ENERGY EFFICIENCY PATHWAY TEMPLATE:

Virginia 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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This template was authored by Rodney Sobin, NASEO Senior Program Director, in February 2017.

Contents

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 (CO_2) emissions.[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, 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 CO_2.[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] 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] Maryland's energy efficiency and renewable energy programs provide about 0.60 parts per billion reduction in ambient ozone levels.[7] Texas has included building energy codes, local government measures, and utility energy efficiency programs in its National Ambient Air Quality Standards (NAAQS)

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[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.

[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.

[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/.

[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.

[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

[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

[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.

State Implementation Plans (SIPs) for ozone.[8, 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]

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] 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] 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] EPA provides a roadmap for incorporating EE/RE into NAAQS SIPs.[14] The agency also pointed to energy efficiency as a key means to address CO_2 and greenhouse gas

[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

[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/.

[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

[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.

[12] https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert.

[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.

[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.

concerns.[15, 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 CO_2 and other greenhouse gases, including state-level standards and targets, are also pertinent.[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.

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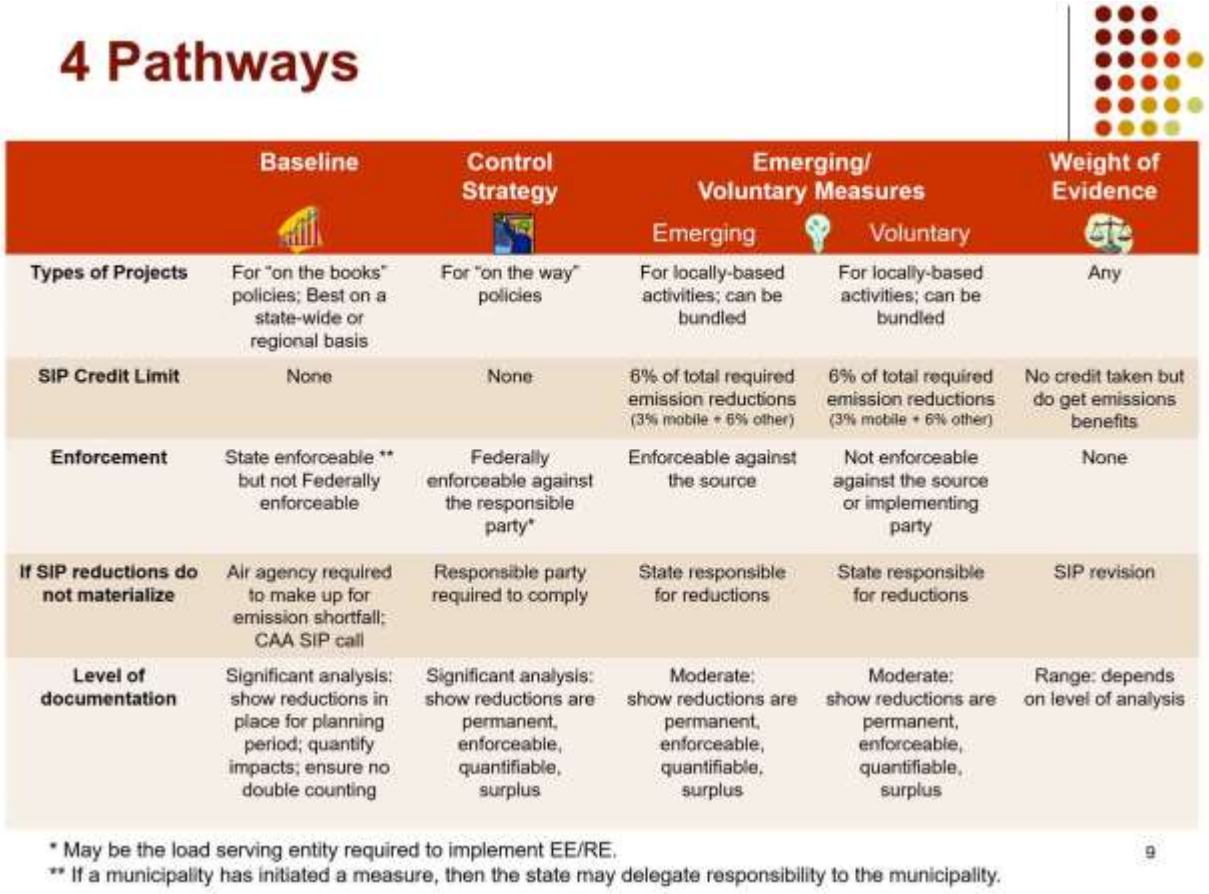
[15] U.S. EPA had included energy efficiency as a major option for compliance with the Clean Power Plan, a rule under a U.S. Supreme Court stay pending litigation at the time of this writing; U.S. EPA, "Fact Sheet: Energy Efficiency in the Clean Power Plan" (https://www.epa.gov/cleanpowerplan/fact-sheet-energy-efficiency-clean-power-plan) provides a summary.

