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**Energy Efficiency Pathway Template:**

Energy Savings Performance Contracting

Abstract

Energy efficiency (EE) programs can deliver air pollutant emission avoidance and reduction. Energy Efficiency Pathway Templates provide a format for summarizing EE program features and opportunities that can be shared with state environmental regulators for consideration in air quality planning. These templates can promote dialogue among State Energy Offices, environmental agencies and other pertinent bodies on potential roles for EE as air pollution management approaches. This template describes Virginia’s Energy Savings Performance Contracting (ESPC) program.

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# Introduction

## Energy Efficiency Benefits

Energy efficiency policies and programs are delivering growing benefits that save consumers money. They reduce or defer needs for costly electricity generation, transmission, and distribution investments, and can support energy security and reliability through reduced stresses to energy supply infrastructure. Further, by reducing the need for electricity generation and onsite fuel consumption, energy efficiency mitigates adverse environmental impacts, including emissions of air pollutants and their health effects.

For example, in 2014 U.S. electric utility energy efficiency programs reported saving about 26,000 gigawatt-hours (GWh) of electricity, equivalent to nearly 20 million tons of carbon dioxide (CO2) emissions.[[1]](#footnote-1) Such utility programs cost an average of 4.6¢ per kilowatt-hour (kWh), significantly less than average retail electricity price of 10.44¢ per kWh.[[2]](#footnote-2), [[3]](#footnote-3) As another example, the U.S. Department of Energy (DOE) estimated that in 2012 building energy codes saved American consumers $5 billion and 40,000 GWh of electricity, while avoiding nearly 40 million short tons of CO2.[[4]](#footnote-4) Lawrence Berkeley National Laboratory (LBNL) estimated that energy savings performance contract (ESPC) projects delivered by the energy service company (ESCO) industry delivered about 34,000 GWh of electricity savings and about 224 trillion British thermal units (Btu) of total energy savings (about 1% of total commercial building consumption) in 2012.[[5]](#footnote-5) Other efforts, such as low-income weatherization, state “lead-by-example” policies, local-led building efficiency programs, industrial energy efficiency, and combined heat and power (CHP) programs also contribute to energy efficiency at various scales.

At an individual state level, Xcel Energy’s efficiency programs in Minnesota avoided the need for 2,500 MW of new power plants since 1992 while preventing over 11,000 tons of nitrogen oxides (NOx).[[6]](#footnote-6) Maryland’s energy efficiency and renewable energy programs provide about 0.60 parts per billion reduction in ambient ozone levels.[[7]](#footnote-7) Texas has included building energy codes, local government measures, and utility energy efficiency programs in its National Ambient Air Quality Standards (NAAQS) State Implementation Plans (SIPs) for ozone.[[8]](#footnote-8), [[9]](#footnote-9) Furthermore, DOE projects that adoption and compliance with the latest model building energy codes (2015 International Energy Conservation Code (IECC) and ASHRAE Standard 90.1-2013) by 2017 would save Florida almost 5 million MWh of electricity and 20 trillion Btu total energy in 2030 along with concomitant avoided emissions.[[10]](#footnote-10)

### Status of Energy Efficiency for Air Quality Compliance

While air emission benefits of energy efficiency have been recognized for years, they have been included explicitly in state air quality management plans and strategies only infrequently. This is because air quality regulators are often unfamiliar with energy efficiency programs and their ability to achieve savings that translate into avoided emissions.[[11]](#footnote-11) Air quality regulators may be unversed in methods used to reliably project and measure energy savings and their emissions impacts. And there can be concerns about the costs and complexity of rigorous evaluation, measurement, and verification (EM&V) when formal regulatory credit is sought under certain Clean Air Act programs. Perhaps because of these reasons, thus far only a few state air regulatory agencies have taken advantage of the guidance and tools that the Environmental Protection Agency (EPA) provides to help states to include savings from energy efficiency in air quality planning.

EPA has signaled support for states to include energy efficiency as an air quality management strategy for NAAQS and other purposes. It has offered “… *to help[] state air quality planners calculate the emissions benefits of EE/RE [energy efficiency/renewable energy] policies and programs so that these emission reductions can be incorporated in Clean Air Act plans….*”[[12]](#footnote-12) As noted previously, there is precedent for recognizing and crediting NOx reductions from energy efficiency in NAAQS SIPs. Also, a few states have “set aside” modest numbers of NOx allowances for allocation to EE/RE projects under certain Clean Air Act programs.[[13]](#footnote-13) EPA provides a roadmap for incorporating EE/RE into NAAQS SIPs.[[14]](#footnote-14) The agency also pointed to energy efficiency as a key means to address CO2 and greenhouse gas concerns.[[15]](#footnote-15), [[16]](#footnote-16) However, federal and state air quality regulators’ are often unfamiliar with energy efficiency and how it can reliably prevent and reduce emissions, and EPA guidance remains imprecise. The hope is that this energy efficiency pathway template along with other efforts will strengthen the opportunity for including energy efficiency in air quality management.

The scope of EPA rules and standards, coupled with the agency’s increased recognition of energy efficiency as a clean air resource, creates an opportunity for states to tap into energy efficiency as a frequently least-cost compliance option that offers multiple co-benefits. Recent and prospective EPA actions that provide energy efficiency-related compliance opportunities include revision of various NAAQS, new criteria and hazardous air pollutant standards for power plants and other sources, and the upcoming second implementation period for the Regional Haze Rule. Concerns about CO2 and other greenhouse gases, including state-level standards and targets, are also pertinent.[[17]](#footnote-17) By reducing the amount of electricity needed to be generated as well as onsite heating fuel use, energy efficiency acts directly to avoid or reduce pollution.

### Options for Quantification and Rigor

It is important to note that air quality regulators can consider energy efficiency at different levels for varied purposes under different regulatory programs. One distinction is between considering energy efficiency for broad planning and projection purposes as compared with formalized crediting of energy efficiency for enforceable regulatory purposes.

**Broad quantification** can be useful for air quality regulators to project likely impacts of programs to help achieve long-term emission and air quality objectives. Avoided energy use reduces emissions irrespective of whether formalized credit is given or whether savings can be ascribed to individual measures or projects. Air regulators can project the combined impacts of multiple programs and apply conservative discount factors to assure that, in aggregate, broad emissions goals can be met even if a particular program may underperform relative to its projection. Periodic program impact evaluations let energy officials and air quality regulators see if savings and emissions avoidance progress is “on track” and provide opportunities to adjust plans if warranted.

**Formal regulatory crediting** often requires more rigorous EM&V and can include considerations of legal enforceability—who is “on the hook” if required reductions are not achieved. As discussed below, EPA identifies several pathways for including energy efficiency in NAAQS SIPs. Formal crediting may involve attribution of energy savings and avoided emissions to individual program or project implementers for issuance of compliance instruments such as tradable NOx allowances or emissions offsets in nonattainment areas. Formal crediting could also play a role under state, regional, or other greenhouse gas programs.

