the annual surveillance audits to confirm continued maintenance of the EnMS (a requirement of ISO 50001).

4. Affected entities – **What entity would be responsible or accountable for the energy efficiency measure? E.g., is it an ESCO? Is it a third party contracting with a utility?**

We are concerned with the possible implications of calling the owners and operators of facilities that decide to install CHP "affected entities." The affected entities and sources under EPA's 111(d) Clean Power Plan rule are existing fossil fuel fired EGUs. The point of installing energy efficiency and other demand side measures is to reduce CO_2 emissions averaged across the state's fleet of existing EGUs to meet the state's target goal (or a blended target in the case of a multi-state regional plan.) That is the ultimate measure of success. Holding individual entities "accountable" is not likely to encourage their participation in an energy efficiency program that otherwise could help the state meet its target goals for EGU emissions at less cost. In other words, insisting on a heavy handed, prescriptive approach would be counter-productive.

What is likely to be federally enforceable under the CPP are the emission targets in the state plan itself, not the individual elements of a compliance strategy. As such, end users that participate in a state or utility CHP program that generates credits for CPP compliance should not be subject to state or federal enforcement. As voluntary suppliers of emission reduction credits, their only obligations are to satisfy the terms of emission credit sales contracts, agreements, or efficiency programs under which they receive financial incentives. Similarly, states would not face penalties if a CHP program does not deliver as expected. Rather, the state will monitor performance of each element in its strategy, periodically report progress to EPA, and if the overall mix of strategies is underperforming, it will make adjustments in programs and strategies to make up the short fall. Such adjustments need not be specific to the CHP elements of the plan.

However, we understand the state's need to be able to track and demonstrate progress and to know who will be responsible for providing the data that will help the state monitor and confirm its progress. There are many ways to provide that data, and each type of CHP program can be tailored to ensure the state receives the data and assurance it needs to track progress in reducing demand for and emissions from existing EGUs.

The entity responsible for implementing a CHP program could track and provide data on CHP projects, installed capacity, and the resulting electricity and thermal production. Tracking will depend on the type of program or programs the state deploys. Recall that there are three broad categories of state policies for increasing deployment of CHP: (1) financial assistance; (2) regulatory support; and (3) creating markets. Each has a different built-in method for tracking success. For example, where a state uses financial incentives for CHP projects in the form of rebates, grants, loans, and/or tax deductions, each of these is tracked and tied to demonstrations of performance. Regulatory support involves streamlined permitting or technical assistance to help guide developers through the permitting process. These also can provide tracking for installed CHP capacity. Market programs administered by a state utility commission also include built-in measures for tracking installed CHP capacity. Our resource document will describe these programs in greater detail. A state could adopt the option that suits its situation best and provides the assurances it desires. What is best for one state may not work well for another. Each state should look at available options and pick what works best for their circumstances.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office (or other appropriate office) would be responsible for policy/program oversight, guidance and implementation. Facilities implementing CHP will be responsible for implementing output and performance monitoring (which is typical business practice), M&V, and other requirements associated with certification in those programs. By using standardized formats for collecting CHP data, states will be able to evaluate their CHP program.	EGUs can buy credits or contract with industrial facilities to achieve acceptable savings. Facilities implementing CHP will be responsible for implementing output and performance monitoring (which is typical business practice), M&V, and other requirements associated with certification in those programs. By using standardized formats for collecting CHP data, states will be able to evaluate their CHP program.

5. **Affected sources** – **What buildings or equipment or facilities will be subject to the program requirements?** For example, in the case of an ESCO, the program could include all state university buildings over a certain size.

First, it is important to remember that only existing fossil fuel fired EGUs are "affected sources" under the Clean Air Act section 111(d) Clean Power Plan. That term should not be applied to measures that are deployed to help reduce emissions from the affected source EGUs by third parties.

That said, one can identify the types of facilities where there CHP can be deployed. Industrial, Commercial, Institutional and Government facilities that have significant and concurrent electric and thermal demands at a single facility or a campus of facilities, represent potential candidates for CHP system deployment. As voluntary suppliers of emission reduction credits, their only obligations as CHP hosts would be to satisfy the terms of emission credit sales contracts, agreements, or efficiency programs under which they receive financial incentives.

CHP systems require less fuel than equivalent separate heat and power systems to produce the same amount of delivered energy services. Since the on-site generation of electricity from CHP systems have the ability to reduce demand for and thus CO_2 emissions from existing fossil fuel EGUs, it would be wise for a state plan to include CHP as part of a diversified portfolio of energy efficiency measures. The level of CO_2 emissions reductions from CHP systems will depend on the energy requirements and the size of the facility being served as well as the make-up of the state's existing fleet of EGUs (i.e., the nature of the electricity that is being displaced).

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Based on a variety of factors, a state can establish specific goals for CHP in industrial, commercial, and institutional settings and offer incentives that can reasonably be expected to achieve those goals. States may be able to have a more direct opportunities to effect CHP implementation or expansion in state-owned or other public facilities.	EGUs can buy credits or contract directly with CHP operating facilities to achieve acceptable savings.

6. **What are the specific standards that must be satisfied?** For example, it is unlikely that EPA or a state environmental agency would accept a completely voluntary energy efficiency program that had no funding and no way to measure whether the voluntary actors were actually implementing any programs.

Several states have established programs to help remove barriers to and to provide incentives for CHP. Such programs are generally state or ratepayer funded and include performance tracking requirements, but program participation is voluntary. The methods for measuring whether CHP is actually deployed as a result of such programs are fairly simple, but vary depending on the approach selected. There are several program approaches that have proven successful in increasing CHP deployment, and we will provide summaries in the resource document currently under development. However, there is no one best approach; the state should choose a CHP program or portfolio of programs that best suit their situation.

Our forthcoming resource document will provide detailed descriptions of many different types of state CHP programs that have been successful, including links to relevant sample regulatory or other text. They are too numerous to list here.

Again, however, it would be a mistake to impose regulatory sanctions on an industrial, university, hospital, or commercial operation if they install CHP but do not achieve all of the energy outputs they anticipated. That would simply set up a powerful new barrier to deploying CHP. Instead, the state would be better served by tracking progress of the CHP program as a whole and if results are not keeping up with projections, take additional steps to remove barriers, provide incentives, or increase reliance on other compliance mechanisms as needed.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
CHP output and performance are measured as standard business practice. There are established M&V and quantification protocols which can provide precise CHP performance data. Only achieved and verified GHG emission reductions from CHP would be incorporated in compliance reporting.	CHP output and performance are measured as standard business practice. There are established M&V and quantification protocols which can provide precise CHP performance data. Only achieved and verified GHG emission reductions from CHP would be incorporated in compliance reporting

7. What is the compliance schedule? What are the milestones? How will the schedule and milestones correlate to the dates set forth in the state plan?

In a portfolio approach, the point is to assess how the mix of energy efficiency programs together are helping to reduce demand for -- and thus CO_2 emissions from -- fossil-fuel fired existing EGUs. The Clean Power Plan sets the compliance schedule for a state to achieve its target to reduce the CO_2 emission rate from its fleet of existing EGUs – or the comparable mass based emissions goal.

The portfolio of complementary measures, including CHP, should be designed to achieve the amount of demand side reduction that will contribute the requisite portion of the state's target goal. For CHP, milestones can be set as targets for a certain level of CHP capacity to be installed by 2020 and 2030. As described above, this is a metric that is easily provided. States can monitor progress annually to determine whether they are on track, and if not, a state can evaluate what additional barriers need to be removed or what incentives provided to ramp up CHP deployment to get back on track. The state may also opt to increase reliance on alternative compliance mechanisms. There is also limited need to worry whether deployed CHP will actually be used. The main hurdle for CHP is the up-front capital cost. Once CHP is installed, it is in the strong economic interest of the facility owner and operator to use this cost-effective source of energy.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Designate an entity responsible for collecting the data and confirming the CPP compliance contribution made by projects. Create a system and standard format for collecting data. Identify targets (e.g. industrial facilities operating in certain sectors or consuming above a certain amount of	Designate an entity responsible for collecting the data and confirming the CPP compliance contribution made by projects. Create a system and standard format for collecting data. Registered projects can produce units of EE (e.g. tradable credits, incentives, etc.) for use in compliance.

energy). Estimate (using 3rd party support if needed) reasonable savings potential for inclusion in the state CPP compliance plan. At the start of each year, a state office responsible for aggregating emission reductions attributable to CHP (e.g. STATE ENERGY OFFICE) should be able to confirm total emissions avoided from the prior year using M&V reporting provided by a registry. This will enable the state to identify any shortfall of CHP-related reductions, and to take credit when CHP-related emission reductions exceed planned levels. If a state measures progress against interim goal milestones during the compliance period, it can evaluate past CHP savings, as well as look in the CHP pipeline (or identified near term CHP projects) to determine future-year contributions. Using M&V reports from all registered CHP in the state, the national registry, State Energy Office or other appropriate office can aggregate on an annual basis all CHP savings and provide state program compliance officials with the GHG avoided. The rigor of the M&V will provide precise data regarding CHP produced to date.	Units of EE produced by industrial facilities used for compliance would be identified in EGU reports to state compliance authority.

8. Are there any alternative compliance options or flexible measures that could be used?

There are a number of states across the country that offer programs designed to increase the deployment of CHP to achieve energy efficiency, business and/or environmental goals. These programs have varying requirements for eligibility and incentive offerings that are based on the state's individual objectives. This same type flexibility would be appropriate for states looking to incorporate CHP in state plans for CPP compliance.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
In the event that CHP savings/reductions are greater than anticipated (e.g. more or larger projects have been implemented than assumed in the state plan), the state will have time (12-24 months as described above in "Progress Reports") to adjust –delaying or possibly cancelling – requirements for other, more costly compliance actions.	N/A

In the event that CHP savings /reductions in aggregate are producing less EE than planned (fewer projects were implemented than projected), state will have time to adjust plan to require additional measures/incentives to increase EE delivered from any source including increased IEE utilization – to address any shortfall.	

9. What types of EM&V are necessary? What are the monitoring requirements? What are the record keeping requirements? How long will the monitoring need to be kept in place? For example, it must be sufficient to demonstrate compliance with a required performance standard. It must estimate or verify the CO_2 emission reductions. The state must be able to translate this into demonstrable progress for meeting the CO_2 emission reduction goal.

The existing state CHP programs referenced in question #8 above provide examples of the types of EM&V protocols that would be needed for CHP in state compliance plans for the CPP. States such as New York, Massachusetts, Maryland, Illinois and New Jersey have established detailed EM&V protocols as part of their CHP programs that include standards for specific system parameters to monitor, meter placement, frequency of data collection, etc., and approaches to performance calculations. In addition, most CHP projects as a matter of standard business practice routinely measure and monitor performance. EM&V protocols for CHP systems in a state plan should be consistent with other energy efficiency programs included in state plans.

Emissions Savings Calculations

State plans will need to detail how energy savings from CHP result in CO_2 emissions reductions. The EGU emission reduction impacts of CHP are similar to the emission reduction impacts of other end-use energy efficiency measures. Like other energy-efficiency investments, CHP reduces demand – and thus the associated emissions – from affected EGUs. As such, the methodology used for crediting emission reductions caused by new and up-graded[72] CHP should be equivalent to the methodology used for crediting other end-use energy-efficiency measures. However, unlike end-use efficiency, implementation of CHP often results in additional incremental fuel use – and incremental CO_2 emissions – at the host facility. It is unclear at this time whether EPA, in the final rule, will recognize the full kWh output of CHP systems as efficiency savings or require the netting out of incremental site emissions. If the latter is required, the credit calculation should be simple, accurate and understandable. CHP's efficiency and emission benefits derive from producing *both* electricity and useful thermal energy simultaneously from a single fuel source. There are accepted output-based emissions measures that account for both the electricity and the thermal energy outputs of the system and that appropriately account for the emissions benefits of CHP. These approaches will be highlighted in our resource document.

Modeling Tools for Calculating EGU Dispatch and CO_2 Emission Reductions from CHP and other reductions in grid power demand

In addition, there are various modeling tools available for determining what type of electric generation would be displaced for a given amount of demand reduction from CHP or any other form of energy

[72] Up-graded CHP units refers to expansion or efficiency improvements to existing CHP systems

efficiency. One option is to run detailed dispatch models such as ICF International's proprietary IPM model used by EPA. The EPA has also developed simpler, non-proprietary models such as the CHP Emissions Calculator and the AVoided Emissions and geneRation Tool (AVERT) that can be used to estimate the energy and emissions characteristic of displaced grid power. Similarly, Gas Technology Institute (GTI) has developed a modeling tool that can be used to evaluate net emission reductions within a region or an individual state for displacing grid power with a given type of energy equipment[73].

Primary energy and greenhouse gas emissions calculations and comparisons typically use average electric power generation mix data for calculations. Such average methodologies may be appropriate for inventory and benchmarking purposes, but are less useful for evaluating energy and emissions reductions from site-specific electricity consumption. Non-baseload or marginal generation more accurately represents the generation avoided due to a specific activity that reduces electricity consumption (or, conversely, increased generation due to increased consumption) at an end-use customer. Thus marginal generation may be a more appropriate increment on which energy investment decisions can be made and fossil EGU emissions avoided[74].

Based on economic dispatch of electricity generation, electricity savings from efficiency measures will nearly always displace fossil fuel power generation, not the composite average of all generation sources. That can make a significant difference when evaluating marginal primary source energy consumption and emissions for areas that are dominated by non-combustion electric generation, but whose marginal or avoided generation will likely be from natural gas or coal power generation. Marginal calculation methodologies also may be more appropriate for evaluating the impacts of changes in electric energy consumption, such as comparing new building energy efficiency design options or evaluating competing retrofit measures.

The types of models mentioned above could be used to estimate and verify the amount of CO_2 emission reductions from existing fossil EGUs achieved by deploying a given amount of CHP capacity in a state or multistate region.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Only achieved and verified GHG emission reductions from CHP projects would be incorporated in compliance reporting. There are accepted CHP M&V protocols including those already recognized in several states. It is standard business practice is to monitor performance	Only achieved and verified GHG emission reductions from CHP projects would be incorporated in compliance reporting. There are accepted CHP M&V protocols including those already recognized in several states. It is standard business practice is to monitor performance

[73] GTI's Carbon Management Information Center (CMIC) Source Energy and Emissions Analysis Tool (SEEAT) at www.cmictools.com uses government published and publicly available data sources to determine source energy consumption and related greenhouse gas and other pollutant emissions for selected fossil fuels and electricity based on point-of-use energy consumed by an appliance, building, industrial application, or vehicle. Default values for most efficiency and emission parameters can be changed by the user.

[74] The EPA CHP Partnership suggests using regional average fossil generation or non-baseload emissions rates as reasonable estimates for marginal generation – EPA, CHP Partnership, 2012, "Fuel and Carbon Dioxide Emissions Savings Calculation Methodology for Combined Heat and Power Systems."

and output. Among other established and accepted protocols that can apply include DOE's Superior Energy Performance M&V Protocol and the International Performance Measurement and Verification Protocol (IPMVP). A state can ensure that only properly verified GHG emission reductions are included in the program for CPP compliance. States can ensure that M&V protocols are enforced by the project registry prior to accepting any GHG reduction credit. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed.	and output. Among other established and accepted protocols that can apply include DOE's Superior Energy Performance M&V Protocol and the International Performance Measurement and Verification Protocol (IPMVP). A state can ensure that only properly verified GHG emission reductions are included in the program for CPP compliance. States can ensure that M&V protocols are enforced prior to accepting any GHG reduction credit for those projects. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed.

10. Would the program be different depending on whether the state plan is rate based or mass based? What are the implementation trade-offs of both approaches?

Under an emission rate-based approach, states will have specific emission rate targets measured in pounds of CO_2 per MWh that must be met over time, averaged over the state's fleet of affected EGUs. When thermal output is properly recognized, well-designed and properly operated CHP systems generate electricity at a lower effective emissions rate than most affected fossil EGUs and below proposed state emission rate targets. Under an emission rate-based approach, CHP generation and emissions savings data can be used to affect both the numerator and denominator of the equations used to determine the state's overall emissions rate for EGUs. Under the final rule, each state will likely be assigned an emission limitation representing the allowable average emission rate for all affected power generation in that state. To achieve the target, emissions from EGUs must be reduced (on average) relative to the total amount of electric power generated. States can help EGUs achieve this more cost effectively through programs that incentivize CHP. These could include existing state or ratepayer programs that stimulate CHP investment as described earlier, or through voluntary market-based mechanisms that allow affected entities to purchase certified savings credits either from an emissions registry or directly from CHP providers.

Under a mass-based approach, the state's rate-based emissions targets would be converted to overall emission targets in terms of annual tons of CO_2 released. This creates the potential for energy efficiency and CHP to participate in a credit trading or portfolio approach. Under this option, CHP deployment reduces both the amount of fossil EGU generation and the resulting emissions. CHP development could be incentivized through existing state or ratepayer programs as described above – (1) financial assistance; (2) regulatory support; and (3) creating markets -- or through allowance set-asides in cap and trade programs.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The implementation of CHP, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).	The implementation of CHP, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).

11. Is the program, or could the program be, multi-state in nature? If it is multi-state in nature, what specifically is required of each state?

CHP could work in either a single state or multi-state plan. As described above, eGRID data and various modeling tools can be used to determine what generation within a state or a NERC region would be backed down or not dispatched as a result of a given amount of demand reduction resulting from a given amount of CHP installed capacity. Modeling and calculation approaches as described in question #9 above would then determine the resulting CO_2 emission reduction – either within the state or within the region. In a multi-state plan, the states would need to decide how to allocate demand reductions in one state that reduces dispatch from EGUs located in another state.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
CHP will work similarly in both single-state and multi-state plans. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options.	CHP will work similarly in both single-state and multi-state plans. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options.

12. Is the program a single element program or a multiple EE program?

CHP can be deployed through a single program or through a set of different programs all aimed at encouraging greater deployment of CHP. A CHP program can be standalone, or part of a diversified portfolio of many energy efficiency measures. Ultimately, the state is not obligated to achieve a set level of CHP or any other energy efficiency measure deployment, but rather an emission target. CHP is one of a number of tools that a state may adopt to achieve that target.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
CHP can operate on its own or in conjunction with other EE programs. Nothing would prevent other EE programs (e.g., ESPC, industrial EE, etc.) from being implemented simultaneously for CPP compliance purposes.	CHP can operate on its own or in conjunction with other EE programs. Nothing would prevent other EE programs (e.g., ESPC, industrial EE, etc.) from being implemented simultaneously for CPP compliance purposes.

Industrial Energy Efficiency via Superior Energy Performance[75]

Description

1. Brief description of the energy efficiency strategy.

The industrial sector, which includes manufacturing, mining, construction and agriculture, accounts for roughly one-third of all end-use energy demand in the United States and remains the largest energy user in the U.S. economy. This level of energy consumption provides vast opportunities for successful deployment of industrial energy efficiency (IEE). Although industry has significantly increased its energy efficiency (EE) and manufacturing energy intensity has declined in recent years, industry is still projected to consume 34.8 quads of primary energy in 2020.[76] Estimates of the potential to reduce industrial energy consumption through efficiency measures by 2020 are as high as 18%.[77] Not surprisingly, EE initiatives are a core element of many corporate sustainability initiatives. Facilities that focus on achieving IEE savings reduce their exposure to energy market volatility, while lowering their operating costs.

Energy Management Systems (EnMS) seek to promote operational, organizational, and behavioral changes that result in greater efficiency gains on a continuing basis. Programs implementing energy management systems focus on establishing the framework and internal management processes for managing energy use, as well as for implementing capital projects.

For example, an EnMS approach based on ISO 50001 seeks to enable companies to better manage energy use, thus creating immediate and lasting energy use reduction through changes in operational practices, as well creating a favorable environment for adoption of more capital-intensive EE measures and technologies.

ISO 50001 was published by the International Organization for Standards in 2011.[78] The standard addresses:

- Energy use and consumption
- Measurement, documentation, and reporting of energy use and consumption
- Design and procurement practices for energy-using equipment, systems, and processes, and
- All variables affecting energy performance that can be monitored and influenced by the organization.

An ISO 50001-based EnMS seeks to integrate energy management into core management processes and engage employees across a company rather than treating energy as an ancillary matter. It can also seek to engage other stakeholders, including customers and supply chain. It embraces the "Plan-Do-Check-Act" structure and continual improvement ethos also common to ISO 9001 (quality management) and

[75] Prepared primarily by AJW on behalf of a consortium of industrial companies with NASEO additions to the description section.
[76] U.S. EIA, 2013, "Annual Energy Outlook".
[77] McKinsey & Company, 2009,"Unlocking Energy Efficiency in the U.S. Economy".
[78] International Organization for Standardization, 2011, "ISO 50001: Energy Management".

ISO 14001 (environmental management) as well as the EPA Energy Star for Industry program. While ISO 50001 does not specify specific energy performance targets, it can be married to such targets adopted by the firm, including as part of such programs as the DOE-supported Superior Energy Performance Program.

Industrial facilities implementing ISO 50001 can participate in Superior Energy Performance, which is an American National Standards Institute-accredited, plant-level program that uses the ISO 50001 Energy Management Standard as a foundation and certifies a plant's energy savings using a regression-based M&V protocol. This program was designed to drive transparent and verified energy performance improvement across the U.S. manufacturing sector. Participation in the program requires implementation of and certification to ISO 50001 and achievement of specific energy performance improvement targets as verified by an accredited verification body. For example, under the "Performance Pathway" silver, gold, and platinum certifications are earned for 5, 10, and 15% improvements, respectively. Table 4 illustrates energy performance improvements (achieved over a period of two to three years) from a number of early Superior Energy Performance participants.

Table 4. Example Superior Energy Performance Certified Facility Performance

Name of Facility	Energy Performance Improvement*	Year of Certification
SEP PLATINUM		
» Volvo Trucks, NA: Dublin, VA	25.8%	2012
» Dow Chemical COmpany, manufacturing plant: Texas City, TX	17.1%	2011
» 3M Canada Company: Brockville, Ontario, Canada	15.2%	2012
SEP GOLD		
» Cook Composites and Polymers Co.: Houston, TX	14.9%	2010
» Allsteel: Mascatine, IA	10.2%	2012
SEP SILVER		
» Dow Chemical Company, energy systems plant: Texas City, TX	8.1%	2011
» Owens Corning: Waxahachie, TX	9.6%	2010
» Nissan, NA: Smyrna, TN	7.2%	2012
» Freescale Semiconductor Inc.: Oak Hill, TX	6.5%	2010

Source: U.S. Council for Energy-Efficient Manufacturing in Alliance Commission on national energy Efficiency Policy, 2013, "Advancing Energy Productivity in American Manufacturing"

Compliance Pathway

2. Who will administer the energy efficiency strategies or measures (e.g., the State Energy Office, State Environmental Agency, Public Service Commission)?
Industrial facility owners enter voluntarily implement energy management systems, such as ISO 50001, and pair it with an established verification system such as DOE's Superior Energy Performance program to implement strategies and measures that save energy. The State Energy Office (SEO), or other appropriate office, can oversee the interaction of industrial energy efficiency (IEE) with CPP planning and compliance activities.