[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).

[17] Some states have CO_2 and greenhouse gas goals and standards. As noted, the EPA Clean Power Plan rule is under a judicial stay pending resolution of litigation.

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] Figure 1 summarizes the four pathways for incorporating EE/RE for NAAQS SIP purposes outlined in its EE/RE Roadmap Manual.[19] Table 1 provides more detail about the projects, characteristics of policies, and programs suitable for each pathway.[20]

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



[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

[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

[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

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* (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 CO_2, NOx, sulfur dioxide (SO_2), methane, and nitrous oxide emissions.[21]
- **AVERT.** The EPA AVoided Emissions geneRation Tool (AVERT) allows for more detailed analyses of avoided emissions on a regional basis.[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] 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 (CO_2, NOx, and SO_2 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-

[21] See https://www.epa.gov/energy/egrid
[22] See https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert
[23] See http://aceee.org/research-report/e1601

specified scenarios to provide emission avoidance projections of CO_2, NOx, and SO_2 as well as several other criteria pollutants and greenhouse gases.[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] Nine Northeastern and Mid-Atlantic state members of the Regional Greenhouse Gas Initiative (RGGI) cap power sector CO_2 emissions.[26] California is mandating greenhouse gas reductions from its power sector and other sources.[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 CO_2 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] 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 CO_2 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 CO_2) 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,

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[24] See http://energyefficientcodes.com/energy-codes-make-sense-with-or-without-the-clean-power-plan/

[25] Center for Climate and Energy Solutions, Greenhouse Gas Emissions Targets, https://www.c2es.org/us-states-regions/policy-maps/emissions-targets

[26] Regional Greenhouse Gas Initiative https://www.rggi.org/

[27] Assembly Bill 32 Overview https://www.arb.ca.gov/cc/ab32/ab32.htm

[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

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: Virginia 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.

Key Issues	General Summary[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** ESPC is used by and encouraged for state and local agencies. The executive branch established state agency energy savings goals, emphasizing ESPC. The Department of Environmental Quality (DEQ) recognizes state ESPC as an emission reduction program under regional Ozone Advance Action Plans.
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,	**Section 1** State and local agencies and bodies in Virginia are authorized to use ESPCs. Executive Order 31 seeks state facility electricity use reduction of 15% by 2017 relative to 2009-10 baseline; EO 31 and State Energy Plan emphasize ESPC Department of General Services provides a prequalified ESCO list, model contracts, and processes. Department of Mines, Minerals, and Energy (the State Energy Office) provides education, contract and technical reviews, and advice to state and local agencies.

[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*

	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.	
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** DEQ Ozone Advance Action Plans reports cumulative CO_2 avoidance from state ESPC projects from 2001 to 2014 as 271,732 tons. Electricity savings estimate (2016-2030) for state, local, and private sector ESPCs:[30] Annual (2030) 3,038,000 MWh; Cumulative 27,662,000 MWh Electricity-related avoided CO_2 projection: Annual (2030) 1,712,000 short tons; Cumulative 15,592,000 short tons Other electricity-related avoided emissions projections (in 2030): NOx 11,600 tons SO_2 29,600 tons
RELIABILITY: How can I document the energy impacts of ESPC programs?	• International Performance Measurement and Verification Protocol (IPMVP).[31] •ASHRAE Guideline 14.[32] • FEMP M&V Guidelines.[33]	**Section 3** ESCOs provide savings guarantees and are required to perform M&V over the life of the contract.

[30] Electricity and emissions savings based on American Council for an Energy-Efficient Economy (ACEEE) State and Utility Pollution Reduction calculator, version 2 (SUPR2).
[31] The IPMVP is a product of the Efficiency Valuation Organization and is available at http://evo-world.org/en/
[32] 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
[33] 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