For NAAQS SIP purposes, EPA’s EE/RE Roadmap Manual outlines four pathways; three of these offer EPA-recognized formal quantified crediting and the fourth (“weight-of-evidence”) offers a less formal recognition of air quality benefit.[[18]](#footnote-18) Figure 1 summarizes the four pathways for incorporating EE/RE for NAAQS SIP purposes outlined in its EE/RE Roadmap Manual.[[19]](#footnote-19) Table 1 provides more detail about the projects, characteristics of policies, and programs suitable for each pathway.[[20]](#footnote-20)

**Figure 1. Pathways for Incorporating EE/RE in NAAQS SIPs**



**Table 1. Characteristics of Policies and Programs Suitable for Each NAAQS SIP Pathway**

|  |
| --- |
| **Baseline Emission Pathway** |
| * EE/RE policies that are “on the books,” have not been accounted for elsewhere in the SIP, and are not emerging and/or voluntary programs
* Can be state enforceable but is not federally enforceable
* Revisions could be required through a Clean Air Act SIP call if reductions from the EE/RE policy are needed to attain the NAAQS and policy is not implemented as assumed in baseline projections
* Electric generating unit (EGU) baseline projections are best done on a coordinated, regional basis
* When available, agencies can utilize EPA’s EGU baseline projections or develop their own projections model or approach
* EGU baseline projections using energy models or similar methods reflect EGU operations as a whole system
 |
| **Control Strategy Pathway** |
| * “On the way” policies and programs that are not emerging and/or voluntary programs and that will produce emissions benefits in the planning timeframe of the SIP/TIP {Tribal Implementation Plan]
* EE/RE policies and programs for which the state, tribal, or local agency wishes to seek SIP credit
* Once approved into the SIP, federally enforceable (enforceable against an air pollution source or implementing party)
* State, tribal, and local agencies will have emission reductions from a control strategy to help them attain the NAAQS
* Documentation is needed to demonstrate that the EE/RE policy and/or program is permanent, enforceable, quantifiable, and surplus
 |
| **Emerging/Voluntary Measures Pathway** |
| * Good option for locally-based EE/RE activities
* Voluntary EE/RE policies and programs that are not enforceable against an air pollution source or implementing party
* Emerging EE/RE policies and programs for which it is difficult to quantify emission impacts
* EE/RE policies and programs for which state, tribal, or local agency wishes to seek SIP credit
* Emerging/voluntary measures can be “bundled” in a single SIP submission and considered as a whole
* EPA will propose to approve through the SIP rulemaking process SIP/TOP credit up to six percent for EE/RE policies and programs, or more, if they can make a clear convincing case
 |
| **Weight of Evidence Pathway** |
| * EE/RE policies and programs for which state, tribal, or local agency does not wish to seek SIP credit and for which quantification of the air quality impacts of the emissions reduction is unavailable or infeasible
* Can include unspecified emission reductions from any policy or program in weight of evidence that may impact a nonattainment area
 |

States seeking formal crediting and inclusion of energy efficiency programs in SIPs are urged to consult closely with their EPA Regional Offices to understand detailed expectations and requirements for SIP-eligibility of programs and measures.

### Tools & Resources to Assist with Quantifying Savings

Various freely available tools can be useful for developing energy and air quality savings estimates that might enable broad programmatic quantification or can lead to formal regulatory crediting for energy efficiency. Using these tools, energy savings can be projected *ex ante* or quantified *ex post*, based on broadly accepted evaluation, measurement, and verification (EM&V) protocols. Once energy savings are quantified they can be translated into avoided emissions.

The State and Local Energy Efficiency Action Network published [*A Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution, and Meet Energy Needs in the Power Sector*](https://www4.eere.energy.gov/seeaction/system/files/documents/pathways-guide-states-final0415.pdf) (2016), which presents case studies of successful regional, state, and local approaches to energy efficiency with sources for more information, resources to understand the range of expected savings from energy efficiency, and common protocols for documenting savings. Appendix A in the guide provides a synopsis of energy efficiency and emission reduction planning tools for states.

 Among the tools available, this template cites the ones summarized below. In addition, electric power dispatch models and other tools may also be applicable.

* **eGRID.** If electricity savings data are available, the EPA Emissions and Generation Resource Integrated Database (eGRID) provides regional average and average non-baseload emission factors for electric power-sector CO2, NOx, sulfur dioxide (SO2), methane, and nitrous oxide emissions.[[21]](#footnote-21)
* **AVERT.** The EPA AVoided Emissions geneRation Tool (AVERT) allows for more detailed analyses of avoided emissions on a regional basis.[[22]](#footnote-22) The AVERT tool allows entry of energy savings data on temporal scales from annual to hourly, which, if temporal savings data are available, can provide more precise emission impact estimates and can support air quality management focused on seasonal ozone levels.
* **ACEEE SUPR.** The State and Utility Pollution Reduction (SUPR) calculator provides a screening-level estimate of some of the costs and benefits of various policies and technologies that could help a state meet its air quality goals. [[23]](#footnote-23) The tool allows the user to select up to nine energy efficiency policies. The results provide users with an idea of the magnitude of the costs and the impacts of selected options on energy use and air pollution (CO2, NOx, and SO2 emissions).
* The **Energy Efficient Codes Coalition Clean Power Plan Energy Code Emissions Calculator** offers conservative projections of the impact of building energy codes based on default and user-specified scenarios to provide emission avoidance projections of CO2, NOx, and SO2 as well as several other criteria pollutants and greenhouse gases.[[24]](#footnote-24)

### Energy Efficiency for Supporting Greenhouse Gas Goals

*At the time of this writing, the CPP is under a stay issued by the U.S. Supreme Court, pending litigation. While disposition of the CPP is currently uncertain, this section may be useful for considering energy efficiency’s potential role under state-level greenhouse gas policies and objectives as well as under local, regional, and voluntary initiatives.*

Nineteen states have adopted state greenhouse gas emission targets.[[25]](#footnote-25) Nine Northeastern and Mid-Atlantic state members of the Regional Greenhouse Gas Initiative (RGGI) cap power sector CO2 emissions.[[26]](#footnote-26) California is mandating greenhouse gas reductions from its power sector and other sources.[[27]](#footnote-27) These and other states considering greenhouse gas standards or targets can find energy efficiency to be a cost-effective approach for meeting greenhouse gas objectives while simultaneously delivering other economic, energy, and environmental benefits.

As with criteria air pollutants, energy efficiency programs can reduce CO2 emissions from both electric power generation and from onsite fuel use. Both broad quantification for high level planning and more detailed quantification for formal regulatory crediting can be useful.

The EPA CPP had included options for states to follow either rate- or mass-based compliance approaches, which may be useful for state-level consideration.[[28]](#footnote-28) Under the rate-based approach, a state’s utility-scale electric generating units (EGUs) would on average need to meet a target emissions rate denominated in pounds of CO2 emitted per MWh generated. The CPP would allow qualified and verified electricity savings (as well as low- and non-emitting generation) to earn emission rate credits (ERCs) that could be bought by electric generating units (EGUs) to help meet targets.