State plans strategies will likely fall into two distinct categories: a state-driven portfolio approach and an EGU-obligated compliance approach. Either approach can be implemented as a rate-based or mass-based program. The State Energy Office (or other appropriate office) will play a role in both approaches, but that role will be different depending on which strategy is employed. Therefore, the answers to each of the following questions will be different depending on which strategy is employed.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
State Energy Office plans, estimates, tracks, and records measured and verified savings from IEE. Under this approach, the State Energy Office, or another appropriate office, would serve as an aggregator of IEE for use in CPP compliance. By using conservative estimates of IEE potential, the state plan can credibly estimate the amount of savings that will be generated by IEE. Using M&V reports generated under the SEP program, the aggregating official would register IEE savings and aggregate the quantity of IEE produced and the GHG emission reductions available for compliance. IEE information, once aggregated, can then be shared with the state air office responsible for compliance with the CPP.	State Energy Office tracks and records measured and verified savings from IEE. In this approach, EGUs should be able to utilize all IEE with appropriate M&V to support their demonstration of compliance. EGUs can access this source of verified, predictable GHG emission reductions in a multitude of ways. For instance, EGUs can enter direct contractual relationships with industrial facilities that assign credit to the EGU for emission reductions created by the project. Another approach would be for the EGU to acquire emission reduction credits created through industrial efficiency through market-based emission credit exchanges. IEE resources could be listed in a centralized registry such as a national, regional, or state registry. Industrial owners or operators could register their projects and sell emission reduction credits directly to the EGU.

3. How will success be measured, how will progress be measured, and what happens if the objectives are not achieved (e.g., NASEO had suggested that states consider multiple EE programs so that if one measure does not achieve the goals, and other programs achieve or exceed the goal, would that be sufficient)? For example, in the building energy codes area, it is not sufficient to point to the existing building code or to simply upgrade the code, there must be some measures of compliance and evidence that such compliance is occurring.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office, for example, or other office responsible for documenting emission reductions attributable to EE projects should be able to confirm total emissions avoided from the prior year using reporting provided by a registry. This will enable the state to take credit for emission reductions from validated projects. If industrial facilities participating in the Superior Energy Performance program are found by the Superior Energy Performance Verification Body to not conform to the requirements, the Verification Body will issue corrective actions that the facility must complete before receiving Superior Energy Performance certification. Superior Energy Performance certification is valid for three years, as long as the facility completes the annual surveillance audits to confirm continued maintenance of the EnMS (a requirement of ISO 50001).	At the start of each year, the State Energy Office, for example, or other office responsible for aggregating emission reductions attributable to IEE should be able to confirm total emissions avoided from the prior year by counting the amount of IEE savings/reductions with appropriate M&V claimed by EGUs. If industrial facilities participating in the Superior Energy Performance program are found by the Superior Energy Performance Verification Body to not conform to the requirements, the Verification Body will issue corrective actions that the facility must complete before receiving Superior Energy Performance certification. Superior Energy Performance certification is valid for three years, as long as the facility completes the annual surveillance audits to confirm continued maintenance of the EnMS (a requirement of ISO 50001).

4. Affected entities – What entity would be responsible or accountable for the energy efficiency measure and the associated reductions? E.g., is it an ESCO? Is it a third-party contracting with a utility?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office, for example, or other appropriate office would be responsible for policy/program oversight, guidance and implementation. Industrial facilities implementing ISO 50001 and participating in the SEP program will be responsible for implementing the M&V and other requirements associated with certification in those programs. By using standard reports from a project registry, states will be able to evaluate their IEE program.	EGUs can buy credits or contract with industrial facilities to achieve acceptable savings. Industrial facilities implementing ISO 50001 and participating in the SEP program will be responsible for implementing the M&V and other requirements associated with certification in those programs. By using standardized formats for collecting industrial efficiency data, states will be able to evaluate their IEE program.

5. Affected sources –What buildings or equipment or facilities will be subject to the program requirements? For example, in the case of an ESCO, the program could include all state university buildings over a certain size.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Industry consumes roughly one-third of all end-use energy in the U.S. and studies have shown that energy efficiency measures can reduce that demand by as much as 18-20%. Based on a variety of factors, a state can establish specific goals for industry, or certain types of industry, and offer incentives that can reasonably be expected to achieve industrial energy efficiency savings.	EGUs can buy credits or contract directly with industrial facilities to achieve acceptable savings.

6. What are the specific standards that must be satisfied? For example, it is unlikely that EPA or the state environmental agency would accept a completely voluntary energy efficiency program that had no funding and no way to measure whether the voluntary actors were actually implementing any programs.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The reliance on appropriate, rigorous M&V protocols, such as the SEP M&V Protocol, will provide precise data regarding IEE produced to date. Only achieved and verified GHG emission reductions from IEE would be incorporated in compliance reporting.	The reliance on appropriate, rigorous M&V protocols, such as the SEP M&V Protocol, will provide precise data regarding IEE produced to date. Only achieved and verified GHG emission reductions from IEE would be incorporated in compliance reporting.

7. What is the compliance schedule? What are the milestones? How will the schedule and compliance options correlate to the dates set forth in the state plan?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Designate an entity responsible for collecting the data and confirming the CPP contribution made by projects. Create a system and standard format for collecting data. Identify targets (e.g. industrial facilities operating in certain sectors or consuming above a certain amount of energy). Estimate (using 3rd party support if needed) reasonable savings potential for inclusion in state CPP compliance plan. At the start of each year, the State Energy Office, for example can be responsible for aggregating emission reductions attributable to IEE and should be able to confirm total emissions avoided from the prior year using M&V reporting provided by a registry. This will enable the state to identify any shortfall of IEE-related reductions, and to take credit when IEE-related	Designate an entity responsible for collecting the data and confirming the CPP contribution made by projects. Create a system and standard format for collecting data. Registered projects can produce units of EE (e.g. tradable credits, incentives, etc.) for use in compliance. Units of EE produced by industrial facilities used for compliance would be identified in EGU reports to state compliance authority.

emission reductions exceed planned levels. If a state measures progress against interim goal milestones during the compliance period, it can evaluate past IEE savings, as well as look in the ISO 50001/Superior Energy Performance pipeline (or identified near term IEE projects) to determine future-year contributions. Using M&V reports from all registered IEE in the state, the national registry, the State Energy Office or other appropriate office can aggregate on an annual basis all IEE savings and provide state program compliance officials with the GHG avoided. The rigor of the M&V will provide precise data regarding IEE produced to date.	

8. Are there any alternative compliance options or flexible measures that could be used?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
In the event that IEE savings/reductions are greater than anticipated (e.g. more or larger projects have been implemented than assumed in the state plan), the state will have time (12-24 months as described above in "Progress Reports") to adjust –delaying or possibly cancelling – requirements for other, more costly compliance actions. In the event that IEE savings/reductions in aggregate are producing less EE than planned (fewer projects were implemented than projected), state will have time to adjust plan to require additional measures/incentives to increase EE delivered from any source including increased IEE utilization – to address any shortfall.	N/A

9. What types of EM&V are necessary? What are the monitoring requirements? What are the recordkeeping requirements? How long will the monitoring need to be kept in place? For example, it must be sufficient to demonstrate compliance with a required performance standard. It must measure or estimate and verify the CO_2 emissions reductions. The state must be able to translate this into demonstrable progress for meeting the CO_2 reduction goal.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Only achieved and verified GHG emission reductions from IEE projects would be incorporated in compliance	Only achieved and verified GHG emission reductions from IEE projects would be incorporated in compliance

reporting. By requiring projects to use internationally accepted protocols for verifying electricity savings and GHG reductions, such as DOE's SEP M&V Protocol and IPMVP, a state could ensure that only properly verified GHG emission reductions are included in the program for CPP compliance. States can ensure that M&V protocols are enforced by the project registry prior to accepting any GHG reduction credit. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed.	reporting. By requiring projects to use internationally accepted protocols for verifying electricity savings and GHG reductions, such as DOE's SEP M&V Protocol and IPMVP, a project registry (or state) could ensure that only properly verified GHG emission reductions are included in the program for CPP compliance. States can ensure that M&V protocols are enforced prior to accepting any GHG reduction credit for those projects. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed.

10. Would the program be different depending on whether the State Plan is rate-based or mass-based? What are the implementation trade-offs of both approaches?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The implementation of industrial energy efficiency, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).	The implementation of industrial energy efficiency, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).

11. Is the program, or could the program be, multi-state in nature? If it is multi-state in nature, what is specifically required of each state?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Industrial energy efficiency will work similarly in both single-state and multi-state plans. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options.	Industrial energy efficiency will work similarly in both single-state and multi-state plans. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options.

12. Is the program a single element program or a multiple EE program?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Industrial energy efficiency can operate on its own or in conjunction with other EE programs. Nothing would prevent other EE programs (e.g. ESPC, CHP, etc.) from being implemented simultaneously for CPP compliance purposes.	Industrial energy efficiency can operate on its own or in conjunction with other EE programs. Nothing would prevent other EE programs (e.g. ESPC, CHP, etc.) from being implemented simultaneously for CPP compliance purposes.

Appendix A: Example Regulatory Plan Language

The "regulatory plan language" provided here was developed by NASEO in coordination with a number of private industry representatives and educational organizations. They serve as examples for consideration and are not offered as definitive or "best" approaches. As discussed in the main text of this report, states need to consider fundamental CPP compliance approach options (e.g., rate- or mass-based target options, EGU-only or "portfolio" compliance options) and their own contexts, including roles of different agencies and entities, for development of specific compliance plan language. The example plan language appearing here was previously provided to EPA for its consideration.

Building Energy Codes

1) **NARRATIVE**: State and local laws establishing building energy codes have been in place for decades. State and local government officials develop and update the model residential and commercial energy codes. The major code-development bodies, the International Codes Council (ICC) and ASHRAE update those codes every three years. The codes are, in-turn, adopted at the state-level, and in some cases, at the local level. Dramatic increases in building energy efficiency, leading to reductions in building energy use and greenhouse gas emissions, have occurred over the decades. For example, the 2012 International Energy Conservation Code (IECC), issued by the ICC, saves 32% in covered energy use nationwide over the 2006 IECC. For commercial buildings, ASHRAE Standard 90.1 – 2013[79] saves 28% in whole building energy use, as compared to the 90.1-2004 baseline. Energy savings calculations associated with those codes are made by the United States Department of Energy (DOE) in accordance with Federal law.[80] Compliance with enhanced building energy codes is an acceptable compliance measure because it increases the energy efficiency of building stock, which is responsible for approximately 38% of energy usage in the United States.

2) **AUTHORITY:** Pursuant to [state statutory cite], the state of [_____________] has enacted the following building energy codes: 1) Residential Buildings – [2012 IECC]; and 2) Commercial Buildings – 2012 IECC or ASHRAE Standard 90.1 – 2013]. The state energy office [or other responsible state agency] within [state] has authority to implement these codes under [state statute or regulation] and has issued an order with an effective date of _____________________,

3) **STRATEGY**: Model building energy codes are projected to reduce building energy consumption by __% in new residential buildings and by ___% in new commercial buildings by 2030, with an interim reduction of ___% by 2020 compared to a baseline of ______. Under the specific statutory and regulatory authority noted in Section 2 herein, the state [agency_______] has authority to issue the building energy codes and regulate their implementation. Local building code officials are responsible for ensuring compliance with these codes in all jurisdictions within the state, including local building code inspections. The [state energy office] conducts a regular [annual] review of building energy code administration and compliance to assure timely code adoption and updates, as well as code performance and compliance. The state energy office [other agency] has executed a memorandum of understanding (MOU) with the state environmental agency on [date] and the intent of the MOU is to facilitate the implementation of this plan.

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[79] Formally ASHRAE Standard 90.1 is the ANSI/ASHRAE/IES Standard 90.1 indicating it is also a standard of the American National Standards Institute, the Illuminating Engineering Society. ASHRAE's former name was the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

[80] U.S. DOE, https://www.energycodes.gov/determinations and https://www.energycodes.gov/sites/default/files/documents/PNNL-22972.pdf.

4) **STANDARDS:** The energy efficient building codes are set forth pursuant to state statute. See Section (1), herein. [In our state, energy efficiency contractors are being certified through the Building Performance Institute. In our state, energy efficiency auditors are utilizing the Home Energy Ratings System (HERS) and the RESNET procedures to support third-party compliance efforts.]

5) **COMPLIANCE SCHEDULE:** The [2012 IECC; ASHRAE Standard 90.1 – 2013] were effective on [date]. Pursuant to Section 410 of the American Recovery and Reinvestment Act of 2009, the Governor transmitted an assurance to the Secretary of Energy, stating that compliance of 90% with the then extant building energy codes would occur in 2017. New residential buildings are estimated to constitute approximately 26% [confirm for each state – based upon an average of 2%/year for 13 years] of all residential buildings in our state for the period January 1, 2018 – December 31, 2030. New commercial buildings are estimated to constitute approximately 26% [confirm for each state – based upon an average of 2%/year for 13 years] of all commercial buildings in our state for the period January 1, 2018 – December 31, 2030.

6) **AFFECTED ENTITITES:** The state energy office [applicable code administration agency] and local building code officials, as well as builders, contractors, design professionals, and subcontractors, are entities with responsibilities related to building energy code compliance. The state energy office shall report to the State Department of Environmental Quality [or other applicable air agency] on energy use reductions for new buildings on an annual basis, beginning on June 1, 2017, through December 31, 2030. Architects, engineers, builders and Heating, Ventilation and Air Conditioning (HVAC) contractors, energy efficiency installers and energy auditors will all be affected by these plans [UTILITY OPTION – The utility has committed to use energy efficiency program funds approved by the State Public Utility Commission to undertake energy efficiency upgrades for new residential and commercial buildings, pursuant to PUC Order No. ______, to invest $____ and [number of personnel ____] for each year during the following period. NOTE – An example is the Rhode Island codes program being implemented with the utility, including the development of a collaborative planning process, a baseline compliance plan, and an energy savings collaborative and a crediting mechanism for the utility.]

7) **AFFECTED SOURCES:** All new residential buildings and all new commercial buildings in [state] are subject to these codes. In addition, existing buildings subject to renovations, additions, and alterations that require permits from local code officials in [state] are subject to these codes. These building energy codes impact primarily building envelope measures (e.g., insulation, windows, and doors), lighting, and heating and cooling equipment and components (e.g., ducts).

8) **MONITORING, RECORDKEEPING AND REPORTING REQUIREMENTS:** U.S. DOE has asserted that energy savings over the life of the building energy efficiency codes total __%. [Source materials for use of codes – ACEEE codes paper, PNNL tool, and ICF CO_2 calculator.[81] Beginning on January

[81] ACEEE, 2015, Navigating the Clean Power Plan: A Template for Including Building Energy Codes in State Compliance Plans, http://aceee.org/sites/default/files/111d-building-codes-template-0315.pdf; S. Hayes, L. Ungar, and G. Herndon, 2015, The Role of Building Energy Codes in the Clean Power Plan, http://www.aceee.org/white-paper/building-codes-111d; PNNL tool available at https://www.energycodes.gov/resource-center/utility-savings-estimators; Energy Efficient Codes Coalition, Clean Power Plan Energy Code Emissions Calculator, accessible via http://energyefficientcodes.com/energy-codes-make-sense-with-or-without-the-clean-power-plan/

1, 2019, the state energy office shall be responsible for reporting to the State EPA the results of the building energy codes program on an annual basis.

9) **FLEXIBLE COMPLIANCE OPTIONS:** [Insert alternative standards, opportunities for credit generation and trading, allowances that could be used].

10) **RATE-BASED VERSUS MASS-BASED PLAN CONSIDERATIONS:** [Insert an explanation of the methodology chosen by the state and any impacts]. [A mass-based compliance program would place a significantly lower burden of measurement and verification of impacts on the states.]

11) **SINGLE VERSUS MULTI-STATE PLAN ELEMENT CONSIDERATIONS:** [Insert whether a state is choosing a single-state or multi-state option or will use a “common elements” approach to allow multi-state opportunities for exchange, trading, averaging, or other multi-state allocation of energy savings and resulting emissions avoidance.

Energy Savings Performance Contracting

1) **NARRATIVE**: Energy Service Performance Contracting (ESPC) and other approaches to guaranteed savings provide a one-stop procurement process that enables building owners to use savings from avoided energy consumption to pay for new energy-efficient equipment and services. Performance contracting is widely regarded as a turnkey mechanism to complete energy-savings projects without reliance on a building or facility owner's capital funds. Every state has legislation that specifically authorizes ESPC in public buildings. Many states also have Executive Orders that establish statewide ESPC programs.[82]

   Under an ESPC, a facility owner will enter into a guaranteed energy savings contract with an Energy Service Company (ESCO). The ESCO will conduct a comprehensive energy audit of the buildings owners' facility or facilities and will identify potential Energy Conservation Measures (ECMs) for achieving maximum cost-effective energy savings. In consultation with the building owner, the ESCO will design and construct a project that may bundle multiple ECMs to achieve energy savings that meet the energy and facility needs of the building owner while also achieving favorable cash flow over an agreed-up contract term. The ESCO guarantees that the energy savings improvements will generate sufficient cost savings to pay for the project over the term of the contract. After the ESPC, all cost savings accrue to the building owner. The building owner benefits from the reductions in energy consumption and the significant equipment upgrades made to the building(s), which improve functionality, performance, and overall energy management.

   The standard protocols already in use by ESPC projects to accurately measure and verify (M&V) energy savings also can be used to quantify CO_2 savings. The high level of rigor associated with the M&V of ESPC project savings is a chief reason why ESPC is a desirable and complementary tool for achieving energy savings applicable for Clean Power Plan compliance. States will benefit from ESPC under either rate- or mass-based approaches.

   ESCOs deliver more than $6 billion of projects annually, according to reports published by the Lawrence Berkeley National Laboratory.[83] Since 1990, U.S. ESCOs have implemented tens of

[82] Examples of Executive Orders are available at: http://energyservicescoalition.org/resources/tools/practice02.
[83] Elizabeth Stuart, Peter H. Larsen, Charles A. Goldman, and Donald Gilligan, 2013, "*Current Size and Remaining Market Potential of the U.S. Energy Service Company Industry*," http://emp.lbl.gov/projects/energy-services-company-esco-industry-and-market-trends.

thousands of projects for state, local, and federal governments as well as private commercial, industrial, institutional, and residential customers. In aggregate, ESCO projects have produced:[84]

- $50 billion in projects paid from savings
- $55 billion in guaranteed and verified savings
- 450,000 person-years of direct employment
- $33 billion of infrastructure improvements in public facilities
- 470 million tons of CO_2 savings at no additional cost

About 90% of ESCO projects are implemented for public sector customers subject to public contracts, most of which include energy savings guarantees. Federal government projects utilize standard contracts, which are available from the Federal Energy Management Program (FEMP), operated by the U.S. Department of Energy (DOE). Most contracts for municipal, university, schools, and hospitals (MUSH) market incorporate the key terms of model contract documents that have been developed by the states and DOE and are available at no cost.[85]

2) **AUTHORITY:** Pursuant to [state statutory cite], the state of [_____________] has enacted the following authorizing legislation to permit the implementation of ESPCs. The state energy office [or other responsible agency] within [state] has authority to manage and assist in implementing this program under [state statute or regulation]. [The Governor has issued an executive order setting forth additional targets for energy efficiency upgrades through ESPCs effective on [date].

3) **STRATEGY**: While ESCOs enter into performance contracts to implement strategies and measures that save energy, the State Energy Office (SEO), or other appropriate office, would oversee the interaction of performance contracting with CPP planning and compliance activities.

State plans strategies will likely fall into two distinct categories: a state-driven portfolio approach and an EGU-obligated compliance approach. Either approach can be implemented as a rate-based or mass-based program. The State Energy Office (or other appropriate office) will play a role in both approaches, but that role will be different depending on which strategy is employed. Therefore, the answers to each of the following questions will be different depending on which strategy is employed.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office estimates, tracks, and records measured and verified savings from ESPC projects.	The State Energy Office tracks and records measured and verified savings from ESPC projects.

[84] National Association of Energy Service Companies (NAESCO), "What is an ESCO?" http://www.naesco.org/what-is-an-esco
[85] U.S. DOE, http://energy.gov/eere/wipo/model-documents-energy-savings-performance-contract-project.

Under this approach, the State Energy Office, or another appropriate office, would serve as an aggregator of EE produced by ESPC projects for use in CPP compliance. By using conservative estimates of PC project potential, the state plan can credibly estimate the amount of savings that will be generated by ESPC projects. Aggregating savings from ESPC projects with appropriate M&V, the aggregating official would aggregate the quantity of EE produced and the GHG emission reductions available for compliance. Project information, once aggregated, can then be shared with the state air office responsible for compliance with CPP.	In this approach, EGUs should be able to utilize all EE from ESPC projects with appropriate M&V to support their demonstration of compliance. EGUs can access this source of verified, predictable GHG emission reductions in a multitude of ways. For instance, EGUs can enter direct contractual relationships with ESPC project participants that assign credit to the EGU for emission reductions created by the project. Another approach would be for the EGU to acquire emission reduction credits created by the ESPC project either through market-based emission credit exchanges or directly from the project.

4) **STANDARDS:** ECMs implemented through ESPCs generally utilize the International Performance Monitoring and Verification Protocol (IPMVP)[86] and/or FEMP M&V Guidelines[87]. These are well-recognized industry standards accepted for state, local, school, and federal projects.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The ESCO market in public buildings, now more than $5 billion annually, is driven by factors independent of the CPP, including legislative and/or executive savings mandates (broadly bi-partisan at the federal and state level) and the need for energy-related capital improvements in buildings that are starved for capital improvement and maintenance funding. The growth of the market is predictable based on these factors and is not dependent on incentives from ratepayer-funded energy efficiency programs. The M&V conducted on each measure and each building in an ESPC project provides rigorous verification needed to include ESPC-derived emission reductions in State plans. States can ensure that M&V protocols are enforced prior to accepting any GHG reduction credit for those projects.	The ESCO market in public buildings, now more than $5 billion annually, is driven by factors independent of the CPP, including legislative and/or executive savings mandates (broadly bi-partisan at the federal and state level) and the need for energy-related capital improvements in buildings that are starved for capital improvement and maintenance funding. The growth of the market is predictable based on these factors and is not dependent on incentives from ratepayer-funded energy efficiency programs. The M&V conducted on each measure and each building in a ESPC project provides rigorous verification needed to include ESPC-derived emission reductions in State plans. States can ensure that M&V protocols are enforced prior to accepting any GHG reduction credit for those projects.

[86] Efficiency Valuation Organization, 2014, "International Performance Measurement and Verification Protocol," http://www.evo-world.org/index.php?lang=en
[87] U.S. DOE, 2015, "M&V Guidelines: Measurement and Verification for Performance-Based Contracts, Version 4.0," http://energy.gov/sites/prod/files/2015/05/f22/final_draft_mv_guidelines.pdf

Using the M&V and reconciliation reports, actual GHG reductions can be confirmed.	Using the M&V and reconciliation reports, actual GHG reductions can be confirmed.

5) **COMPLIANCE SCHEDULE:** Pursuant to [state/regulation] the state energy office projects that between January 1, 2018 and December 31, 2030, ESPC projects will be implemented in [state] totaling [building #/square footage] with a projected energy savings of [__________] and electricity-related emissions reductions of [________].