	• Uniform Methods Project (UMP).[34] • eProject Builder (ePB) to manage project data and benchmark projects.[35]	M&V is generally done in accordance with the IPMVP. State and local ESPC energy savings are reported to DMME; DMME is piloting eProjectBuilder as a tracking tool and is developing an RFP for state facility energy information acquisition, visualization, and analytics.
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** Department of General Services (DGS) is responsible for contractual/procurement processes for state agency/entity ESPCs. DMME is responsible for technical aspects of state agency/entity ESPCs. DMME provides education, training, review, advice and technical assistance for state and local agency/entity ESPCs. Individual state and local agencies and bodies are responsible for customer contractual obligations under ESPC. DMME provides review and assistance on request. ESCOs must meet contractual obligations including energy savings guarantees. ESCOs responsible for performing and reporting measurement and verification (M&V) of savings
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.	**Section 5** DGS receives a fee amounting to 1% of ESPC contract value for administration. Over the last seven years, DMME has received approximately

[34] U.S. Department of Energy, Uniform Methods Project for Determining Energy Efficiency Program Savings https://energy.gov/eere/about-us/ump-home

[35] Lawrence Berkeley National Laboratory, eProjectBuilder, https://emp.lbl.gov/projects/eproject-builder

	• 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.	$250,000 of general funds annually to support ESPC-related work. A small fraction of other funding for state agency energy management also supports ESPC work. From 2002 through 2015, ESCOs have invested $697,337,119 with savings paying for project costs.

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.

Virginia 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 set in the 2014 State Energy Plan and emphasized in Executive Order (EO) 31. ESPC also figures in an ongoing roadmapping exercise focused on energy efficiency for meeting a broader state-wide electricity savings goal.

The Department of General Services (DGS) provides contractual/procurement support for state agencies and its pre-qualified ESCO list and contract language are also available to localities. The Department of Mines, Minerals, and Energy (DMME) 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 Virginia, ESCOs typically use the IPMVP, which is recognized by EPA as a best practice M&V approach, including for application under the CPP.

DMME currently collects financial data on ESPCs over which it has purview. It is in the process of developing a central database and dashboard for state facility energy information, visualization, and analytics to benchmark and track state facility energy use, including for validation of ESPC financial, energy, and emission benefits. The tool would also help target state facilities for ESPC or other energy

efficiency services. The state is also piloting eProjectBuilder as a tracking system in a collaborative project with Georgia, Kentucky, U.S. DOE, and several other partners.[36]

Implementation of these measures would strengthen the ability of Virginia to quantify and track energy savings and emission impacts (and potential broader environmental benefits) of ESPCs and facility energy efficiency upgrades generally. This would strengthen the option of counting ESPC and other energy efficiency savings for air quality management purposes, including broad emissions planning and projection and, potentially, for specific crediting under NAAQS or, potentially, under any future greenhouse gas programs. The DEQ already recognizes ESPCs (via the Virginia Energy Management Program) as an emission control measure under the Ozone Advance program.

The state has tracked annual energy and dollar savings (guaranteed and reported) for more than a decade. However, in recent years it has collected and tracked only dollar savings and extrapolated estimated energy unit savings and imputed emissions avoidance based on the dollar savings.

Projections are offered here, indicating significant energy and electricity savings and avoided CO_2 and criteria pollutant emissions opportunities from expanded ESPC activity.

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 CO_2-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.[37]

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.

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

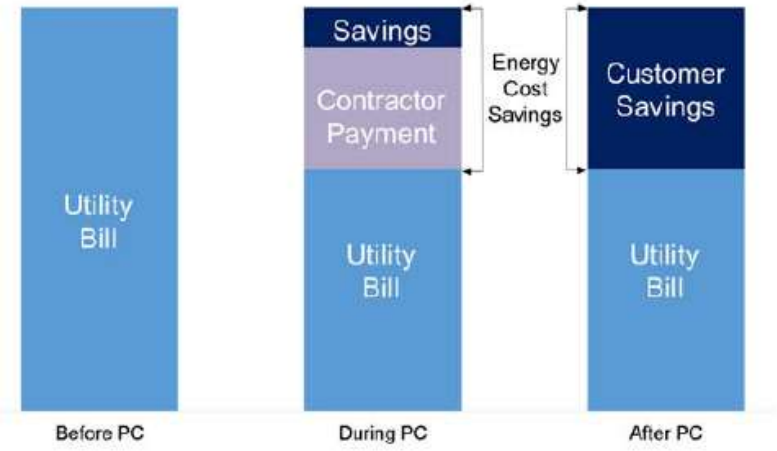
[36] eProjectBuilder is secure web-based data entry and tracking system for energy savings performance contract (ESPC) projects developed by Lawrence Berkeley National Laboratory, https://emp.lbl.gov/projects/eproject-builder

[37] 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/.

maximum cost-effective energy savings.[38] 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[39]



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.[40]

Frequently, performance contracting reduces annual energy use by 15% to 30%.[41] Electricity accounts for an estimated two-thirds of the energy savings for public and institutional (e.g., universities and

[38] 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.