Under the mass-based approach, the state would have a total tonnage goal for its EGUs’ emissions. Similar to the mechanism used by the RGGI states, EGUs would need to hold allowances (one for each ton of CO2) to cover their emissions. Such allowances could be traded to help EGUs lower compliance costs. Under a mass-based system, energy efficiency would reduce power demand and, thus, emissions, so helping with compliance. Energy efficiency programs could be “complementary” to the emission allowance system (i.e., not directly involved in allowance issuance and trading) or a state could opt for an allowance distribution approach that further encourages cleaner power options, such as by allotting some allowances for low or non-carbon generation as well as for energy efficiency. Under this option, quantification of energy efficiency could be used as a basis for allocating allowances to energy efficiency project owners or providers.

## Template Purpose and Use

The purpose of this template is to be a tool to help states recognize options and opportunities for energy efficiency programs to contribute to air quality management and compliance. It is organized around a series of questions about a specific energy efficiency pathway, which can help illuminate the potential and likelihood for particular programs and policies to help prevent air pollution.

This template is designed for State Energy Offices (SEOs), in collaboration with other relevant agencies and organizations, to fill in. They could use the completed template in discussions with their air quality agencies on opportunities for the energy efficiency pathway described in the template to be considered in air quality planning and management. Air quality regulators may have differing needs depending on a state’s context, such as NAAQS attainment status, regional haze requirements, state greenhouse gas goals, and other matters. However, this template can serve as a starting point.

The template highlights specific actions a state can take to achieve, quantify, and verify savings from energy efficiency efforts, and identify gaps that may need to be filled, to give confidence to air quality regulators that a particular pathway can deliver reliable energy savings and emissions avoidance. The actions and guidelines outlined in the template can be helpful for broad projections and planning or for formal regulatory purposes. As noted previously, broadly quantified projections are useful for air quality regulators to project likely impacts of programs to help achieve long-term emission and air quality objectives while more rigorous quantification and EM&V may be needed for formal crediting in SIPs or for issuance and trading of emissions credits and allowances (e.g., NOx Trading Program).

Some gaps that impede consideration of energy efficiency programs for air quality management may be bridgeable with existing data, tools, and technical assistance resources. Other gaps may be addressed through programmatic changes, such as implementing certain EM&V and related quantification practices or enhancing program and project reporting and tracking processes. Still others may illuminate the need for new or enhanced data, tools, and other resources to assure confidence in savings.

States can work with the National Association of State Energy Officials (NASEO), U.S. DOE, EPA, and others to identify gap-filling resources or, if those are lacking, inform the need for research, tool development, and technical assistance.

## Next Steps: Energy Savings Performance Contracting (ESPC)

Ideally, the SEO should partner with air quality regulators early to discuss each agency’s areas of responsibility, topics of mutual interest, and collaborative opportunities, including recognizing energy efficiency benefits. The SEO should complete the template and have a dialogue with its air quality regulatory agency to familiarize the agency with energy savings performance contracting (ESPC) as an air quality management and compliance strategy and to familiarize the SEO with air regulatory requirements. The SEO and air quality regulators should bring in other pertinent agencies and stakeholders as appropriate.

The agencies should discuss available data and tools showing past and projected future savings from ESPC. They should identify any information gaps or concerns that air quality regulators may have about the reliability of ESPC as an emissions avoidance tool. The state can consult with NASEO as well as with the U.S. DOE and EPA to help identify options for filling such gaps.

The state air quality agency, in partnership with the SEO, should also consult with the pertinent EPA Regional Office if formal inclusion and crediting in SIPs is sought to understand EPA expectations and requirements.

# Energy Efficiency Pathway: Energy Savings Performance Contracting

*Note: Red, italicized text provides instructions to complete the template. Blue text describes the template fields that need to be completed. Black text represents model or example responses, as they might be filled in by a state.*

## Summary: State Energy Savings Performance Contracting (ESPC)

*Following completion of sections 1-5, provide a high-level summary in the final column of this table. The first two columns can be drawn from the February 2016 State and Local Energy Efficiency Action Network document* [*Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution and Meet Energy Needs in the Power Sector*](https://www4.eere.energy.gov/seeaction/system/files/documents/pathways-guide-states-final0415.pdf)*.*

|  |  |  |
| --- | --- | --- |
| **Key Issues** | **General Summary[[29]](#footnote-29)** | **State-Specific Summary**  |
| FEASIBILITY: Can ESPC programs help achieve GHG and criteria air pollutant reductions in the required time frame? | • Yes. They reduce the amount of electricity generated and fossil fuel consumed at EGUs. Also, onsite combustion emissions from furnaces, boilers, industrial processes, and water heaters can be reduced. Reduced energy demand yields emissions reductions. | **Section 1** |
| APPROACH: How can a state achieve energy savings from ESPC?  | ESPC is a shared savings mechanism; an ESCO offers guaranteed savings, performs a project, and is compensated by payments over time that are less than total energy savings of customer; finance may be obtained by the ESCO or by customer agencies (e.g., bonds, state loan fund, capital budget); customer agency realizes savings, in many cases without needing to use its own capital for the project. Best practices include:• Authorize state and local agencies and entities to enter into ESPCs.• Establish rules and processes for project contracting, procurement, development, and performance; consider model contracts and ESCO prequalification.• Provide education, training, and technical assistance to state and local agencies and entities, including financial, procurement, and facility managers.• Track ESPC energy savings and financial performance.  | **Section 1** |
| IMPACT: What energy savings and emission reductions can ESPC programs achieve, and are the savings permanent? | • Project energy savings range from 15% to 30%. Savings from active ESPC projects in the U.S. in 2012 was 34 TWh. • Expected savings from a $10 million state ESPC program is 3,000 to 12,000 MWh/year for the life of the measures. • Resulting emission reductions vary with the amount and timing of energy savings and EGU emission profiles. Values can be determined with simple estimates or detailed modeling.• Savings lifetimes depend on measures installed; contracts typically cover 10 to 20 years.  | **Section 2** |
| RELIABILITY: How can I document the energy impacts of ESPC programs? | • International Performance Measurement and Verification Protocol (IPMVP).[[30]](#footnote-30)•ASHRAE Guideline 14.[[31]](#footnote-31)• FEMP M&V Guidelines.[[32]](#footnote-32)• Uniform Methods Project (UMP).[[33]](#footnote-33)• eProject Builder (ePB) to manage project data and benchmark projects.[[34]](#footnote-34) | **Section 3** |
| RESPONSIBILITY: Who is responsible for administering and implementing ESPC programs, and what are the best practices? | • A lead state agency typically is responsible for administering the program. • Best practices include: * strong governor’s office support,
* including other public sectors (school and local governments) in the program,
* providing model contracts and documents,
* providing technical assistance to agencies contemplating and implementing ESPCs,
* M&V to assure savings, and
* consistent reporting, tracking of ESPCs (investments, savings, energy unit savings, emission impacts, and other savings).
 | **Section 4** |
| COST: What is the cost structure of ESPC programs, and how much do they cost?  | * ESPC is a shared savings mechanism; financing may be obtained by ESCO or provided by customer (e.g., bonds, state loan fund, capital budget); savings pay for project cost.