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
At the start of each compliance year, the State Energy Office, for example, would be responsible for aggregating emission reductions attributable to ESPC EE projects and should be able to confirm total emissions avoided from the prior year using M&V reporting provided by a registry. This will enable the state to identify any shortfall of ESPC-related reductions, and to take credit when ESPC-related emission reductions exceed planned levels. The state will also be able to reliably project the future savings produced by projects implemented during the compliance period, because these savings are guaranteed, generally for contract terms longer than the compliance period. ESPCs contain contractually-binding correction requirements in the event that expected savings fail to materialize. Typically the ESCO is responsible for addressing any savings shortfall and correcting those measures that contributed to the shortfall.	At the start of each compliance year, the State Energy Office, for example, would be responsible for aggregating emission reductions attributable to ESPC EE projects and should be able to confirm total emissions avoided from the prior year by counting the amount of ESPC savings/reductions with appropriate M&V claimed by EGUs. ESPCs contain contractually-binding correction requirements in the event that expected savings fail to materialize. Typically the ESCO is responsible for addressing any savings shortfall and correcting those measures that contributed to the shortfall.

6) **AFFECTED ENTITIES:**

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office (or other appropriate office) would be responsible for policy/program oversight, guidance and implementation.	EGUs can buy credits or contract with ESCOs or building owners to achieve savings in any building sector.

ESCOs and other contractors will be responsible for contractual requirements, including any performance guarantees for savings for implemented projects. Through an ESPC, ESCO guarantees provide a mechanism to address potential energy savings shortfalls. By using standard reports from a project registry, states will be able to evaluate its ESPC program.	ESCOs and other contractors will be responsible for contractual requirements, including any performance guarantees. By using standardized formats for collecting ESPC project data, states will be able to easily evaluate their ESPC program and projects. The state may choose to periodically review a project registry to benchmark ESPC emission reductions.

7) AFFECTED SOURCES:

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
State ESPC plans can achieve savings in any building sector. The most success in historic ESPC markets has been in public and institutional (e.g., universities, schools, hospitals) buildings. Based on a variety of factors, including economics, politics, and policy mechanisms, a state can establish specific goals for target buildings. (E.g., by utilizing state ESPC authority, a 20% EE improvement will be achieved in public buildings comprising at least 50% of the energy used in state public buildings, etc.) Several states (CO, KS and PA) have demonstrated that a program with strong Gubernatorial leadership can predictably implement ESPC in virtually all state facilities within the ten-year CPP compliance period.	EGUs can buy credits or contract with ESCOs or building owners to achieve savings in any building sector.

8) MONITORING, RECORDKEEPING AND REPORTING REQUIREMENTS:

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
M&V used by ESPC projects (e.g., IPMVP and U.S. DOE Federal Energy Management Program M&V Guidelines) on each measure and each building provides rigorous verification needed to include ESPC-derived emission reductions in State plans. Since the average ESPC project has a performance period longer than the CPP compliance period of ten years, the state can rely on delivery of savings. States can ensure that M&V protocols are enforced and document by a project registry prior to accepting any	M&V used by ESPC projects (e.g., IPMVP and FEMP M&V Guidelines) on each measure and each building provides rigorous verification needed to accept electricity avoided or GHG reduced by the EGU. Since the average ESPC project has a performance period longer than the CPP compliance period of ten years, the state can rely on delivery of savings. States can ensure that M&V protocols are enforced prior to accepting any GHG reduction credit for those projects. Using the M&V and reconciliation reports,

GHG reduction credit for projects from the registry. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed. The potential problem of double-counting savings by several different types of EE programs is minimized by the rigor of ESPC project documentation. The cost of each measure and any utility or other ratepayer incentive that may have been used for that measure is detailed in an ESPC contract, so it is easy to identify the fraction of project energy savings and CO_2 emissions reductions that will be credited to the utility.	actual GHG reductions can be confirmed. The potential problem of double-counting savings by several different types of EE programs is minimized by the rigor of ESPC project documentation. The cost of each measure and any utility or other ratepayer incentive that may have been used for that measure is detailed in an ESPC contract, so it is easy to identify the fraction of project energy savings and CO_2 emissions reductions that will be credited to the utility. The fact that government agencies at all levels lack the funding necessary to undertake necessary repairs required to bring buildings up to code, and therefore, in the absence of an ESPC project, may operate obsolete, inefficient equipment indefinitely, makes it difficult to claim that energy savings from an ESPC project are due to the energy building code rather than the ESPC project.

9) FLEXIBLE COMPLIANCE OPTIONS:

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
In the event that ESPC projects are producing greater amounts of EE than anticipated (e.g. more or larger projects have been implemented than assumed in the state plan), the state will have time (12-24 months as described above in "Progress Reports") to adjust – delaying or possibly cancelling – requirements for other, more costly compliance actions. In the event that ESPC projects in aggregate are producing less EE than planned (fewer projects were implemented than projected), state will have time to adjust plan to require additional measures or incentives to increase EE delivered from any source including increased ESPC project utilization – to address any shortfall. Alternately, the state can extend or increase the enforcement of its EE mandates, which will increase the number of ESPC projects implemented.	N/A

10) RATE-BASED VERSUS MASS-BASED PLAN CONSIDERATIONS:

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The implementation of performance contracting, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).	The implementation of performance contracting, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).

11) SINGLE VERSUS MULTI-STATE PLAN ELEMENT CONSIDERATIONS:

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Performance contracting will work similarly in both single-state and multi-state plans. All states have performance contracting enabling legislation, and could therefore be developed in any state that participated in a multi-state plan. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options, which in many cases, will involve comprehensive energy retrofits.	Performance contracting will work similarly in both single-state and multi-state plans. All states have performance contracting enabling legislation, and could therefore be developed in any state that participated in a multi-state plan. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options, which in many cases, will involve comprehensive energy retrofits.

Industrial Energy Efficiency

An outline of the items that need to be addressed in each energy efficiency reduction strategy includes, but may not be limited to, the following:

1. Brief description of the energy efficiency strategy.

The industrial sector--which includes manufacturing, mining, construction, and agriculture--accounts for roughly one-third of all end-use energy demand in the United States and remains the largest energy user in the U.S. economy. This level of energy consumption provides vast opportunities for successful deployment of industrial energy efficiency (IEE). Although industry has significantly increased its energy efficiency (EE) and manufacturing energy intensity has declined in recent years, industry is still projected to consume 34.8 quads of primary energy in 2020.[88] Estimates of the potential to reduce industrial energy consumption through efficiency measures by 2020 are as high as 18%.[89] Not surprisingly, EE initiatives are a core element of many corporate sustainability initiatives. Facilities that focus on achieving IEE savings reduce their exposure to energy market volatility while lowering their operating costs.

Energy Management Systems (EnMS) seek to promote operational, organizational, and behavioral changes that result in greater efficiency gains on a continuing basis. Programs implementing energy management systems focus on establishing the framework and internal management processes for managing energy use, as well as for implementing capital projects.

An EnMS approach based on ISO 50001[90] seeks to enable companies to better manage energy use, thus creating immediate and lasting energy use reduction through changes in operational practices, as well creating a favorable environment for adoption of more energy efficient measures and technologies.

Industrial facilities implementing ISO 50001 can participate in the U.S. DOE-administered Superior Energy Performance program. Superior Energy Performance is an ANSI-accredited, plant-level, federal program that uses the ISO 50001 Energy Management Standard as a foundation and certifies a plant's energy savings using a regression-based M&V protocol. The program is designed to drive transparent and verified energy performance improvement across the U.S. manufacturing sector. Participation in the Superior Energy Performance program requires implementation of and certification to ISO 50001 as well as achievement of specific energy performance improvement targets as verified by an accredited verification body.

2. Who will administer the energy efficiency strategies or measures (e.g., the State Energy Office, State Environmental Agency, Public Service Commission)?

[88] Energy Information Administration. "Annual Energy Outlook", 2013.
[89] McKinsey & Company, "Unlocking Energy Efficiency in the U.S. Economy". July 2009.
[90] International Organization for Standards (ISO) ISO 50001 is based on the management system of continual improvement used in other well-known standards such as ISO 90001 Quality Management System standard and the ISO 140001 Environmental Management System standard; http://www.iso.org/iso/home/standards/management-standards/iso50001.htm

Industrial facility owners voluntarily implement energy management systems, such as ISO 50001, and pair it with an established verification system such as the Superior Energy Performance program to implement strategies and measures that save energy. The State Energy Office (SEO), or other appropriate office, can oversee the interaction of industrial energy efficiency (IEE) with CPP planning and compliance activities.

State strategies will likely fall into two distinct categories: a state-driven portfolio approach and an EGU-obligated compliance approach. Either approach can be implemented as a rate-based or mass-based program. The State Energy Office (or other appropriate office) will play a role in both approaches, but that role will be different depending on which strategy is employed. Therefore, the answers to each of the following questions will be different depending on which strategy is employed.

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office plans, estimates, tracks, and records measured and verified savings from IEE. Under this approach, the State Energy Office, or another appropriate office, would serve as an aggregator of IEE for use in CPP compliance. By using conservative estimates of IEE potential, the state plan can credibly estimate the amount of savings that will be generated by IEE. Using M&V reports generated under the Superior Energy Performance program, the aggregating official would register IEE savings and aggregate the quantity of IEE produced and the GHG emission reductions available for compliance. IEE information, once aggregated, can then be shared with the state air office responsible for compliance with CPP.	The State Energy Office tracks and records measured and verified savings from IEE. In this approach, EGUs should be able to utilize all IEE with appropriate M&V to support their demonstration of compliance. EGUs can access this source of verified, predictable GHG emission reductions in multiple ways. For instance, EGUs can enter direct contractual relationships with industrial facilities that assign credit to the EGU for emission reductions created by the project. Another approach would be for the EGU to acquire emission reduction credits created through industrial efficiency either through market-based emission credit exchanges.

3. How will success be measured, how will progress be measured, and what happens if the objectives are not achieved?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office could be made responsible for documenting emission reductions attributable to EE projects and should be able to confirm total emissions avoided from the prior year using reporting provided by a registry. This will enable the state to take credit for emission reductions from validated projects. If industrial facilities participating in the Superior Energy Performance program are found by the Superior Energy Performance Verification Body to not conform to the requirements, the Verification Body will issue corrective actions that the facility must complete	At the start of each year, the State Energy Office, for example, would be responsible for aggregating emission reductions attributable to IEE and should be able to confirm total emissions avoided from the prior year by counting the amount of IEE savings/reductions with appropriate M&V claimed by EGUs. If industrial facilities participating in the Superior Energy Performance program are found by the Superior Energy Performance Verification Body to not conform to the requirements, the Verification Body will issue corrective actions that the facility must complete

before receiving Superior Energy Performance certification. Superior Energy Performance certification is valid for three years, as long as the facility completes the annual surveillance audits to confirm continued maintenance of the EnMS (a requirement of ISO 50001).	before receiving Superior Energy Performance certification. Superior Energy Performance certification is valid for three years, as long as the facility completes the annual surveillance audits to confirm continued maintenance of the EnMS (a requirement of ISO 50001).

4. Affected entities – What entity would be responsible or accountable for the energy efficiency measure and the associated reductions?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The State Energy Office(or other appropriate office) would be responsible for policy/program oversight, guidance and implementation. Industrial facilities implementing ISO 50001 and participating in the Superior Energy Performance program will be responsible for implementing the M&V and other requirements associated with certification in those programs. By using standard reports from a project registry, states will be able to evaluate their IEE program.	EGUs can buy credits or contract with industrial facilities to achieve acceptable savings. Industrial facilities implementing ISO 50001 and participating in the Superior Energy Performance program will be responsible for implementing the M&V and other requirements associated with certification in those programs. By using standardized formats for collecting industrial efficiency data, states will be able to evaluate their IEE program.

5. Affected sources –What buildings or equipment or facilities will be subject to the program requirements?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Industry consumes roughly one-third of all end-use energy in the U.S. and studies have shown that energy efficiency measures can reduce that demand by as much as 18-20%. Based on a variety of factors, a state can establish specific goals for industry, or certain types of industry, and offer incentives that can reasonably be expected to achieve industrial energy efficiency savings.	EGUs can buy credits or contract directly with industrial facilities to achieve acceptable savings.

6. What are the specific standards that must be satisfied?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The reliance on appropriate, rigorous M&V protocols, such as the Superior Energy Performance M&V Protocol, will provide precise data regarding IEE produced to date. Only achieved and verified GHG	The reliance on appropriate, rigorous M&V protocols, such as the Superior Energy Performance M&V Protocol, will provide precise data regarding IEE produced to date. Only achieved and verified GHG

emission reductions from IEE would be incorporated in compliance reporting.	emission reductions from IEE would be incorporated in compliance reporting.

7. What is the compliance schedule? What are the milestones? How will the schedule and compliance options correlate to the dates set forth in the state plan?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Designate an entity responsible for collecting the data and confirming the CPP contribution made by projects. Create a system and standard format for collecting data. Identify targets (e.g. industrial facilities operating in certain sectors or consuming above a certain amount of energy). Estimate (using 3rd party support if needed) reasonable savings potential for inclusion in state CPP compliance plan. At the start of each year, the State Energy Office, for example, could be responsible for aggregating emission reductions attributable to IEE and should be able to confirm total emissions avoided from the prior year using M&V reporting provided by a registry. This will enable the state to identify any shortfall of IEE-related reductions, and to take credit when IEE-related emission reductions exceed planned levels. If a state measures progress against interim goal milestones during the compliance period, it can evaluate past IEE savings, as well as look in the ISO 50001/Superior Energy Performance pipeline (or identified near term IEE projects) to determine future-year contributions. Using M&V reports from all registered IEE in the state, the national registry, the State Energy Office or other appropriate office can aggregate on an annual basis all IEE savings and provide state program compliance officials with the GHG avoided. The rigor of the M&V will provide precise data regarding IEE produced to date.	Designate an entity responsible for collecting the data and confirming the CPP contribution made by projects. Create a system and standard format for collecting data. Registered projects can produce units of EE (e.g. tradable credits, incentives, etc.) for use in compliance. Units of EE produced by industrial facilities used for compliance would be identified in EGU reports to state compliance authority.

8. Are there any alternative compliance options or flexible measures that could be used?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
In the event that IEE savings/reductions are greater than anticipated (e.g. more or larger projects have been implemented than assumed in the state plan), the state will have time (12-24 months as described above in "Progress Reports") to adjust –delaying or possibly cancelling – requirements for other, more costly compliance actions. In the event that IEE savings /reductions in aggregate are producing less EE than planned (fewer projects were implemented than projected), state will have time to adjust plan to require additional measures/incentives to increase EE delivered from any source including increased IEE utilization – to address any shortfall.	N/A

9. What types of EM&V are necessary? What are the monitoring requirements? What are the recordkeeping requirements? How long will the monitoring need to be kept in place?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Only achieved and verified GHG emission reductions from IEE projects would be incorporated in compliance reporting. By requiring projects to use well-accepted protocols for verifying electricity savings and GHG reductions, such as DOE's Superior Energy Performance M&V Protocol and IPMVP, a state could ensure that only properly verified GHG emission reductions are included in the program for CPP compliance. States can ensure that M&V protocols are enforced by the project registry prior to accepting any GHG reduction credit. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed.	Only achieved and verified GHG emission reductions from IEE projects would be incorporated in compliance reporting. By requiring projects to use well-accepted protocols for verifying electricity savings and GHG reductions, such as DOE's Superior Energy Performance M&V Protocol and IPMVP, a project registry (or state) could ensure that only properly verified GHG emission reductions are included in the program for CPP compliance. States can ensure that M&V protocols are enforced prior to accepting any GHG reduction credit for those projects. Using the M&V and reconciliation reports, actual GHG reductions can be confirmed.

10. Would the program be different depending on whether the State Plan is rate-based or mass-ased?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
The implementation of industrial energy efficiency, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).	The implementation of industrial energy efficiency, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how it is measured (MWh in a rate based, or converted to tons of CO_2).

11. Is the program, or could the program be, multi-state in nature? If it is multi-state in nature, what is specifically required of each state?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Industrial energy efficiency will work similarly under single-state and multi-state plans or with multi-state exchange or allocation of credits under single-state plans as suggested by the “common elements” approach. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options.	Industrial energy efficiency will work similarly under single-state and multi-state plans or with multi-state exchange or allocation of credits under single-state plans as suggested by the “common elements” approach. The development and use of single-state and multi-state emission credit trading programs and other market-based systems will facilitate compliance in either a state-driven portfolio approach or an EGU-obligated compliance approach. It will facilitate the use of the least-cost compliance options.

12. Is the program a single element program or a multiple EE program?

State-Driven Portfolio Approach	EGU-Obligated Compliance Approach
Industrial energy efficiency can operate on its own or in conjunction with other EE programs. Nothing would prevent other EE programs (e.g. ESPC, CHP, etc.) from being implemented simultaneously for CPP compliance purposes.	Industrial energy efficiency can operate on its own or in conjunction with other EE programs. Nothing would prevent other EE programs (e.g. ESPC, CHP, etc.) from being implemented simultaneously for CPP compliance purposes.

Above-Code Building Certification

1) NARRATIVE

Above-code certification is a proven strategy to achieve energy efficiency in buildings. Above-code certification provides third-party verification that a building or portfolio of buildings has achieved savings in electricity beyond that that would be achieved from meeting the applicable building code. Examples of above-code certification include ENERGY STAR, developed by the Environmental Protection Agency (EPA), and Leadership in Energy and Environmental Design (LEED), overseen by the U.S. Green Building Council.[91]

Above-code building certification systems can be used in new construction and existing buildings. Above-code certification systems generally include minimum requirements along with a suite of credits; projects earn more points for deeper efficiency gains. These systems are effective tools for achieving whole building energy efficiency (and can include load reduction), providing for integrated improvements across building systems: envelope, lighting, hot water, heating, ventilation and air conditioning (HVAC), and appliances. LEED certification establishes minimum energy efficiency requirements based on ENERGY STAR or improved design efficiency beyond ASHRAE standard model building energy code baselines. For example, from 2011-2013, the average design efficiency for certified new commercial buildings was 29% better than ASHRAE 90.1-2007,[92] and the latest version, LEED v4, requires improvement over ASHRAE 90.1-2010. Performance studies by the Pacific Northwest National Laboratory (PNNL) and the National Research Council have concluded that LEED certified buildings save energy.[93] The rigorous certification process, along with required commissioning,[94] provides some of the best-available assurances of the energy savings that each building is optimized to deliver energy savings.

Each project receiving above-code certification goes through well-established and rigorous processes and documentation. For example, for LEED new construction projects, the project team develops a whole building energy model – consistent with the International Performance Measurement and Verification Protocol (IPMVP) –that incorporates all of the energy saving features and compares it to a baseline. These same models can also be used to identify the electricity savings component compared to the governing building energy code. The models and supporting data are submitted to a third-party certification body which reviews them and approves the results. Post-construction fundamental

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[91] The third party certifying body for LEED is GBCI.

[92] Dan Winters, Lane Burt, Chris Pyke, and Jeremy Sigmon, "The Plaque Unpacked: a Decade of LEED Project Data Reveals Energy Efficiency Market Truths," published by ACEEE in August, 2014. Available at: https://www.aceee.org/files/proceedings/2014/data/papers/6-637.pdf.

[93] General Services Administration (GSA) Public Buildings Service, "Green Building Performance: A Post Occupancy Evaluation of 22 GSA Buildings" (August 2011); National Research Council, "Energy-Efficiency Standards and Green Building Certification Systems Used by the Department of Defense for Military Construction and Major Renovations" (2013). The NRC conducted a detailed literature review and concluded, that despite variations, "the 13 studies that measured actual energy use (not modeled energy) found that high-performance or green buildings, on average, used 5 to 30 percent less site energy than conventional buildings."

[94] See http://www.usgbc.org/node/2612328?return=/credits/new-construction/v4/energy-%26-atmosphere

commissioning and verification of mechanical, plumbing, and electrical systems are also required. For existing buildings, the certification process itself requires 12 months of metered data and uses ENERGY STAR to establish performance.

Above-code building certification is an acceptable compliance measure because it increases the electricity efficiency of buildings, which represent 70% of retail electricity use in the U.S.

2) AUTHORITY

Pursuant to [state statutory cite], the state of [_____________] has enacted the following authorizing legislation to require (in the case of certain public buildings) or to facilitate the use of above-code building certification by building projects in the state.

A. With respect to certain state building projects, the state energy office [or other responsible agency] within [state] has authority to manage and assist in implementing this program under [state statute or regulation or executive order] setting minimum requirements for above-code certification for certain public building projects.
B. With respect to utility efficiency programs, the [state public utilities commission] has authority under [cite state statutory authority] to oversee utility electric efficiency programs.
C. With respect to credit programs, the state energy office [or other responsible agency] within [state] has authority to manage and assist in implementing this program under [state statute or regulation].

3) STRATEGY

Above-code building certification systems can be deployed in several ways in a CPP state plan:

A. <u>State Buildings Policy</u>: A State (through its plan) could commit to "greening" its own buildings by adopting above-code certification requirements for all or a subset of public buildings.
B. <u>EGU Obligations/Utility Incentives Program:</u> Where a State Environmental Agency places all obligations on utilities with electric generating units (EGUs) (either obligations for emissions generally or for energy efficiency specifically), the agency and/or the State Public Utility Commission (PUC) could include above-code certification among the options available to an EGU.
    i. A utility with an EGU could use above-code certification incentives in its energy efficiency program; as described below, some currently do so. In this scenario, the PUC would approve and potentially have audit responsibility for the EM&V (or could assign it to a third party, or another state agency).
C. <u>Credit Program:</u> Where a state will use a registry, the registry can be used to capture and further incentivize above-code building certification. Crediting building energy efficiency projects could be used where a state assumes responsibility for achieving energy efficiency or where EGUs are responsible (e.g., under an energy efficiency resource standard (EERS) or other mechanism), whereby an EGU could purchase energy efficiency credits generated from an above-code certification project or portfolio of projects.

These scenarios are not mutually exclusive. For example, a state that is generally placing obligations on the EGU may nonetheless choose to implement the state buildings policy to provide some relief to EGUs. Similarly, incentives for private sector above-code building certification could be implemented by a state rather than EGUs. For the purpose of this model plan, these permutations are not detailed but the information herein could be tailored to provide the relevant language.

There are also possible variations within each scenario; examples of implementing requirements for the scenarios are shown in Table 1.

Table 1. Examples of Implementation

Scenario	Nature of Effect on Sources	Possible Variables in Specifying Affected Sources	Examples
State Buildings Policy	Requirement for covered projects	• New or existing • Building size • Building type • Building project value • Achievement level • Specific LEED credits or points or ENERGY STAR score	All new construction over 25,000 square feet gross floor area (GFA) (or by some threshold dollar value of budget)[95] or Existing buildings when renovated[96]
EGU Obligations/ Utility Incentives Program	Requirement to receive incentive payment	• Same as above • Minimum electricity savings	Projects that are LEED certified and meet other requirements[97]
Credit Program	To realize credit value, project must meet requirements	• State will determine sources eligible to create creditable efficiency	n/a

For each of these scenarios, state agency roles will vary as shown in Table 2.