[39] 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

[40] Stuart, Elizabeth, 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

[41] 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.

hospitals) ESPC projects.[42] ESCOs deliver more than $6 billion of projects annually, according to LBNL.[43] 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.[44] 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.[45]

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.[46] 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.[47]

[42] 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

[43] Stuart, Elizabeth, 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

[44] 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.

[45] 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.

[46] 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

[47] 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.

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[48] can be a helpful resource. Then complete the worksheet tables with state-specific information.

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.[49]

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

[48] 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*

[49] This section is drawn from ibid. pp. 73-74, footnotes in the original are omitted here.

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.[50]

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

What is the state's ESPC program and requirements?

The Commonwealth of Virginia has authorized state agencies and local governments (including K-12 public school divisions) to use ESPCs to implement building/facility upgrades that save energy (and water) and finance capital improvements without requiring agencies to employ their own capital budgets. Legislative authorization of the ESPC mechanism has been reinforced by the 2014 State Energy Plan and Executive Order 31, establishing energy facility energy savings objectives emphasizing ESPC as a mechanism to reach those objectives. The state agency ESPC program is part of a broader Virginia Energy Management Program (VEMP) that works to improve energy efficiency and lower energy procurement costs for state agencies and other public bodies.

The state designated the Department of General Services (DGS) as a lead agency supporting administrative and contractual aspects of ESPC for state agencies. DGS provides a list of pre-qualified ESCOs and contract language that is required of state agency ESPCs but is also available for local agencies' use. The Department of Mines, Minerals, and Energy (DMME, which houses the State Energy Office) provides technical support to both state and local agencies considering or performing ESPC, including education and training, advice on technical options, and review of contracts and M&V. DMME collects data from state agency ESPC customers for analysis and reporting to the Administration, legislature, and public. DMME also interacts with the Department of Environmental Quality (DEQ), which includes consideration of ESPCs as a pollution abatement measure under the Ozone Advance program for several regions of the state.

Are related activities occurring that can contribute additional savings?

ESPC is a component of the broader Virginia Energy Management Program (VEMP) that supports energy efficiency and procurement activities to reduce costs for state and public buildings.

The EO31 goal of reducing state facility electricity consumption 15% by 2017 relative to a 2009-2010 baseline emphasizes but is not limited to ESPC as a mechanism for achieving energy efficiency and conservation objectives.

[50] Commons Energy, "How to Create and Build a Public-Purpose Energy Services Company," http://www.ppescohowto.org/

TIP

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.

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[51] can be a helpful resource. Then complete the worksheet tables with state-specific information.

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[52] 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, DMME, or DEQ could take those MWh savings and multiply it by the relevant eGRID non-baseload average emissions factor to provide estimated avoidance of CO_2, NOx, and SO_2. 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.

Virginia DEQ recognizes ESPC as an emission abatement measure in Ozone Advance Action Plans for Fredericksburg, Richmond-Petersburg, and Hampton Roads.[53] DEQ used the "weight-of-evidence" pathway that does not require formal emissions reduction quantification, but enhanced quantification could provide opportunity for greater recognition of ESPC as an air quality management measure.

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[51] 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*

[52] U.S. EPA, AP-42: Compilation of Air Pollution Emission Factors. https://www3.epa.gov/otaq/ap42.htm

[53] Virginia DEQ, "Fredericksburg Ozone Advance Action Plan, Annual Report, 04-30-2016," "Hampton Roads Ozone Advance Action Plan, Annual Report, 04-30-2016," and "Richmond-Petersburg Ozone Advance Action Plan, Annual Report, 04-30-2016."

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?

The 2014 Virginia Energy plan sets a goal for state agencies to save 15% of their electricity consumption as compared to a 2010 baseline by 2017.[54] Executive Order (EO) 31 directs executive branch agencies to use ESPC to meet the goal.[55] DMME is to lead an effort with other agencies, ESCOs, and other stakeholders to develop an Energy Performance Contracting (EPC) Roadmap for the state.

Complementing this, DMME received U.S. Department of Energy (DOE) funding via the State Energy Program (SEP) to develop a statewide Energy Efficiency Roadmap in support of a legislated goal of 10% reduction in electricity consumption by 2022 relative to 2006 base sales.[56] Administratively the goal was advanced to 2020 in the 2014 Virginia Energy Plan.[57] This effort will include ESPC among energy efficiency pathways. It involves the Governor's Executive Committee on Energy Efficiency and the Virginia Energy Efficiency Council. Also, the Governor created a Cabinet-level Chief Energy Efficiency Officer with a charge to enhance ESPC.