• ESCOs help to educate their customers about the available types of financing, or state agencies can use capital or maintenance budgets, tax-exempt bonds, or a revolving loan fund. ESCOs also leverage utility rebates.• Savings pay for project costs over the term of the contract, typically 10 to 20 years. Typical installation costs for state/local government projects: about $7 per square foot.• The lead state agency role can be funded by the state general fund, energy supplier fee, or fee-for-service arrangement. | **Section 5**.   |

## Summary of Findings

*If your state partners would like a text summary of findings, it can be placed here or at the end of the document. This can be a helpful way to offer conclusions after completing all worksheets.*

*Example text:*

*State X has an established program of state and local level ESPCs that are delivering energy savings. The state has focused on ESPC for achieving state facility energy savings goals …*

*The Department of X provides contractual/procurement support for state agencies and its pre-qualified ESCO list and contract language are also available to localities. The SEO provides technical support for state and local agencies considering or performing ESPCs.*

*ESPCs include savings guarantees that obligate ESCOs to perform M&V and report savings. In State X, ESCOs typically use the IPMVP, which is recognized by EPA as a best practice M&V approach, including for application under the CPP.*

*(…)*

*While the fate of the EPA CPP is uncertain, the “project-based measurement and verification” section of EPA’s draft CPP EM&V guidance may be useful. It recognizes well-established IPMVP and FEMP M&V Guidelines used by the ESCO community. These approaches can confirm ESPC savings should the state choose at adopt CO2-related goals, targets, or regulatory standards, whether for state- or public-sector facilities or broader application. EPA has previously recognized energy efficiency as a NOx emission reduction measure in a SIP for the ozone NAAQS.[[35]](#footnote-35)*

*ESPCs offer good potential for recognition and inclusion in state energy planning and in air quality management and planning.*

## Energy Savings Performance Contracting (ESPC) Description

*Provide a brief description of the energy efficiency pathway in broad terms.*

*Example text:*

*Energy Savings Performance Contracting (ESPC) provides guaranteed energy savings and offers a procurement process that enables building owners to use savings from avoided energy consumption to pay for new energy-efficient equipment and services. ESPCs can be structured to perform energy-savings projects without relying on the customer’s capital funds.*

*Under an ESPC, a public agency or other facility owner enters into a guaranteed energy savings contract with an energy service company (ESCO). The ESCO will conduct a comprehensive energy audit of the building owner’s facilities to identify potential Energy Conservation Measures (ECMs) for achieving maximum cost-effective energy savings.[[36]](#footnote-36) In consultation with the 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, together to achieve energy savings and cash flow over an agreed-upon and allowable contract term. The ESCO guarantees that the comprehensive energy savings improvements will generate sufficient cost savings to pay for the project over the term of the contract, typically 10 to 20 years. After the ESPC, all cost savings accrue to the building owner.*

*Figure 2 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, occupant comfort/health, and overall energy management.*

***Figure 2. How Energy Savings Performance Contracting Works****[[37]](#footnote-37)*

**

*Source: AJW*

*Typically, ESCOs obtain outside financing for projects, allowing the customer to achieve capital upgrades without having to tap into its own capital budget. State and local agencies and other ESCO customers can follow this route or they can use other capital sources that may be available, such as bonding authority or revolving loan funds, if they are able and willing to do so. The typical installation cost for state and local government ESPC projects is about $7 per square foot.[[38]](#footnote-38)*

*Frequently, performance contracting reduces annual energy use by 15% to 30%.[[39]](#footnote-39) Electricity accounts for an estimated two-thirds of the energy savings for public and institutional (e.g., universities and hospitals) ESPC projects.[[40]](#footnote-40) ESCOs deliver more than $6 billion of projects annually, according to LBNL.[[41]](#footnote-41) The remaining investment potential in public and institutional facilities is large, estimated at about $71 billion to $133 billion. Thus, in addition to significant incremental electricity savings, ESCO energy upgrades for public and institutional facilities represent a large potential source of in-state jobs.*

*Actual ESPC savings often exceed expected savings. LBNL researchers found that the energy savings from federal facility performance contracting exceeded the expected savings by 2% over the lifetime of the contract.[[42]](#footnote-42) Oak Ridge National Laboratory examined the persistence of cost savings for federal performance contracting projects and found that the federal government receives nearly twice the amount of the guaranteed savings for a typical project. There are several reasons why these projects achieve higher-than-expected savings. For example, ESCOs do not always guarantee all of the estimated savings, and the useful life of the equipment often extends beyond the performance period of the ESPC.[[43]](#footnote-43)*

*LBNL estimated that ESPC projects delivered about 34,000 GWh of electricity savings and about 224 trillion British thermal units (Btu) of total energy savings (about 1% of total commercial building consumption) in the United States in 2012.[[44]](#footnote-44) Of this, about 15,000 GWh of electricity savings were from state and local government facilities, schools (K-12), colleges and universities, and healthcare facilities.[[45]](#footnote-45)*

## Section 1: Energy Savings Performance Contracting (Feasibility and Approach)

*Succinctly describe what activities are required to implement this pathway to achieve energy savings; the SEE Action Network Guide for States[[46]](#footnote-46)can be a helpful resource. Then complete the worksheet tables with state-specific information.*

*Example text:*

*State legislation or an executive order that facilitates or requires the use of performance-based contracting with ESCOs for energy projects in the public and institutional sectors is key to success. Policies can cover local government facilities and schools, as well as state facilities.[[47]](#footnote-47)*

*Including deferred maintenance activities (e.g., roof replacement and asbestos mitigation) helps facilitate performance contracting for public and institutional facilities by bundling high priority projects with energy-saving measures. Other sector-specific priorities, such as student comfort and performance in schools, also can be a driver for ESPC projects. In addition, support from the governor’s office is important. For example, a governor could establish energy savings targets for state facilities and require tracking and reporting on the state’s progress using performance contracting to meet these targets.*

*Another helpful policy, through state legislation or governor’s executive order, is designating a lead state agency to be a single point of contact for public agencies and institutions to facilitate performance contracting. The lead agency can:*

* *Establish a precertification process for qualified ESCOs*
* *Develop rules and processes for project contracting, procurement, development and performance*
* *Provide technical assistance services*
* *Train state facility managers, contractors, engineers and architects*
* *Develop oversight, program management, and evaluation and verification processes.*

*Some states use a fee-for-service model to support technical assistance for ESPC administration and management. Under this approach, the lead state agency covers its cost for providing services by collecting a fee directly from the public entity it is serving.*

*Some states require that public agencies use an ESCO pre-qualified to provide ESPC services. Pre-qualification may include accreditation by the National Association of Energy Services Companies (NAESCO). Accreditation requires demonstration of technical and managerial competence to develop comprehensive energy efficiency projects and provide a full range of energy services, as well as financial solvency and a regular business practice of developing performance-based projects. NAESCO maintains a searchable database of ESCO providers.*

*States also may consider policies and programs that address small projects. The U.S. DOE’s Federal Energy Management Program (FEMP) provides a model process—for small federal facilities—that states could replicate for their own facilities. FEMP’s ENABLE program is attractive for small projects through features such as a streamlined list of standard, eligible energy conservation measures; a standardized energy audit tool (soon to be available on-line); streamlined EM&V procedures; and templates to guide agencies through the process. These features lower the administrative burden on agencies implementing ESPC projects.*

*Another strategy is to aggregate small projects across multiple organizations to a sufficient size for performance contracts with ESCOs. That is the idea behind public-purpose ESCOs. For example, Commons Energy was established to aggregate small- to medium-sized facilities and provide performance contracting and financing for underserved markets such as multi-family housing and community buildings.[[48]](#footnote-48)*

### Section 1 State Worksheet: Energy Savings Performance Contracting (ESPC)

|  |
| --- |
| **What is the state’s ESPC program and requirements?** |
| **Are related activities occurring that can contribute additional savings?** |

The Energy Services Coalition (<http://www.energyservicescoalition.org/>) provides a compendium of lessons learned and best practices, key attributes of successful ESPC programs, model procurement and contracting documents, case studies, and other resources. Customized technical assistance is also available.