[95] See, e.g., Kentucky, HB 2, available at http://www.lrc.ky.gov/record/08RS/HB2/bill.doc (requiring all new public facilities and renovations using 50% or more of state funding and over $5 million achieves LEED certification).

[96] See, e.g., State of New Mexico Executive Order 2006-001, available at http://www.emnrd.state.nm.us/ecmd/Documents/EO_2006_001.pdf

[97] See generally http://www.energybiz.com/article/15/04/utilities-leed-us-energy-savings. See, e.g., BGE commercial green building incentive (up to $20,000 per project), requiring projects set an energy efficiency goal of at least 10% above that necessary to meet the chosen or required LEED levels for New Construction Projects or 12% above that necessary to meet the chosen or required LEED levels for Existing Building Projects. See http://www.bgesmartenergy.com/business/energy-solutions-business/comprehensive-new-construction/green-building

Table 2. Roles of State Agencies and Other Entities

Scenario	Initiating Entity[98]	Program Implementer	Third Party Verifier	Accountability to State Air Agency
State Buildings Policy	State (Administration/ Construction entity) – imposes requirement for state- and state-funded buildings	State (Agencies/ Construction entity) – incorporate above-code certification into projects	Certification body of system used; can provide aggregated data	State (Agencies/ Construction entity)
EGU Obligations/ Utility Incentives Program	State PUC – authorizes and issues guidance to EGUs on use of above-code certification in efficiency programs	EGUs - incorporate above-code certification into efficiency programs	Certification body of system used; can provide aggregated data	State PUC has oversight responsibility of program effectiveness (including audits) and may require additional QA steps[99] EGU aggregates results as approved by PUC, translates to carbon emission reductions using approved methods, and submits to State Air Agency
Credit Program	State – sets rules for efficiency credits (e.g., required documentation, M&V, certification)	Authorized entities can implement eligible projects	Certification body of system used	Registry to enforce its rules for registered credits; EGUs responsible for adequate emission reductions

4) STANDARDS

At the single project level, EPA-accepted EM&V will be used to document and verify the electricity savings realized. Because above-code building certification systems are whole building approaches, the anticipated EM&V is IPMVP whole building methods (Option C or D as appropriate). The implementing agency or EGU will track and aggregate the building projects, translate them into CO_2 emission

[98] Beyond any legislation required or desired, which would be enacted by the state legislature and signed by the Governor.

[99] For example, some utilities require a post-construction on-site inspection. Also, many utilities with custom commercial incentive programs (including LEED and ENERGY STAR) have a consultant managing the program and conducting quality assurance/ quality control (QA/QC).

reductions (if required),[100] and submit the cumulative results to the [state] air agency. To ensure progress, the results reporting could be made annually or more frequently.

At the program level, the different scenarios involve different approaches to predict the electricity savings, as shown below:

Table 3. Projecting and Measuring Results

Scenario	Basis for Calculating Projected Results	Measurement of Progress
State Buildings Policy	Projected electricity savings will be based on the estimated building projects covered by the policy and a per square foot (s.f.) savings over the baseline energy code, developed from the specifics of the policy (e.g., minimum points and other requirements)	Individual projects will apply accepted EM&V which will be verified by the certification body Aggregated data will be tracked by the state agency and provided according to the reporting frequency
EGU Obligations and Utility Incentives Program	Projected electricity savings will be based on the estimated building projects using the incentive (e.g., from construction market outlook data) and a per s.f. savings over the baseline energy code, developed from the specifics of the incentive (e.g., minimum points and other requirements)	Individual projects will apply accepted EM&V which will be verified by the certification body Aggregated data will be tracked by the EGU agency and provided according to the reporting frequency
Credit Program	Market-based	Verified EM&V

5) COMPLIANCE SCHEDULE

A. State Buildings Policy: Pursuant to [state/regulation] the state projects that between January 1, 2018 and December 31, 2030, above-code certification will be implemented in [state] totaling [building #/s.f.] with a projected energy savings of [__________] and electricity –related emissions reductions of [________].
B. EGU Obligations/Utility Incentives Program: Pursuant to [state/regulation] the state projects that between January 1, 2018 and December 31, 2030, above-code certification will be implemented in [state] totaling [building #/s.f.] with a projected energy savings of [__________] and electricity –related emissions reductions of [________].

[100] The need to translate electricity savings into avoided CO_2 may vary by state compliance program design. For instance, emission-free megawatt-hours (MWh) savings may be added to the denominator of the lb CO_2 per MWh for compliance crediting under a rate-based program.

C. Credit Program: Pursuant to [state/regulation] the state projects that between January 1, 2018 and December 31, 2030, a registry with credit trading will be available to EGUs to meet obligations meeting requirements, including qualifying above-code building certification.

For each of these scenarios, annual review will help improve predictions and accurate reporting. The annual review will be conducted to compare the predicted versus realized electricity savings and associated carbon emissions reduction, and to identify average electricity savings per square foot (by building type or other relevant factors). This review will support any needed adjustments to the projections, and if there is a shortfall, changes can be made to the process, guidance to implementing agencies/project teams, and if necessary the policy.

6) AFFECTED ENTITIES

Key state responsibilities are listed above. Table 4 shows other affected entities as well as state entities involved in each scenario to implement above-code building certification to achieve deep electricity savings.

Table 4. Affected Entities

Scenario	Governor/ State Admin.	State Offices/ Agencies (Air, Energy, Construction)	State PUC	EGUs	State-funded Buildings	Private Buildings	Registry
State Buildings Policy	√	√			√		
EGU Obligations/ Utility Incentives Program		√	√	√		√	
Credit Program	√	√	Possible	√	Possible	√	√

7) AFFECTED SOURCES

Under the State Buildings Policy scenario, the affected sources include state buildings meeting the specific threshold criteria in [state's] policy (see Table 1). In addition, state above-code certification policies can include state-funded buildings such as state-funded university and college buildings and some local government buildings, such as schools.[101] Many existing policies focus on new construction and could be expanded to capture additional sources (e.g., from state-owned only to including state-funded), or to include existing buildings, potentially triggered by renovation projects or other capital spending, such as in Colorado.[102]

Under the EGU Obligation/Utilities Incentive Program approach, the affected sources could include virtually all types of buildings, and both new and existing:

[101] See, e.g., Arizona Executive Order 2005-05; Massachusetts School Building Authority at http://www.massschoolbuildings.org/building/advisories/24.
[102] Executive Order # D005 05.

- Residential: Utilities such as Anaheim Public Utilities have incentives for achieving efficiency with LEED for Homes.
- Commercial and Industrial: Many programs such as the Energy Trust of Oregon[103] offer incentives, based on a per kWh saved basis, for achieving efficiency with LEED in commercial and/or industrial buildings.
- Other: Incentives could also target data centers and other building types.

8) MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

As explained above, the predicted electricity savings, and associated carbon emissions reduction, will be calculated. Then as each project under a given program (e.g., state policy or utility-run incentives) is implemented and recognized, the electricity savings, and associated carbon emissions reduction, will be tracked. In establishing the program (see Tables 1-3), the state [office/agency] will specify recordkeeping requirements for the affected entities. For example, the entity aggregating the electricity savings from above-code certification will retain all copies of forms (e.g., energy-related forms used to support certification or additional forms that are required) and proof of certification.

A. State Buildings Policy: Beginning on January 1, 2019, the state [Administration/Construction entity] shall be responsible for reporting to the State Air Agency the results of the program on an annual basis.
B. EGU Obligations/Utility Incentives Program: Beginning on January 1, 2019, the EGUs shall be responsible for reporting to the [state] Air Agency and [state] PUC the results of the program on an annual basis.
C. Credit Program: Beginning on January 1, 2019, the EGUs shall be responsible for reporting to the [state] Air Agency and [state] PUC identification numbers for all efficiency credits on an annual basis.

9) FLEXIBLE COMPLIANCE OPTIONS

In the credit model, as outlined above, an EGU could purchase credits through a registry. One possible approach to capture above-code certification as a source of electric efficiency is that the certification body could populate the registry with certified projects and electricity savings information, with consent of building owners. The [state agency] would then review and accept the project for crediting by assigning an ID number. EGUs could then purchase the credits.

10) RATE-BASED VERSUS MASS-BASED PLAN CONSIDERATIONS

Above-code certification can work with either rate-based or mass-based plans.

11) SINGLE VERSUS MULTI-STATE PLAN CONSIDERATIONS

Electricity savings in an above-code certification program have location information (e.g., building location), facilitating addressing any cross-border service area complexities.

[103]See Jeff Cropp and Allen Lee, Cadmus, and Sarah Castor, Energy Trust of Oregon, "Evaluating Results for LEED Buildings in an Energy Efficiency Program."

Low-Income Residential Sector Weatherization

1. Brief description of the energy efficiency strategy.

This section targets the low-income residential market. Depending on what metric is used to determine low-income status, up to 35% of all U.S. households can be defined as low-income.[104] These families generally live in older, less energy-efficient homes, are more likely to be renters, and are more likely to live in multifamily buildings. According to the U.S. Energy Information Administration's Residential Energy Consumption Survey (RECS),[105] 45 percent of low-income families live in houses built before 1969, while 40 percent of the general population lives in houses of the same age. In addition, 40 percent of low-income families live in multifamily buildings, compared to 25 percent of all families. These single- and multifamily buildings have enormous cost-effective achievable energy efficiency potential that can be addressed to meet the objectives of Clean Power Plan.

The core strategy targets both single- and multifamily buildings and provides a mix of energy savings measures, with incentives and loans for financing improvements. Two existing, proven delivery systems can be used: (1) the federal Weatherization Assistance Program (WAP), available nationally; and (2) ratepayer-funded utility or public benefit programs that are used in approximately 26 states.

By saving electrical energy, low-income residential weatherization and energy efficiency programs deliver emissions avoidance from electrical generating units. According to a 2010 report by the Oak Ridge National Laboratory, the average single-family household served by WAP saves 29 million Btu (electrical and non-electrical energy) in the first year, reducing the household energy bill by $437. WAP reduces residential and power plant emissions of CO_2 by 2.65 metric tons annually per home and, over the life of the measures, saves 53 metric tons of CO_2 emissions per house.[106]

Recent efforts to estimate energy savings in low-income multifamily buildings include a May 2015 report prepared by Optimal Energy for the National Resources Defense Council that estimates maximum potential energy savings from multifamily affordable housing in nine states. The report finds that of the states analyzed, the average cumulative savings through 2034 due to energy efficiency efforts is 753 GWh of electricity and 2,254 billion Btu of natural gas.[107] A New York State Energy Research and Development Authority report of multifamily residential projects found energy savings between 21 and 40 percent.[108]

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[104] The Low Income Home Energy Assistance Program defines low income as 60% of the state median income, or 150% of federal poverty guidelines, whichever is higher. The Department of Energy Weatherization Assistance Program defines it at 125 percent of federal poverty guidelines or the federal LIHEAP definition in use by the state, whichever is higher. Utility and public benefit programs sometimes use one of those standards or use 60% or 80% of Area Median Income for better coordination with low-income and affordable housing programs.

[105] U.S. EIA, Residential Energy Consumption Survey, http://www.eia.gov/consumption/residential/

[106] U.S. EIA, 2010, Short-Term Energy Outlook.

[107] Natural Resources Defense Council, Energy Efficiency for All, and Optimal Energy, 2015, "Potential for Energy Savings in Affordable Multifamily Housing," http://www.energyefficiencyforall.org/sites/default/files/EEFA%20Potential%20Study.pdf

[108] New York State Energy Research and Development Authority, Multifamily Performance Program Case Studies" http://www.nyserda.ny.gov/About/Publications/Case-Studies/Multifamily-Performance-Program-Case-Studies; note that these case studies are not limited to affordable or low-income multifamily building.

2. Who will administer the energy efficiency strategies or measures?
The State Energy Office (SEO) or state WAP agency could be the administrator of the programs, coordinating with utilities, utility regulatory bodies, and other interested parties.

3. How will success be measured, how will progress be measured, and what happens if the objectives are not achieved?
States can design programs using well-established savings data from existing WAP and utility programs. Generally, data about numbers of eligible households, cost-effective measures, and savings per household (depending on electrical end uses) are readily available. Success will be measured by numbers of households addressed, whether all cost-effective electric efficiency measures were installed, and the level of savings achieved. These should track to state-established program plans, with remediation plans required when deficiencies are identified.

Programs should be designed to address all cost-effective electric end uses, and, where possible, partner with other resources to address all cost-effective measures for all end uses. This helps to reduce customer acquisition costs and improves program-level cost-effectiveness.

WAP protocols call for post-installation inspection for all homes weatherized. Quality assurance and control protocols for utility and public benefit programs vary, but are generally designed to ensure high realization rates. States may wish to establish additional monitoring of savings on a sample of buildings to ensure persistence of savings.

4. Affected entities – What entity would be responsible or accountable for the energy efficiency measure and the associated reductions?
The State Energy Office or WAP office will be accountable for the energy efficiency measure and associated reductions. The State Energy Office or WAP office will directly oversee funds allocated to WAP grantee (state-level) or utility or public benefit programs. The State Energy Office would establish reporting protocols and frequency, and then would aggregate data to record all savings achieved from the low-income initiative for use in Clean Power Plan compliance. The State Energy Office will be responsible for requiring evaluation, measurement and verification (EM&V) protocols of participating organizations. DOE has established WAP protocols. Utility-ratepayer funded low-income residential energy efficiency programs are subject to public utility commission (PUC) or state EM&V requirements

5. Affected sources –What buildings or equipment or facilities will be subject to the program requirements?
States can establish eligibility levels to coordinate best with other available energy efficiency services. Such eligibility levels should be designed to be as inclusive as possible and should not exclude renters and occupants of multifamily buildings. This effort would maximize the savings potential of this initiative. State program designs should specify the level of eligibility (e.g., 200% of Federal Poverty Limit; 80% of Area Median Income; 60% of State Median Income). Eligibility for multifamily buildings should be established at the project level, with a requirement that a certain percentage of units are eligible. Program designs should take advantage of established eligibility certifications by other state and federal programs, avoiding, wherever possible, requirements for income verification for those already established as low-income by another source, e.g., Supplemental Nutrition Assistance Program.

6. What are the specific standards that must be satisfied?

a. Cost-effectiveness will be screened at the project level to maximize cost-effective measure installations.
b. Cost-effectiveness screens will appropriately specify all costs and all benefits relevant for the cost-effectiveness test used.
c. DOE WAP standards or other State Energy Office or PUC-approved residential energy efficiency standard with M&V.

7. What is the compliance schedule? What are the milestones? How will the schedule and compliance options correlate to the dates set forth in the state plan?

State plans for compliance will include separate target schedules for multifamily and single-family homes for the period 2018-2026. Schedules shall be devised taking account of existing capabilities and capacity and the need to build capability and capacity in a state. Using current delivery systems allow for a relatively rapid roll-out. Compliance schedules shall include annual targets for number of homes addressed, annual energy savings achieved, annual energy savings by measure life, cumulative energy savings (with appropriate degradation for measure life, measure characteristics, and changes in law, regulation, or code). Milestones established for the first two years should include reporting on capacity building (e.g., numbers of contractors, waitlists for service), as well as savings, and should be more frequent than reporting required for established programming. Reporting in the first two years should be at least semi-annually, with a preference for quarterly, to ensure deficiencies in activity are addressed before savings are degraded. The State Energy Office or WAP agency will certify each year that targets are met, and make programmatic adjustments, when necessary.

8. Are there any alternative compliance options or flexible measures that could be used?

States would adjust the mix of multifamily to single family retrofits as well as incentives based on the performance of local contracting networks to achieve energy savings in this segment, in order to meet the goals set for this segment. If savings within the program are still insufficient, then funds could be shifted to other programs in the portfolio.

9. What types of EM&V are necessary? What are the monitoring requirements? What are the recordkeeping requirements? How long will the monitoring need to be kept in place? For example, it must be sufficient to demonstrate compliance with a required performance standard. It must measure or estimate and verify the CO_2 emissions reductions. The state must be able to translate this into demonstrable progress for meeting the CO_2 reduction goal.

EM&V protocols should be specified by the State Energy Office or WAP agency and conform to DOE WAP standards, or an alternative approved by the State Energy Office or PUC. Monitoring should include sampling of units completed for physical inspection at the completion of work. Access to utility bills for a period of at least two years pre- and post-installation should be required, including access to aggregated whole building data for multifamily buildings. Where Technical Reference Manuals exist and are up-to-date and accurate, deemed savings values and algorithms can be obtained and used. CO_2 calculation conversions for electric savings shall be established by the State Energy Office, if necessary.[109] Measurement protocols shall account for degradation of savings due to measure life, measure

[109] The need to translate electricity savings into avoided CO_2 may vary by state compliance program design. For instance, emission-free megawatt-hours (MWh) savings may be added to the denominator of the lb CO_2 per MWh for compliance crediting under a rate-based program.

characteristic(s), and changes in codes and standards. Third-party monitoring of savings is recommended annually in the first three years of programming, biannually in the next four years, and every third year thereafter as long as results remain robust. The State Energy Office will be responsible for calculating CO_2 emissions reductions based on reported savings and its electric generation mix.

The State Energy Office or other aggregating office would compile savings from weatherization projects with appropriate M&V and calculate the quantity of EE produced and, as needed, CO_2 emission reductions available for compliance. Project information, once aggregated, can then be shared with the state air quality office responsible for compliance with the Clean Power Plan rule

10. Would the program be different depending on whether the State Plan is rate-based or mass-based? What are the implementation trade-offs of both approaches?
The implementation of a program to obtain savings from the low-income residential sector would not differ depending on whether a State Plan was rate-based or mass-based. The State Energy Office would be responsible for specifying methods for quantification of electrical energy savings and, if needed, translation to avoided emissions. Under a mass-based system, EM&V components of the state compliance plan may be considered "complementary measures" since compliance is based on actual EGU CO_2 emissions rather than crediting energy savings directly for CPP compliance (though such savings are important for achieving the EGU stack emissions reductions).

11. Is the program, or could the program be, multi-state in nature? If it is multi-state in nature, what is specifically required of each state?
WAP is a national program and therefore lends itself very well to a multi-state initiative. Utility and public benefit programs tend to be state-specific, as they are often in response to state legislation or regulation. For those utilities that cross state boundaries, some potential exists for multistate work. Individual state-level reporting of savings would be required due to differences in the fuel mix of electric generation.

WAP and other low-income residential energy efficiency programs can be used in both single-state and multi-state compliance regimes, the latter under both joint multi-state compliance plans or in the context of single-state compliance plans that allow states employing "common elements" to trade, exchange, average, or otherwise allocate compliance credits across state lines.

Appliance Recycling Programs (Utility)

NARRATIVE: Appliance recycling programs are among the most effective programs to reduce energy consumption and demand on the electrical grid. Older model appliances are often much less efficient than newer models. In the case of refrigerators, for example:

- Every year, refrigerator efficiency improves. An average refrigerator purchased in 2008 consumes 3 percent less energy than one from 2007.
- Forty-four percent of refrigerators that could be recycled are used as second refrigerators, sold or given away.
- Only three out of 10 refrigerators sold are Energy Star-qualified.
- Twenty-seven million inefficient models made before 1993 are still in American homes.
- Surveys indicate that in many areas 30% of consumers own two or more refrigerators.

Programs that remove these products from the electrical system constitute effective energy efficiency programs. Energy savings calculations associated with appliance recycling programs are based on credible studies and approved by the [state energy office, relevant utility commission, utility board, municipal authority, or other] per specifications listed in Section 8 below.

1) **AUTHORITY:**
Pursuant to [state statutory cite /municipal charter cite / utility board resolution], the [state of ______________ / city of __________] / governing board of utility] has enacted [or adopted] the following – [insert policy supporting the appliance recycling program]. The state [or city] energy office [or other responsible agency] within [state/city] has authority to manage and assist in implementing this program under [state statute or regulation/municipal ordinance or other local regulatory authority's regulation].

2) **STRATEGY**: Each of the following appliances removed from consumer use and recycled reduces energy consumption and peak demand according to the following schedule:

    a. Each [insert appliance type and specification (e.g., pre-2000 refrigerator]) recycled reduces energy consumption by __kWh and reduces peak demand by ___kWh each year [insert technical study or technical reference document citation here].
    b. Each [insert appliance type and specification (e.g., pre-2000 freezer]) recycled reduces energy consumption by __kWh and reduces peak demand by ___kWh each year [insert technical study or technical reference document citation here].

3) **STANDARDS:** [Insert tailored option such as the following: In order to be eligible for recycling programs, refrigerators and freezers must be in working condition, and must be between 10 and 30 cubic feet in size, using inside measurements. Utilities contract with third-party administrators to pick up and recycle refrigerators and freezers that are in working condition. The appliance must be operating in order for the recycler to verify functionality. Once functionality is confirmed, the recycler will cut the cord and mark the exterior of the unit to ensure that it does not go back into operation before it reaches the recycling center. A program

was developed many years ago in New York City by the New York State Energy Research and Development Authority for residential air-conditioning units. In addition, an appliance recycling program was implemented in all the states under the American Recovery and Reinvestment Act of 2009.

4) **COMPLIANCE SCHEDULE:**
Pursuant to [state/regulation] the state energy office projects that between [date] and [date], appliance recycling projects will be implemented in [state] totaling [# of units] with a projected energy savings of [__________]. The state will be able to verify the savings by collecting data on the number of appliances recycled provided by [program administrator] and calculating the savings based on the savings values stated in Section 3 above.

5) **AFFECTED ENTITITES:** [The state energy office and/or entity administering the program] is the affected entity responsible for policy/program oversight, guidance and implementation.

6) **AFFECTED SOURCES:** Old appliances that will be destroyed through recycling as a result of this program are the affected sources. The energy savings and associated emissions reductions can be calculated.

7) **MONITORING, RECORDKEEPING AND REPORTING REQUIREMENTS:** The savings calculations used for these programs are approved by the [state energy office, relevant utility commission, utility board, municipal authority, or other] and are based on credible studies that are published in technical resource manuals (TRMs) or energy efficiency savings databases.

   If a state has a TRM of its own, the utility or entity administering the program will typically adhere to the state's TRM. However, if the state does not have a one of its own, the entity administering the program can utilize a TRM created in-house or one that is created by a different state, to quantify savings from the program.

   TRMs and energy efficiency savings databases provide information on deemed savings, costs and useful lives of energy efficiency measures

8) **FLEXIBLE COMPLIANCE OPTIONS:** [Insert alternative standards, opportunities for credit generation and trading, allowances that could be used].

9) **RATE-BASED VERSUS MASS-BASED PLAN CONSIDERATIONS:** The appliance recycling program and its benefits will occur in either a rate-based or mass-based state plan. The difference is how the benefits are counted (MWh in a rate based, or converted to tons of CO_2).

10) **SINGLE VERSUS MULTI-STATE PLAN ELEMENT CONSIDERATIONS:** [Insert whether a state is choosing a single-state or multi-state option and any related considerations here].