Are there consequences of not meeting the targets?

It is unclear.

What are historical energy savings?

DMME does not track energy savings from ESPC; however, state agencies do report recent year net cost savings (net present value), which result from energy savings. Data from 2012 to 2015 show:
2012: $10,197,079
2013: $15,446,316
2014: $16,831,129
2015: $4,109,529

What future energy and emissions savings estimates have been produced and using what assumptions?

ESPC energy savings can be projected for Virginia. The ACEEE SUPR2 calculator is designed to provide high-level estimates of energy and emission impacts of several energy efficiency pathways for screening purposes, including ESPC programs.[58] SUPR2's projections are for

[54] 2014 Virginia Energy Plan https://www.dmme.virginia.gov/DE/PerformanceContractingSupport.shtml
[55] Executive Order 31 (October 16, 2014) Conserving Energy and Reducing Consumption in the Commonwealth of Virginia
[56] SB 1416, Enacted as Chapter 933 of the 2007 Acts of the General Assembly http://leg1.state.va.us/cgi-bin/legp504.exe?071+ful+CHAP0933
[57] 2014 Virginia Energy Plan https://www.dmme.virginia.gov/DE/PerformanceContractingSupport.shtml
[58] The ACEEE SUPR2 Calculator and user manual are available via http://aceee.org/research-report/e1601

ESPCs statewide and are not limited to state and local public sector programs. The SUPR2 tool assumes that the national trend line of 8.7% annual ESPC market growth continues. Table 2 provides SUPR2's projections for annual and cumulative savings and avoided electricity-based emissions through 2030.

Electricity savings estimate (2016-2030) for state, local, and private sector ESPCs:[59]
Annual (2030) 3,038,000 MWh;
Cumulative 27,662,000 MWh

Electricity-related avoided CO_2 projection:
Annual (2030) 1,712,000 short tons;
Cumulative 15,592,000 short tons

Other electricity-related avoided emissions projections (in 2030):
NOx 11,600 tons
SO_2 29,600 tons

Are other environmental impacts estimated?

DEQ Ozone Advance Action Plans reports cumulative CO_2 avoidance from state ESPC projects 2001-2014 as 271,732 tons.

Are other non-energy benefits estimated?

Water, waste, and other non-energy benefits and impacts of ESPC energy savings have not been estimated in this state yet.

TIP

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 CO_2, NOx, SO_2, methane, and nitrous oxide emissions.[60] The EPA AVoided Emissions geneRation Tool (AVERT) allows for more detailed analyses of avoided emissions on a regional basis.[61] 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

Tip (Codes): The ACEEE SUPR calculator allows rough, screening level projection of CO_2, NOx, and SO_2 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 CO_2, NOx, and SO_2 as well as several other criteria pollutants and greenhouse gases.

[59] Electricity and emissions savings based on American Council for an Energy-Efficient Economy (ACEEE) State and Utility Pollution Reduction calculator, version 2 (SUPR2).
[60] See https://www.epa.gov/energy/egrid
[61] See https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert

Table 2. Virginia summary of estimated energy savings and air emissions reductions from ESPC, SUPR2

Summary results

	2020	2025	2030
Cumulative NO_x reductions (short tons)	2,500	6,100	11,600
Cumulative SO_2 reductions (short tons)	6,300	15,700	29,600
Cumulative CO_2 reductions (short tons)	3,315,000	8,246,000	15,592,000
Annual CO_2 reductions (short tons)	772,000	1,149,000	1,712,000
Cummulative net cost (million 2011$)	(60)	(126)	(197)
Cumulative energy saved (MWh)	5,880,400	14,628,600	27,662,000
Annual energy saved (MWh)	1,369,000	2,039,000	3,038,000

* Results are for all selected measures combined (see *Help/v/definitions*).

What does this mean for EPA's Clean Power Plan?