TIPS

The U.S. Department of Energy offers primers, model documents, and other ESPC resources <http://energy.gov/eere/slsc/energy-savings-performance-contracting>

### Section 1 State Worksheet: ESPC Follow Up Items

*Information gaps and questions that arise can be entered for consideration and follow up attention.*

|  |
| --- |
| **Information gaps:** |
| **Critical questions to answer:** |
| **Other:** |

##

## Section 2: Energy Savings and Emissions Reductions (Impact)

*Succinctly describe how energy savings and emission reductions are achieved through this pathway; the SEE Action Guide for States[[49]](#footnote-49)can be a helpful resource. Then complete the worksheet tables with state-specific information.*

*Example text:*

*Energy savings resulting from ESPC projects decrease emissions from both electricity generation as well as onsite (e.g., natural gas) consumption. ESCOs perform M&V and provide M&V reports to their clients to show energy savings and determine if ESPC energy savings guarantees are met.*

*Once energy savings are quantified, they can be translated into avoided emissions. As discussed previously under “Options for Quantification and Rigor” and “Tools and Resources to Assist with Quantifying Savings,” there are a variety of tools and approaches for doing this. Such tools as eGRID and AVERT can translate electricity savings into estimated emissions avoidance. The ACEEE SUPR tool can project electricity savings and avoided emissions for selected energy efficiency program types.*

*For onsite combustion of natural gas and other fuels for space and water heating and industrial processes, there are established emissions factors from the EPA[[50]](#footnote-50) as well as industry, manufacturer, and other sources to allow calculation of pollution avoidance.*

*For example, M&V reports from an ESPC project or a portfolio of projects provide MWh savings. The client agency, SEO, or air quality regulatory agency could take those MWh savings and multiply it by the relevant eGRID non-baseload average emissions factor to provide estimated avoidance of CO2, NOx, and SO2. The MWh savings entered into the AVERT tool can provide a more precise estimate based on historic marginal emissions rates. If monthly, daily, or up to hourly savings data are entered in AVERT, more precise and temporally relevant avoided emissions (such as for considering ozone season impacts) can result. Likewise, natural gas savings in therms or Btus provided by M&V reports can be translated using standard emission factors.*

*Avoided emissions can be broadly estimated and projected for broad air quality management planning purposes even if no formalized “credit” under air quality rules is sought. Or more rigorous quantification may provide emissions reductions that can be formally credited under SIPs, state emission goals, or other programs. State air quality regulators should consult EPA on requirements for formalized recognition and crediting under Clean Air Act regulations.*

*While currently beyond the focus of this template, states could consider energy savings benefits to water resources (water savings, water quality), avoided waste, land, and other resource impacts.*

### Section 2 State Worksheet: Energy Savings and Emissions Reductions – Policy and Goals

|  |
| --- |
| **Does the state have energy savings goals related to this pathway?** |
| **Are there consequences of not meeting the targets?**  |
| **What are historical energy savings?** |
| **What future energy and emissions savings estimates have been produced and using what assumptions?** |
| **Are other environmental impacts estimated?** |
| **Are other non-energy benefits estimated?** |

TIPS

*Tip: If electricity savings data are available, the EPA Emissions and Generation Resource Integrated Database (eGRID) provides regional average and average non-baseload emission factors for electric power-sector CO2, NOx, SO2, methane, and nitrous oxide emissions.[[51]](#footnote-51) The EPA AVoided Emissions geneRation Tool (AVERT) allows for more detailed analyses of avoided emissions on a regional basis.[[52]](#footnote-52) The AVERT tool allows entry of energy savings data on temporal scales from annual to hourly, which, if temporal savings data are available, can provide more precise emission impact estimates and can support air quality management focused on seasonal ozone levels.*

*Tip (Codes): The ACEEE SUPR calculator allows rough, screening level projection of CO2, NOx, and SO2 from building energy codes. The Energy Efficient Codes Coalition Clean Power Plan Energy Code Emissions Calculator offers more conservative projections based on default and user-specified scenarios to provide emission avoidance projections of CO2, NOx, and SO2 as well as several other criteria pollutants and greenhouse gases.*

TIPS

### Section 2 State Worksheet: Energy Savings and Emissions Reductions Estimates – Follow Up Items

*Information gaps and questions that arise can be entered for consideration and follow up attention.*

|  |
| --- |
| **Information gaps:** |
| **Critical questions to answer:** |
| **Other:** |

## Section 3: Approach to Energy Savings and Emissions Reductions Documentation (Reliability)

*Succinctly describe how energy savings and emissions reduction values are determined for this pathway; the SEE Action Guide[[53]](#footnote-53)can be a helpful resource. Then complete the worksheet tables with state-specific information.*

*Example text:*

*As noted previously, ESPC projects offer guaranteed energy savings which need to be confirmed through M&V processes. ESCOs typically use well-recognized protocols such as the IPMVP to evaluate energy savings. In addition, states can implement broader state or public building energy monitoring and management programs that can track energy use across a fleet of buildings and facilities (whether participating in ESPC projects or not) that can be analyzed for purposes of quantifying energy savings.*

*Also previously noted, differentiating between electricity and onsite fuels (such as natural gas), as well as other energy inputs (such as steam or chilled water supplied to the building or facility by a district energy system) allows translation of energy use and savings into emissions impacts. EPA tools such as eGRID and AVERT can be used to estimate electric grid emission impacts. Emissions impacts from onsite fuel, as well as purchased steam or chilled water from district energy systems, can be calculated based on published emissions factors, equipment specifications, and other data sources.*

### Section 3 State Worksheet: Approach to Estimation and EM&V

|  |
| --- |
| **Are energy savings (electricity and other fuels) regularly estimated or measured?**  |
| **Is there currently an evaluation, monitoring, and verification (EM&V) process to confirm energy savings estimates?**  |
| **Are additional efforts needed to verify energy savings?** |
|  |

### Section 3 State Worksheet: Approach to Estimation and EM&V – Follow Up Items

*Information gaps and questions that arise can be entered for consideration and follow up attention.*

|  |
| --- |
| **Information gaps:** |
| **Critical questions to answer:** |
| **Other:** |

TIS

*Tip: EPA published draft EM&V Guidance for demand-side energy efficiency under the Clean Power Plan in 2015 that may still be useful in the absence of a CPP for supporting other state energy and emission objectives. The document discusses project-based M&V that can be applied to ESPC projects.*

TIPS

## Section 4: Policy Implementation (Responsibility)

*Succinctly describe who in the state is responsible for implementing the pathway and ensuring energy savings are achieved; the SEE Action Guide[[54]](#footnote-54)can be a helpful resource. Then complete the worksheet tables with state-specific information.*