    Multi-state plans should acknowledge and credit all of these types of energy efficiency programs originating in any of the participating states. States not participating in a multi-state plan may still choose to collaborate; in which case, states should effectively be allowed to recognize energy efficiency programs with essentially the same criteria/characteristics to allow interstate trading of credit for those programs. This comports with the “common elements” approach that would allow states with single-state compliance to plans to exchange, trade, average, or otherwise allocate credits with other states employing comparable and compatible approaches.

States should consider a ‘multi-state ready’ deemed credit for appliance recycling programs. The calculated savings from each lamp replacement should be available to the entity that produces them across multiple state lines as long as the calculations are performed using TRMs.

Lighting Retrofit Programs (Utility)

1) NARRATIVE:

Older lighting technologies are often much less efficient than newer technology. Since their introduction in the 1930s, low pressure sodium (LPS) have evolved from giving 30-40 lumens per watt to now approaching 200 lumens per watt, which shows the rapid growth this industry has seen in lighting efficiency.[110] Among the most commonly used bulbs in energy efficiency programs, light emitting diodes (LEDs) alone use 20-25% of the energy traditional lamps use and last up to 8-25 times longer.[111] There are programs designed to replace aging residential, commercial, and/or industrial lighting with the available energy efficient alternatives, including LEDs, compact fluorescent lamps (CFLs), and others. Lighting retrofit programs range from installing new bulbs in a single building to transforming the lighting bulbs, fixtures, and ballasts across the entire town.

In particular, street lighting retrofit programs are extensively used in urban settings, along small town downtown main streets, in residential neighborhoods, in commercial districts, in industrial parks, at interstate highway interchanges, and rural intersections. LED lights are among the most common energy saving bulbs used in these programs. One of the most touted benefits of LED street lighting is its lower energy use compared to standard technologies, such as high pressure sodium (HPS) bulbs. In Iowa alone, case studies of public power utilities showed a reduction of energy consumption of the retrofitted luminaires of between 29 and 63 percent.[112]

2) AUTHORITY:

Pursuant to [state statutory cite / municipal charter cite / utility board resolution], the [state of _____________ / city of _________ / governing board of utility] has enacted [or adopted] the following – [insert policy supporting the lighting retrofit program]. The state [or city] energy office [or other responsible agency] within [state/city] has authority to manage and assist in implementing this program under [state statute or regulation/municipal ordinance or other local regulatory authority's regulation].

3) STRATEGY:

The replacement of each [replaced bulb type] by [retrofitted bulb type] in [insert type of program – residential building, street lighting, commercial, etc.] will reduce energy consumption by ___kWh each year based on the [insert technical study or technical reference document].

4) STANDARDS:

Each entity administering the program has a unique method to determine which bulb is appropriate for the specific replacement setting. The energy savings for a specific project depend on many factors, including existing lighting technology, new lighting technology, control strategies, and whether the illumination level is changed during the retrofit. The administering party is responsible for justifying the standard to be used in the identified lighting retrofit

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[110] http://americanhistory.si.edu/lighting/tech/chart.htm
[111] http://energy.gov/energysaver/articles/lighting-choices-save-you-money
[112] LED Street Lighting: A Handbook for Small Communities, Washington D.C., American Public Power Association, 2012.

program. Many entities choose to qualify their programs through efficiency programs, such as Energy Star, the Design Lights Consortium, Consortium for Energy Efficiency, etc.

5) COMPLIANCE SCHEDULE:
Pursuant to [state statutory cite] [municipal charter cite], the [state energy office, local municipality, or other entity] projects that between [date] and [date], lighting retrofit projects will be implemented in [state/territory] totaling [# of units] with a projected energy savings of [__________]. The state will be able to verify the savings by collecting data on the number of retrofits provided by [program administrators] or by requesting documentation of savings from the program administrators.

6) AFFECTED ENTITITES:
[The state energy office and/or entity administering the program] is the affected entity responsible for policy/program oversight, guidance and implementation.

7) AFFECTED SOURCES:
Old bulbs, and in some cases, fixtures, ballasts, and other components related to the replacement of the bulb. The energy savings are, if necessary, then translated into emissions reductions.[113]

8) MONITORING, RECORDKEEPING AND REPORTING REQUIREMENTS:
The savings calculations used for these programs are approved by the [state energy office, relevant utility commission, local utility and/or their governing board, municipal authority, etc.] and are based on credible studies that are published in technical resource manuals (TRM), or available through energy efficiency savings databases. These technical resources provide information on deemed savings, costs and measure lives of energy efficiency measures, and in some cases, specify savings for different load shapes. Project implementers will use state and regional specific TRMs, or energy efficiency savings databases, to quantify savings from a specific energy efficiency program.

If a state has a TRM of its own, the utility or entity administering the program will typically adhere to the state's TRM. However, if the state does not have their own, the entity administering the program can utilize a TRM created in-house or one that is created by a different state, to quantify savings from the program. For example, the Missouri River Energy Services (MRES) joint action agency created a comprehensive in-house database, which utilities in neighboring states rely on for energy efficiency program savings information.

9) FLEXIBLE COMPLIANCE OPTIONS:
Alternative standards and opportunities for credit generation and trading should be considered for programs of this type.

10) RATE-BASED VERSUS MASS-BASED PLAN CONSIDERATIONS:

[113] The need to translate electricity savings into avoided CO_2 may vary by state compliance program design. For instance, emission-free megawatt-hours (MWh) savings may be added to the denominator of the lb CO_2 per MWh for compliance crediting under a rate-based program.

The lighting retrofit program and its benefits can be utilized in either a rate-based or mass-based state plan. The difference is how the benefits are counted (MWh in a rate based, or converted to tons of CO_2). Energy efficiency reductions can be credited in a rate based compliance mechanism. Each energy efficiency credit would be equivalent to a pound (or ton) or MWh, and be freely tradable and bankable. In a mass based compliance approach, energy efficiency credits also could be bought, sold, and banked. A state may create an energy efficiency credit set-aside to ensure credits are available to incentivize particular energy efficiency programs.

To add flexibility, states should consider use of deemed savings values for implementers of this program based on the TRM values and state generation mix. A deemed allowance will allow implementers to proceed with their energy efficiency upgrades with more surety and therefore incentivize such upgrades.

11) SINGLE VERSUS MULTI-STATE PLAN ELEMENT CONSIDERATIONS:

Multi-state plans should acknowledge and credit all of these types of energy efficiency programs originating in any of the participating states. States not participating in a multi-state plan may still choose to collaborate; in which case, states should effectively be allowed to recognize energy efficiency programs with essentially the same criteria/characteristics to allow interstate trading of credit for those programs. This comports with the “common elements” approach that would allow states with single-state compliance to plans to exchange, trade, average, or otherwise allocate credits with other states employing comparable and compatible approaches.

States should consider a ‘multi-state ready’ deemed credit for lighting retrofit programs. The calculated savings from each lamp replacement should be available to the entity that produces them across multiple state lines as long as the calculations are performed using TRMs.

Energy Star Manufactured Housing Incentive

1) **NARRATIVE**: Energy efficiency programs that provide incentives to help consumers afford the upfront cost of more efficient manufactured housing assists consumers in keeping their energy bills low and can reduce both electric consumption and demand. One example is the Tennessee Valley Authority's (TVA) Energy Star Manufactured Home Program (TVA ESMHP) model and the process developed and administered by the Systems Building Research Alliance (SBRA) [or equivalent].[114] The program incentivizes homeowners to upgrade to Energy Star standards. SBRA [or equivalent] tracks and verifies the structure's upgrade in the manufacturing factory as well as verifies the proper on-site installation of both the structure and its heat pump heating and cooling system. Energy and emissions reductions are developed based on the difference between heating and cooling loads for a standard efficiency house and one built to an ENERGY STAR standard based on input from experts and studies published by TVA or other experts and approved by the [state energy office, relevant utility commission, utility board, municipal authority, or other].

2) **AUTHORITY:**
Pursuant to [state statutory cite /municipal charter cite / utility board resolution], the [state of _____________ / city of _________] / governing board of utility] has enacted [or adopted] the following – [insert policy supporting the manufactured housing program]. The state [or city] energy office [or other responsible agency] within [state/city] has authority to manage and assist in implementing this program under [state statute or regulation/municipal ordinance or other local regulatory authority's regulation].

3) **STRATEGY**: The Program will pay incentives in the form of rebates for electrically-heated manufactured homes that qualify for the ENERGY STAR label as defined by the U.S. EPA. ENERGY STAR compliance requires the use of a combination of envelope and equipment measures that in combination result in performance that is significantly more energy efficient than comparable homes built to the federal HUD code. Each ENERGY STAR manufactured housing upgrade completed as a result of this program reduces building energy consumption by __kWh and reduce peak demand by ___kWh each year [insert technical study or technical reference document citation here].

   An ENERGY STAR certified manufactured home is equipped with the following features:
   - Thermal envelope improvements
     - increased envelope insulation.
     - improved duct insulation.
     - tight ducts construction.
     - high efficiency windows (requirements for U-value, area and solar heat gain coefficient).
     - tight envelope construction.
   - High efficiency equipment/control strategies

114 https://www.research-alliance.org/pages/es_rebates.htm

- high efficiency heat pumps in place of typically installed electric resistance furnaces and air conditioning equipment.
- high efficiency domestic water heater.
- programmable thermostat.

Each ENERGY STAR manufactured housing upgrade completed as a result of this program reduces building energy consumption by __kWh and reduce peak demand by ___kWh each year [insert technical study or technical reference document citation here].

4) STANDARDS:
Under a policy effective November 1, 2005, the U.S. EPA made plant certification, third-party plant Certifier oversight and field performance verification for ENERGY STAR manufactured homes the responsibility of SBRA [or equivalent] as the national Quality Assurance Provider (QAP). To assure quality at every step in the ENERGY STAR process, SBRA [or equivalent] has established a process that both leverages the quality control measures already in place for manufactured homes (the plant the Design Approval Primary Inspection Agency [DAPIA] and In-Plant Plan Inspection Agency [IPIA] process discussed below) and has created a separate network of third-party agents called ENERGY STAR Certifiers that function in a similar capacity as Home Energy Rating System (HERS) raters and providers. This four-tiered quality control system—DAPIAs, IPIAs, Certifiers and SBRA [or equivalent] —taken together assure that ENERGY STAR manufactured homes consistently perform to expectation and, if and when exceptions arise, they are addressed quickly and the method of their resolution is used to improve the overall Quality Control process.

5) COMPLIANCE SCHEDULE:
Pursuant to [state/regulation] the state energy office projects that between [date] and [date], manufactured housing projects will be implemented in [state] totaling [# of units] with a projected energy savings of [__________]. The state will be able to verify the savings by collecting data on the number of upgrades provided by SBRA [or equivalent] and calculating the savings based on the savings values stated in Section 3 above.

6) AFFECTED ENTITITES: [The state energy office and/or entity administering the program] is the affected entity responsible for policy/program oversight, guidance and implementation.

7) AFFECTED SOURCES: New manufactured housing upgraded as a result of this program are the affected sources.

8) MONITORING, RECORDKEEPING AND REPORTING REQUIREMENTS:

There are several overlapping and reinforcing procedures identified below that assure that the manufacturer that builds ENERGY STAR homes is meeting or exceeding the requirements of the program.

- **DAPIA approvals of the ENERGY STAR package:** Under the HUD standards that regulate manufactured homes, every design must be approved by a third-party agent called the Design

Approval Primary Inspection Agency (DAPIA). Manufacturers develop ENERGY STAR compliant packages that are incorporated into the DAPIA package and are thus covered under the umbrella of HUD enforcement. Therefore, failure to build the home as specified would be a regulatory breach. Conformance of the design to the ENERGY STAR requirements is verified by the ENERGY STAR Certifiers.

- **IPIA approval during construction:** The HUD standards also require an in-plant inspection of all homes by another third party called an IPIA (In-Plant Plan Inspection Agency). The IPIA is responsible for verifying that the manufacturer is building the home in accordance with the DAPIA-approved plans. For ENERGY STAR homes, the IPIA checks during the production process that the home is built with the required insulation, equipment, windows, controls and other features found on the approved plans.

- **ENERGY STAR Certifiers:** Separate and apart from the above process that leverages the existing inspection agencies, every manufacturer must have a third-party ENERGY STAR Certifier. The Certifiers are responsible to SBRA [or equivalent] as the ENERGY STAR QAP. SBRA [or equivalent] requires that these agents have skills equivalent to HERS raters and must be familiar with factory building practices. The actions of the manufactured home Plant Certifiers are governed by procedures stipulated by SBRA [or equivalent]. The Certifiers provide a unique function and are on the front lines of assuring conformance to ENERGY STAR requirements. The role of the Certifier includes the following:

    - Oversee the plant ENERGY STAR qualification process.
    - Train plant production staff in ENERGY STAR techniques.
    - Review and if acceptable, approve plant processes and the plant's ENERGY STAR-related documentation, including ENERGY STAR qualified home designs, ENERGY STAR Site Installation Checklist, Quality Control Manual and the Manufacturer's Site Installation Manual.
    - After initial plant certification, conduct ongoing quality control inspection and testing of a representative sample of completed homes.
    - Participate in and contribute to periodic meetings of Certifiers conducted by SBRA [or equivalent] regarding program quality control and oversight.

- **SBRA [or equivalent] Oversight:** As the national QAP, SBRA [or equivalent] oversees the work of the Certifiers and routinely reviews quality control methods and approaches with the Certifiers.

9) **FLEXIBLE COMPLIANCE OPTIONS:** [Insert alternative standards, opportunities for credit generation and trading, allowances that could be used].

10) **RATE-BASED VERSUS MASS-BASED PLAN CONSIDERATIONS:** The benefits of this manufactured housing program, and its benefits, will occur in either a rate-based or mass-based state plan. The difference is how the benefits are counted (MWh in a rate based, or converted to tons of CO_2).

11) **SINGLE VERSUS MULTI-STATE PLAN ELEMENT CONSIDERATIONS:** [Insert whether a state is choosing a single-state or multi-state option and any related considerations here].

Appendix B: ACEEE Templates—Building Energy Codes and Combined Heat and Power

ACEEE partnered and collaborated with NASEO in case study development, the State 111(d) Hub website, webinars, 3N collaboration support, and other CPP-pertinent efforts.

With permission, the ACEEE publications “Navigating the Clean Power Plan: A Template for Including Building Energy Codes in State Compliance Plans” and “Navigating the Clean Power Plan: A Template for Including Combined Heat and Power in State Compliance Plans” are included in full in this appendix.

Navigating the Clean Power Plan: A Template for Including Building Energy Codes in State Compliance Plans

ACEEE, 2015, Navigating the Clean Power Plan: A Template for Including Building Energy Codes in State Compliance Plans http://aceee.org/sites/default/files/111d-building-codes-template-0315.pdf

At a Glance

The Environmental Protection Agency's proposed Clean Power Plan establishes state-specific emissions targets for carbon dioxide emissions from existing power plants (EPA 2014b). The proposed plan allows states to use end-use energy efficiency as a primary means to comply with the emissions targets.

Adoption and implementation of building energy codes (referred to in this document by the single term, "adoption") could help states achieve significant emissions reductions from the electric power sector. Buildings consume roughly 70% of our nation's electricity (DOE 2011). ACEEE has estimated that, taken together, increased code stringency and improved building code compliance could result in 139–232 million megawatt-hours (MWh) of electricity savings in 2030 (Hayes, Ungar, and Herndon 2015). These reductions in electricity consumption have the potential to help states reduce greenhouse gas emissions by 102–169 million metric tons in 2030.[115]

This document is intended to help states document and claim emissions reductions resulting from building energy codes as a means of complying with their obligations under the Clean Power Plan. It includes

1. A discussion of the guidance, precedent, and major themes relied on to develop this template
2. A list of the elements states should address in order to claim emissions reduction credit for building energy codes
3. Specific recommendations on how to address these elements
4. A case study of a state that seeks to include adoption of a building energy code in its compliance plan[116]

Guidance and Precedent Relied on to Develop this Document

[115] Range of greenhouse gas reductions possible from covered generation sources nationally between a low and high energy savings scenario, as modeled by ACEEE (Hayes, Ungar, and Herndon 2015).

[116] This work product is not intended to provide an exhaustive representation of what EPA or EPA regional offices will require for the inclusion of building energy codes in a Clean Power Plan Compliance Plan. Rather, it offers a conceptual framework on which to build. In drafting this document, we have relied on the provisions in the proposed rule as well as on guidance on and past precedent for the treatment of energy efficiency under other provisions of the Clean Air Act. The final rule could change and EPA could opt to develop different processes for the treatment of energy efficiency.

At the time this document was developed, the Clean Power Plan was still a proposed rule offering limited guidance on what a state's compliance plan would need to include. In section VIII Part C of the Clean Power Plan (79 FR 34909), EPA outlines four general criteria it will use to evaluate state plans and emissions reduction measures:

1. The measures contained in the plan are enforceable.
2. The plan as a whole is projected to achieve the emissions standard.
3. The emissions reductions from measures are quantifiable and verifiable.
4. Each measure has a clear process of reporting on implementation.

Although these four criteria are similar to the elements required in state implementation plans (SIPs) for National Ambient Air Quality Standards (NAAQS), "approvability criteria for [Clean Air Act] section 111(d) plans need not be identical to approvability criteria for SIPs" (79 FR 34909). Nevertheless, the historical precedent of EPA's treatment of energy efficiency in SIPs may still be informative. EPA has issued specific guidance on how to ensure that end-use energy efficiency is enforceable, quantifiable, and verifiable, as well as on how to project the emissions impacts of an efficiency policy and report on the implementation of that policy in the context of a SIP submission.[117] Several approved SIPs have been reviewed to understand how states have successfully documented and obtained emissions credit for energy efficiency policies. Relying on the guidance in the proposed rule, existing EPA guidance on documenting and crediting energy efficiency in SIPs, and approved state plans, we have developed a recommended approach that states can use to include the adoption of building energy codes in their Clean Power Plan compliance plans.

The Clean Power Plan provides states with a great deal of flexibility, and the method outlined in this document is not the only one a state may use. We have followed EPA precedent to develop a conservative approach that may be more rigorous and complex than what is ultimately required for compliance. States may use much simpler options, and EPA will likely provide additional guidance on options for them to consider.[118]

In the remainder of this section, we apply the established approaches and existing guidance to the four criteria above. This high-level discussion touches on several of the major themes that contribute to the recommended elements (Section 2), specific recommendations (Section 3), and example language (Section 4).

[117] The previous guidance referred to here is for the incorporation of energy efficiency measures into SIPs for NAAQS found in the 2012 *Roadmap* (EPA 2012). EPA has suggested there may be some overlap between this guidance and what is applicable under the Clean Power Plan, and has requested comment on this issue.

[118] See discussions of simpler approaches in recent publications from the Regulatory Assistance Project: http://www.raponline.org/document/download/id/7501 and http://www.raponline.org/document/download/id/7491.

Enforceability

The exact meaning of "enforceability" in the context of the Clean Power Plan is still uncertain.[119] In spite of this uncertainty, some general lessons are likely applicable. If a measure is ineffective and fails to achieve the emissions reductions it is supposed to, methods to establish that a measure is "enforceable" to EPA's satisfaction (79 FR 34909) might include authority to levy penalties or force corrective action, or obligating the state to make up any shortfall. Therefore, if a measure is to be federally enforceable, a state would likely need to commit to evaluating its effectiveness. Establishing enforceability has historically involved demonstrating that the measure is mandatory and that legal authority has been granted by legislation and/or regulations to the relevant governing body (EPA 2012).

In the case of building energy codes, states may adopt model codes through legislation or regulation. In some cases local governing bodies have jurisdiction over the adoption of building energy codes. A key to enforceability is having a responsible party that will face penalties or find additional emissions reductions to compensate for a shortfall. A measure may be federally enforceable when the state or affected power plants are directly obligated by law to implement it. However, it is possible that measures could be enforceable against other third parties, such as local governments or builders responsible for implementation of building energy codes. States may consider where they want this obligation to fall and should consult the final rule for additional guidance. One option we recommend is for states to shield builders and local governments from federal enforceability by agreeing to meet any shortfall in anticipated emissions reductions through other energy efficiency policies or measures as part of a larger portfolio.

Projected Achievement of Emissions Standard

State compliance plans must show that included measures will reduce the emissions rates of regulated power plants to the required standard of performance within the designated timeframe. One way to ensure this is to adopt measures that will have lasting effects on emissions. Building energy codes affect electricity consumption and the greenhouse-gas emissions associated with it. Benefits can last for the lifetime of a building, and emissions reductions could typically be credited for upwards of 20 years, well within the Clean Power Plan's timeframe (PNNL 2014). Additionally, in order to garner further energy savings for years to come, many states mandate that building energy codes be reviewed and updated periodically as new technologies become available and cost effective.

Because compliance plans are forward looking, each state will need to develop a reasonable estimate of the energy savings it expects to achieve by adopting new building energy codes (including any updates that would be required by law). These projections will vary by climate zone and rate of new construction. They are made available on a state-by-state basis by the U.S. Department of Energy (DOE) (DOE 2012). States may wish to adjust these estimates to allow for noncompliance of an assumed

[119] EPA sought comment on this issue in the Clean Power Plan (79 FR 34909).

amount (based on past experience, a recent compliance study, or a conservative estimate). Later in this document, we provide a sample calculation for states' consideration. These estimates would later be trued up with actual savings using a compliance verification study or other tools.[120]

The state is also required to ensure that the measure's forecasted emissions reductions actually occur. This means that the state should take action to ensure that no backsliding or reduction in code stringency or enforcement occurs over the compliance timeframe. One way to do this is by securing extended funding for code implementation and enforcement in order to ensure consistent compliance and effective implementation. Binding legislation or regulations can also ensure that the code stays in place and carries the force of law.

Quantifiable and Verifiable Emissions Reductions

State plans must detail how emissions reductions will be quantified and verified. According to SIP guidance, in order for a measure to be considered "quantifiable," it must have a measureable, replicable effect on emissions (EPA 2012). The Clean Power Plan contemplates methods for quantifying the impact of an efficiency policy by measuring energy savings and converting those savings into an emissions impact. In the case of building energy codes, we recommend that a state identify a protocol for quantifying the electricity savings and associated emissions reduction from the adoption of new codes that is best suited to the resources the state has available. An effective protocol for electricity savings quantification might engage stakeholders who already are involved in code enforcement and implementation at all levels, such as builders, local and municipal code officials, and state development boards.

States should use software capable of developing sophisticated estimates to model the effects of building energy codes on electricity consumption. Achievable savings can be determined using a representative group of the most common building types by assessing their energy consumption under the previous code, comparing that amount to the estimated consumption under the new building code, and then weighting the savings from each building type by the number of homes (for the residential sector) or square feet (for the commercial sector) of each building type built in a state each year. These steps are included in utility savings estimators created by the Pacific Northwest National Laboratory (PNNL) for DOE. Specific analyses are also available for many states from PNNL, although states should review their assumptions (DOE 2014).[121]

A variety of important variables need to be considered when devising methods for modeling emissions reductions from codes. Climate zone considerations will play a major role, and the rate of new

[120] See a variety of resources to assist states here: https://www.energycodes.gov/compliance.