Reduction in emissions required by EPA in 2030 (short tons of CO_2 as % of adjusted 2012 baseline)		23%
Reduction in emissions achieved by selected measures in 2030 (short tons of CO_2 as % of adjusted 2012 baseline)		5%
EPA 2030 emission rate goal (lbs of CO_2/MWh)		934
Emission rate achieved by selected measures in 2030 (lbs of CO_2/MWh)		1,291
Cumulative utility bill savings through 2030 (million 2011$)	$	2,003

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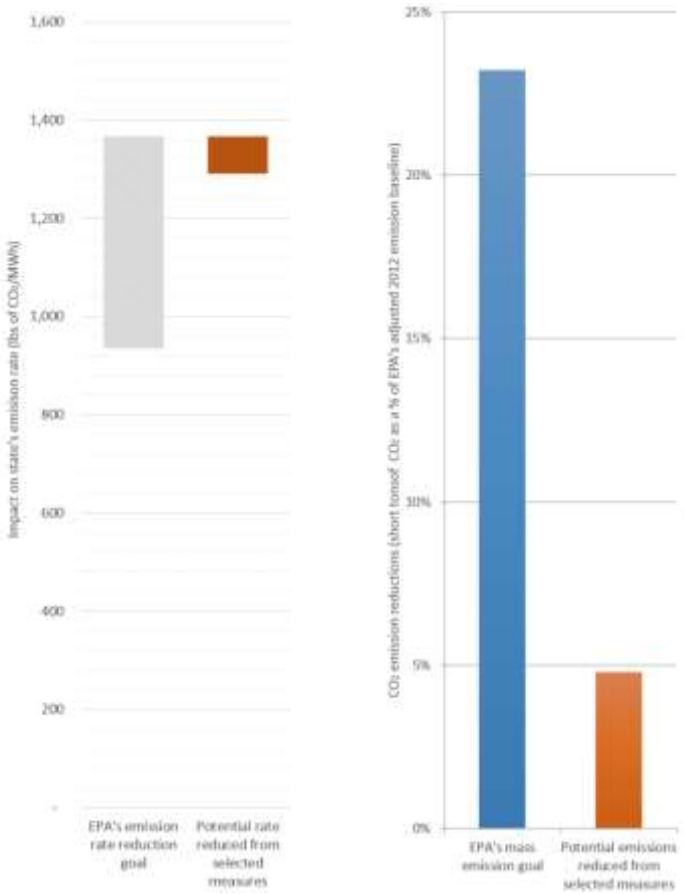
Figure 3. Virginia ESPC projected contributions to meeting CPP rate and mass targets.



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[62] can be a helpful resource. Then complete the worksheet tables with state-specific information.

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? ESCOs are obligated to perform annual M&V to show that energy savings guarantees are being met. DMME receives state and local ESPC financial data for ESPCs that the Department supports. DMME has tracked annual energy and dollar savings (guaranteed and reported) for more than a decade. However, in recent years it has collected and tracked only dollar savings and extrapolated estimated energy unit savings and imputed emissions avoidance based on the dollar savings. While ESPC customer agencies receive ESCO M&V reports, energy savings (in units of energy) have not heretofore been collected and aggregated by DMME. DMME is in process of developing a central database and "dashboard" for energy information , visualization and analytics to benchmark and track state facility energy use, including for validation of ESPC financial, energy, and emission benefits.
Is there currently an evaluation, monitoring, and verification (EM&V) process to confirm energy savings estimates? ESCOs in Virginia generally use well-recognized IPMVP options to support their M&V of projects. IPMVP is a recognized best practice according to EPA in its draft "EM&V Guidance for Demand-Side Energy Efficiency."
Are additional efforts needed to verify energy savings? DMME needs to collect and track agency data on energy use and savings from ESPC customer agencies. Annual verified energy savings would be required for formalized, quantified crediting for air quality management purposes.

[62] 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*

As noted, DMME intends to procure energy information acquisition, visualization and analytics services to benchmark and track energy use data from all state facilities. One purpose of the system is to validate the benefits of ESPC as a tool to reduce energy consumption, costs, and emissions and to improve targeting of ESPC and other energy efficiency services to state facilities with the highest potential for savings.
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) Current estimates have been recognized under the "weight-of-evidence" pathways as emissions abatement measures for the Ozone Advance program. Projections of future state (or public) building energy savings (with distinct projections for electricity and onsite fuel savings) would be needed for planning purposes. This could comport with the state's state facility energy savings goals. Such savings could result from both ESPC and non-ESPC building energy performance improvements. As noted, ESCOs generally use the IPMVP, which is a recognized best practice according to EPA in its draft "EM&V Guidance for Demand-Side Energy Efficiency." The EPA Regional Office should be consulted on quantification and EM&V needs and available pathways for recognition under NAAQS SIPs. Third party verification is not required for broader planning and projection purposes of air quality managers.

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:

TIP

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.

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[63] can be a helpful resource. Then complete the worksheet tables with state-specific information.

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?

State agencies (including state colleges and universities) and localities (including K-12 public school districts) are authorized by statute to enter into ESPCs (Code of Virginia, Title 11, Chapter 6.1, §11-34.1 et seq.).