*Example text:*

*ESCOs make energy savings guarantees as part of ESPCs. However, the customer must properly operate and maintain the building and facility in order for energy savings to be achieved and to meet its conditions under the ESPC guarantee provision. Energy savings shortfalls pursuant to ESPC conditions must be remedied by the ESCO.*

*Typically, state ESPC programs are under the purview of one or more state agencies with the State Energy Office often the technical lead while a financial, administrative or general services agency has purview over procurement, financial, and contractual matters. The lead agency or agencies have oversight responsibility and often responsibility for tracking and reporting on the ESPC program; also individual ESCO-customer agencies are responsible for their particular contracts. The state lead agency or agencies usually provide technical assistance, training and education, and other resources for ESCO-customer agencies. States vary as to oversight, authority, and technical assistance offerings made to localities, K-12 public school divisions, and other non-state ESCO customers.*

### Section 4 State Worksheet: Implementation

|  |
| --- |
| What legal authority governs (statute, regulation, executive order, other) this pathway?  |
| Who is responsible for achieving savings? What happens if they are not achieved? |
| Who monitors and verifies savings?  |
| What more is needed to monitor and verify savings?  |

### Section 4 State Worksheet: Implementation Follow Up Items

*Information gaps and questions that arise can be entered for consideration and follow up attention.*

|  |
| --- |
| **Information gaps:** |
| **Critical questions to answer:** |
| **Other:** |

## Section 5: Costs and Funding Mechanisms

*Succinctly describe how what costs are needed to implement this pathway and where funding comes from – or could come from. The SEE Action Guide for States[[55]](#footnote-55)can be a helpful resource. Then complete the worksheet tables with state-specific information.*

### Section 5 State Worksheet: Costs and Funding Mechanisms

|  |
| --- |
| **How are implementation costs funded?**  |
| **How have costs / funding varied over time?**  |
| **How certain is future funding?**  |
| **What funding would be needed to fully implement the pathway and document energy savings?**  |

### Section 5 State Worksheet: Cost and Funding Follow Up Items

*Information gaps and questions that arise can be entered for consideration and follow up attention.*

|  |
| --- |
| **Information gaps:** |
| **Critical questions to answer:** |
| **Other:** |

## Next Steps: State Energy Performance Savings Contracting

*Example text:*

*The SEO should continue its effort to better quantify and track ESPC and broader energy efficiency savings, including through the aforementioned energy information benchmarking and tracking system. It should also continue its eProjectBuilder pilot and consider requiring ESCOs to use that tool for tracking and reporting.*

*The SEO should collaborate with the state air quality regulatory agency to discuss opportunities and needs for including ESPCs and other energy efficiency programs and measures as emission reduction or avoidance approaches. The two agencies should bring in other pertinent agencies and stakeholders, including the ESCO industry, as appropriate…*

*The agencies should discuss available data and tools showing ESPC past and projected savings. They should identify any information gaps or concerns that air regulators may have about ESPCs as an emissions avoidance tool. The state can consult with NASEO as well as with the U.S. DOE and EPA to help identify options for filling such gaps.*

## Appendix: State Energy Savings Performance Contracting

*To include any relevant Helpful Resources, Detailed Calculations, Models & Tools, Additional Questions*

### Helpful Resources

AJW, 2014, “Greenhouse Gas Reductions through Performance Contracting under EPA’s Clean Power Plan.” <http://ajw-inc.com/wp-content/uploads/2014/11/PC-111d-technical-paper-with-appendices.pdf>

American Council for an Energy-Efficient Economy, State and Utility Pollution Reduction Calculator Version 2 (SUPR2). <http://aceee.org/research-report/e1601>

Carvallo, Juan Pablo, Peter H. Larsen, and Charles A. Goldman, 2015, “Estimating Customer Electricity and Fuel Savings from projects installed by the U.S. ESCO Industry,” Energy Efficiency, vol. 8, pp. 1251-1261. Information from abstract at <https://emp.lbl.gov/publications/estimating-customer-electricity-and>

Energy Services Coalition, <http://www.energyservicescoalition.org/> and <http://www.energyservicescoalition.org/resources>

National Association of Clean Air Agencies, “Implementing EPA’s Clean Power Plan: Model State Plans.” <http://www.4cleanair.org/sites/default/files/Documents/5_30_2016_NACAA_State_Models_FINAL.pdf>

National Association of Energy Service Companies (NAESCO), Resources <http://www.naesco.org/resources>

State and Local Energy Efficiency (SEE) Action Network, “Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution, and Meet Energy Needs in the Power Sector.” <https://www4.eere.energy.gov/seeaction/eepathways>

Stuart, Elizabeth, [Peter H. Larsen](http://emp.lbl.gov/publications/author/774), [Charles A. Goldman](http://emp.lbl.gov/publications/author/244), and [Donald Gilligan](http://emp.lbl.gov/publications/author/252), 2013, [Current Size and Remaining Market Potential of the U.S. Energy Service Company Industry](http://emp.lbl.gov/publications/current-size-and-remaining-market-potential-us-energy-service-company-industry), Lawrence Berkeley National Laboratory, <http://emp.lbl.gov/projects/energy-services-company-esco-industry-and-market-trends>

U.S. Department of Energy, Better Buildings Accelerator: Energy Savings Performance Contracting, <https://betterbuildingssolutioncenter.energy.gov/accelerators/energy-savings-performance-contracting>

U.S. Department of Energy, Energy Savings Performance Contracting, <http://energy.gov/eere/slsc/energy-savings-performance-contracting>

U.S. Department of Energy, “How Energy Savings Performance Contracting Can Support State Climate and Energy Planning,” <http://energy.gov/eere/slsc/downloads/how-energy-savings-performance-contracting-can-support-state-climate-and-energy>

U.S. Department of Energy, State and Local Solution Center, <http://energy.gov/eere/slsc/state-and-local-solution-center>

U.S. Environmental Protection Agency, AVoided Emssions and geneRation Tool (AVERT), <https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert>

U.S. Environmental Protection Agency, Emissions and Generation Resource Integrated Database (eGRID), <https://www.epa.gov/energy/egrid>

U.S. Environmental Protection Agency, “Evaluation Measurement and Verification (EM&V) Guidance for Demand-Side Energy Efficiency: Draft for Public Comment, August 3, 2015.” <https://www.epa.gov/cleanpowerplantoolbox/evaluation-measurement-and-verification-emv-guidance-demand-side-energy>

U.S. Environmental Protection Agency, “Including Energy Efficiency and Renewable Energy Policies in Electricity Demand Projections: A Resource for State & Local Air Agencies Preparing NAAQS SIPs.” <https://www.epa.gov/sites/production/files/2015-08/documents/including_ee_and_re_policies_in_ed_projections_03302015_final_508.pdf>

U.S. Environmental Protection Agency, Incorporating Energy Efficiency and Renewable Energy into State and Tribal Implementation Plans. <https://www.epa.gov/energy-efficiency-and-renewable-energy-sips-and-tips>

U.S. Environmental Protection Agency, “Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans.” <https://www.epa.gov/energy-efficiency-and-renewable-energy-sips-and-tips/energy-efficiencyrenewable-energy-roadmap>