[121] A wealth of protocols is already in place in states where utilities are involved in code compliance improvement and development. For more information on quantifying the effects of building energy codes, see http://www.energycodes.gov/development/commercial/methodology and http://www.energycodes.gov/development/residential/methodology.

construction and project square footage are also important factors in accurately calculating energy usage and the savings from codes.

Process for Reporting On Plan Progress and Corrective Actions

For a measure to be deemed acceptable for inclusion in a state compliance plan, it must include a process for reporting its performance and implementation to EPA. One option is to set up a hierarchy of oversight under which building energy code enforcement and implementation practices are monitored at the local level and then reported to the state agency responsible for ensuring that the code is effectively implemented. To track emissions reductions attributable to codes, the state may want to set milestones specifying levels of savings to be achieved in particular years. States should monitor progress with compliance studies and report the results to EPA biennially (79 FR 34837).

Building Energy Code Elements to Include in State Plans

Here are the template elements that a state should consider addressing when incorporating building energy codes in a Clean Power Plan compliance plan. Although various levels of rigor may be required depending on the compliance plan approach adopted, ACEEE recommends that these elements be included to ensure the plan has the best chance of being accepted by EPA. In the following sections we provide (1) guidance on filling in the template elements, and (2) model language based on a hypothetical compliance plan scenario.

Brief Overview of Building Energy Code

- Description of new building energy code adoption process, including the roles of state agencies
- Timeline for code adoption, effective date, and obligated sectors (commercial, residential, public)
- The energy code's role in the state's overall plan approach

Discussion of Measure Technology

- History of building energy codes in the state
- Manner in which codes will yield emissions reductions at affected electric generating units (EGUs)
- Common assumptions surrounding new code adoption and compliance

Quantification of Emissions Benefits Potential

- Methodology for calculating the electricity savings attributable to new code adoption
- General equation for calculating electricity savings
- Description of data assumptions and sources
- Potential effects on emissions of new code adoption

Implementation

- Current status of code implementation in the state
- Existing structures of code implementation
- Entities involved in implementation

Monitoring and Reporting

- Process by which code implementation will be monitored and evaluated
- Entities responsible for monitoring code implementation progress (state/federal/local government, utilities, and so on)
- Sources of relevant data collected from monitoring (square footage, energy consumption, and so on)
- Process for overseeing and reporting on code implementation progress

Enforcement

- Entities legally culpable in the case of noncompliance, failure to implement, or emissions reduction shortfall
- Entities with the jurisdiction to enforce the building energy code
- Process for enforcing the building energy code
- Corrective actions available in case of emissions reduction shortfall, and shortfall remedies

Verification and Quantification

- Verification process for electricity savings attributable to new code adoption
- Entities responsible for verifying code has been complied with and electricity savings have occurred
- Process for reporting verified electricity savings
- Process to be used in quantifying energy savings and emissions reductions

Guidance, Recommendations, and Items to Consider When Compiling Building Energy Code Elements

This section contains detailed instructions and specific questions we recommend that states consider addressing in their compliance plans. Following this is a hypothetical where we provide example responses to these descriptions and questions for the state of Virginia.

Brief Overview of the Building Energy Code

Description of new building energy code adoption process, including the roles of state agencies. Briefly describe the building code being adopted, the process that led to the code taking effect, the entities involved in reviewing and updating codes, and how this process may have been amended in the present context.

The timeline for code adoption, effective date, and the obligated sectors (commercial, residential, public). Give the schedule for reviewing and regularly updating codes, if any. Discuss when the code will go into effect and electricity savings will begin to be counted. Include the building types the specific energy code applies to.

The energy code's role in the state's overall plan approach. Briefly describe the status of the measure in the overall plan. Include how the measure will be enforced relative to other measures, and the role the measure will have in achieving the overall required emissions reductions.

Questions to consider for this section:

- What is the current status of the state's building codes?
- What commitments have state or local governments made under the policy/program?
- How might code enforcement and administration need to change to ensure that the energy savings claimed are being achieved?[122]

Discussion of Measure Technology

The state's history on building energy codes. Include some description of the history of building energy codes in the state, such as energy codes or standards previously adopted and the existence of any prior studies detailing historic electricity savings or emissions reductions attributable to building energy codes.

The manner in which codes will yield emissions reductions at affected EGUs. Explain the measure and how emissions reductions are expected to occur. Discuss how building energy codes reduce electricity consumption and therefore emissions from electricity generation at affected EGUs.

The common assumptions surrounding the new code's adoption. Discuss the common assumptions the state may depend on for quantification purposes. These may include the measure life typically associated with building energy codes, as well as documentation of the typical energy savings seen with the adoption of new codes.

Questions to consider for this section:

- What sectors/buildings does this new code apply to?
- What, if any, code is being replaced?
- How will the newly adopted code reduce EGU emissions?
- Are there any reports or studies describing how building energy codes impact emissions in the state?

[122] Many of these questions are addressed above, but we list them here as well for purposes of completeness.

Quantification of Emissions Benefits Potential

The methodology used in calculating the electricity savings attributable to the new code's adoption. Describe any emissions benefits anticipated from the new code's implementation and the high-level methodology used to arrive at them.

The general equation used in calculating electricity savings. You may base the emissions benefits potential of building energy codes on an equation that takes into account forecasts of new construction, renovations, and additions, as well as a baseline of what electricity consumption would have been under previous code editions. A simple approach might be to rely on utility energy savings estimators or even on already published analysis results such as those created by PNNL for DOE (DOE 2014). If a state wishes to conduct its own calculation, we suggest the following equation as a potential basis for a codes quantification methodology:

Incremental annual electricity savings by building type = (a)(b)(c)(d) + (a)(b)(c)(e)(f)

Where
a = Estimated square footage of new construction affected by code
b = Average electric intensity at 2009 IECC/ASHRAE 90.1-2007 for climate zone
c = Percent electricity savings from new code over 2009 IECC/ASHRAE 90.1-2007
d = Percentage of new construction assumed to be fully compliant
e = Percentage of new construction assumed to be noncompliant
f = Percentage of electricity savings realized in noncompliant buildings[123]

This is just an example, and other equations are also possible. For example, another equation might be (a)(b)(c)(g) where g = the average percentage of electricity savings realized in all buildings.

Description of assumptions and sources. Include detailed assumptions, as well as any supporting documentation. Assumptions should address variables such as compliance rates, lost energy savings from noncompliance, and the effect of interstate electricity flows on the reduction of electricity generation from affected EGUs.[124]

The potential effects of the new code on emissions. Your calculations should result in an estimate of the impact of new building energy codes on electricity consumption and the associated EGU emissions. Document the level of reduced emissions expected from the measure.

Questions to consider for this section:

[123] In this sample quantification approach, we use 2009 IECC/ASHRAE 90.1-2007 as the starting place or baseline against which savings from new codes are measured. EPA has not specified a single baseline that states should use. We believe our approach is a conservative one. Future EPA guidance may provide additional detail on the possibility of states' using a different baseline or earlier code as a starting place.

[124] We discuss this last issue later in this document.

- How will the state treat lapses in code compliance?
- What baseline should be used to calculate electricity savings from the new code?
- What assumptions should be used concerning code compliance, rate of new construction, and percentage electricity savings?
- How will the effect of interstate electricity flows be compensated for?
- Where are data available to prepare an estimate?

Implementation

The current status of code implementation in the state. Explain the current processes used in code implementation in the state, as well as what is necessary for proper program administration.

The existing structures for code implementation. Describe the existing structures for code implementation, including who has authority over whom. Note whether it will be necessary to alter these structures in order to include the measure in the compliance plan submission.

The entities involved in implementation. List any federal, state, and local government agencies and private stakeholders involved in building code enforcement and compliance. Describe the level of responsibility that is assigned to each group.

Questions to consider for this section:

- What are the responsibilities of the parties involved?
- What structures for code implementation already exist?
- Will resources need to be allocated to improve code compliance and enforcement?

Monitoring and Reporting

The process by which code implementation will be monitored and evaluated. Provide specifics on the process the state will use to monitor whether electricity savings and emissions reductions are occurring. Include the means of code inspection and permitting. Set explicit deadlines and timeframes for reporting on code implementation.

The entities responsible for monitoring code implementation progress (state/federal/local government, utilities, and so on). Identify the parties responsible for code inspection and compiling relevant data on code implementation. Include the parties with the legal authority to administer the code.

Sources of data from monitoring (e.g., square footage, energy consumption). Identify where data necessary for quantifying energy code effects on greenhouse-gas emissions will come from. Identify the parties who currently have access to the necessary data, and describe how the state will access and compile these data.

Process for overseeing and reporting on code implementation progress. Identify process to ensure that code inspection is faithfully monitored. Include measures to ensure that affected EGUs regularly collect and report relevant data, and structures for regular reporting from local to state to federal entities.

Questions to consider for this section:

- What agencies will be charged with the task of monitoring energy code implementation and progress?
- Through what channels will reporting on implementation and enforcement take place?
- What agency relationships are necessary to ensure accurate and efficient monitoring and enforcement?

Enforcement

The entities against which the compliance plan will be federally enforceable in the case of noncompliance, failure to implement, or an emissions reduction shortfall. Identify who is responsible for any shortfall in actual versus anticipated emissions reductions. The entities responsible for implementing the code need not be the same as those responsible to EPA in the case of an emissions reduction shortfall. In order to shield third parties (e.g., builders) from federal enforceability, states may opt to take on the responsibility for assuring the federal government that the emissions reductions claimed from the enactment of the code have actually occurred.

The entities with the authority to enforce the building energy code. Identify the entities charged with code inspection and having the authority to issue building permits. Identify the regulations or legislation empowering code officials.

The process to be used in enforcing the building energy code. Identify the structures and processes set in place to ensure that the measure is implemented.

The corrective actions available in case of an emissions reduction shortfall, and shortfall remedies. Identify the measure that will be taken if the building energy code does not achieve the necessary emissions reduction. Explain how the overall plan will be reviewed and adjusted to correct the shortfall. Penalties for failure to correctly implement the code may include denial of permits, prohibition of occupancy, or alteration of the structure to meet the code.

Questions to consider for this section:

- Who has the jurisdiction to enforce the code?
- In states where local jurisdictions have enforcement authority, can a state agency be given an enforcement role?
- What will the process of code inspection and enforcement be?
- What corrective actions may be necessary in order to remedy any shortfall?

Verification and Quantification

The verification process for electricity savings attributable to new code adoption. Outline the process for verifying that the energy savings and emissions reductions potential previously quantified actually occur. You should monitor new construction and may need to take samples of compliance in order to ensure that energy savings are occurring at the scale estimated through modeling. We recommend two options for incorporating the impact of code compliance into quantification of the energy savings from new codes. States could conduct a code compliance study of a sample of new construction to extrapolate the statewide compliance rate. Alternatively, a state may assume some reasonably conservative level of compliance and discount its credited energy savings appropriately. For more information on either of these approaches see Appendix B of *Comments of the American Council for an Energy-Efficient Economy (ACEEE) on the Environmental Protection Agency's Proposed Clean Power Plan* (ACEEE 2014).

The entities responsible for verifying that the code has been complied with and that the stated electricity savings have occurred. Identify which entities (either state agencies, EGUs, utilities, or third parties) have access to building energy code data and who will be responsible for measuring energy savings.

The process for reporting verified electricity savings. Describe the process to be used in reporting verified emissions reductions to both the state and EPA.

The process to be used in quantifying energy savings and emissions reductions. Describe the process for calculating the 2030 emissions reduction attributable to the adoption of building energy codes. Identify how electricity consumption reductions will be translated into emissions reductions.[125]

Questions to consider for this section:

- Who will be responsible for verifying code compliance and implementation?
- How often will emissions reductions be calculated?
- How often will emissions reductions and energy savings be reported?
- How will emissions reductions be quantified?

A Note on Compliance Improvement Activities

Although the potential for energy savings and emissions reductions from improved code compliance may be less than the potential savings from the adoption of new, more stringent building energy codes, compliance improvement may still play a large role in reducing emissions. A 2013 analysis completed by the Institute for Market Transformation (IMT) estimates that improved code compliance alone could account for 2.8–8.5 trillion Btus of energy savings in 2030 (Stellberg 2013).

States may be able to claim credit in their Clean Power Plan compliance plan submissions for emissions reductions attributable to the adoption of new codes, improvement of compliance rates with existing codes, or a mixture of new code adoption and improved compliance. In order to claim emissions reductions from improved code compliance rates, states may need to present documentation to EPA that shows verifiable increases, over time, in the rate of code compliance, as well as calculations supporting the effect of increased compliance on the overall energy savings from codes. These increases in code compliance may be attributable to policies or programs instituted by the state, utilities, or other

[125] This latter question could be the subject of an entire paper. Many approaches are possible, ranging from dispatch modeling at the most complex to a simple rate-based approach provided in the draft Clean Power Plan. In this approach only kWh savings need be calculated, and these savings are factored into an emissions rate with no further emissions calculations needed.

third parties. Many states have already engaged their utilities in code compliance improvement activities. Several states allow utilities to claim energy savings credit under statewide energy savings goals for such activities.[126]

Sample Building Energy Code Submission

For the purpose of demonstration, we have developed the following hypothetical scenario, based in the real code processes and institutions of the Commonwealth of Virginia. In this scenario, Virginia has just recently adopted the latest versions of building energy codes for both its residential and commercial sectors and is seeking credit for the adoption and implementation of these new codes in its Clean Power Plan compliance plan submission.

Adoption and Implementation of the 2015 International Energy Conservation Code for Residential and Commercial New Construction, Renovations, and Additions

The following represents a hypothetical submission by the Virginia Department of Environmental Quality to the United States Environmental Protection Agency (EPA) Region 3 for the crediting of newly adopted building energy codes in reducing greenhouse-gas emissions from electric generating units (EGUs) commensurate with the provisions enumerated in the Clean Power Plan.[127]

Brief Overview of Building Energy Code

Building energy codes reduce the electricity consumption of both residential and commercial buildings through the imposition of efficiency standards on various building components, such as insulation, water heating, lighting, and air conditioning. The Commonwealth of Virginia requires all new construction, as well as major renovations and additions, to comply with Virginia's Uniform Statewide Building Code (USBC) as adopted by the Virginia Board of Housing and Community Development ("the Board"). The USBC is reviewed and updated every three years, with the next scheduled update set for 2017. However, in recognition of the potential for building energy codes to be included in Virginia's Clean Power Plan compliance plan submission, due June 2016, the Board has deemed it prudent to expedite the code update process. Working in conjunction with the Virginia Department of Mines, Minerals, and Energy, the Virginia State Corporation Commissions, and the Virginia Department of Environmental Quality, the Board has reviewed and adopted the 2015 International Energy Conservation Code (IECC), with amendments, as the new mandatory, statewide building energy code for both residential and commercial buildings, as of June 1, 2016, effective July 15, 2016.

The statewide implementation of the 2015 IECC, with amendments, has been included by the Commonwealth of Virginia in its Clean Power Plan compliance plan submission as a state commitment.

[126] Arizona, California, Massachusetts, Minnesota, and Rhode Island. See Misuriello et al. 2012.
[127] To condense this demonstration, we have omitted certain elements that may be required. Specifically, we have not included the calculations, modeling, technical support documents, and other supporting materials that may accompany a formal compliance plan submission.

The enforcement of the 2015 IECC, as well as all other provisions of the USBS, will remain the sole authority of the Commonwealth. Any shortfalls in forecasted emissions reductions shall be enforced against the Commonwealth, should EPA see fit to do so. If necessary, the Commonwealth will enact other measures as appropriate to rectify any lapse in emissions reductions herein attributed to the statewide adoption and implementation of the 2015 IECC. The localities in the Commonwealth shall retain the authority and autonomy to issue building permits, inspect new construction and renovations for code compliance, and perform all tasks otherwise associated with the administration of the USBC.

Discussion of Measure Technology

In 1973 Virginia adopted the first version of the USBC. Prior to the adoption of this mandatory statewide code, local jurisdictions adopted their own codes. Previous editions of the USBC have included reference to the 2000 IECC, ASHRAE Standard 90.1–2004, 2006 IECC, and 2009 IECC. The most recent USBC in effect prior to the adoption of the 2015 IECC was adopted in June of 2014 and referenced the 2012 IECC, with amendments, as the statewide mandatory energy code.

Nationally, building energy code adoption and implementation has provided cost-effective energy savings for decades. Through the reduction of electricity consumption in both residential and commercial buildings, a corresponding amount of electricity generation is avoided from fossil-fuel-fired EGUs. A 2013 assessment of the DOE Building Energy Code Program (BECP) found program activities to have contributed to 2 quads of cumulative energy savings over the 1992–2012 time period. These energy savings were calculated to have resulted in 344 trillion tons of avoided CO_2 emissions from the electric power sector over that same time period (PNNL 2014). Specific to Virginia, a 2012 DOE analysis estimated energy cost savings of 27% when moving from the 2009 IECC to the 2012 IECC.[128] These code improvements maintain an average simple payback of 5.2 years. A final determination on the 2015 IECC, completed by DOE, found on average a 5% reduction in electricity consumption in climate zone 4 with the adoption of the 2015 IECC over the 2012 IECC for both residential and commercial buildings.[129] It is assumed that these electricity savings will accrue over the lifetime of a building, typically 30 years.

Quantification of Emissions Benefits Potential

In order to develop a preliminary estimate of the potential emissions benefits attributable to the adoption of the 2015 IECC, the Commonwealth of Virginia has elected to use the following base equation:

[128] http://www.energycodes.gov/sites/default/files/documents/VirginiaResidentialCostEffectiveness.pdf

[129] Hypothetical number as example of type of backing analysis states should mention

Incremental annual electricity savings by building type = (a)(b)(c)(d) + (a)(b)(c)(e)(f)

Where
a = Estimated square footage of new construction[130]
b = Average electric intensity at 2009 IECC[131]
c = Percent electricity savings from 2015 IECC over 2009 IECC[132]
d = Percentage of new construction assumed to be fully compliant
e = Percentage of new construction assumed to be noncompliant
f = Percentage of electricity savings realized in noncompliant buildings

A 2015 study completed by the Virginia State Corporation Commission found compliance with the 2012 IECC (pass/fail) to be 42–80% for new residential construction and 30–66% for new commercial and large multifamily buildings, depending on jurisdiction. The report found averages of 62% and 44% compliance (pass/fail) for the residential and commercial sectors, respectively. Noncompliant residential structures experienced on average a 15% loss in potential energy savings. Noncompliant commercial structures experienced on average a 22% loss in potential energy savings.[133] For the purposes of this preliminary calculation it has been assumed that compliance will remain at the levels specified in this study for the duration of the projected period. Thus, (d) in the above equation has been assumed to equal 62% for the residential sector and 44% for the commercial sector; (e) is assumed to equal 38% for the residential sector and 56% for the commercial sector; (f) is assumed to be 85% for the residential sector and 78% for the commercial sector. The Commonwealth relies on common practice, citing multiple DOE studies, and assumes that savings persist for 30 years. Additionally, the Commonwealth has assumed that 50% of the electricity savings attributable to the implementation of the 2015 IECC will occur at EGUs out of state. Therefore, the Commonwealth will only be taking credit for half of the potential emissions reductions. Detailed assumptions, as well as modeling spreadsheets, can be found in Appendix A of this submission.

Using the above quantification methodology, the Commonwealth of Virginia estimates the potential total annual electricity savings attributable to the adoption and implementation of the 2015 IECC to be 3,100 gigawatt-hours in 2030. These energy savings were added to the denominator of the Commonwealth's current emissions rate for affected EGUs (1,438 lbs/MWh) as zero-emissions generation (0 lbs/MWh) in order to estimate the potential effect on the attainment of the state's 2030 standard of performance target. This calculation found a potential 108 lbs/MWh reduction in emissions rate attributable to the adoption and implementation of the 2015 IECC.

[130] Including major renovations and additions

[131] As estimated by DOE in the relevant Final Determination for Climate Zone 4

[132] As estimated by DOE in the relevant Final Determination for Climate Zone 4

[133] This is based on a hypothetical study illustrating the type of data that may be necessary to calculate the potential energy savings and emissions reductions attributable to new building energy code adoption.

Implementation

As is typical of building codes in general, measure implementation will be the responsibility of builders, developers, homeowners, and any other groups or entities involved in either commercial or residential construction or renovation. To ensure that those charged with implementation of the 2015 IECC do so at a level that adequately satisfies all provisions of the code, the Virginia Board of Housing and Development has determined it prudent to allocate $200,000 of its annual budget to builder/developer education and building energy code advancement for FY 2017. The Board commits to continuing this allocation for the foreseeable future.[134]

Monitoring and Reporting

The implementation of the 2015 IECC will be monitored by local code officials, as well as local building offices. The number of building permits issued, square footage, and compliance rates, as well as energy consumption, will be tracked and monitored by each jurisdiction, with oversight by the Virginia Board of Housing and Development on monitoring and reporting practices. Plan review and onsite inspection will be performed for each building. Localities will report these data annually to the Board no later than February 15 of each year. The Board will then compile and report the annual totals to the Virginia Department of Environmental Quality no later than March 15. The Virginia Department of Environmental Quality will track the progress of all measures contained in this plan submission, as well as the emissions rates of all affected EGUs, and compile and submit a report on the previous year's progress to the General Assembly, the Governor's Office, and EPA Region 3 headquarters no later than July 1 of each calendar year.[135]

Enforcement

Local and municipal code officials and building offices will maintain the authority to enforce the 2015 IECC, as well as all provisions of the USBC. Building plans will be scrutinized to ensure all provisions of the code are addressed. Should a building fail to meet the 2015 IECC upon final inspection by a state-certified code official, 90 days will be given to bring the structure into compliance. Should the structure fail to reach compliance after 90 days, occupancy of the structure will be prohibited until that time that the builder can show that the structure meets all provisions contained in the USBS. The Virginia Board of Housing and Community Development will maintain oversight over code enforcement, issuing a biennial report on the status of code enforcement at the local level beginning in 2017.

Should the pace of new construction fail to meet that which was assumed in the calculation of potential emissions benefits contained herein, or any other lapses in implementation occur that cause the

[134] This is a hypothetical allocation. In order to assure the effective implementation of the building energy code, states may wish to empower builders and developers through education and training.

[135] This process does not reflect current practices. It is a suggestion of what EPA may require to show that a state is faithfully executing plan progress monitoring.

electricity savings and emissions reductions attributable to the 2015 IECC to fall short of those claimed in this compliance plan, the Virginia Department of Environment, working with the Board of Housing and Community Development, as well as the State Corporation Commissions, will reevaluate the provisions contained in this submission and enact the necessary measures to make up the shortfall.

Verification and Quantification

In order to verify that the electricity savings estimated from the adoption of the 2015 IECC occur, local building offices will perform site visits upon completion of construction to ensure that the structure is in compliance. A sample of newly constructed buildings will be monitored each year for site electricity consumption, which will then be compared to that of a similarly constructed building at the 2009 IECC. The results of complex modeling, based on actual new construction rates across the Commonwealth, will be used to extrapolate based upon the results of the monitored sample. All electricity savings found using these methods will be discounted by 50% in order to account for the effects of interstate electricity flows.[136] The Board of Housing and Community Development will be responsible for conducting regular oversight of local verification practices.