The 2014 Virginia Energy plan sets a goal for state agencies to save 15% of their electricity consumption as compared to a 2010 baseline.[64] Executive Order (EO) 31 directs executive branch agencies to use ESPC to meet the goal.[65]

Who is responsible for achieving savings? What happens if they are not achieved?

ESCOs are contractually bound to meet savings guarantees.

DGS is responsible for contractual and procurement issues pertinent to state agency ESPCs. DGS maintains a list of ESCOs pre-qualified for state agency ESPCs. DGS also provides standard contract language and associated documents. These are required of state agency ESPCs but can also be used by localities at their option.

DMME has technical responsibilities. It provides education, training, review, advice, and other technical assistance to both state and local agencies considering or engaged in ESPCs. DMME also receives reports from agencies of their ESPCs.

[63] 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*

[64] 2014 Virginia Energy Plan https://www.dmme.virginia.gov/DE/PerformanceContractingSupport.shtml

[65] Executive Order 31 (October 16, 2014) Conserving Energy and Reducing Consumption in the Commonwealth of Virginia

Who monitors and verifies savings? ESCOs perform M&V to show that they are meeting their guarantee or to show efficacy of corrective actions if shortfalls should occur.
What more is needed to monitor and verify savings? Customer agencies with technical support from DMME (or third party contractor) should review M&V reports to assure that savings guarantees are being met and to track energy savings (electricity and onsite fuel use). Such savings data should be reported to DMME to allow tracking of ESPC program and broader state and public building savings efforts. Virginia is beginning to pilot eProjectBuilder as a tracking tool. The tool includes an M&V capability to support tracking of energy savings and, potentially, emissions impact analyses, whether for broad air quality planning or for more rigorous crediting (e.g., Emission Rate Credits and, under some allocation schemes, allowances under the Clean Power Plan). DMME is in the process of developing energy information acquisition, visualization, and analytics services for benchmarking and tracking state facility energy usage, including those operating under ESPCs

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[66] 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?

ESPCs are a shared savings mechanism to achieve energy savings and capital improvements. State or other public agencies can finance ESPC-implemented upgrades without employing either their agency operating or capital budgets. Depending on circumstances, agencies can opt to finance upgrades from their own budgets, through bonding, via revolving loan funds, through lease mechanisms, or using other financing vehicles. For example, the Virginia Resource Authority operates revolving loan funds available for localities and public authorities for energy, local government buildings, water and wastewater, and other projects.

ESPCs pay for themselves so do not require appropriated capital expenditures for energy efficiency measure implementation.

DGS receives a fee amounting to 1% of ESPC contract value for administration.

One DMME staff member serves as lead and a second provides backup for technical services associated with the ESPC program. Over the last seven years, DMME has received approximately $250,000 of general funds annually for this activity. A small fraction of other funding for state agency energy management and procurement can also be used to support ESPC work.

How have costs / funding varied over time?

Funding for program administration, oversight, and technical assistance has been stable; over the last seven years, DMME has received approximately $250,000 of general funds annually to support ESPC among state agencies. As noted, DGS receives a fee of 1% of contract value.

The following figures note cumulative and recent year state agency ESPC investment. As noted, under the ESPC mechanism, agencies finance upgrades through bonding, loan funds, and other financing vehicles without outlay from their own capital budgets. These project investments pay for themselves through energy and other cost savings.

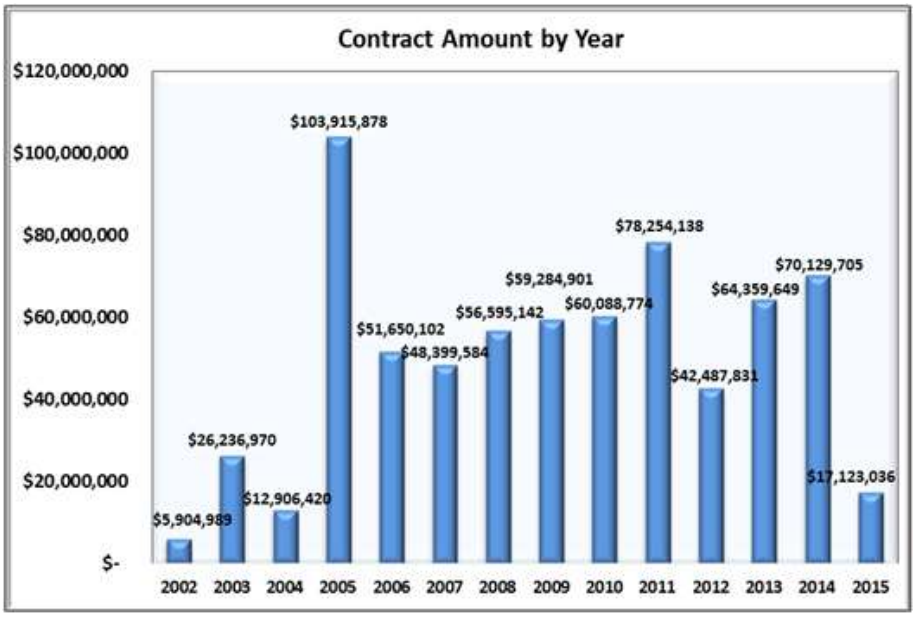
Cumulative state agency ESPC investment during years 2002 through 2015: $697,337,119