U.S. Environmental Protection Agency, “Technical Support Document – DRAFT Demonstrating NOx Emission Reduction Benefits of State-Level Renewable Energy and Energy Efficiency Policies.” <https://www.regulations.gov/document?D=EPA-HQ-OAR-2016-0202-0035>

1. Consortium for Energy Efficiency, 2016, “2015 State of the Efficiency Program Industry: Budgets, Expenditures, and Impacts.” Savings are gross incremental savings; emissions avoided based on EPA eGRID. [↑](#footnote-ref-1)
2. Hoffman, Ian M., 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>. [↑](#footnote-ref-2)
3. U.S. EIA, State Electricity Profiles, United States Electricity Profile 2014, Table 1. 2014 Summary statistics (United States), <http://www.eia.gov/electricity/state/unitedstates/>. [↑](#footnote-ref-3)
4. U.S. Department of Energy, 2014, “Building Energy Codes Program: National Benefits Assessment, 1992-2040,” <http://www.energycodes.gov/building-energy-codes-program-national-benefits-assessment-1992-2040-0> . Monetary savings are net present value and emissions avoided includes both electricity and non-electricity savings. [↑](#footnote-ref-4)
5. Carvallo, Juan Pablo, Peter H. Larsen, and Charles A. Goldman, 2015, “Estimating Customer Electricity and Fuel Savings from projects installed by the U.S. ESCO Industry,” Energy Efficiency, vol. 8, pp. 1251-1261. Information from abstract at <https://emp.lbl.gov/publications/estimating-customer-electricity-and> [↑](#footnote-ref-5)
6. Xcel Energy, 2013, “Partnering for a Better Future,” cited in State and Local Energy Efficiency (SEE) Action Network, “Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution, and Meet Energy Needs in the Power Sector,” p. 12. <https://www4.eere.energy.gov/seeaction/eepathways> [↑](#footnote-ref-6)
7. Aburn, T., 2013, “Building Energy Efficiency and Renewable Energy into the Clean Air Act Planning Process.” Presentation at the ACEEE Market Transformation Conference, Washington, D.C., March 24-26, 2013. [↑](#footnote-ref-7)
8. The Texas Commission on Environmental Quality included NOx reductions from building codes as well as local government and utility energy efficiency programs in a 2005 Dallas-Ft. Worth area SIP revision. See <https://www.tceq.texas.gov/airquality/stationary-rules/nox/eere.html> [↑](#footnote-ref-8)
9. The Texas A&M University Energy Systems Laboratory provides analytic support to the Texas Emissions Reduction Program (TERP), including quantification of emissions reduced by energy efficiency and renewable energy programs. It can serve as an exemplar for other states. See <http://esl.tamu.edu/terp/>. [↑](#footnote-ref-9)
10. U.S. Department of Energy, 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> [↑](#footnote-ref-10)
11. An exception to this is that air quality agencies are familiar with transportation control measures used to reduce emissions from cars, trucks, and other mobile sources. The EPA and state agencies employ recognized models to estimate emission impacts from transportation measures. There is a good analogy between transportation and end-use energy efficiency. [↑](#footnote-ref-11)
12. <https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert>. [↑](#footnote-ref-12)
13. U.S. EPA, 2006, “State Clean Energy-Environment Technical Forum Roundtable on State NOx Allowance EE/RE Set-Aside Programs, June 6, 2006, Call Summary.” <https://www.epa.gov/sites/production/files/2016-03/documents/summary_paper_nox_allowance_6-6-2006.pdf>. [↑](#footnote-ref-13)
14. U.S. EPA, 2012, “Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans, <https://www.epa.gov/energy-efficiency-and-renewable-energy-sips-and-tips>. [↑](#footnote-ref-14)
15. U.S. EPA had included energy efficiency as a major option for compliance with the Clean Power Plan, a rule under a U.S. Supreme Court stay pending litigation at the time of this writing; U.S. EPA, “Fact Sheet: Energy Efficiency in the Clean Power Plan” (<https://www.epa.gov/cleanpowerplan/fact-sheet-energy-efficiency-clean-power-plan>) provides a summary. [↑](#footnote-ref-15)
16. U.S. Environmental Protection Agency, 2016, “Energy Efficiency and Evaluation, Measurement and Verification in State Plans” (<https://www.epa.gov/sites/production/files/2016-01/documents/ee_and_emv_in_the_cpp_1-14-16_-_final_508.pdf>). [↑](#footnote-ref-16)
17. Some states have CO2 and greenhouse gas goals and standards. As noted, the EPA Clean Power Plan rule is under a judicial stay pending resolution of litigation. [↑](#footnote-ref-17)
18. U.S. EPA, 2012, “Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans,” <https://www.epa.gov/energy-efficiency-and-renewable-energy-sips-and-tips> [↑](#footnote-ref-18)
19. Angie Shatas, 2014, “Energy Efficiency (EE) & Renewable Energy (RE) in SIPs – EPA’s Roadmap and a Tour of Several States,” National Air Quality Conference (February 12, 2014), slide 9. <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=0ahUKEwiGrtb_urDPAhWJyT4KHbDFAnQQFggsMAM&url=https%3A%2F%2Fwww3.epa.gov%2Fairnow%2F2014conference%2FCommunications%2FWednesday%2FShatas_final.pptx&usg=AFQjCNHTlSnqs4u9aJn9-uc9pw44scLQbA&sig2=LpXOMA86FdAhIdkvzwdWIA&bvm=bv.134052249,bs.2,d.dmo> [↑](#footnote-ref-19)
20. U.S. EPA, 2012, “Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans,” fig. 7, p. 30. <https://www.epa.gov/sites/production/files/2016-05/documents/eeremanual_0.pdf> [↑](#footnote-ref-20)
21. See <https://www.epa.gov/energy/egrid> [↑](#footnote-ref-21)
22. See <https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert> [↑](#footnote-ref-22)
23. See <http://aceee.org/research-report/e1601> [↑](#footnote-ref-23)
24. See <http://energyefficientcodes.com/energy-codes-make-sense-with-or-without-the-clean-power-plan/> [↑](#footnote-ref-24)
25. Center for Climate and Energy Solutions, Greenhouse Gas Emissions Targets, <https://www.c2es.org/us-states-regions/policy-maps/emissions-targets> [↑](#footnote-ref-25)
26. Regional Greenhouse Gas Initiative <https://www.rggi.org/> [↑](#footnote-ref-26)
27. Assembly Bill 32 Overview <https://www.arb.ca.gov/cc/ab32/ab32.htm> [↑](#footnote-ref-27)
28. U.S. EPA, Clean Power Plan for Existing Plant, <https://www.epa.gov/cleanpowerplan/clean-power-plan-existing-power-plants>; also see U.S. EPA, “Fact Sheet: Energy Efficiency in the Clean Power Plan” <https://www.epa.gov/cleanpowerplan/fact-sheet-energy-efficiency-clean-power-plan> for more on energy efficiency considerations and the State Plan Decision Tree <https://www.epa.gov/sites/production/files/2015-08/documents/flow_chart_v6_aug5.pdf> [↑](#footnote-ref-28)