Working with the Board, the Virginia Department of Environmental Quality will report to the Virginia General Assembly, the Governor's Office, and EPA Region 3 headquarters on the level of verified electricity savings biennially, no later than July 1 of the calendar year, beginning in 2017.

References

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Navigating the Clean Power Plan: A Template for Including Combined Heat and Power in State Compliance Plans

ACEEE, 2015, Navigating the Clean Power Plan: A Template for Including Combined Heat and Power in State Compliance Plans http://aceee.org/sites/default/files/chp-cpp-template.pdf

At a Glance

The US Environmental Protection Agency's (EPA's) proposed Clean Power Plan establishes state-specific emissions targets for carbon dioxide emissions from existing power plants (EPA 2014a). The proposed plan allows states to use end-use energy efficiency as a primary means to comply with the emissions targets.

Combined heat and power (CHP) is an energy-efficient method of generating both electricity and useful thermal energy in a single, integrated system. Emissions reductions from CHP can be a key component of a state's strategy for cost effectively reducing emissions from its power sector. In a recent report, ACEEE found that more than 68 million megawatt-hours (MWh) of electricity could be saved nationwide in the year 2030 from installing new CHP, representing approximately 18 gigawatts (GW) of avoided capacity (Hayes et al. 2014). These energy savings could cut carbon dioxide emissions and offset the need for about 36 coal-fired power plants. These reductions in electricity consumption would help states reduce greenhouse gas emissions by approximately 46 million metric tons in 2030 (see EPA 2014b).

CHP could earn credit in a Clean Power Plan compliance plan in various ways, depending on how a state chooses to structure the plan. This template is designed to account for the various ways CHP might be treated and to act as a resource to help states document and claim emissions reductions as a compliance pathway for the Clean Power Plan. It includes:

5. A discussion of the guidance, precedent, and themes relied on to develop this template
6. A list of the components states should address in order to claim emissions reduction credit for CHP
7. Specific recommendations on how to address these components
8. A hypothetical case study of a state that includes adoption of CHP in its compliance plan

This work product is not intended as an exhaustive representation of what EPA or EPA regional offices will require for the inclusion of CHP in a Clean Power Plan compliance plan. Rather, it offers a conceptual framework on which to build. In drafting this document, we have relied on the provisions in the proposed rule as well as on guidance on and past precedent for the treatment of energy efficiency under other provisions of the Clean Air Act. The final rule could change, and EPA could opt to develop different processes for the treatment of energy efficiency.

Section 1: Guidance and Precedent Relied On to Develop This Document

At the time this document was developed, the Clean Power Plan was still a proposed rule that offered limited guidance on what a state's compliance plan will need to include (EPA 2014a). In Section VIII, Part C of the Clean Power Plan, EPA outlines four general criteria it will use to evaluate state plans and emissions reduction measures:

5. The plan as a whole is projected to achieve the emissions standard.
6. The emissions reductions from compliance measures are quantifiable and verifiable.
7. Each measure has a clear process of reporting on implementation.
8. The measures contained in the plan are enforceable.[137]

These criteria are similar to those EPA has used to judge the adequacy of a state implementation plan (SIP).[138] A SIP is a plan states are required to develop and submit to EPA to meet National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment.[139] The state compliance plan required under Section 111(d) for carbon pollution is not the same as a SIP, and Section 111(d) plans afford states greater flexibility in achieving compliance (James and Colburn 2015).[140] Still, some of the similarities between SIPs and 111(d) compliance plans may be informative. For example, in its guidance for the incorporation of energy efficiency measures into SIPs for NAAQS, EPA described how to ensure that end-use energy efficiency is enforceable, quantifiable, and verifiable; how to project the emissions impacts of an efficiency policy; and how to report on the implementation of that policy (EPA 2012a). We have reviewed several approved SIPs to understand how states have successfully documented and obtained emissions credit for energy efficiency policies, but states have yet to incorporate CHP into an approved SIP. Here, we rely on the guidance in the proposed rule and existing EPA guidance on documenting and crediting energy efficiency and CHP in SIPs to develop a recommended approach that states can use to include CHP in their Clean Power Plan compliance plans.[141]

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137 The text of the proposed Clean Power Plan was published in Volume 79 of the *Federal Register* on June 18, 2014 (EPA 2014a). Readers can access the complete text here: http://www.gpo.gov/fdsys/pkg/FR-2014-06-18/pdf/2014-13726.pdf. Section VIII, Part C can be found on page 34909.

138 Although these four criteria are similar to the elements required in state implementation plans (SIPs) for National Ambient Air Quality Standards (NAAQS), "approvability criteria for [Clean Air Act] section 111(d) plans need not be identical to approvability criteria for SIPs" (EPA 2014a, 34909).

139 The Clean Air Act requires EPA to set NAAQS for pollutants considered harmful to public health and the environment. These standards regulate six common air pollutants (known as "criteria pollutants"): ozone, particulate matter, carbon monoxide, nitrogen oxide, sulfur dioxide, and lead.

140 The Regulatory Assistance Project (RAP) details the difference between 111(d) plans and SIPS and offers recommendations for states to take advantage of the flexibility afforded under 111(d) (James 2015).

141 See discussion of CHP in EPA 2012a, Appendix I.

The Clean Power Plan provides states with a great deal of flexibility, and the method outlined in this document is not the only one a state may use. We have followed EPA precedent to develop a conservative approach that may be more rigorous and complex than what is ultimately required for compliance. States may use much simpler options, and EPA will likely provide further guidance in the future on additional options.[142]

In the remainder of this section, we apply the established approaches and existing guidance to the four criteria above. This high-level discussion touches on several of the major themes that contribute to the recommended elements (Section 2), specific recommendations (Section 3), and example language (Section 4).

Projected Achievement of Emissions Standard

State compliance plans must show that included measures will reduce the emissions rates of regulated power plants to the required standard of performance. This means states that choose to include CHP in their compliance plans must demonstrate how CHP will contribute to its achievement of the emissions standard and by how much.

There are various ways in which CHP might figure in a state's compliance plan and help it achieve its emissions standard. The state could simply expand upon existing state and utility programs, or it could develop new initiatives. Program options could include one or more of the following:

- Implement a program or policy that results in CHP deployment such as an incentive, feed-in tariff, rebate, or other financial assistance program for CHP targeted at utility customers
- Include CHP as an eligible resource in a state energy efficiency resource standard (EERS) or renewable portfolio standard (RPS)

What Are CHP Programs and Policies?

States have engaged a variety of policies and programs to support CHP. Here are a few examples.

Interconnection standards and procedures. Statewide technical standards that provide straightforward and streamlined procedures for connecting to the transmission and distribution network support CHP deployment.

Energy savings targets. Allowing CHP to qualify as an eligible measure in state energy savings standards (such as an EERS) can drive investments in CHP.

Financial assistance. Incentives, grants, and loan programs help eliminate barriers to CHP deployment.

Standby rates. Fair and equitable backup, standby, and supplemental power utility rates can encourage CHP.

Streamlined permitting. "Fast-track" air permitting for qualified systems and output-based emissions standards can encourage CHP deployment and more fairly calculate CHP's efficiency benefits.

Technical assistance. Assistance for engineering or

[142] See Colburn, James, and Shenot 2015 for a discussion of simpler approaches.

- Develop an annual CHP target that requires utilities to obtain a certain percentage of annual sales from CHP in a given year or by a certain year
- Develop a market-based trading program that recognizes CHP
- Enter into bilateral contacts with third parties for CHP generation

More options than those listed here are possible. States should carefully evaluate the full set of available options and choose a structure that fits best within its current context.

In their Clean Power Plan compliance plan submissions, states may be able to claim credit for emissions reductions attributable to both new and existing CHP systems. For an existing system that dispatches to the grid, a state might seek credit for increasing the hours of operation or switching the system to a lower-carbon fuel. It appears EPA intends to credit existing renewable energy systems, but it is not clear if existing CHP systems will receive the same treatment. For more information on the treatment of existing and new CHP in the Clean Power Plan and various approaches to calculating emissions reductions, see ACEEE 2014, Appendix C.[143]

To determine how much CHP will contribute to the achievement of the emissions standard, each state will need to develop a reasonable estimate of the energy savings or avoided emissions it expects to achieve with CHP. These projections will vary by state, sector, and the operating characteristics of the system, such as the power-to-heat ratio and how much it is scheduled to run. States can obtain operational and performance data for various types of CHP technologies from agencies such as the EPA Combined Heat and Power Partnership and the US Department of Energy's (DOE's) CHP Technical Assistance Partnerships (TAPs).[144] States may work with their affiliated TAP or private consultants to produce a potential study that discusses the application of CHP technologies in their state; this would provide useful data for compliance planning.[145] To develop an estimate of expected energy savings, EPA recommends starting with local energy experts and agencies, including public utility commission staff and state or local energy offices that may help in this regard (EPA 2012a).[146]

ICF International has published estimates of technical and economic potential for CHP under several scenarios on a state-by-state basis (ICF 2013a), and this may offer useful guidance to states. In a recent report, ACEEE adapted ICF's technical potential estimates and estimated effective electricity savings (MWh) resulting from the expected installation of new, cost-effective CHP systems by 2030 in each state (Hayes et al. 2014). States may wish to use these potential estimates as a starting point, possibly

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[143] For more discussion on different categories of CHP in the context of the Clean Power Plan, see Spurr 2015.

[144] Operational and performance data are available from EPA CHP Partnership 2015a. More information about EPA's CHP Partnership (2015c) is available at: http://www.epa.gov/chp/. More information about DOE's CHP TAPs (DOE 2015) is available at: http://energy.gov/eere/amo/chp-technical-assistance-partnerships-chp-taps.

[145] An example of such a study, prepared in 2010 for the state of Maryland by the US DOE Mid-Atlantic Clean Energy Application Center (2010), is available at http://energy.maryland.gov/empower3/documents/MarylandCHPMarketAnalysis.pdf.

[146] See EPA 2012a, Appendix I, p. 12.

adjusted on the basis of past experience, a recent potential study, the adoption of new policies, or a conservative estimate. In Section 4 of this document, we provide a sample calculation for quantifying electricity savings from CHP for states' consideration. These estimates can later be trued up with actual savings, a process that generally involves direct measurement of CHP system output using an approved metering technology.

The state is also required to ensure that forecasted emissions reductions actually occur within the designated time frame. One way to ensure this is to adopt measures that will have lasting effects on emissions. The technical lifetime of a CHP system is generally 15 to 20 years, depending on variations in technology and application. The state should take action to ensure that CHP systems continue to operate at expected efficiencies and anticipated run times. The latter may be more difficult as utilization of CHP fluctuates with seasonal and/or production demand and with variations in energy price. CHP systems are likely to operate at high capacity factors after they are built to maximize the upfront investment. One way states can help assure the CHP system remains economical to run is to design a program that incentivizes continued operation with performance-based payments. Capital incentives for installation ($/kW) will ensure that CHP systems are constructed and operational, while incentives for performance ($/kWh) will help ensure that systems operate at or near the capacity factor assumed in an emissions reduction estimate. Binding legislation or regulations can also ensure that programs to support CHP stay in place over time. For example, a state that currently does not have an EERS or RPS could consider establishing these policies as frameworks for ensuring long-term continuity.

Quantifiable and Verifiable Emissions Reductions

State plans must detail how emissions reductions will be quantified and verified. According to SIP guidance, in order for a measure to be considered "quantifiable," it must have a measureable, replicable effect on emissions (EPA 2012a). The Clean Power Plan contemplates methods for quantifying the impact of an efficiency policy by measuring energy savings and converting those savings into an emissions impact. In the case of CHP, more than one methodology for quantifying emissions savings from CHP may be permissible (EPA 2012b). Energy savings and emissions reductions may be quantified and verified through direct measurement or another technically sound method that is both reliable and replicable. We recommend that a state identify a protocol for verifying the electricity savings and associated emissions reduction from CHP.

In general, CHP reduces power sector emissions by shifting electric load away from conventional power plants to the CHP unit (typically near the point of use) while moderately increasing fuel consumption at the CHP unit. Due to the avoided transmission and distribution losses and the overall efficiency of cogenerating heat and power, CHP results in primary fuel savings. Overall fuel savings can be determined by subtracting the fuel used to power a CHP site's electrical and thermal generation from the fuel that would have been used to provide the same energy services with separate heat and power (i.e., central station generation and onsite thermal generation).

The EPA Combined Heat and Power Partnership has published a simple methodology for calculating fuel savings and carbon dioxide emissions savings from CHP (EPA 2012b). Based on this method, the EPA developed a CHP Emissions Calculator, an online tool to help states estimate emissions impacts from a particular CHP project or group of projects (EPA CHP Partnership 2015d). EPA's calculator may be useful to states in estimating CHP emissions savings, although some critical assumptions are required.

More recently, EPA released the Avoided Emissions and Generation Tool (AVERT), another online instrument that can be used to estimate the energy and emissions characteristics of displaced grid power (EPA 2015). AVERT provides a more sophisticated approximation of avoided central station generation and performs emissions displacement calculations based on historical hourly emissions rates for electric-generating units for 10 regions of the country.

States should consider using software capable of modeling the effects of CHP on electricity consumption from the grid. A variety of key variables need to be considered when devising methods for modeling emissions reductions from CHP. The nature of the generation from the electricity grid that the CHP system is avoiding is one of the most important factors in accurately calculating energy and emissions savings from CHP. Without dispatch modeling, characteristics of displaced grid electricity can be reasonably approximated using Emissions and Generation Resource Integrated Database (eGRID) heat rates and emissions factors for the electric grid of the subregion where a given CHP system is located. The EPA CHP Partnership recommends selecting the eGRID subregion all fossil generation emission factor and heat rate for baseload CHP systems (i.e., those operating at least 6,500 hours annually) or the non-baseload emission factor and heat rate for CHP systems operating fewer than 6,500 hours annually (EPA 2012b).[147]

Process for Reporting on Plan Progress and Corrective Actions

For a measure to be deemed acceptable for inclusion in a state compliance plan, it should include a process for reporting its performance and implementation to EPA. One option is to set up a system for measuring the output of individual CHP systems using meters at the facility level. Facilities would report measured output data back to the agency responsible for monitoring the implementation of the CHP program or policy. States should monitor progress, which can be done by direct measurement, and report the results to EPA biennially (EPA 2014a, 34837).

Enforceability

The exact meaning of enforceable in the context of the Clean Power Plan is still uncertain.[148] In spite of this uncertainty, some general principles are likely applicable if a measure is ineffective and fails to achieve the emissions reductions it is supposed to. Methods to establish that a measure is enforceable to EPA's satisfaction might include the authority to levy penalties or force corrective action, or an

[147] On 6/8/2015 the author corrected the wording of this sentence originally published on 6/2/2015.

[148] EPA sought comment on this issue in the Clean Power Plan (EPA 2014a, 34909).

obligation on the state's part to make up any shortfall (EPA 2014a, 34909). Therefore, if a measure is to be federally enforceable, a state would likely need to commit to evaluating its effectiveness. Establishing enforceability has historically involved demonstrating that a measure is mandatory and that legal authority has been granted by legislation and/or regulations to the relevant governing body (EPA 2012a).

In general, a key to enforceability is having a responsible party that will face penalties or find additional emissions reductions to compensate for a shortfall. A measure may be federally enforceable when the state or affected power plants are directly obligated by law to implement it. However it is possible that measures could be enforceable against third parties, such as utility companies or individual CHP system owners who may be responsible for operating a certain number of hours per year. States must consider where they want this obligation to fall and should consult the final rule for additional guidance. One option for states to consider is to shield CHP system owners from federal enforceability by agreeing to meet any shortfall in anticipated emissions reductions through other energy efficiency policies or measures as part of a larger portfolio. Including a diverse portfolio of measures in a state compliance plan reduces the risk of failing to reach the emissions goal. While some elements of a portfolio may underperform, others may overperform, helping to safeguard states from concerns about enforceability.

Section 2: Combined Heat and Power Template Components to Include in State Plans

The following list outlines seven overarching template components and a series of corresponding subcomponents that a state should consider addressing when incorporating CHP in a Clean Power Plan compliance plan. Although various levels of rigor may be required, depending on the approach adopted, ACEEE recommends that these elements be included to give the plan the best chance of being accepted by EPA. In the sections that follow this list, we provide more detailed guidance on filling in the template inputs and a case study with language for a hypothetical compliance plan.

Brief Overview of CHP Compliance Measure

- Description of CHP measure, including the roles of state agencies
- Time line for the CHP compliance measure, effective date, and any obligated sectors (industrial, commercial, governmental)
- CHP's role in the state's overall plan

Discussion of Measure Technology

- History of CHP in the state
- Manner in which CHP will yield emissions reductions at affected electric generating units (EGUs)
- Common assumptions surrounding CHP

Quantification of Emissions Benefits Potential

- Methodology for calculating the electricity savings attributable to CHP
- Equation for calculating electricity savings
- Data assumptions and sources
- Potential effects of CHP on emissions

Implementation

- Status of CHP in the state
- Existing frameworks for CHP implementation
- Entities involved in implementation

Monitoring and Reporting

- Process by which CHP will be monitored and evaluated
- Entities responsible for monitoring CHP compliance (facility, utility, state agency, federal agency, and so on)
- Sources of relevant data collected from monitoring (fuel input, net MWh output, net useful heat output, and so on)
- Process for overseeing and reporting on CHP

Enforcement

- Entities legally responsible in the case of noncompliance, failure to implement, or emissions reduction shortfall
- Entities with the jurisdiction to enforce CHP compliance measure
- Process for enforcing CHP compliance measure
- Corrective actions available in case of emissions reduction shortfall, and shortfall remedies

Verification and Quantification

- Verification process for electricity savings attributable to CHP
- Entities responsible for verifying that electricity savings have occurred
- Process for reporting verified electricity savings
- Process to be used in quantifying energy savings and emissions reductions

Section 3: Instructions and Recommendations for Addressing Template Components

This section contains detailed instructions and specific questions we recommend that states consider addressing in their compliance plans. Following this is a hypothetical in which we provide example responses to these instructions and questions for the state of Mississippi. This example does not represent any commitment or intention on the part of Mississippi; rather, it illustrates the process by which Mississippi or any other state could effectively incorporate CHP as part of its compliance plan.

Brief Overview of CHP Compliance Measure

Description of CHP compliance measure, including the roles of state agencies. Briefly describe the CHP facility, program, or policy for which the state is seeking credit, the process that led to the measure's taking effect, the entities involved in evaluating CHP compliance options and setting parameters, and how this process may have been amended in the present context.

The time line for the CHP compliance measure, effective date, and obligated sectors (industrial, commercial, governmental). Discuss when the CHP measure will go into effect and electricity savings will begin to be counted. If adopting a new CHP policy or program, include which customer class the program or policy targets.

CHP's role in the state's overall plan. Briefly describe the status of the measure in the overall plan. Include how the measure will be enforced relative to other measures, and the role the measure will have in achieving the overall required emissions reductions.

Questions to consider for this section:

- What is the status of CHP deployment in the state?
- What commitments have state or local governments made under the policy/program?
- How might CHP program administration and enforcement need to change to ensure that the energy savings claimed are being achieved?[149]

Discussion of Measure Technology

The state's history on implementation of CHP. Include some description of the existing CHP capacity in the state and any existing laws, policies, or programs relevant to CHP deployment. A description of existing capacity may include information on system size, range, fuel, site, and sector. Refer to any prior studies detailing historic electricity savings or emissions reductions attributable to CHP programs or policies.

The manner in which the CHP compliance measure will yield emissions reductions at affected EGUs. Explain the measure and how emissions reductions are expected to occur. Discuss how CHP shifts electric load away from conventional power plants and burns less fuel overall to reduce electricity consumption and emissions from electricity generation at affected EGUs.

The common assumptions surrounding CHP. Discuss the common assumptions the state may depend on for quantification purposes. Assumptions could be related to CHP system, size ranges, technologies, fuel types, or system efficiencies. A description of how savings from CHP systems will be rewarded may be

[149] Many of these questions are addressed above, but we list them here as well for completeness.

included, as well as documentation of the typical energy savings seen with the implementation of CHP policies and programs.

Questions to consider for this section:

- What sectors/entities does this compliance measure apply to?
- What, if any, existing CHP policies or programs are modified or replaced?
- How will the CHP compliance measure reduce EGU emissions?
- Are there any reports or studies describing how CHP impacts emissions in the state?

Quantification of Emissions Benefits Potential

The methodology used in calculating the electricity savings attributable to CHP. Describe any emissions benefits anticipated from the CHP compliance measure and the high-level methodology used to arrive at them.

The general equation used in calculating electricity savings. You may base the emissions benefits potential of CHP on an equation that takes into account forecasts of new CHP installations, as well as a baseline of what electricity consumption would be without implementation of the proposed CHP compliance measure. Another approach might be to rely on energy savings estimates provided by utilities or published estimates of state CHP potential such as those conducted by ICF International or ACEEE (ICF 2013a; Hayes et al. 2014). The simplest approach could be to obtain or commission a potential study that includes a forecast of associated savings for compliance purposes. If a state wishes to conduct its own calculation, we suggest the following method as a possible basis for estimating the energy savings from CHP:

Step 1. Determine total electricity output (MWh) from the CHP measure (either a single system or a fleet of systems in the state).

Step 2. Determine a discounted portion (%) of electrical output that should be attributed to a CHP measure as “avoided generation” from the grid. In spite of being highly efficient, CHP systems still generate some carbon dioxide emissions. Rather than credit 100% of the MWh generated as “avoided generation,” a state can use the following steps to discount the amount of electricity generated by CHP for crediting purposes.

- *Step 2a*. Calculate an incremental CHP emissions rate for the CHP measure (either a single system or a fleet of systems in the state).

- *Step 2b*. Calculate a percentage by which the MWh of CHP generation should be discounted by comparing the incremental CHP emissions rate with the state’s 2012 fossil emissions rate.

Step 3. The result of Step 2 is the percentage of CHP electric output that is eligible for credit. Multiply total electricity output (MWh) from Step 1 by the percentage from Step 2. This yields the projected electricity savings that should be credited to the CHP measure.

This is just an example, and other methodologies and calculations are possible. For example, some CHP programs may consider the total amount of electric output from CHP as equivalent to the amount of avoided grid generation. However this one-for-one approach does not account for the incremental increase in fuel use and incremental CO_2 emissions at the CHP facility.

Data assumptions and sources. Include detailed assumptions and any supporting documentation. Assumptions could include values for variables such as the estimated hours of operation for the measure, the efficiency of the avoided boiler, the average heat rate for the CHP measure and for the local grid, and fuel-specific emissions factors.[150] Assumptions could also include the effect of interstate electricity flows on the reduction of electricity generation from affected EGUs.[151] States should include detailed descriptions of any assumptions, default values, and/or modeling results with their submissions.

The potential effects of CHP on emissions. Your calculations should result in an estimate of the impact of the CHP compliance measure on electricity consumption and the associated EGU emissions. Document the level of reduced emissions expected from the measure by clearly showing how you arrived at your estimate. This may include attaching detailed spreadsheets or model results.

Questions to consider for this section:

- How will the state treat or make up for shortfalls in expected savings?
- What baseline forecast of energy use should be used to calculate electricity savings from the CHP compliance measure?
- What assumptions should be used in CHP compliance measure development?
- How will the effect of interstate electricity flows be accounted for?
- Where are data available for use in preparing an estimate?