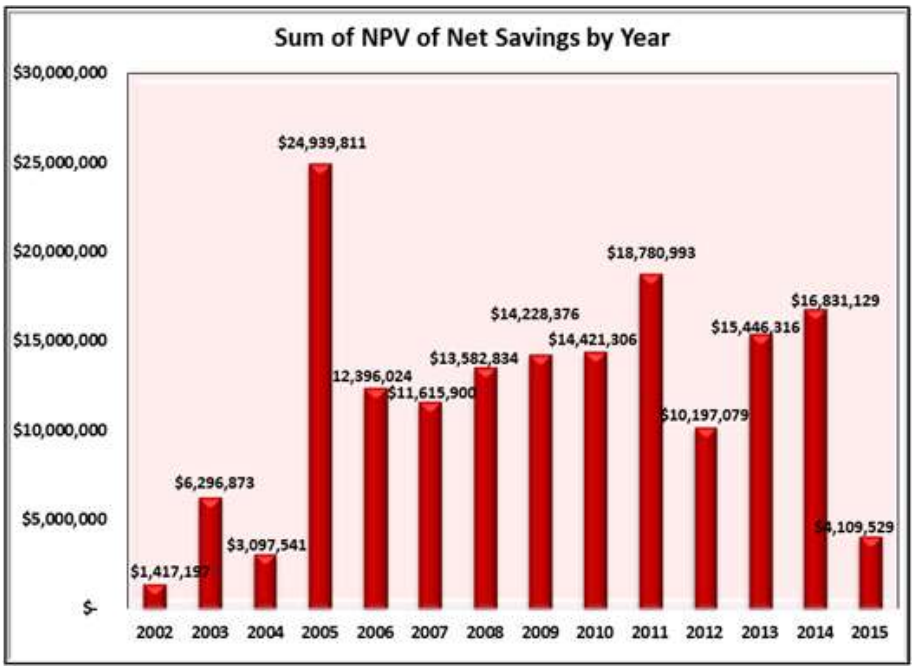
Recent year investment --
2012: $42,487,831
2013: $64,359,649
2014: $70,129,705
2015: $17,123,036

[66] 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*

Recent year net savings (net present value) --
2012: $10,197,079
2013: $15,446,316
2014: $16,831,129
2015: $4,109,529

The following figures illustrate the amount of ESPC investment made under DMME purview and net present value of net savings.





How certain is future funding? As noted in the description of how ESPCs operate, ESCOs and agencies have various sources of funding available to perform projects including bonds, leases, and term loan facilities. As a result, future funding for ESPC is very likely as it is not dependent on appropriations. The 1% of ESPC contract value DGS receives to support administration is not likely to change. Appropriations to DMME have been stable in recent years.
What funding would be needed to fully implement the pathway and document energy savings? As noted, DMME is in process of developing energy information acquisition, visualization and analytics services to benchmark and track energy usage data for all state facilities. Funding for FY2017 and FY2018 has been budgeted. One purpose of the system is to validate the benefits of ESPC as a tool to reduce energy consumption, costs, and emissions and to improve targeting of ESPC and other energy efficiency services to state facilities with the highest potential for 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: Virginia ESPC

DMME 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 DMME with DEQ should continue to better familiarize DEQ with energy efficiency while increasing DMME's understanding of DEQ's perspectives. The two agencies should bring in other pertinent agencies and stakeholders, including the ESCO industry, as appropriate. The current energy efficiency roadmapping exercise, the Governor's creation of a Chief Energy Efficiency Officer position and establishment of the Virginia Energy Efficiency Council strengthen the opportunity for integration of energy efficiency into air quality management.

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: Virginia Energy Savings Performance Contracts (ESPC)

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, 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

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