29. State and Local Energy Efficiency Action Network. February 2016. [*Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution and Meet Energy Needs in the Power Sector*](https://www4.eere.energy.gov/seeaction/system/files/documents/pathways-guide-states-final0415.pdf) [↑](#footnote-ref-29)
30. The IPMVP is a product of the Efficiency Valuation Organization and is available at <http://evo-world.org/en/> [↑](#footnote-ref-30)
31. ASHRAE Guideline 14-2014, Measurement of Energy, Demand, and Water Savings is available at <http://webstore.ansi.org/RecordDetail.aspx?sku=ASHRAE+Guideline+14-2014> [↑](#footnote-ref-31)
32. U.S. Department of Energy, 2015, “M&V Guidelines: Measurement and Verification for Performance-Based Contracts, Version 4.0” <https://energy.gov/sites/prod/files/2016/01/f28/mv_guide_4_0.pdf> [↑](#footnote-ref-32)
33. U.S. Department of Energy, Uniform Methods Project for Determining Energy Efficiency Program Savings <https://energy.gov/eere/about-us/ump-home> [↑](#footnote-ref-33)
34. Lawrence Berkeley National Laboratory, eProjectBuilder, <https://emp.lbl.gov/projects/eproject-builder> [↑](#footnote-ref-34)
35. See <https://www.tceq.texas.gov/airquality/stationary-rules/nox/eere.html>; the Texas A&M University Energy Systems Laboratory provides analytic support, including quantification of energy savings and emissions avoidance, see <http://esl.tamu.edu/terp/>. [↑](#footnote-ref-35)
36. ESPCs can also include water and other resource savings measures and often, by implementing capital upgrades, can offer operation and maintenance (O&M) savings as well. [↑](#footnote-ref-36)
37. AJW, 2014, “Greenhouse Gas Reductions through Performance Contracting under EPA’s Clean Power Plan.” <http://ajw-inc.com/wp-content/uploads/2014/11/PC-111d-technical-paper-with-appendices.pdf> [↑](#footnote-ref-37)
38. Stuart, Elizabeth, [Peter H. Larsen](http://emp.lbl.gov/publications/author/774), [Charles A. Goldman](http://emp.lbl.gov/publications/author/244), and [Donald Gilligan](http://emp.lbl.gov/publications/author/252), 2013, [Current Size and Remaining Market Potential of the U.S. Energy Service Company Industry](http://emp.lbl.gov/publications/current-size-and-remaining-market-potential-us-energy-service-company-industry), Lawrence Berkeley National Laboratory, <http://emp.lbl.gov/projects/energy-services-company-esco-industry-and-market-trends> [↑](#footnote-ref-38)
39. Patterson, A. and C. Hessler (2014). “Energy Efficiency Case Study: Performance Contracting.” 3N Implementation Meeting: Energy Efficiency Compliance Options for 111(d). December. <http://111d.naseo.org/Data/Sites/5/media/events/2014-12-04/espc-patterson-hessler.pdf>. [↑](#footnote-ref-39)
40. Carvallo, Juan Pablo, Peter H. Larsen, and Charles A. Goldman, 2015, “Estimating Customer Electricity and Fuel Savings from projects installed by the U.S. ESCO Industry,” Energy Efficiency, vol. 8, pp. 1251-1261. Information from abstract at <https://emp.lbl.gov/publications/estimating-customer-electricity-and> [↑](#footnote-ref-40)
41. Stuart, Elizabeth, [Peter H. Larsen](http://emp.lbl.gov/publications/author/774), [Charles A. Goldman](http://emp.lbl.gov/publications/author/244), and [Donald Gilligan](http://emp.lbl.gov/publications/author/252), 2013, [Current Size and Remaining Market Potential of the U.S. Energy Service Company Industry](http://emp.lbl.gov/publications/current-size-and-remaining-market-potential-us-energy-service-company-industry), Lawrence Berkeley National Laboratory, <http://emp.lbl.gov/projects/energy-services-company-esco-industry-and-market-trends> [↑](#footnote-ref-41)
42. Coleman, P., S. Earni and C. Williams, Lawrence Berkeley National Laboratory (2014). “Could What That ESCO Sales Rep Said Really Be True? Savings Realization Rates in ESPC versus Bid-to-Spec Projects” Proceedings of the ACEEE 2014 Summer Study on Energy Efficiency in Buildings, Washington, DC: American Council for an Energy-Efficient Economy. August. <http://www.aceee.org/files/proceedings/2014/data/papers/5-1278.pdf>. [↑](#footnote-ref-42)
43. Shonder, J. 2013. “Beyond Guaranteed Savings: Additional Cost Savings Associated With ESPC Projects” Oak Ridge National Laboratory. March. <http://btric.ornl.gov/publications/Publication%2041816.pdf>. [↑](#footnote-ref-43)
44. Carvallo, Juan Pablo, Peter H. Larsen, and Charles A. Goldman, 2015, “Estimating Customer Electricity and Fuel Savings from projects installed by the U.S. ESCO Industry,” Energy Efficiency, vol. 8, pp. 1251-1261. Information from abstract at <https://emp.lbl.gov/publications/estimating-customer-electricity-and> [↑](#footnote-ref-44)
45. The ESPC institutional market is sometimes referred to as “MUSH” (municipalities, universities, schools, and hospitals), in contrast to federal and state agencies and the private sector. [↑](#footnote-ref-45)
46. State and Local Energy Efficiency Action Network. February 2016. [*Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution and Meet Energy Needs in the Power Sector*](https://www4.eere.energy.gov/seeaction/system/files/documents/pathways-guide-states-final0415.pdf) [↑](#footnote-ref-46)
47. This section is drawn from ibid. pp. 73-74, footnotes in the original are omitted here. [↑](#footnote-ref-47)
48. Commons Energy, “How to Create and Build a Public-Purpose Energy Services Company,” <http://www.ppescohowto.org/> [↑](#footnote-ref-48)
49. State and Local Energy Efficiency Action Network. February 2016. [*Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution and Meet Energy Needs in the Power Sector*](https://www4.eere.energy.gov/seeaction/system/files/documents/pathways-guide-states-final0415.pdf) [↑](#footnote-ref-49)
50. U.S. EPA, AP-42: Compilation of Air Pollution Emission Factors. <https://www3.epa.gov/otaq/ap42.htm> [↑](#footnote-ref-50)
51. See <https://www.epa.gov/energy/egrid> [↑](#footnote-ref-51)
52. See https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert [↑](#footnote-ref-52)
53. |  |
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| **To what extent can energy and emissions estimates be relied upon for planning and decision making? (e.g., general estimate of benefits, verified and attributed, other)** |

 State and Local Energy Efficiency Action Network. February 2016. [*Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution and Meet Energy Needs in the Power Sector*](https://www4.eere.energy.gov/seeaction/system/files/documents/pathways-guide-states-final0415.pdf) [↑](#footnote-ref-53)
54. State and Local Energy Efficiency Action Network. February 2016. [*Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution and Meet Energy Needs in the Power Sector*](https://www4.eere.energy.gov/seeaction/system/files/documents/pathways-guide-states-final0415.pdf) [↑](#footnote-ref-54)
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