Implementation

The status of CHP in the state. Explain the current processes for implementing the CHP compliance measure in the state, as well as what is necessary for proper program administration. This may include identifying the entities responsible for constructing and operating a CHP facility. If the compliance measure is the adoption of a policy or program, this may include identifying who is responsible for reviewing applications for program eligibility, approving or denying CHP projects, conducting site

150 The term “heat rate” is often used to express the efficiency of electric generators and is represented in terms of Btus of fuel consumed per kWh of electricity generated. The heat rate of a CHP system varies by type of fuel input and technology.

151 We discuss this last issue later in this document.

inspections, and reviewing monthly or annual operating data to ensure technical performance requirements are met.

The existing structures for CHP implementation. Describe the existing structures for CHP implementation, including who has authority over whom. Note whether it will be necessary to alter these structures in order to include the measure in the compliance plan submission.

The entities involved in implementation. List any federal, state, and local government agencies and private stakeholders involved in implementation or administration of the CHP compliance measure. Describe the level of responsibility that is assigned to each group.

Questions to consider for this section:

- What are the responsibilities of the parties involved?
- What structures for CHP construction or program administration already exist?
- Will resources need to be allocated to improve program implementation and administration?

Monitoring and Reporting

The process by which CHP will be monitored and evaluated. Provide specifics on the process the state will use to monitor electricity savings and emissions reductions. Include the protocols for monitoring and data collection. Some monitoring procedures and metering equipment may be consistent with and not additional to separate requirements for obtaining a valid air permit. Set explicit deadlines and time frames for reporting on CHP system performance.

The entities responsible for monitoring CHP compliance (system owner, utility, state agency, federal agency, and so on). Identify the parties responsible for compiling relevant data on compliance and CHP system or program performance. Include the parties with the legal authority to administer the compliance measure.

Sources of data from monitoring (e.g., fuel input, electricity output, useful heat output, and so on). Identify where data necessary for quantifying effects of CHP on greenhouse gas emissions will come from. Identify the parties who currently have access to the necessary data, and describe how the state will access and compile these data.

Process for overseeing and reporting on CHP. Identify a process to ensure that CHP performance is faithfully monitored. Include measures to ensure that affected EGUs regularly collect and report relevant data, and describe structures for regular reporting from local to state to federal entities.

Questions to consider for this section:

- What agencies will be charged with the task of monitoring implementation of the measure?
- Through what channels will reporting on implementation and enforcement take place?
- What will be the process for reviewing annual reporting data?

- What agency relationships are necessary to ensure accurate and efficient monitoring and enforcement?

Enforcement

The entities against which the compliance plan will be federally enforceable in the case of noncompliance, failure to implement, or an emissions reduction shortfall. Identify who is responsible for any shortfall in actual versus anticipated emissions reductions. The entities responsible to EPA in the case of an emissions reduction shortfall are not necessarily the same as those responsible for implementing the measure. States may consider taking on the responsibility for assuring the federal government that the emissions reductions claimed from CHP have actually occurred. Monitoring progress over time and having a plan in place to make necessary adjustments reduces the risk of an emissions reduction shortfall.[152]

The entities with the authority to enforce the CHP measure. Identify the entities charged with enforcing the measure. Identify regulations or legislation empowering the enforcing entity.

The process to be used in enforcing the CHP measure. Identify the structures and processes set in place to ensure that the measure is implemented and entities subject to the measure are acting within the requirements for compliance.

The corrective actions available in case of an emissions reduction shortfall, and shortfall remedies. Identify the action that will be taken if the CHP measure does not achieve the necessary emissions reduction. Explain how the overall plan will be reviewed and adjusted to correct the shortfall. Penalties for failure to comply might include the issuance of a plan for correction of noncompliance or levying of a fee for noncompliance.

Questions to consider for this section:

- Who has the jurisdiction to enforce the measure?
- What will be the process for enforcing the measure?
- What corrective actions may be necessary in order to remedy any shortfall?
- Who is responsible for remedying any shortfall?

Verification and Quantification

The verification process for electricity savings attributable to CHP. Outline the process for verifying that the energy savings and emissions reductions potential previously quantified actually occur. Explain how annual reporting data will be used to demonstrate savings.

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[152] EPA requested comment on multiple options for handling enforcement, and we anticipate clear guidance on this issue in the final rule. Including a diverse portfolio of measures in a state compliance plan may reduce the risk of an emissions reduction shortfall.

The entities responsible for verifying that the stated electricity savings have occurred. Identify which entities (state agencies, EGUs, utilities, or third parties) have access to CHP performance data and who will be responsible for measuring energy savings.

The process for reporting verified electricity savings. Describe the process to be used in reporting verified emissions reductions to both the state and EPA.

The process to be used in quantifying energy savings and emissions reductions. Describe the process for calculating the 2030 emissions reduction attributable to the CHP measure. Identify how electricity consumption reductions will be translated into emissions reductions. This latter question could be the subject of an entire paper. Many approaches are possible, ranging from dispatch modeling at the most complex to a simple denominator adjustment reflecting MWh savings, as provided in the draft Clean Power Plan. In the latter approach, only MWh savings need be calculated, and these savings are factored into the state's emissions rate with no further emissions calculations needed.

Questions to consider for this section:

- Who will be responsible for verifying that the CHP measure is operating as mandated?
- How often will emissions reductions be calculated?
- How often will emissions reductions and energy savings be reported?
- How will emissions reductions be quantified?

Section 4: Sample Case Study for Combined Heat and Power in a State Compliance Plan

For the purpose of demonstration, we have developed a hypothetical scenario based on the real processes and institutions of the state of Mississippi. This example does not represent any commitment or intention on Mississippi's part, but illustrates how Mississippi or any other state could effectively incorporate CHP as part of its state compliance plan. In this scenario, Mississippi has established a goal of increasing CHP capacity from its current capacity by the year 2030 and is seeking credit for the implementation of this program in its Clean Power Plan compliance plan submission.

Adoption and Implementation of a Statewide Energy Savings Target for Combined Heat and Power

The following represents a hypothetical submission by the Mississippi Department of Environmental Quality (MDEQ) to EPA Region 4 for the crediting of new combined heat and power requirements in reducing greenhouse-gas emissions from EGUs under the provisions of the Clean Power Plan.[153] This

[153] To condense this demonstration, we have omitted certain elements that may be required. Specifically, we have not included all calculations, modeling, technical support documents, and other supporting materials that may accompany a formal compliance plan submission.

hypothetical scenario was created solely by ACEEE with no contribution from any agency from the state of Mississippi.

Brief Overview of the CHP Compliance Measure

CHP reduces power sector emissions by shifting electric load away from conventional power plants to the CHP unit. With the establishment of a goal to increase CHP capacity by approximately 40% from the current 514 MW by 2030, the state will reduce the electricity consumption of electric generating units in Mississippi.[154]

The Energy and Natural Resources Division of the Mississippi Development Authority (MDA), in cooperation with the Mississippi Department of Environmental Quality (DEQ) and the Mississippi Public Service Commission (MSPSC), shall determine the percentage of annual electricity sales each retail supplier shall obtain from CHP resources based on a study of the potential for CHP in the suppliers' service territories.[155] As part of achieving this goal to increase CHP capacity, retail electricity suppliers shall provide financial assistance to customers installing and operating CHP systems. All retail electricity suppliers have filed plans for meeting CHP energy savings requirements. All plans were approved by the state as of June 1, 2016, and are effective January 1, 2017.

The implementation of the Statewide Energy Savings Target for CHP has been included by the state of Mississippi in its Clean Power Plan compliance plan submission as a state commitment. The enforcement of the requirements will remain the sole authority of the state. Any shortfalls in forecasted emissions reductions shall be enforced against the state, should EPA see fit to do so. If necessary, the state will enact other measures as appropriate to rectify any lapse in emissions reductions herein attributed to the statewide adoption and implementation of the Statewide Energy Savings Target for CHP. MDA's Energy and Natural Resources Division has the authority to implement and administer the program, and electricity service providers shall have retail autonomy to perform all tasks otherwise associated with the program, with regulatory approval where applicable.

Discussion of Measure Technology

Mississippi has experience developing CHP projects in the state. There are currently 20 CHP units representing approximately 514 MW of existing operating CHP capacity in the state (ICF 2013b). The first CHP system in Mississippi came online in 1951; it is owned by the Transcontinental Gas Pipeline Corporation. The largest system (approximately 168 MW) is a natural gas combustion turbine owned by

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154 This is a hypothetical goal that could be implemented in Mississippi through either administrative or legislative action. Each state will need to identify the best means by which to implement the compliance measure, depending on its specific circumstances. For example, in Mississippi, the Mississippi Development Authority administers the state's existing CHP program and may be the best entity to implement the goal. The Mississippi Public Service Commission does not have jurisdiction over all electric service providers in the state.

155 States will need to conduct a target-setting exercise based on available data (such as existing CHP capacity) and a study of potential savings from new CHP installations.

Mississippi Power and operating at the Chevron Oil Refinery. Of the 514 MW of installed capacity, 484 MW, or about 94%, was installed prior to the year 2000. The most recent installation was the Jones County Poultry Digester, a 1.5 MW farm-scale biogas system installed in 2010. Existing capacity primarily serves Mississippi's pulp and paper (57%) and refining (31%) industries.

CHP is eligible for a low-interest loan through one of the state's existing programs, the Energy Efficiency Revolving Loan Fund, which MDA administers to encourage the implementation of a broad list of energy efficiency measures, including CHP. However no CHP project has applied for a loan through the program to date. The Statewide Energy Savings Target for CHP does not replace this MDA-administered loan program, though these programs may have a compounding effect.

Nationally, CHP has provided cost-effective energy savings for decades. Through a reduction of electricity consumption at industrial, commercial, and government facilities, a corresponding amount of electricity generation is avoided from fossil fuel–fired EGUs. According to a 2012 EPA and DOE analysis, the existing 82 gigawatts (GW) of installed CHP capacity in the United States saves 1.8 quadrillion Btus each year, which is about 2% of US annual energy use. These energy savings are calculated to result in a reduction of 240 million metric tons of CO_2 emissions each year (EPA and DOE 2012).

Specific to Mississippi, a 2013 analysis conducted by ICF International for the American Gas Association found 274 MW of natural gas–fueled CHP potential in the state with a simple payback of 5 to 10 years. The study found an additional 1,086 MW of natural gas–fueled CHP potential with a simple payback greater than 10 years. State policies and incentive programs such as the Statewide Energy Savings Target for CHP will improve the return on investment for financing CHP systems and increase the economic potential for CHP in Mississippi. A 2016 potential study, completed for the state by the DOE's Southeast CHP TAP, evaluated the potential impact of the proposed policy.[156] The study found the Statewide Energy Savings Target for CHP would result in at least 200 MW of additional installed capacity by 2030.

The Statewide Energy Savings Target for CHP creates an obligation for all retail electricity providers to acquire CHP certificates equal to a set percentage of annual retail electricity sales (MWh).[157] Qualified CHP units generate certificates that are sold to obligated electricity providers, creating an incentive for Mississippi's commercial, industrial, and governmental customers to install energy-efficient CHP systems and reduce energy use in the state. Certificates from CHP are counted toward the electric providers'

[156] This is a hypothetical study.

[157] The state of Mississippi does not presently have such a policy. A similar policy structure exists in Massachusetts, where an Alternative Portfolio Standard (APS) sets a statewide savings target for generation from alternative energy sources (including CHP) as a percentage of electricity sales. The policy outlined here is also similar to a policy recommended by FVB Energy to the Minnesota Department of Commerce (FVB Energy 2014).

CHP savings requirement. The following summarizes some of the eligibility requirements systems must meet to qualify for the program:[158]

- Eligible systems shall not supply more than 25 MW and one-third of their power back to the grid.
- Eligible equipment shall include reciprocating engines, combustion turbines, steam turbines, micro-turbines, and fuel cells.
- Qualifying units are nonrenewable-fueled systems. This program operates in conjunction with a separate renewable portfolio standard that covers renewable-fueled CHP.
- The system must be placed in operation after June 1, 2014.
- Qualifying systems must achieve a combined electric and thermal efficiency of at least 60% higher heating value (HHV).
- A percentage of MWh electric output will qualify for crediting based on a prorated credit for CHP, described below.
- 1 MWh of eligible electricity output = 1 CHP certificate.

Quantification of Emissions Benefits Potential

In order to develop a preliminary estimate of the potential emissions benefits attributable to the implementation of a Statewide Energy Savings Target for CHP, the state of Mississippi has elected to use the following approach for a CHP quantification methodology:

Step 1. Determine total electricity output (MWh) from CHP measure (either a single system or a fleet of systems in the state).

The Statewide Energy Savings Target for CHP is expected to result in the installation of 200 MW of CHP electric generating capacity by 2030 in Mississippi. We assume that a fixed amount of capacity is installed each year starting in 2017, such that the state would reach 200 MW by 2030. This new capacity is expected to generate 1,401,600 MWh of annual electricity output in the year 2030.

Step 2. Determine a discounted portion (%) of electrical output that should be attributed to a CHP measure as avoided generation from the grid.[159]

- *Step 2a.* Calculate an incremental CHP emissions rate for the CHP measure (either a single system or a fleet of systems in the state).

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158 Most states define the attributes of CHP systems that are eligible in their portfolio standards. EPA's CHP Partnership provides guidance on CHP program design features and key policy considerations of CHP in portfolio standards (EPA CHP Partnership 2015b). This guidance may be useful to states pursuing a policy option similar to the one presented here. These attributes are for demonstration purposes only and do not represent a recommendation for how individual programs should be structured. For example, a state may allow CHP technologies other than those listed in this example to be eligible.

159 Appendix A of this document provides more detail on Step 2 of this calculation.

$$= \frac{\left(CHP\ fuel\ input * Fuel\ emission\ factor - \left(\frac{Useful\ thermal\ output}{Boiler\ efficiency} * Fuel\ emission\ factor\right)\right)}{CHP\ electricity\ output\ (MWh)}$$

$$= \frac{\left(14{,}906{,}016\ MMBtu * 116.9\ lbs/MMBtu - \left(\frac{5{,}801{,}012\ MMBtu}{80\%} * 116.9\ lbs/MMBtu\right)\right)}{1{,}401{,}600\ MWh}$$

$= 638$ *lbs./MWh*

- *Step 2b.* Calculate a percentage by which the MWh of CHP generation should be discounted, by comparing the incremental CHP emissions rate with the 2012 fossil emissions rate.[160]

$= 1 - Incremental\ emissions\ rate/2012\ fossil\ emissions\ rate\ adjusted\ for\ T\&D\ losses$

$= 1 - \left(\frac{638}{1185} * (1 - 7\%)\right)$

$= 49.9\%$

Step 3. Multiply total electricity output (MWh) from Step 1 by the percentage from Step 2. The result yields the projected electricity savings that should be credited to the CHP measure.

$= Total\ electricty\ output\ (MWh) * Prorated\ credit\ for\ CHP\ (\%)$
$Eligible\ electricty\ output\ (MWh) = 1{,}401{,}600 * 49.9\%$
$Eligible\ electricity\ output\ (MWh) = 699{,}320$

Using the above quantification methodology, and assuming the target is achieved each year from 2017 until 2030, the state of Mississippi estimates the potential total electricity savings attributable to the adoption and implementation of the Statewide Energy Saving Target for CHP to be 699,320 MWh by the year 2030. In addition, the state has entered into a memorandum of understanding (MOU) with other states in the electric region specifying that all savings attributable to the implementation of the program will be claimed by the state of Mississippi.

These energy savings were added to the denominator of Mississippi's current emissions rate for affected EGUs (1,185 lbs./MWh) as net zero emissions generation (0 lbs./MWh) in order to estimate the potential effect on the attainment of the state's 2030 standard of performance target. This calculation found a potential 19 lbs./MWh reduction in emissions rate attributable to the adoption and implementation of the Statewide Energy Savings Target for CHP.

160 According to EPA, Mississippi's 2012 fossil emissions rate is 1,185 lbs./MWh. Emissions rates can be accessed in EPA's "Clean Power Plan State Goal Visualizer" spreadsheet.

Implementation

Program implementation will be the responsibility of MDA's Energy and Natural Resources Division. Commercial, industrial, and governmental customers will submit applications for certification of qualifying CHP units to MDA. Retail electricity suppliers are responsible for obtaining CHP certificates equal to the set percentage of its sales. The Department of Energy (DOE) allocated additional funding to MDA and other energy offices for Clean Power Plan implementation, and MDA will allocate $200,000 of its annual budget for program administration and management for FY 2017.[161]

Monitoring and Reporting

MDA's Energy and Natural Resources Division will monitor and report on the program. MDA will review applications for qualifying CHP units, and site inspections will be periodically performed. Metering of all fuel inputs and energy outputs are required, and all eligible projects must install MDA-approved metering equipment. Facilities will report metered data annually to MDA no later than February 15 of each calendar year. MDA will then compile and report the annual totals to MDEQ in an annual compliance report no later than March 15. MDEQ will track the progress of all measures contained in this plan submission, as well as the emissions rates of all affected EGUs, and compile and submit a report on the previous year's progress to the General Assembly, Governor's Office, and EPA Region 4 headquarters no later than July 1 of each calendar year.[162]

Enforcement

The enforcement of the rule will remain the sole authority of the state. Any shortfalls in forecasted emissions reductions shall be enforced against the state, should EPA see fit to do so. MDA's Energy and Natural Resources Division will maintain the authority to enforce the program in accordance with the rule. Should an electricity service provider fail to obtain the CHP certificates required to meet the Statewide Energy Savings Target for CHP, an alternative compliance payment will be collected. If the target established by the program fails to meet the level of savings assumed in the calculation of potential benefits contained herein, or if any other lapses in implementation occur that cause the electricity savings and emissions reduction attributable to the CHP program to fall short of those claimed in this compliance plan, MDEQ, working with MDA, as well as the MSPSC, will reevaluate the provisions contained in this submission and enact the necessary measures to make up the shortfall. Alternative compliance payments collected through the program may be used to address the shortfall.

Verification and Quantification

In order to verify that the electricity savings estimated from the implementation of the CHP program occur, actual savings obtained through direct measurement of CHP system output using an approved meter technology will be compared and trued up with earlier estimates. All electricity savings found

[161] This is a hypothetical allocation.

[162] This process does not reflect current practices. It is a suggestion of what EPA may require of a state to show that the state is faithfully executing plan progress monitoring.

using these methods will be credited to the state of Mississippi.[163] MDA will be responsible for conducting regular oversight of facility metering equipment, calibration, and data collection procedures. Working with MDA, MDEQ will report to the Mississippi General Assembly, Governor's Office, and EPA Region 4 headquarters on the level of verified electricity savings biennially, no later than July 1 of the calendar year, beginning in 2017.

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Appendix. Calculation for Program Savings in 2030

Step 2a: Incremental CHP emissions rate (lbs./MWh)

Total annual CHP capacity in 2030 (MW)	200
CHP annual capacity factor (hours)	7008
Average CHP fleet efficiency	71%
Average CHP heat rate (MMBtu/MWh)	10.6
Annual CHP fuel input (MMBtu)	14,906,016
Annual CHP fleet electricity output (MWh)	1,401,600
Annual CHP fleet thermal output (MMBtu)	5,801,012
Fuel-specific CO_2 emissions factor (natural gas) (lbs./MMBtu)	116.9
Estimated efficiency of displaced boiler	80%

$$Incremental\ CHP\ emissions\ rate\ (lbs/MWh)$$

$$= \frac{\left(CHP\ fuel\ input * Fuel\ emission\ factor - \left(\frac{Useful\ thermal\ output}{Boiler\ efficiency} * Fuel\ emissn\ facfactor\right)\right)}{CHP\ electricity\ output\ (MWh)}$$

Where

- CHP fuel input (MMBtu) = CHP electricity output (MWh) * CHP heat rate (MMBtu/MWh)
- Fuel emission factor is a specific CO_2 emissions factor for a particular type of fuel (116.9 lbs./MMBtu for natural gas).
- Useful thermal output (MMBtu) = CHP fuel input (MMBtu) * CHP system efficiency (%) – CHP electricity output (MWh) * 3.412 (MMBtu/MWh)[164]
- Boiler efficiency (%) is a default value (such as 80%) or a measured or known boiler efficiency value.
- CHP electricity output (MWh) = CHP capacity (MW) * Estimated hours of operation

$$Incremental\ CHP\ emissions\ rate\ (lbs/MWh)$$

$$= \frac{\left(14{,}906{,}016\ MMBtu * 116.9\ lbs/MMBtu - \left(\frac{5{,}801{,}012\ MMBtu}{80\%} * 116.9\ lbs/MMBtu\right)\right)}{1{,}401{,}600\ MWh}$$

$$Incremental\ CHP\ emissions\ rate\ (lbs/MWh) = 638$$

Step 2b: Prorated MWh Credit for CHP (%)

2012 fossil emissions rate for Mississippi (lbs./MWh)	1,185
2012 fossil emissions adjusted for T&D losses	1,274

[164] Conversion factor of 1 MWh = 3.412 MMBtu

$$\textit{Prorated credit for CHP}\ (\%) = 1 - \textit{Incremental CHP emissions rate}/2012\ \textit{Fossil Emissions Rate adjusted for T\&D losses}$$

Where

- 2012 fossil emissions rate adjusted for T&D losses = 2012 fossil emissions rate/1 – T&D loss percentage
- We assume a 7% transmission and distribution loss. A typical loss can be 6–7%, and on peak days, the loss can be up to 20%.[165]

$$\textit{Prorated credit for CHP}\ (\%) = 1 - 638/1274$$

$$\textit{Prorated credit for CHP}\ (\%) = 49.9$$

For every MWh generated, 49.9% will qualify for credit as eligible electricity output. Insert this value into the formula in Step 3 on page 19 to determine eligible electricity output.

[165] eGRID lists estimated T&D losses for each of the five US interconnect power grids on p.19 of its Technical Support Document for the 9th edition of eGRID available online: http://www.epa.gov/cleanenergy/documents/egridzips/eGRID_9th_edition_V1-0_year_2010_Technical_Support_Document.pdf.

Appendix C: Technical Papers

Performance Contracting

AJW, "Greenhouse Gas Reductions Through Performance Contracting under EPA's Clean Power Plan" (November 2014); prepared for AMERESCO, Honeywell, Ingersoll Rand, Johnson Controls, Schneider Electric, Siemens, and United Technologies. http://ajw-inc.com/pc/

Industrial Energy Efficiency

AJW, "Securing Greenhouse Gas Reductions Through Private-Sector Delivered Industrial Energy Efficiency Under EPA's Clean Power Plan" (December 2014); prepared for Institute for Industrial Productivity, National Electrical Manufacturers Association (NEMA), ABB, Danfoss, Easton, General Electric, Ingersoll Rand, Rockwell Automation, Schneider Electric, and Siemens. http://ajw-inc/IEE/

Combined Heat and Power

David Gardiner and Associates and Institute for Industrial Productivity, "Combined Heat and Power (CHP) as a Compliance Option under the Clean Power Plan" (July 2015); prepared for the American Gas Association, American Chemistry Council, and American Forest & Paper Association.
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